Doctoral Dissertation

INEQUALITY IN EDUCATIONAL ATTAINMENT: MEASUREMENTS AND DETERMINANTS

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September 2013

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D103619

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A Dissertation Submitted to
the Graduate School for International Development and Cooperation
of Hiroshima University in Partial Fulfillment
of the Requirement for the Degree of
Doctor of Philosophy

September 2013

We hereby recommend that the dissertation by Ms. PRASARTPORNSIRICHOKE JIRADA entitled "INEQUALITY IN EDUCATIONAL ATTAINMENT: MEASUREMENTS AND DETERMINANTS" be accepted in partial fulfillment of the requirements for the degree of DOCTOR OF PHILOSOPHY.

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ABSTRACT

Title of Dissertation: Inequality in Educational Attainment: Measurements and Determinants

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Year: September 2013

The main objective of this dissertation is to analyze an inequality in educational attainment. The author hopes to shed the light on the following questions: 1) what factors determine educational attainment and its inequality? 2) How does educational attainment and its inequality affect economic outcome? 3) Are there any existences of intergenerational transmission of educational attainment and its inequality? The dissertation covers national, provincial, and individual analyses. For national analysis (chapters four and five), the author uses the data of educational attainment from Barro-Lee and Cohen- Soto. For provincial and individual analyses (chapters six and seven), the cross-sectional data from the Household Socioeconomic Survey (SES) which was conducted in 2011 by Thailand's National Statistics Office was obtained for estimations.

After the introductory discussion in Chapter one, Chapter two provides theoretical discussion. Definition of the key concept, inequality in education is identified in comparison with similar terms while its measurement is argued. In addition, theoretical approaches concerned such as the human capital approach, the intergenerational persistence in educational choices, and the wage regression are introduced. Next, more specific review on the empirical literature is conducted, followed by introducing the research methodology and the overall conceptual framework of this dissertation.

Chapter three overviews Thai education. More specifically, education systems, major education indicators including school enrollment and educational attainment as well as educational policies and expenditures are discussed with focusing on historical transition and current status.

Chapter four analyzes the method of measuring degree of inequality in educational attainment in order to splits the whole observations into sub-groups based on given level of educational attainment for finding the degree of contribution by different sub-groups to total inequality in educational attainment. Firstly, the author discovers the empirical evidence for supporting the infeasibility of using the education Lorenz curves in the analysis. The main reason is due to the limitation of macroeconomic data on educational attainment. Secondly, the author found that the pattern of diminishment in inequality in educational attainment overtime is different between advanced countries and less developed countries. The greater equality in educational attainment of the former comes from an abatement of population with primary education and the additions of population with secondary and tertiary educations. On the contrary, in the case of the latter group, a decrease in an inequality in educational attainment is caused by the shrinkage of people with no schooling and the rise of population with primary and secondary levels of education.

Chapter five investigates a macroeconomic factors influencing inequality in educational attainment during the period of 1975 to 2005 with five-year intervals and examines the impacts of educational attainment and its inequality on labor productivity on a national level from 1950 to 2010 with five-year intervals. In a part of determinants, there are two major findings. Firstly, the author found that direct factors to schooling are not significant while indirect factors to schooling have significant impacts on inequality in educational attainment. Secondly, the author found quadratic (U-shape) relationship between rural growth rate and

inequality in educational attainment. So the higher rural growth rate brings both an increase and a decrease in inequality in educational attainment with turning point at rate -1.88. In a part of impact on labor productivity, according to our findings, educational attainment strongly and positively affects a level of labor productivity. On the contrary, the insignificant association between inequality in educational attainment and labor productivity is found as expected. Therefore, a change in degree of inequality in educational attainment does not affect the national labor productivity.

For the provincial and individual analyses, a case study of Thailand, begin with chapter six. This chapter aims to investigate inequality in educational attainment in Thailand. The author employs Gini coefficients and Theil index to assess and decompose the unequal distribution of Thai educational attainment. At national level, an average number of years of schooling are 7.63 years, Gini coefficient is 0.349, and Theil index is 0.215. At regional level, the author found that the northern part of Thailand shows the largest inequality in educational attainment while in other parts of Thailand the levels of inequality in educational attainment are slightly lower. The biggest Gini coefficient is from Mae hong son (Northern) and the smallest is from Nonthaburi (Central). The biggest (0.521) is nearly double the smallest (0.272). When comparing gender groups, there is more equal distribution of educational attainment in the male group. If breaking inequality in educational attainment down into subgroups of gender, age group, province, and region; the between-group inequality in educational attainment is smaller than that of the within-group while among the sub groups of educational level the former is larger than the latter.

The advantage of the study in chapter six is that inequality in educational attainment is more precisely computed by using individual data in the analysis. This freed us in two constraints from the previous studies. Firstly, the author can measure years of schooling for

dropouts at many levels without assuming half completion. Secondly, range of education levels becomes wider. The author includes the graduate (master and doctoral) level of educational attainment in the analysis. Expanding the variety of education reflects real numbers of years of schooling. This prevents an underestimation of inequality in educational attainment.

Passing on to chapter seven, its objectives are to investigate the determinants of educational attainment and its inequality, particularly the intergenerational transmission of educational attainment and its inequality as well as examine private returns to education of workforce age (25 to 60 years old) in Thailand. The findings of this chapter are that, the intergenerational transmission of educational attainment is at least partly found in Thailand when the intergenerational transmission of inequality in educational attainment is also clearly found in Thailand. Father's educational attainment is almost twice as important on influencing children's educational attainment as mother's educational attainment. The author also found that interaction term between household's educational attainment and financial assets is negatively associated to children's educational attainment while individually regressors are positively related to children's educational attainment. The liquidity constraint plays the most significant role on children's educational attainment.

In addition, the author found a nonlinear relationship (inverted-U-shape) between the difference in age between parents and children at the turning point approximately 30 years due to mature age and generation gap. The negative relationship of children's age and their educational attainment is confirmed. That is because of institutional and time effects. The author found the unequal opportunity of accessing in education in the specific groups as disable-at-birth people and tribal.

Last but not least, in this chapter, the average number of years of schooling for females is larger than that for males. The author found improvement of gender parity in Thailand. The findings are that the rate of private returns to education is 12.4 percent. The impact of education on log hourly earnings for females is higher than for males under the regressor years of schooling. On the other hand, under the regressor educational dummy variables, rates of return to higher education (undergraduate, master, and doctoral) for males are greater than for females.

Based on all those analytical results, the author answered three research questions of the dissertation as follows. Firstly, at national level, past inequality in educational attainment, educational attainment, and ratio of capital to GDP significantly determine current level of inequality in educational attainment. In a case of Thailand, parental inequality in educational attainment, educational attainment, and population density significantly influence degree of inequality in educational attainment. In addition, the author found parental educational attainment, household wealth, household incomes, and difference in age between parents and children are significantly associated with children's educational attainment.

Secondly, the results of analyses show that educational attainment plays a significant role of increase in labor productivity and individual earnings while the author could not find the significance of inequality in educational attainment on labor productivity. Last but not least, the author found existences of intergenerational transmission of educational attainment and its inequality.

Keywords: Inequality in educational attainment, Years of schooling, Gini coefficient, Theil index, Intergenerational transmission, Rate of return, Labor productivity.

JEL classification Codes: I20, I21, O15

ACKNOWLEDGEMENTS

The author would never have been able to finish this doctoral dissertation without the guidance of my advisor and committee members, help from friends, and support from my family.

The author would like to express the deepest gratitude to my advisor, Associate Professor TAKAHASHI Yoshi, for his excellent guidance, caring patience and providing me with an excellent atmosphere for doing research.

Besides my advisor, the author would like to thank my committee members, Associate Professor GOTO Daisaku, Professor ICHIHASHI Masaru, Professor KANEKO Shinji, and Professor INTARAKUMNERD Patarapong for their insightful comments, thoughtful questions and invaluable suggestions.

The author expresses my appreciation to Associate Professor CHAROENPORN Peera. Advice and comments given by him has been a great help in my dissertation.

The author also would like to express my gratitude to Japanese Government for their financial support for studying master and doctoral courses in Hiroshima University.

The author also would like to thank my friends, Songyoo Khemarat and Supsrisanjai Wansiri, for their helps and supports in econometrics and English proofreading.

The author would like to thank Homklin Tassanee and Siau Jia Jia, who as good friends, were always willing to help, giving their best suggestions and encouraging me.

Last, but by no means least, special thanks to my mother, elder sister, and younger brother. They were always supporting me and standing by me through the good and bad times. Without my mother's encouragement, the author would not have finished the degree.

For any errors or inadequacies that may remain in this study, the responsibility is entirely my own.

Prasartpornsirichoke Jirada

September, 2013

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LIST OF ABBREVIATIONS

The following table describes the significance of various abbreviations and acronyms used throughout the dissertation. The page on which each one is defined or first used is also given.

Abbreviation	Meanings	Page
MDGs	Millennium Development Goals	1
SES	Socioeconomic Survey	5
NSO	National Statistics Office	5
R&D	Research and Development	15
UNU-WIDER	World Institute for Development Economics Research	25
OLS	Ordinary Least Squares	25
WLS	Weighted Least Squares	25
GPI	Gender Parity Index	32
EB	Educational Budget	33
GDP	Gross Domestic Product	33
NB	National Budget	33

CHAPTER 1

INTRODUCTION

"Education is the key to creating, adapting and spreading knowledge… But the gains in access to education have been unevenly distributed, with the poor seldom getting their fair of share."

World Bank, World Development Report, 1998/99

1.1. Introduction

In recent decades, economists have paid more attention to 'Human Capital' and added it as the third important input into the production function after physical capital and labor. Schultz (1961) identified four channels of investment in human capital. One out of the four channels is '***Investment in education'***. The huge benefit of education is significantly observed for a long time not only in the economic impacts like; equalizing income distribution and developing economic growth but also in the non-economic effects as; increasing democracy, reducing criminal, increasing life expectancy, and so forth. The issue of education is included in the Millennium Development Goals (MDGs)[1].

[1] United nation Development Programme (UNDP) launches eight Goals of MDGs achieving in 2015 as follows;
Goal 1 - Eradicate extreme poverty and hunger
Goal 2 - Achieve universal primary education
Goal 3 - Promote gender equality and empower women
Goal 4 - Reduce child mortality
Goal 5 - Improve maternal health
Goal 6 - Combat HIV / AIDS, malaria and other diseases
Goal 7 - Ensure environmental sustainability
Goal 8 - Develop a global partnership for development

Education is not only an investment but also a consumption. Individuals and households are ones that make the decision of investment in education depending on the opportunity cost, education is public and merit good. Therefore the government's intervention of providing the basic education is necessary. Thus, individual/household and the government are two important players in the education market. The former creates demand for education and latter partly provides the supply of education[2].

As scholars know, there are various aspects of education[3]. This study raises the issue of educational attainment by focusing on the dimension of inequality. The author utilizes the concept of equality in educational attainment from Warnock (1975) who argues that people should get equal rights to education. The equal rights are in terms of *'a certain amount of education, and the chance or opportunity to get more than this if people want it*'. Even though equal access to education is the basic human rights which everyone is entitled in every country (Thomas, *et al*., 2000), the education gaps still exist between various groups in many countries. Study on inequality in educational attainment is one of welfare consideration reflecting population's living in the sense of inequality of opportunities and income distribution (Thomas, *et al*., 2000).

This study chooses Gini coefficients and Theil index as measures of inequality in educational attainment. The author analyzes the factors influencing educational attainment, its inequality and its impacts on economic outcomes. The analyses cover national, provincial, and individual levels. In the case of national analysis, the author works on international level of data. For the provincial and individual analyses, the author specifically selects Thailand as the

[2] The author mentioned the government partly provides supply of education due to the availability of private schools generally.

[3] Park (1996) mentioned four types of education variables used in explaining income distribution "(1) a flow variable of education such as enrollments at different levels of education, (2) a stock variable of education such as the mean or median years of schooling of the labor force, (3) the rate of return on education at the different levels of education, and (4) the dispersion of educational attainment" (p. 52).

case study. Thailand is chosen since it is a developing country, which is not an extreme case of inequality in educational attainment; like developed countries with high equality or less developed countries with low equality.

This study carefully avoids using the word 'educational attainment' as 'human capital'. As explained by Schultz (1970), 'b*y concentrating on education, we are in danger of losing sight of other sources of human capital and, not seeing their contributions, credit some of them to education'* (p. 299). So inequality in educational attainment should be discussed separately from inequality in human capital.

1.2. Objectives of study

The main objective of this dissertation is ***to analyze educational attainment and its inequality*** at national, provincial, and individual levels;

National level analysis

Chapter 4:

1).To measure inequality in educational attainment by Lorenz curve at national level,

2).To test the dominance of the education Lorenz curves,

3).To identify the causes of improvement of equality in educational attainment overtime,

Chapter 5:

4).To identify the relationship between educational attainment and its inequality,

5).To examine factors determining inequality in educational attainment,

6).To investigate the impact of educational attainment and its inequality on labor productivity,

Provincial and individual level analysis: A case of Thailand

Chapter 6:

7).To assess inequality in educational attainment,

8).To decompose inequality in educational attainment,

Chapter 7:

9).To analyze an intergenerational transmission of educational attainment at individual level,

10).To investigate factors influencing educational attainment at individual level,

11).To examine relationship between educational attainment and its inequality at individual level,

12).To analyze an intergenerational transmission of inequality in educational attainment at provincial level,

13).To determine factors influencing inequality in educational attainment at provincial level,

14).To investigate rate of private return to education.

1.3. Significance of study

This study provides significant information to researchers and policy makers about inequality in educational attainment.

As found in this study, there are many limitations in previous studies of inequality in educational attainment. For this reason, findings from this study are beneficial for further development in this field.

For policy makers, this study provides the current situations of inequality in educational attainment worldwide as well as on a specific country. In addition, this study explains how

important an increase in educational attainment and a reduction of inequality in educational attainment in the current generation are to future generations and what factors influence educational attainment and its inequality. These factors are crucial for setting appropriate policies to improve public standard of living.

1.4. Scope of study

This dissertation measures ***'educational attainment'*** by ***'number of years of schooling'***. The target group of observation in this study is population aged 25 years and older. The study applies the theory of schooling, the model of intergenerational transmission, Cobb-Douglas production function, and Mincerian earnings function to analyze educational attainment and its inequality.

The main analyses are horizontally separated into two parts; *national-level analysis* and *individual- and provincial-level analyses*. Both parts utilize the secondary data to estimate the results. The former employs a panel data mainly from Barro-Lee[4], Cohen-Soto, the World Bank, World Institute for Development Economics Research (UNU-WIDER), and Penn World Table 7.1 in the country level. The maximum number of countries is 146 countries in the world due to data of educational attainment by Barro-Lee. Time-frame of the study in national analysis is from 1950 -2010, with five-year interval to make as the longest coverage as possible based on the available data. This follows the data on educational attainment by Barro-Lee. The data source was chosen because it is the most comprehensive one both in years and countries and it is expected that we can make our analysis in the most general way.

[4] Barro and Lee are two famous economists who compute and distribute data on educational attainment every five years.

The latter uses a cross-sectional data set from the Household Socioeconomic Survey (SES) which was conducted in 2011 by Thailand's National Statistics Office. The survey randomly chose households from 76 provinces in Thailand. Time-frame of the study in provincial and individual analyses is in 2011 which is the latest year of SES data to identify the latest status of the matter in Thailand more specifically.

In the analysis section, this dissertation covers a part of measurements of inequality in educational attainment; Gini coefficient and Theil index and a part of determinants of educational attainment and its inequality. A part of economic outcomes is constructed for supporting both previous analyses. Data analyses are carried out by Ordinary Least Squares (OLS), Fixed-effect, and Feasible Weighted Least Squares (WLS) estimates.

1.5. Contributions of study

The study on inequality in educational attainment in this dissertation provides own contributions of study as follows;

1. This study argues underestimation of inequality in educational attainment of the previous studies. More levels of education are identified; more precise measurement is implemented in terms of degree of inequality in educational attainment (chapters 4 and 6). Application of more precise data the determinants and economic outcomes of educational attainment and its inequality (Chapters 5, 7).

2. This study found the rural population growth contributes inverted-U shape relationship with inequality in educational attainment (chapter 5).

3. This study found, in the case of Thailand, intergenerational transmission of educational attainment and its inequality which mentions that reduction of inequality in educational attainment in this current generation can improve equality in educational attainment in the next generation (chapter 7).

4. This study identifies characteristics of Thailand. The author found the greater contribution of father's education to children's educational attainment than mother's education. In addition, the author found that the difference in age between parents and children can negatively and positively affect children's educational attainment (chapter 7).

1.6. Organization of study

This dissertation is divided into eight chapters as shown in figure 1-1. The following chapters, focusing on specific themes, occupy the rest of the study. Chapter two reviews related theoretical and empirical backgrounds and describes research methodology of the whole dissertation. Chapter three provides general information of the Thai education system.

The next four chapters, four to seven, are the main analysis parts of the dissertation. As shown in figure 1-1, the main analyses are horizontally separated into two parts; 'national analysis' and 'individual and provincial analyses' and vertically classified into three parts; measurements of inequality in educational attainment, determinants of educational attainment and its inequality, and the impact of educational attainment and its inequality on economic outcomes.

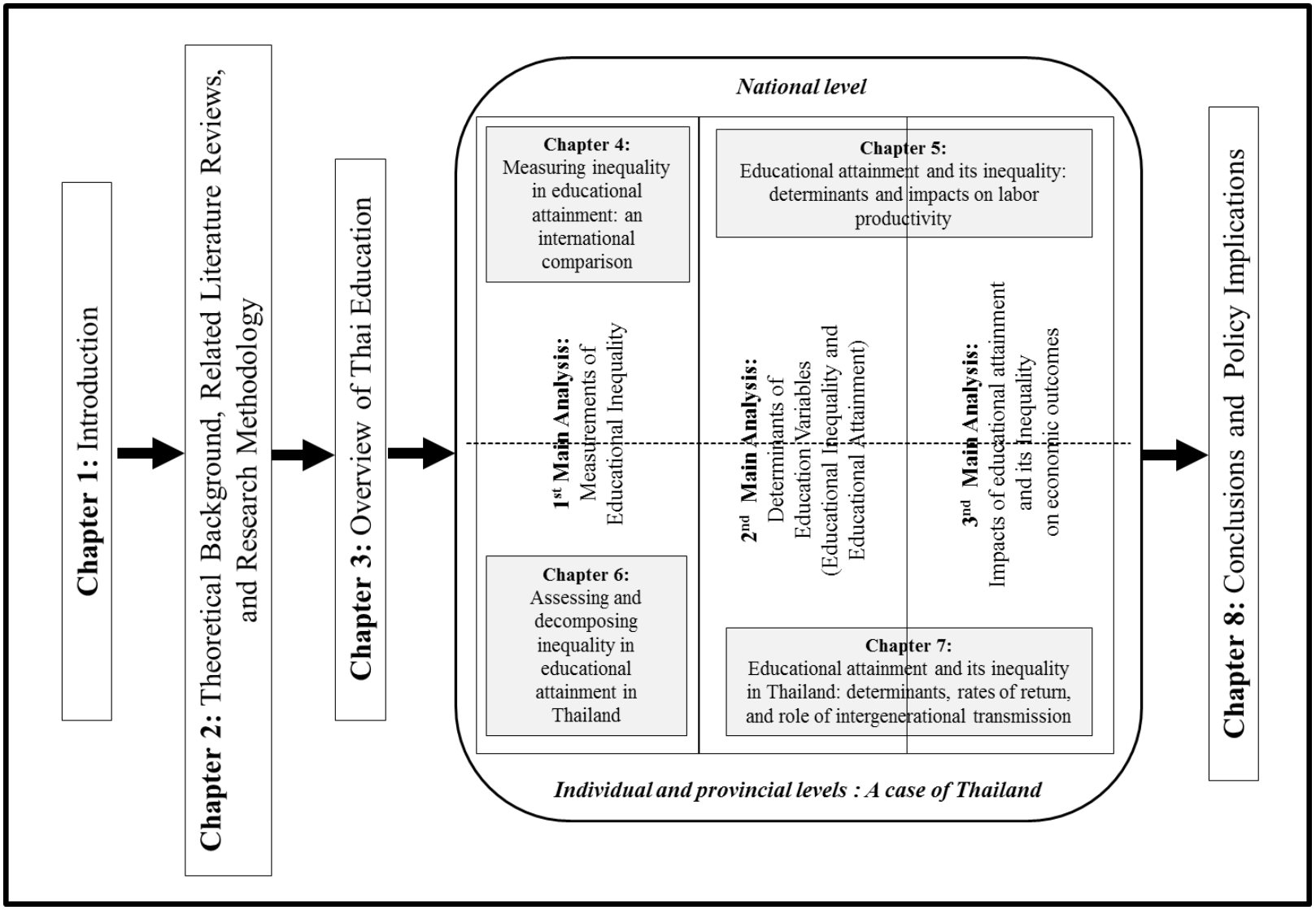
In the national analysis, Chapter four presents the measures of inequality in educational attainment in the international comparison by using the education Gini coefficients. In addition, the author provides evidence from 15 Asian countries to answer the difficulties of

using the education Lorenz curve as a measure of educational inequality by employing the concept of the dominance of Lorenz curve. Furthermore, the population is divided by the level of education for pointing out causes of greater equality in educational attainment for world, advanced countries, and less developed countries overtime. Chapter five examines the macroeconomic factors determining inequality in educational attainment and investigates the impacts of educational attainment and its inequality on labor productivity in an unbalanced panel data for the period 1950 to 2010, with five-year intervals. In addition, the author further looks into the relationship between an average number of years of schooling and the education Gini coefficient.

Moving to the second analysis, Thailand is selected as a specific country for individual and provincial analyses. Beginning with Chapter six, the author assesses inequality in educational attainment in Thailand by geographic information. In addition, inequality in educational attainment is decomposed by subgroup of gender, region, province, age in this chapter. Moving on the next chapter, Chapter seven examines determinants of educational attainment and its inequality and investigates private rates of return to education in Thailand. The author concentrates on the effect of the intergenerational transmission on educational attainment and its inequality.

For the conclusion, Chapter eight summarizes the overall dissertation. The policy implications and limitations are included in this chapter.

Figure 1-1: The structure of dissertation



Source: Outlined by Author

CHAPTER 2

THEORETICAL BACKGROUND, RELATED LITERATURE REVIEWS, AND RESEARCH METHODOLOGY

2.1. Concept and definition of *'Inequality in Educational attainment'*

Firstly, the author will start with the definition and measurement of inequality in educational attainment. Due to the fact that the concept of inequality in educational attainment is broad, the meaning of inequality in educational attainment is equivocally identified. There are many familiar economic terms that are overlapped in terms of meanings such as inequity in education and inequality of educational opportunity. Warnock (1975) simply mentioned the difference between the two as 'everyone has an equal right to education and everyone has a right to equal education' (p.3). This section elaborates the inequality in educational attainment in more detail.

2.1.1. Definition of 'Inequality in Educational attainment'

❖ *The equality in educational attainment*

According to the previous researches, the definition of inequality in educational attainment is ambiguous and various depending on the educational variables in use. Basically, economists defined equality in educational attainment as the rights to education for all citizens. Warnock (1975) described an equal right as two different things that citizen should be entitled to; '***to a certain amount of education, and the chance or opportunity to get more than this if they***

want it' (p. 4). Both balances between 'what people want and what they need' (p.4). But practically in the measurement, the author cannot capture those aspects precisely. Thomas et al. (2000) mentioned three indicators of measuring inequality in education on both quantity and quality sides as (1) flow variable: enrollment ratios, (2) stock variable: educational attainment (an average number of years of schooling), and (3) quality of schooling measured by two aspects which are input approach (resources for schooling) and output approach (test score of cognitive performance).

This dissertation utilizes on the concept of inequality in educational attainment by Warnock (1975). However, due to the unavailability of data concerned, the variable of educational attainment, particularly number of years of schooling, is selected for measuring inequality in educational attainment. It has two advantages compared with other indicators. Firstly, number of years of schooling can explain the distribution shape of educational attainment better than enrollment ratios. Secondly, using educational attainment can be applied to the workforce age at the time covering larger group of population compared to enrollment ratios which can only capture school-age population. However, there is a disadvantage of using educational attainment for its inequality that is criticized for being focused on the dimension of quantity of education without capturing quality of education.

❖ *Equality in educational opportunity*

The definition of equality of educational opportunity is similar to equality of opportunity generally. Blaug (1972) defined the concept of equality of educational opportunity as follows;

> Equality of educational opportunities is a somewhat ambiguous concept. Does it mean (a) equal amounts of education for everyone, (b) education sufficient to bring everyone to a given standard or (c) education sufficient to permit everyone to reach their endowed potential? No country has adopted the first interpretation at all levels of education. The second interpretation is sufficient to account for compulsory attendance laws but is of no help in making decisions about education above the minimum prescribed level. The third no doubt corresponds to the everyday meaning of 'equality of educational opportunities'. (pp. 115-116)

The terminology of inequality of opportunity put forward by Roemer (1998) on the relationship with circumstances; factors outside the individual's control, and effort; factors subject to the individual choice. Equality of opportunity happens when the potential is achieved as the outcome of individuals' choosing.

❖ *Equity in education*

The concept of equity in education concerns the differences in personal and family backgrounds of current pupils and students. Like equality in education, definition and scope of equity in education are broad and depend on how the economists scope down in their research fields. Basically, equity in education has two dimensions; *fair and inclusive education*. The former means that "making sure those personal and social circumstances should not be an obstacle to achieving educational potential" and the latter is defined as "ensuring a basic minimum standard of education for all" (OECD, 2008, p. 2).

For example, Opheim (2004) described equity in education in his research as "the demographic characteristics of socio-economic background, place of residence, ethnic background, and gender are used as indicators of measuring how groups of pupils and students

are different. Thus, analyzing equity in education involves studying access, participation, achievement and educational outcomes among pupils and students with different demographic characteristics in the educational system" (p.8). Therefore, equity of education focuses on the population during school age while inequality in educational attainment concentrates on the population who has completed their education already.

2.1.2. Measurement of inequality in educational attainment

A method of measuring degrees of inequality in educational attainment is adapted from the theory of income distribution. Basically, two measures of dispersion; ***absolute***; standard deviation, and ***relative***; Gini coefficient, Theil index, mean log deviation, and so forth, are applied for examining inequality in educational attainment. Scholars used many educational variables for evaluating different types and degrees of inequality in educational attainment such as enrollment rates and an average number of years of schooling.

Hence, the author again relies on the discussion on income inequality that has more arguments historically, Haughton and Khandker (2009) mentioned six criteria that make a good measure of income inequality as follows;

1. *Mean independence*. If all incomes were doubled, the measure would not change.
2. *Population size independence*. If the population were to change, the measure of inequality should not change, all else equal.
3. *Symmetry*. If any two people swap incomes, there should be no change in the measure of inequality.
4. *Pigou-Dalton Transfer sensitivity*. Under this criterion, the transfer of income from rich to poor reduces measured inequality.

5. *Decomposability*. Inequality may be broken down by population groups or income sources or in other dimensions.

6. *Statistical testability*. One should be able to test the significance of changes in the index over time.

These criteria are general ones and can be applied to inequality in educational attainment. In general, there are two methods of measuring dispersion; first is absolute dispersion and second is relative dispersion. In this regard, relative measures are better than absolute ones. Since the number of the observations is varied in each country and province, the absolute measure of dispersion is not able to compare degree of inequality in educational attainment between countries or between provinces in the case of different size of population.

In this dissertation, the author uses Gini coefficient and Theil index, two of the relative indicators, measuring the inequality in educational attainment with different purposes. The Gini coefficient of educational attainment is employed in the regression equations while Theil index utilizes for decomposing the components of inequality in educational attainment. The author should adopt Gini coefficient for commonly assessing inequality in educational attainment because the range of Gini value is between zero and one while Theil index's value is between zero and log N (N is number of sample). Employing Gini coefficient for assessing inequality in educational attainment makes it easy to compare levels of inequality in educational attainment between countries and provinces. Gini coefficient has a disadvantage in 'unable to decompose' while Theil index and log of variation are able to decompose. Thus, the author uses Theil index for decomposing inequality in educational attainment.

2.2. Theoretical approaches

In this section, the author presents the related economic theories in the dissertation. Three theories are involved; the human capital approach by Becker (1975) and Lucus (1988) & Romer (1989), the intergenerational persistence in educational choices by Checchi (2006), and the wage regression by Mincer (1974).

- *The human capital approach*

Two theories of human capital are presented in this part. The first is human capital theory by Becker (1975) and the second is human capital approach in endogenous growth theory by Lucas (1988) and Romer (1989).

Theory of investment in human capital by Becker (1975) analyzes the effect of human capital on many economic variables such as earnings and employment. Schooling[5] is analyzed as a source of human capital. Indirect costs of schooling are calculated from the opportunity cost of going to school instead of working ("the difference between what earnings could have been and what is earned" (p.38)). Direct costs of schooling are for example tuition, fee, books and others. Net earnings are defined as the difference between actual earnings and direct costs of schooling. "Thus schooling would increase the age-earnings profile, mix together the income and capital accounts, introduce a negative relation between permanent and current earnings of young persons, and implicitly provide for depreciation on its capital" (Becker, 1975, p.39).

[5] According to economics of education, there is a positive relationship between formal education and on-the-job company training. "Firm tends to invest more in workers with more schooling they have because these workers can improve their productivity more easily (cheaply) from having specific training grafted on to their knowledge acquired through formal schooling" (Perlman, 1973, p. 32).

Lucas (1988) model demonstrated the relationship between human capital and growth by combining Solow model with focus on the technological change as the engine of growth and Becker (1975) model related to human capital term. Production is a function of physical capital, effective labor, and human capital. Human capital is specified two times because the model captures the internal effect of human capital; individual's human capital, and the external effect of human capital; human capital at the society level. For individual's human capital, the worker with human capital is supposed to be as productive as two workers.

This theory concentrates on how an individual allocates his/her time for several activities which impact his/her productivity. The approach assumes that workers allocate their time for non-leisure time to current production or leisure time to human capital accumulation. Then the growth rate of human capital depends on the leisure time for learning new skill, years of schooling, period for on-the-job training are determinants of human capital.

Romer (1989) approach in endogenous growth theory focuses on human capital from primary, secondary, or higher education and from number of scientists, technicians, and engineers. Technology is from stock of idea or knowledge. Therefore, change in technology depends on the amount of R&D and the number of scientists, technicians, and engineers or workers in the R&D sector. Both approaches from endogenous growth theory stated that human capital is one factor which that impacts the level of output.

The model of human capital by Becker (1975) explains the different levels of the total amount invested in human capital due to differences in demand and supply conditions with two controversial approaches; 'Egalitarian' and 'Elite'. The former believes the identical demand conditions of investment in human capital. The level of investment in education is varied due to a difference in supply conditions. Difference in supply conditions (difference in environment) give some opportunities to invest more than others. On the contrary, the latter

believes the other conditions of supply. The different levels of investment in education are from the differences in abilities.

- A model of intergenerational persistence in educational choices

Checchi (2006) mentioned four channels of intergenerational persistence in educational choices. There are (1) individual unobservable abilities, (2) family cultural background, (3) family financial resources, and (4) public resources. His explanations concentrate more on the second, the third, and the fourth sources of intergenerational persistence. That is because although the unobservable abilities are able to be transmitted by genetic but they are low in contribution to intergenerational mobility (Checchi, 2006). The second channel is through the educational system. "The cultural background within a family is made more homogenous, and the influences received by each parent reinforce one another" (p.216). Financial resources link to public resources. Poor families have access to education or to better schools due to greater public resource allocation.

Moving to the theoretical model of intergenerational persistence introduced by Checchi (2006), the earnings (Y) of individual *i* in generation *t* are identified by their education (E) and ability (A) as follows;

$$Y_{it} = \beta E_{it} + \varepsilon A_{it} + w_{it} \quad (2.1)$$

The generational effect from the parent's generation (*t-1*) can be transferred to the children's generation (*t*) from equation (2.1) by two factors that are education and genetic

ability. Checchi indicated the relationship between two generations of both variables as follows;

$$A_{it} = \delta + \alpha A_{it-1} + e_{it} \quad \ldots\ldots (2.2)$$

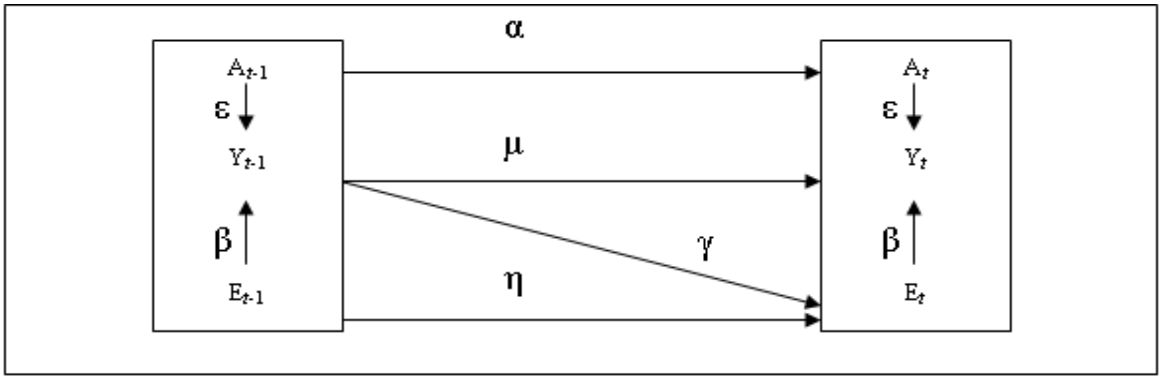
$$E_{it} = \eta E_{it-1} + \gamma Y_{it-1} \quad \ldots\ldots (2.3)$$

Checchi also mentioned the impact of family networking on earnings of individual *i* belongs to children's generation as follows;

$$Y_{it} = \beta E_{it} + \varepsilon A_{it} + \mu Y_{it-1} w_{it} \quad \ldots\ldots (2.4)$$

Figure 2-1 depicts the channels influencing the intergenerational mobility by Checchi (2006) which corresponds to equation (2.1) – (2.4) previously;

Figure 2-1: Intergenerational transmission



Source: Checchi (2006), p. 222.

- The Mincerian earnings function

At the beginning, under the schooling model and distribution analysis, Mincer (1974) initially provided the wage regression in the labor market which simply "shows the logarithm of potential earnings to be a strict linear function of time spent at school" (p.11) as follows;

$$\ln Y_s = \ln Y_0 + rs \quad \ldots\ldots (2.5)$$

Where Y_s is the annual earnings of an individual with s years of schooling; s is number of years spent in the school. In the next step, the variable of accumulated experience in the labor market (EXP) is introduced into the expression as follows;

$$\text{Ln } Y_s = \ln Y_0 + rs + \beta_0 \text{ EXP} + \beta_1 \text{ EXP}^2 \quad \ldots\ldots (2.6)$$

The above equation is also known as '***Mincer wage regression***'. Where r is the return to schooling, and β_0/β_1 are the returns to experience.

2.3. Literature review

As Milner (1972) stated in his book, *The Illusion of Inequality*, on a concept of inequality "…if the meaning of inequality is relatively clear, a method of describing and measuring different degrees and types of inequality is much less clear" (p.34). This statement is also true in an unequal educational scheme. Scholars utilize many educational variables for assessing degrees of educational inequality. Thomas, *et al.* (2000) provided a measure of the education Gini coefficients for aggregate macro-data which became a prototype for many later studies regarding this analysis.

Regarding a relationship between educational attainment and its inequality, internationally they have a dualistic relationship due to measures of inequality. Basically, there are two measures of dispersion; absolute and relative, which are applied for examining inequality in education. The difference between the two measures seems to have an impact on the relationship between an average number of years of schooling and its inequality. Ram (1990), Gregorio and Lee (2002), and Lim and Tang (2008) applied the standard deviation to measure unequal distributions of education and revealed the existence of a concave (inverted U-shape) relation between them. This negative monotonic relationship was found by Thomas, et al. (2000), Checchi (2001), Castelló and Domenéch (2002), and Lim and Tang (2008) and all of these studies employed the Gini index of education to assess educational disparity.

Within a single country, the negative linear slope between average years of schooling and its Gini coefficients have been clearly identified in the case of the Philippines (Mesa, 2007), Brazil (Lorel, 2008), and Indonesia (Kumba, 2010). On the other hand, Hojo (2009) observed an inverted U-shape relationship between average years of schooling and the education Gini coefficients due to decreasing proportions of people ending schooling at the primary level and increasing proportions of higher-educated groups.

In the country level, Gregorio and Lee (2002) investigated the determinants of educational inequality (in a form of the standard deviation) by specifying nonlinear relationship between educational attainment and its inequality. They found an existence of inverted-U-shape relationship between time-lagged educational attainment and its inequality with turning point at 4.2 years. Initial income is significantly and positively associated with inequality in educational attainment while the government social expenditure was negatively related to inequality in educational attainment.

Checchi (2006) investigates the determinants of enrollment ratio at the different levels of education (primary, secondary, and higher education). Factors included both sides; household behavior as demand for schooling, and government provision of the public service as supply of schooling. The negative relationship between an income Gini coefficient and enrollment ratio is found.

On an issue of inequality in Thai education, the study on the relationship between average years of schooling and the education Gini coefficients is lacked. Most of earlier studies identified inequality in education through enrollment ratio of the school age population. Chiangkul (2008) observed that during 2002-2006, the northeastern part of Thailand had the lowest enrollment ratio of primary and upper-secondary education while the eastern part of Thailand had the highest enrollment ratio of primary and secondary education. Bangkok and provinces located near Bangkok had the lowest enrollment ratio of lower-secondary education due to the high opportunity cost of education.

Moving on to the determinants of educational attainment, the pattern of educational attainment depends on national, regional, provincial, household, or individual characteristics. Table 2-1 summarizes previous literatures on the determinants of educational attainment. Earlier studies found significant demographic characteristics on individual's educational attainment. Parental education is observed to have positive and significant impacts on children's educational attainment (Tansel, 2002). Father and mother with less education reduced an educational attainment of their children (Sander, 2010). Zhao and Glewwe (2010) found that mother's education played crucial role on child's education; especially for girls. While father's education was not significantly associated with children's education, mother tends to have a closer relation to children than father. However, Psacharopoulos and Yang (1991) found that 'a more educated father means a more educated child' (p. 292).

In terms of household background, the effect of religion and religiosity on educational attainment was observed in previous studies. Sander (2010) found that Muslim and Jewish significantly and positively affected the educational attainment in the United States while there were insignificant impacts of Buddhist and Catholic on educational attainment in a sample group of US residents and immigrants. In addition, household income has a positive impact on children's educational attainment (Tansel, 2002; Zhao and Glewwe, 2010).

One criticism on the study by Zhao and Glewwe (2010) is that their observations are among people aged between 13 to 17 years. This is because many of these people had high potentials in continuing their education at higher level.

In terms of measuring educational attainment and its inequality, although graduate level education has been more pervasive, it has not been reflected in most empirical analysis. More comprehensive is really required to reduce the bias of measurement and in turn analytical results on determinants and outcome of educational attainment and its inequality.

For the analysis on the determinants and economic outcome of educational attainment and its inequality, most previous studies have not incorporated many independent variables, the present study can more accurately identify the effect of all the possible independent variables separately.

According to the literature, results on some of the causal relationships have been inconclusive (for instance, per capita income and inequality in educational attainment). By obtaining the original empirical results including the specific case of Thailand, the author can identify the reason of this inconclusiveness more clearly.

Table 2-1: The summation of empirical studies

Author (year)	Observations	Methodology	Major finding
Psacharopoulos & Yang (1991)	Individual level observations obtained from the Venezuela 1987 Household Survey (Sample aged 10-18 years old)	Logit and OLS estimates	The study analyzed the determinants of educational attainment. Four dependent variables of education are discussed; years of schooling, illiterate, no schooling, and schooling-for-age. On the OLS estimate of years of schooling, age, father's schooling, urban, and family income were significantly associated to the number of years of schooling. On the other hand, male gender was significantly related to the number of years of schooling.
Al-Samarrai & Peasgood (1998)	individual level sample obtained from the Household survey conducted by Tanzania Development Research Group in 1992, Tanzania	multivariate regression	The study focused on the effects of household and individual characteristics access to primary and secondary education of children. Occupation of the head, marital status and education tend to be more highly correlated with decisions on girls' education than boys. The bigger number of children increased chances of attending and completing school in both boys and girls.
Tansel (2002)	individual level sample obtained from the household income and expenditure survey in Turkey, year 1994 (boys and girls aged between 14-20 years)	Ordered probit	The study on the determinants of school attainment of boys and girls observed the normal-good characteristic of education. In term of household characteristics, household income and parental education played the significant and positive impacts on children's school attainment. The effect of parental education was larger on girls over boys which suggested the less intergenerational socioeconomic mobility on girls. In term of community characteristics, the households in the industrializing communities tended to better

Author (year)	Observations	Methodology	Major finding
			educate their children than the households in the agricultural communities.
Ersado (2005)	individual level sample obtained from the 1990-91 Zimbabwe Income Expenditure Consumption Survey, the 1994 Peru living Standards Measurement Survey, and the 1995 Nepal Living Standards Survey	multinomial logit and IV estimates	The major finding is the parental education was positively and significantly associated to children's schooling among all three countries.
Daouli et al. (2010)	Individual level data obtained from the Greek Household Budget Survey and the Greek Census in 1981, 1991, and 2001, in Greece (daughters aged 16-17 years old)	Probit and OLS estimates	The study examined the international transmission of educational attainment of Greek woman. There were the educational correlations between generations. Mother's educational background played more crucial role on daughters' education than father's educational background. The inequalities in educational outcomes were from difference in parents' education, family, regional, individual characteristics, and environmental variables.
Sander (2010)	individual level sample obtained from General Social Survey: 1998-208 in the United States (populations aged 25 years and over)	OLS estimates	The study on the role of religion on educational attainment among the different groups of people in the United States. Jews acquired more education than do Protestants and Catholics. Excluding the immigrants, Buddhism played positive and significant impact on educational attainment.
Sen and Clemente (2010)	Individual level data obtained from the general social surveys conducted by	OLS estimates	The study examined the impact of parental education on individual educational attainment and found the significant intergenerational spillover.

Author (year)	Observations	Methodology	Major finding
	Statistics Canada in 1986, 1994, and 2001 (observations aged 25-64 years old)		
Zhao and Glewwe (2010)	individual level sample obtained from the Gansu Survey of Children and Families: collected in 2000 and 2004 in China (Observations aged between 13 to 17 years)	Censored ordered logit	They found the significant and positive impact of mother's education and household income on children's school attainment.
Huang (2013)	Individual-level Longitudinal data from the Panel Study of Income Dynamics (observations are aged 29 years old for two cohorts; 1984 and 1994)	Logit and OLS estimates	The study concentrated on the heterogeneity in the intergenerational transmission of educational attainment. The author found that the household assets increased the strength of the association between parents' and children's educational attainment due to liquidity constraints and decreased the strength between both because of the financial resources.

Source: compiled by Author

2.4. Research methodology

This dissertation is a quantitative research which requires secondary data collection in order to analyze educational attainment and its inequality. The author hopes to shed the light on the following questions: ***1) what factors determine educational attainment and its inequality? 2) How does educational attainment affect economic outcome? 3) Are there any existences of intergenerational transmission of educational attainment and its inequality?*** These research questions themselves do not contribute directly to better understanding of the study field. I prefer to explain that improvement in measurement as well as selection and specification of the variables leads to the contribution by realizing the empirical analyses more precisely.

Units of analyses in the dissertation are country (chapters four and five), provincial (chapters six and seven), and individual levels (chapters six and seven). Key variables of the dissertation are educational attainment (years of schooling) and its inequality (the education Gini coefficient).

The data set comes from two important sources; *part of national level analyses*, *and part of provincial and individual level analyses*. A part of national level analyses was presented in two main chapters of analysis (chapters four and five). The aforementioned chapters utilize the panel data set from Barro–Lee, Cohen–Soto for data on educational attainment, the World Bank, World Institute for Development Economics Research (UNU-WIDER), and Penn World Table 7.1 for other remaining macroeconomic variables during the period 1950-2010, with five-year intervals. The data source was chosen because it is the most comprehensive one both in years and countries and it is expected that we can make our analysis in the most general way.

A part of provincial and individual level analyses was utilized in the next three main chapters of analysis (chapters 6 and 7) use the cross-sectional data set from the Household Socioeconomic Survey (SES) which was conducted in 2011 by Thailand's National Statistics Office, is used. This data set was selected to identify the latest status of the matter in Thailand more specifically. The author selected Thailand because of two reasons; the first is accessibility of individual data and the second is that I relatively know Thai education better than other countries. In addition, the author utilized local-language information in this study.

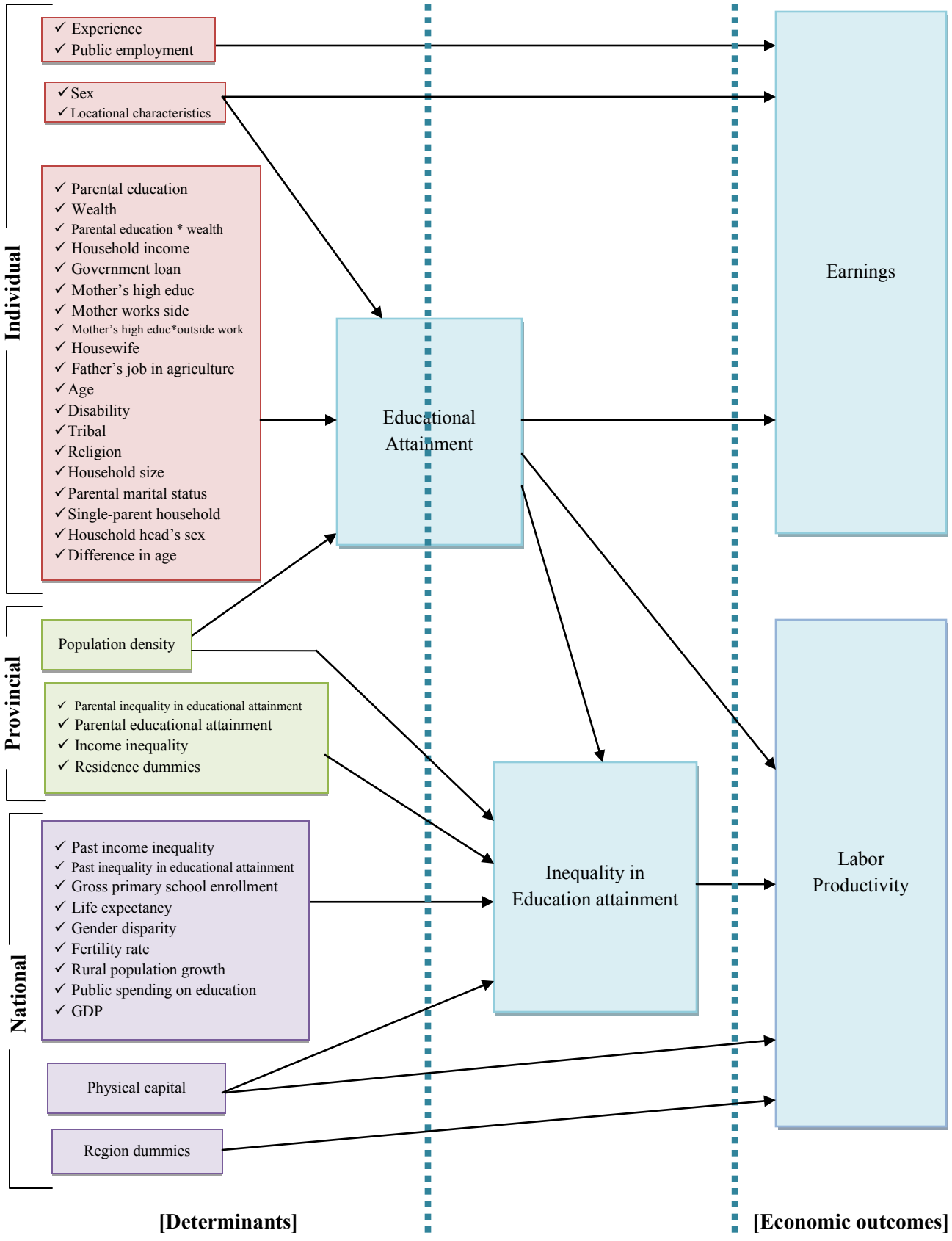
The author derived my theoretical framework based on previous related literature review. The notable feature of the framework is its comprehensiveness. It covers both determinants and economic outcomes of educational attainment and its inequality while the scope includes the national, provincial, and individual levels. It is necessary to be comprehensive to reflect research questions.

The author uses several methods for carrying out data analyses in this dissertation. Chapter five employs Fixed-effects and OLS estimates, Chapter six employs descriptive analysis; Chapter seven uses OLS and WLS estimates, and the marginal effects. Analytical tool used in the study is STATA12.

2.5. Conceptual framework

In this section, conceptual framework of dissertation is shown in figure 2-2. The conceptual framework is derived based on theoretical background and previous related literature review. It covers both determinants and economic outcomes of educational attainment and its inequality.

Figure 2-2: Conceptual framework of dissertation



CHAPTER 3

OVERVIEW OF THAI EDUCATION

3.1. Introduction

The objective of this chapter is to provide general and historical information of Thai education for further analysis. This chapter comprises of four parts. The next part describes the education system in Thailand. Section 3.3 presents some basic education indicators of Thailand which demonstrate the change in the performance of Thai education over the period. The last section, section 3.4, presents the government's expenditures on education.

3.2. Education system in Thailand

In Thailand, there are two schooling system; formal and non-formal. The Thai formal education system is roughly and basically organized in five levels[6]: pre-elementary (three years), elementary (six years), lower-secondary (three years), upper-secondary (three years), and higher education (four years or more). Figure 3-1 depicts the flow of Thai schooling along the age line. There was a big structural change in Thai education in 1978. The Thai formal educational cycle durations of primary and secondary levels of education were completely

[6] Along the International Standard Classification of Education (ISCED) indicating by UNESCO Institute for Statistics (1997) , there are seven levels of education as follows;

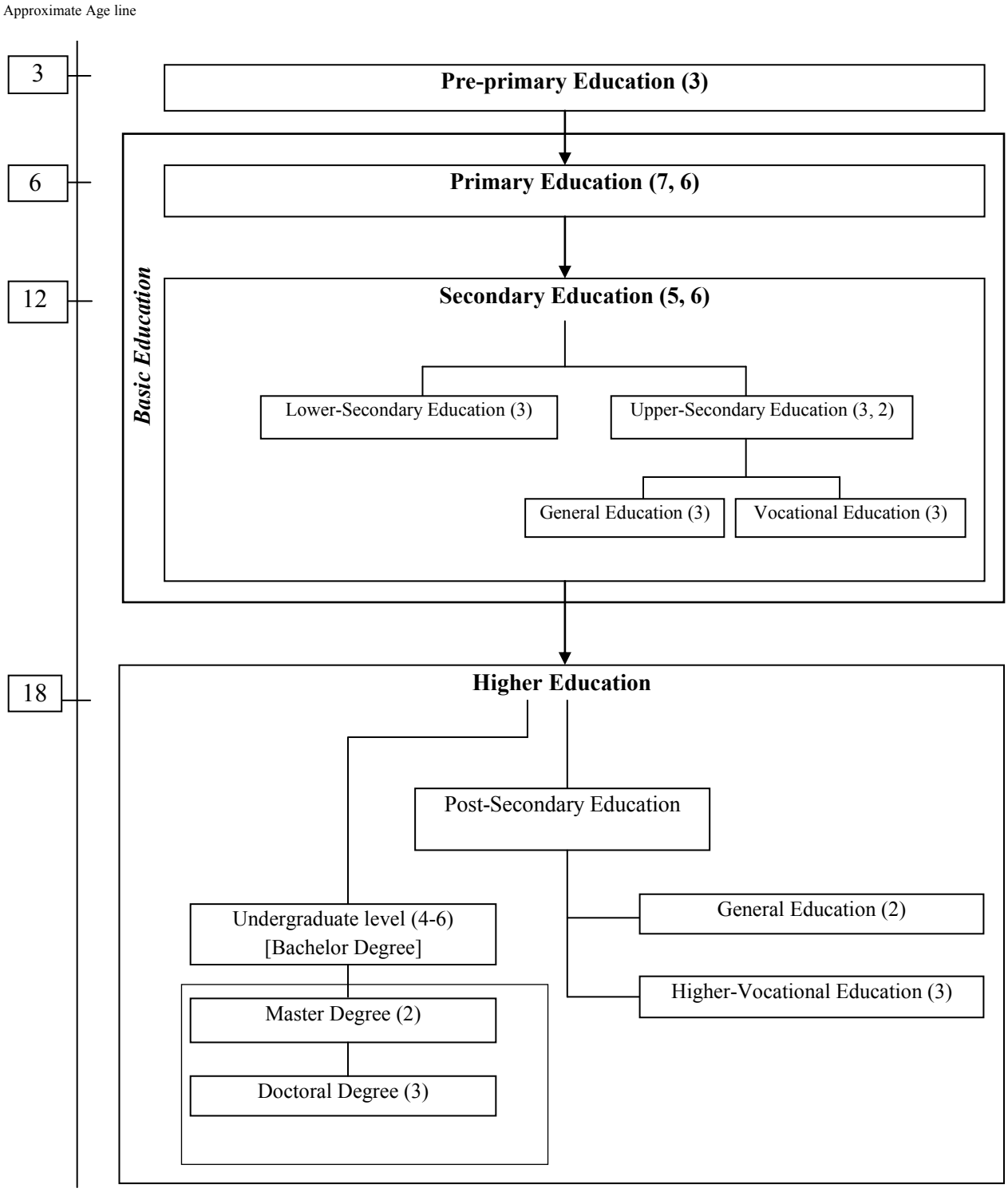
ISCED 0 is pre-primary education
ISCED 1 is primary education or first stage of basic education
ISCED 2 is lower secondary education or second stage of basic education
ISCED 3 is upper secondary education
ISCED 4 is post-secondary non-tertiary education
ISCED 5 is first stage of tertiary education
ISCED 6 is second stage of tertiary education

changed by legislation from “seven and five” to “six and six” in this year (Hawley, 2004). Under the Thai National Education Act, free basic education was expanded from nine years to twelve years in 1999, while in 2003 compulsory education was expanded to nine years (UIS, 2013).

3.3. On basic education indicators in Thailand

Focusing on basic education indicators, table 3-1 describes the ratio of the number of students on the number of the school-age population. The ratios for overall levels of education tended to decrease from 2007 to 2011 due to the continuous reduction of the ratios in tertiary education. On the other hand, the table shows the increasing trends of the ratios corresponds to secondary level of education. Linked to the net enrolment rate of schooling in Thailand which is shown in table 3-2, the net enrolment rate corresponds to the secondary level of education continuously increased from 1973 to 2011 in both female and male groups. Among the students, 80 percent were in public schools while remaining 20 percent were in private schools. The drop-out rate of schooling in table 3-4 illustrates the upward trend from 2003 to 2007, while from 2007 to 2010, a decline in the trend was observed.

Figure 3-1: A flow chart of Thai formal school system



Source: Author's chart based on information from Bureau of International Cooperation (2013) and the questionnaire of the Household Socioeconomic Survey (2011).
Note: The numbers in parenthesis describe durations of schooling cycle corresponding to each education level.

Table 3-1: The ratio of students on the school-age population by level of education

Level of education	Age	Year				
		2007	2008	2009	2010	2011
Total	3-21	83.33	83.11	81.78	80.45	80.41
Pre-elementary	3-5	73.78	74.01	74.33	76.03	76.80
Primary	6-11	104.51	104.83	104.00	104.30	103.50
Lower secondary	12-14	96.37	95.62	94.87	98.01	98.43
Upper secondary	15-17	67.16	68.14	69.57	71.68	72.18
Tertiary	18-21	61.05	60.47	56.21	46.21	47.18

Source: The Ministry of Education of Thailand, 2013
Note: the ratio of students on the school-age population is over a hundred because number of students and number of the school-age population come from different sources. Underachievers and students who aged over the range but still in that education level are counted corresponding to that range of age. This causes the ratio is over a hundred.

Table 3-2: Net enrolment rate of schooling in Thailand

Educational level	By Gender	Year							
		1973	1974	2006	2007	2008	2009	2010	2011
Primary	Female	71.76	72.55	92.85	91.43	89.93	89.37	...	...
	Male	78.40	78.34	94.32	92.95	91.38	89.97	...	...
	Total	75.14	75.50	93.60	92.21	90.68	89.68	...	...
Secondary	Female	13.45	15.03	70.26	74.29	75.05	77.35	76.50	78.44
	Male	17.71	19.98	63.13	65.36	67.82	68.18	68.17	69.86
	Total	15.61	17.54	66.62	69.73	71.36	72.66	72.24	74.05

Source: UNESCO Institute for Statistics (UIS), 2013
Note: … mentions the unavailability of data. A unit is in percentage.

The figure 3-2 historically depicts percentage shares of population aged 25 years and over with their highest educational attainment from 1950 to 2010, in five-year intervals. This figure demonstrates a similarity with other countries in the world, due to the society's own efforts and international aids, the amount of population without schooling has continuously and dramatically reduced during 1950 to 1985 and become stagnated after 1985 until present. A decline of population with no schooling has pushed an obvious increase in shares of people

with partial-primary education because people without schooling stepped into schooling cycle. Although total shares of citizen with primary education (partial-primary and complete-primary) have become larger, noticeably, proportion of people with complete-primary has reduced during 1960 to 1980 and stepped up after the period. The size of population with secondary and higher educational attainments has become greater over time. This is also observed by the net enrollment ratio in table 3-2. The net enrollment ratio of secondary education has outstandingly plumped up from 16 percent in 1973 to 74 percent in 2011. Figure 3-3 depicts historical trends of the average number of years of schooling of population above twenty-five years of age. The average number of years of educational attainment continuously increased after 1970.

Table 3-3: The share of students in Public school vs. Private school

Level of education	2008	2009	2010	2011
Total	81:19	82:18	81:19	81:19
Pre-Elementary Education	70:30	70:30	69:31	67:33
Elementary Education	82:18	82:18	80:20	80:20
Lower Secondary Education	87:13	87:13	86:14	87:13
- General Education	87:13	87:13	86:14	87:13
- Vocational Education	100:0	100:0	100:0	100:0
Upper Secondary Education	79:21	80:20	79:21	80:20
- General Education	89:11	89:11	88:12	88:12
- Vocational Education	66:34	65:35	65:35	66:34
- Other	100:0	100:0	100:0	100:0
Higher Education	83:17	86:14	84:16	85:15
- Vocational Education	66:34	66:34	66:34	69:31
- Other	100:0	100:0	100:0	100:0
Undergraduate Degree and Higher	86:14	89:11	87:13	87:13

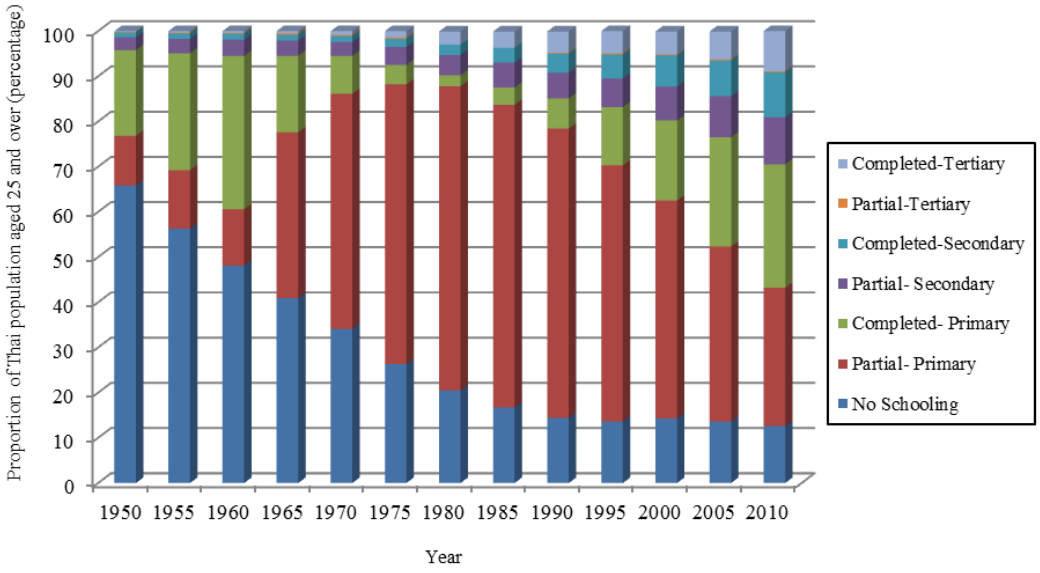
Source: combined by Author based on the Ministry of Education of Thailand, 2013

Table 3-4: Drop-out rate of schooling

Level of education	2010	2009	2008	2007	2006	2005	2004	2003
Total	0.56	0.70	1.57	1.68	1.49	1.31	1.24	0.89
Primary	0.19	0.23	0.98	1.13	0.88	0.69	0.72	0.51
Lower secondary	0.94	1.31	2.44	2.43	2.25	2.11	2.00	1.45
Upper secondary	1.03	1.05	1.90	2.16	2.33	2.21	1.92	1.38

Source: combined by Author based on the Ministry of Education of Thailand, 2013

Figure 3-2: Percentage share of population with their highest education levels attained

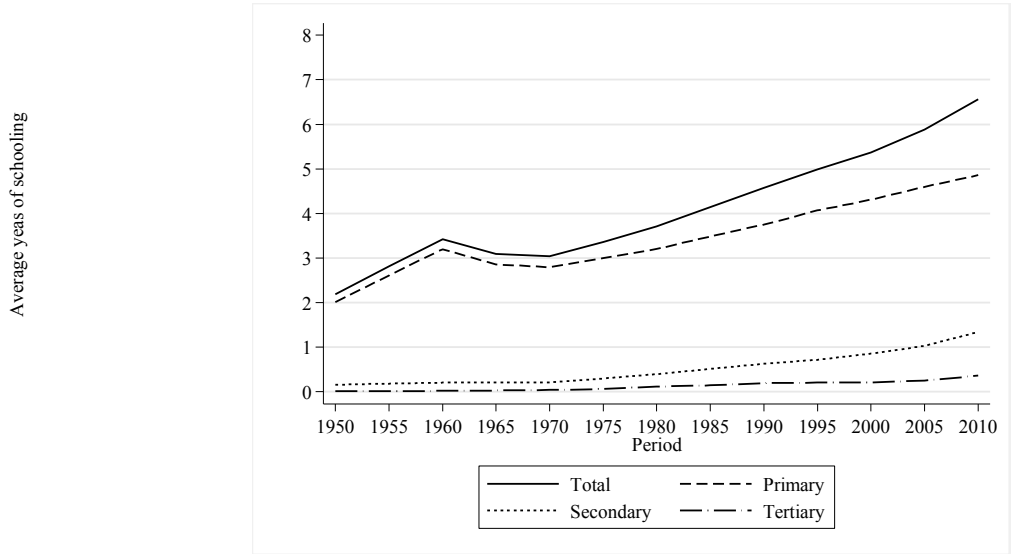


Source: Author's figure based on education information by Barro and Lee, 2011.
Note: Population in this figure are aged 25 years and over.

Considering an issue of gender disparity of education in Thai society, table 3-5 describes the gender parity index of net enrollment rate. In primary education, the index has slightly increased over time instead there has been a cosmic increase in the index in the secondary level. Accordingly, the issue of gender disparity is always tied in with the issue of educational

inequality. The gender gap in education can be interpreted in two dimensions; gender disparity in access to education and gender disparity in educational attainment. Thomas, et al. (2000) found that 'reducing gender gaps in education is crucial to addressing the inequality in education' (p.21). In the case of Thailand, earlier researches reported that gender disparity in educational attainment was higher than gender disparity in an access to education (UNESCO Institute for Statistics (2011); Office of the Education Council (2012)). Indicating by gender parity index (GPI) in educational attainment, women have disadvantages at all levels of educational attainment (All Thai GPIs in educational attainment were less than the standard values). On the contrary, GPI in schooling became greater corresponding to higher level of an access to education. Except primary level of schooling, The GPIs were over unity in 2009. Although Thailand faced a problem of gender disparity in educational attainment, the study by Knodel (1997) observed that the gender gaps in educational attainment tended to be closer in Thailand.

Figure 3-3: Historical trends in the average number of years of schooling



Source: Author's figure based on education data by Barro-Lee, 2011.
Note: The population corresponds in this figure are aged 25 years and older.

Table 3-5: Gender parity index for net enrolment rate in Thailand

Education level	1973	1974	2006	2007	2008	2009	2010	2011
Primary	91.53	92.61	98.44	98.36	98.42	99.33	...	...
Secondary	75.94	75.21	111.29	113.66	110.66	113.44	112.21	112.29

Source: UNESCO Institute for Statistics, 2013
Note: '…' mentions the unavailability of data. A unit is in percentage.

By looking at the inequality in education in Thailand, Thomas *et al*. (2000) compared historical trends of educational inequality of some selected countries including Thailand. The educational inequality in Thailand, measuring by Gini coefficient, tended to slightly decrease overtime from 1960 to 1990 similar to the Global trend of inequality in education. Focusing on an equality of educational attainment, the Bangkok metropolis and suburban districts got the highest opportunities of accessibility to education while other remoted provinces got lower opportunities (Office of the Education Council, 2008). However, province characteristics cannot be ignored as it seems to influence inequality in Thai education rather than region characteristics. For example, Office of the Education Council (2008) shows that Thai people aged 15-17 years who live in Sing buri (locates in Central region) got the highest opportunities in education. On the other hand, Thai people aged 15-17 years who live in Samut sakhon (also locates in Central region) got the lowest opportunities in education.

3.4 Educational policies and expenditures in Thailand

In the role of Government's spending on education, figure 3-4 presents a comparison of the historical curves of the ratios of educational budget (EB) to gross domestic product (GDP) and the ratios of EB to national budget (NB) from year 1996 to 2009. The percentage ratios of EB to GDP and the percentage ratios of EB to NB have not varied in a wide range over time. The former is at around four per cent and the latter is approximately at 20 to 25 percent. Public expenditure per pupil as a percentage of GDP per capita in table 3-6 describes an increase of primary education and a decrease of secondary and higher education. Among all three levels of education, primary education and higher education are the most heavily subsidized by the state, while secondary education is barely subsidized (Blaug, 1976).

The scheme of Thai government policies for education after institutional and political revolution in 1932 can be roughly separated into two periods. In 1932-1974, the first period of government educational policies emphasized on laying the foundation for the education system by expanding the supply of schooling and education reform. In 1975, the government under Prime Minister Seni Pramoj raised the issue of educational equality in education policy. After that, equality in education has become an ongoing issue of Thai education policy. The major starting point is the Education Act 1999, which also state priority in improving inequality in educational attainment. Transferring of resources and mandates to local governments is one of key policies (however, in practice, the policy is not effectively implemented at all). The educational policies of the current government under Prime Minister Yingluck Chinnawat partly target equality in education by focusing on '(1) creating and expanding the opportunity for an access to basic education, (2) releasing the limitations of

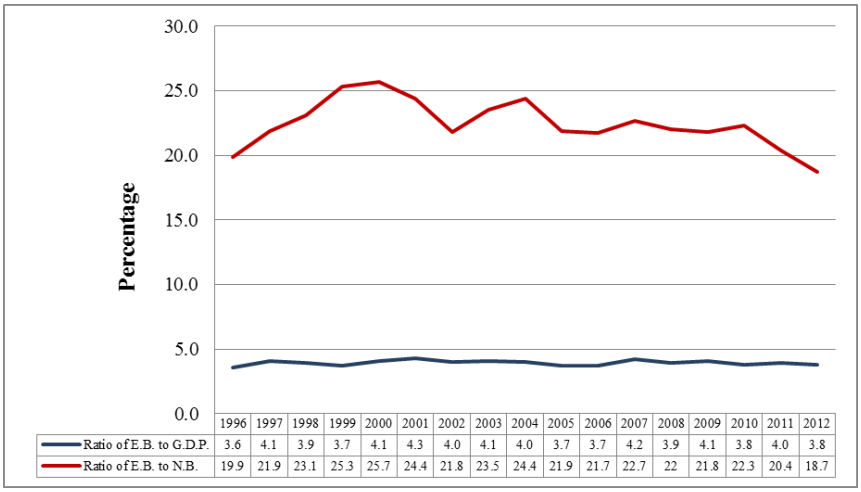
accessing the tertiary education and vocational education (3) certifying high-skilled people without schooling to be people with any levels of schooling'.

Table 3-6: Public expenditure per pupil as a percentage of GDP per capita

Year	1971	1974	1977	1988	1998	2001	2004	2008	2009
All levels	17.78	11.60	16.72	13.57	20.88	21.40	18.26	16.76	18.61
Primary	...	...	...	...	12.96	17.07	14.59	20.77	24.35
Secondary	...	...	...	...	19.15	16.16	16.09	7.72	9.27
Tertiary	...	...	...	...	45.92	33.17	23.86	22.31	22.65

Source: UNESCO Institute for Statistics, 2013

Figure 3-4: The ratios of educational budget; 1996-2012



Source: Author's calculations based on Thai Ministry of Education, 2012
Note: E.B. is educational budget. N.B. is national budget. G.D.P. is gross domestic product.

Guide to Bureau of International Cooperation (2008), the targets of the Tenth plan of National Economic and Social Development (2007-2011) for human development are:

1. Increase average years of schooling to 10 years.

2. Improve test scores (higher than 55%) in core subjects, at all levels.
3. Raise the percentage of medium-level skills workforce to 60% of labor force.
4. Increase the ratio of R&D workers to 10-in-10000.

To achieve these targets, the Tenth plan lays out strategies for development of human quality by promoting human development for integrity, knowledge, and resilience as well as providing children with a strong basis of knowledge, promoting life-long learning.

The targets for human development specifically increase in an average number of years of schooling to ten years and improvement of test scores in core subjects can induce greater educational quantity and quality. These would reduce inequality in educational attainment. Relationship between an average number of years of schooling and its inequality will be discussed in the next chapter.

Box 3.1: Policies for enhancement of educational opportunities of the Ministry of Education, 2012-2015

1. **Opportunity to access resources, facilities, to get education equitably, equity is not identified by location because most students live in rural and outreached areas with poverty, the government therefore has projects like**
   i. One tablet per child: smart Thai children will take tablets to schools. The tablets will be distributed to primary children year one with free Wi-Fi in public areas.
   ii. Learning rooms will be built in many areas and teachers paid by the government will teach primary students. Educational software and e-books will be installed to replace normal books to create e-learning and knowledge-based society.
   iii. E-Education: programs and contents will be developed to change schools to life-long learning centers and promote efficient education using education systems that really serve the needs.
   iv. Dreamed primary and secondary schools to excellent higher education: there will be school board to hire talented principals and teachers with facilities for students like dormitories, school buses, bicycle, etc.
   v. Powerful teachers: to develop potentials of teachers and educational personnel, solve debt problems, reduce expenses, increase income, enhance opportunities by training on morality, home accounting, revise debt structure by incorporating informal debts into formal systems and increase sufficient additional income as well as enhance new opportunities.
   vi. International education centers
   vii. One school one nurse to look after children and also teach.
   viii. Prototype school in every district to develop school potentials for excellence using telecommunication.
2. **Opportunity to access financial resources; students can lean without worries about finance, the government has projects like**
   i. Smart card for basic education
   ii. Income contingency loan program
   iii. Scholarship to study abroad (one district one scholarship)
   iv. Graduates' endowment fund; Thai people must settle with dignity; some do not know how to and have no property. The procedure will be to establish a fund in public and private universities, set up committee comprising lecturers and successful alumni, representatives of public and private authorities. This project is based on the idea that universities are producing graduates; knowledge is in universities; knowledge-based businessmen are more advantaged; therefore more entrepreneurs could be produced.
3. **Opportunity to accumulate and cultivate skills; students could grow up in activity-based learning world.**
   i. Promoting vocational education; knowledge in practice, to be professionals.
   ii. Fix-it center targeted to have enough centers to provide services for every community. Vocational students' skills are utilized to provide low cost maintenance for people in communities.
   iii. Genius creation; students could find their aptitudes in various fields.
   iv. One music one sport two languages; competent youth are encouraged to join competitions at national and international levels. English, Chinese must be taught in atmosphere of language owners. Basic knowledge in mathematics and sciences must be strengthened.
   v. Curricular revision; learning by heart must be quitted, applying video links; evaluation must be modern and meet standard requirements.
   vi. 25 years up Thai citizens could transfer experiences to upper secondary education and learn full time, part time, to catch up with the world and children.
   vii. Rajabhat universities and vocational institutions to find their own excellence and attach importance to knowledge in practice, professionalism. Then open for people to develop their additional skills in various fields according to their needs and aptitudes using income contingency loan.
4. **Opportunity to life-long learning; to promote non-formal and informal education using libraries, museums, galleries, culture centers.**
   i. Sub-district internet and village internet (community learning centers) an opportunity for people to find their aptitudes, learn anywhere, anytime, to further what they would like to do and for those who would like to change occupations.
   ii. Creative gathering places for students; providing computers, Wi-Fi, teachers.

Source: The Ministry of Education, 2012, pp. 21-24

National Analysis

CHAPTER 4

MEASURING INEQUALITY IN EDUCATIONAL ATTAINMENT: AN INTERNATIONAL COMPARISON

4.1. Introduction

The main objective of this chapter is to measure an inequality in education by using the Gini coefficient in cross countries. Within two specific objectives, firstly the author concentrates on measures of educational inequality. The Gini coefficient is frequently selected as a relative dispersion indicator of inequality in education. Under the studies on measuring inequality in education, the author observes that earlier studies utilized various methods for assessing the educational inequality. Thomas, *et al.* (2000) introduced the education Lorenz curve which depicts the relationship between cumulative proportions of schooling (vertical Y-axis) and cumulative proportions of population (horizontal X-axis). They mentioned unique qualifications of the education Lorenz curve; kinked, non-continuous curve, and truncated along the horizontal axis. As the unique of the education Lorenz curve is reason for researchers to avoid using as a measure of inequality in educational attainment, there has been no empirical evidence before.

The first objective is to provide the evidence supporting the assumption of why the education Lorenz curve is not suitable for measuring the educational inequality. The author applies the conventional method of order-rankings of Lorenz dominance to test the infeasibility of the education Lorenz curve. The second objective of this chapter is to

categorize population groups for finding the change in population corresponding given education levels.

This chapter is divided into six sections. The next section describes data and samples in this analysis. Section 4.3 presents two measures of inequality in educational attainment; the education Gini coefficients and the education Lorenz curves. Section 4.4 provides the empirical evidence which supports an idea of why the education Lorenz curve is seldom in use in the study of inequality in educational attainment. Section 4.5 decomposes the inequality in educational attainment by each level of education. Two extreme cases are provided; advanced countries and less developed countries. The last section summarizes this chapter.

4.2. Data and sample

As the author mentioned in the previous section, this chapter employs two methods of evaluating inequality in educational attainment. In the case of measuring inequality in educational attainment, the education Gini coefficient will be utilized and the data set of educational attainment is obtained from two well-known sources; Barro-Lee and Cohen-Soto. The former provided the data on educational attainment for 146 countries within five-year-intervals during 1950 to 2010 (13 years) while the latter provided the data on educational attainment for 85 countries within ten-year-intervals during 1960 to 2010 (six years).

In order to measure inequality in education, the author will use a concept of the education Lorenz curves and data set of education attainment for total population aged 15 years and older is obtained from Cohen-Soto (2011). The Sample is 15 Asian Countries as shown in table 4-1. The education Lorenz curves of 15 Asian countries are constructed in a year 2010. The data of educational attainment from Soto-Cohen is selected to test the

education Lorenz dominance due to the provision of schooling cycle duration. This is feasible for drawing the education Lorenz curves. The educational attainment is classified into seven levels; no schooling, partial primary, completed primary, partial secondary, completed secondary, partial tertiary, and completed tertiary. The partial level of any educational attainment is assumed to take half schooling cycle durations of completion.

Table 4-1: List of countries included in the analysis

High	OECD	Japan, Korea
	Non-OECD	Singapore
Middle	Upper	China, Iran, Jordan, Malaysia, Thailand
	Lower	Fiji, India, Indonesia, Iraq
Low		Bangladesh, Myanmar, Nepal

Source: Author's table.
Note: Classified by World Bank (2012), the groups are: low income, $1,025 or less; lower middle income, $1,026 - $4,035; upper middle income, $4,036 - $12,475; and high income, $12,476 or more.

4.3. Measures of inequality in educational attainment

Basically, two measures of dispersion; absolute and relative, are applied in order to investigate an inequality in educational attainment. The difference between two measures observed from earlier studies is the relationship between average years of schooling and its inequality. Ram (1990), De Gregorio and Lee (2002), and Lim and Tang (2008) apply the standard deviation as an absolute method to measure schooling dispersion and reveal an existence of concave relation between them. Controversially, the negative monotonic relationship between them is discovered by Thomas et al. (2000), Checchi (2001), Castelló and Domenéch (2002), and Lim

and Tang (2008) when they utilized Gini coefficient for assessing inequality in educational attainment.

4.3.1. The Gini coefficient of education

This paper chooses Gini index as a measure of inequality in educational attainment. The specification of the education Gini coefficients, a relative measure of the distribution of educational attainment (G_{educ}) is obtained from Thomas et al. (2000, 2002), Checchi (2001), and Castelló & Domenéch (2002). This general formulation is adapted from a measure of Gini coefficient of income distribution for the purpose of aggregate macroeconomic data. The specification is as follows;

$$G_{educ} = \frac{1}{2\mu} \sum_{h=0}^{3} \sum_{k=0}^{3} |y_h - y_k| \, n_h \, n_k \quad \text{..... (4.1)}$$

Where the subscripts h and k correspond to the different four levels of educational attainment: no schooling (0), primary (1), secondary (2), and tertiary levels of education (3); μ is the number of average years of schooling in the corresponding total/female population; n_h and n_k represent the proportions of the corresponding population with determinate levels of education; y_h and y_k are the cumulative average years of schooling at each level of educational attainment, define y_0 0, y_1 s_1, y_2 $s_1 + s_2$, y_3 $s_1 + s_2 + s_3$, where s_1, s_2, and s_3 defined as average schooling years of each educational level in each proportion of corresponding population who achieve that level of education; primary, secondary, and tertiary respectively. The education Gini coefficients of 146 countries are presented in the appendix.

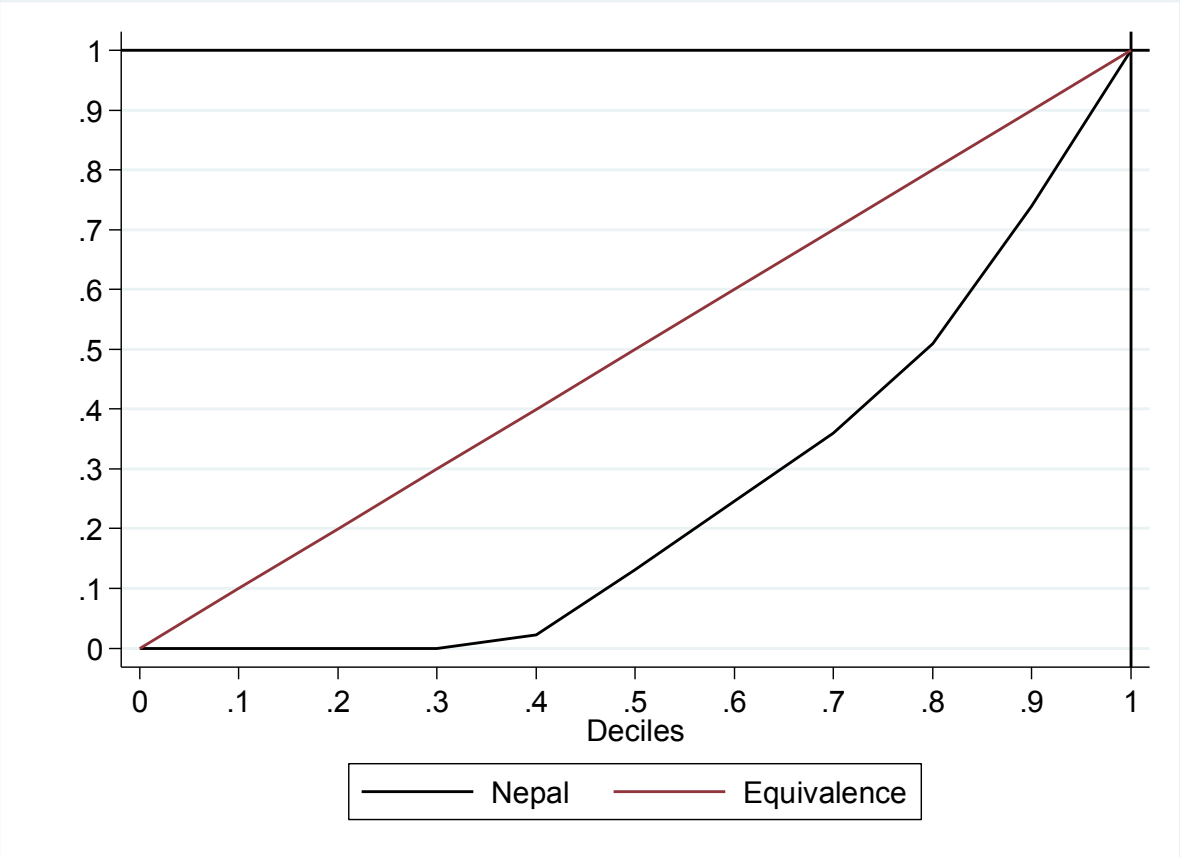
4.3.2.The Lorenz curves of education

A concept of the education Gini index is obtained from a concept of income Gini index which is indirectly defined as 'the ratio of the area formed by the Lorenz curve and the egalitarian line to the area of the entire egalitarian triangle' (Thomas, *et al*., 2000). In the normative traditional theory of income distribution raised by Atkinson (1970), the Gini coefficient is criticized as it is unable to be internationally compared in the case of the crossing Lorenz curves. In order to find the evidence that supports the question why the education Lorenz curve seldom appears in the studies on inequality in education, we construct the education Lorenz curves for 15 Asian countries in 2010.

Levels of educational attainments are newly classified from four levels to seven levels (no schooling (0), partial primary (1), completed primary (2), partial secondary (3), completed secondary (4), partial tertiary (5), and completed tertiary (6)) to elaborately calculate the cumulative distribution of education in deciles for the cumulative proportional population which is shown in table 4-2.

The education Lorenz curves of 15 Asian countries are constructed with nine-point connections from the information presented in table 4-2. The example of the education Lorenz curve is depicted in figure 4-1, the vertical axis presents the cumulative proportion of educational attainment; value is within zero to unity (total amount of years of schooling), and the horizontal axis shows the cumulative proportion of total population aged 15 years and over in deciles; value is within zero to unity (total population). From this figure, the kinked, truncated, and non-smooth education Lorenz curve is found as Thomas, et al. (2010) mentioned previously due to the macroeconomic data of educational attainment.

Figure 4-1: The example of education Lorenz curve: a case of Nepal



Source: draw by Author
Note: the education Lorenz curve of Nepal is constructed in year 2010.

Table 4-2: The cumulative distribution of education in 2010, based on Cohen-Soto data

	COUNTRY	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
1	Bangladesh	0	0	0	0.087	0.187	0.288	0.388	0.539	0.727	1
2	China	0.008	0.055	0.132	0.209	0.286	0.367	0.499	0.654	0.808	1
3	Fiji	0.030	0.066	0.133	0.205	0.312	0.421	0.545	0.690	0.836	1
4	India	0	0	0.026	0.074	0.138	0.234	0.371	0.534	0.725	1
5	Indonesia	0.015	0.059	0.137	0.215	0.293	0.396	0.514	0.659	0.815	1
6	Iran	0	0.004	0.043	0.103	0.182	0.292	0.426	0.592	0.781	1
7	Iraq	0	0	0.040	0.091	0.187	0.282	0.398	0.565	0.746	1
8	Japan	0.072	0.143	0.235	0.330	0.426	0.521	0.619	0.746	0.873	1
9	Jordan	0.015	0.069	0.130	0.215	0.316	0.418	0.535	0.676	0.838	1
10	Korea	0.037	0.096	0.168	0.275	0.388	0.501	0.613	0.742	0.871	1
11	Malaysia	0.014	0.075	0.137	0.228	0.319	0.434	0.566	0.698	0.830	1
12	Myanmar	0.000	0.051	0.102	0.154	0.205	0.286	0.389	0.550	0.727	1
13	Nepal	0	0	0	0.022	0.131	0.246	0.360	0.510	0.739	1
14	Singapore	0.000	0.054	0.110	0.193	0.283	0.401	0.524	0.679	0.839	1
15	Thailand	0.058	0.130	0.201	0.273	0.345	0.416	0.513	0.638	0.809	1

Source: Author's calculations

4.4.Why Gini? Why not Lorenz curves?

To provide a clear answer to this question, approaches of the order-rankings of Lorenz dominance and pairwise-comparison are operated in this section. 210 (15x14) pairwise-comparisons are prepared for checking a dominated-dominating status of Lorenz curve. There are two ways to check the international pairwise-comparisons of the education Lorenz curves. The first is a direct test from the two Lorenz curves as shown in figure 4-2. The second is a test of the two-country differences of the cumulative proportion of schooling corresponding each deciles of the cumulative proportion of population, the author found that there are various tiny crossing points[7] in each pairwise-comparison as in the case demonstrated in table 4-3.

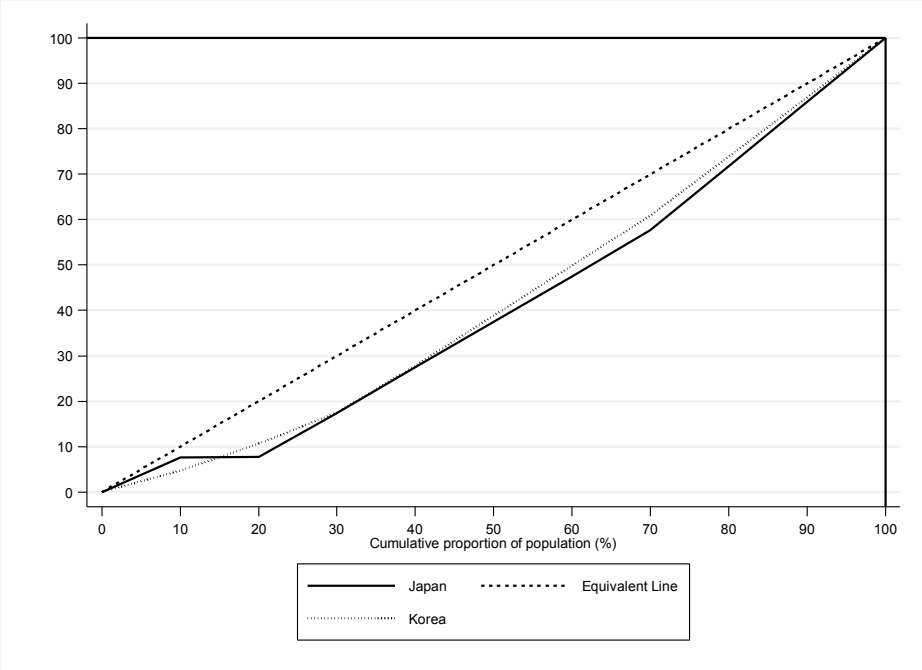
Table 4-3: The case of over-two crossing Lorenz curve in pairwise-comparisons

Deciles	One crossing				Three crossings			
	Malaysia	**Thailand**	**delta**		**Jordan**	**Indonesia**	**delta**	
D1	0.014	0.058	-0.044		0.015	0.015	-0.001	
D2	0.075	0.130	-0.055		0.069	0.059	0.010	
D3	0.137	0.201	-0.064		0.130	0.137	-0.007	3Crossings
D4	0.228	0.273	-0.045		0.215	0.215	0.000	
D5	0.319	0.345	-0.025	Crossing	0.316	0.293	0.023	
D6	0.434	0.416	0.018		0.418	0.396	0.021	
D7	0.566	0.513	0.053		0.535	0.514	0.021	
D8	0.698	0.638	0.060		0.676	0.659	0.017	
D9	0.830	0.809	0.021		0.838	0.815	0.023	
D10	1.000	1.000	0.000		1.000	1.000	0.000	

Source: Author's calculations

[7] We can observe the crossing Lorenz curves from the differences of the cumulative proportion of educational attainment in every deciles of the cumulative proportion of population between two countries. The positive differences in all deciles of the cumulative proportion of population indicate the dominance of the Lorenz curve and vice versa, the negative differences in all deciles of the cumulative proportion of population indicate the weakness of the Lorenz curve. The sign changes in the differences (from positive to negative or from negative to positive) identify the crossing points of both Lorenz curves.

Figure 4-2: The international pairwise-comparison of education Lorenz curves: a case of Japan vs. Korea in 2010



Source: Author's calculations

Table 4-4 depicts the summation of 210 cases of the pair-wise comparisons of the education Lorenz dominance in 15 Asian countries. The comparison is classified in five conditions;

[++], the country in the row strongly dominates the country in the column (no crossing);

[+], the country in the row weakly dominates the country in the column;

[--], the country in the row is strongly dominated the country in the column;

[-], the country in the row is weakly dominated the country in the column;

[0], there is an ambiguous relationship between both Lorenz curves (crossing).

The author found that out of 210 cases, there are at least 16 cases of outstanding crossing of Lorenz curves which are unable to identify the dominance Lorenz curve. Our findings are;

1. Due to Macroeconomic data availability of educational attainment, the best information of the cumulative distribution of education that can be operated is in deciles. There are not sufficient observations for employing any statistic test for the significance of Lorenz curves.
2. Due to the kink Lorenz curve, we found there are over-two crossings in pairwise comparison of education Lorenz curve. So the order-rankings of education Lorenz curve inelastically apply in the field of educational inequality.

In conclusion, under the limitation of aggregate data of educational attainment, it is difficult to employ Lorenz approach in the analysis.

4.5.Fragmentation of world inequality in educational attainment

In this section, the author further looks into trends of educational attainment and its inequality over time. Figure 4-3 depicts trends of educational attainment from 1950-2010 in advanced, and less developed countries. The figure shows upward trends of educational attainment overtime. On the other hand, a decline of inequality in educational attainment has been observed overtime (figure 4-4). Obviously, advanced countries have greater educational attainment and its equality than the world's level. On the contrary, less developed countries have less educational attainment and its equality than the world's level.

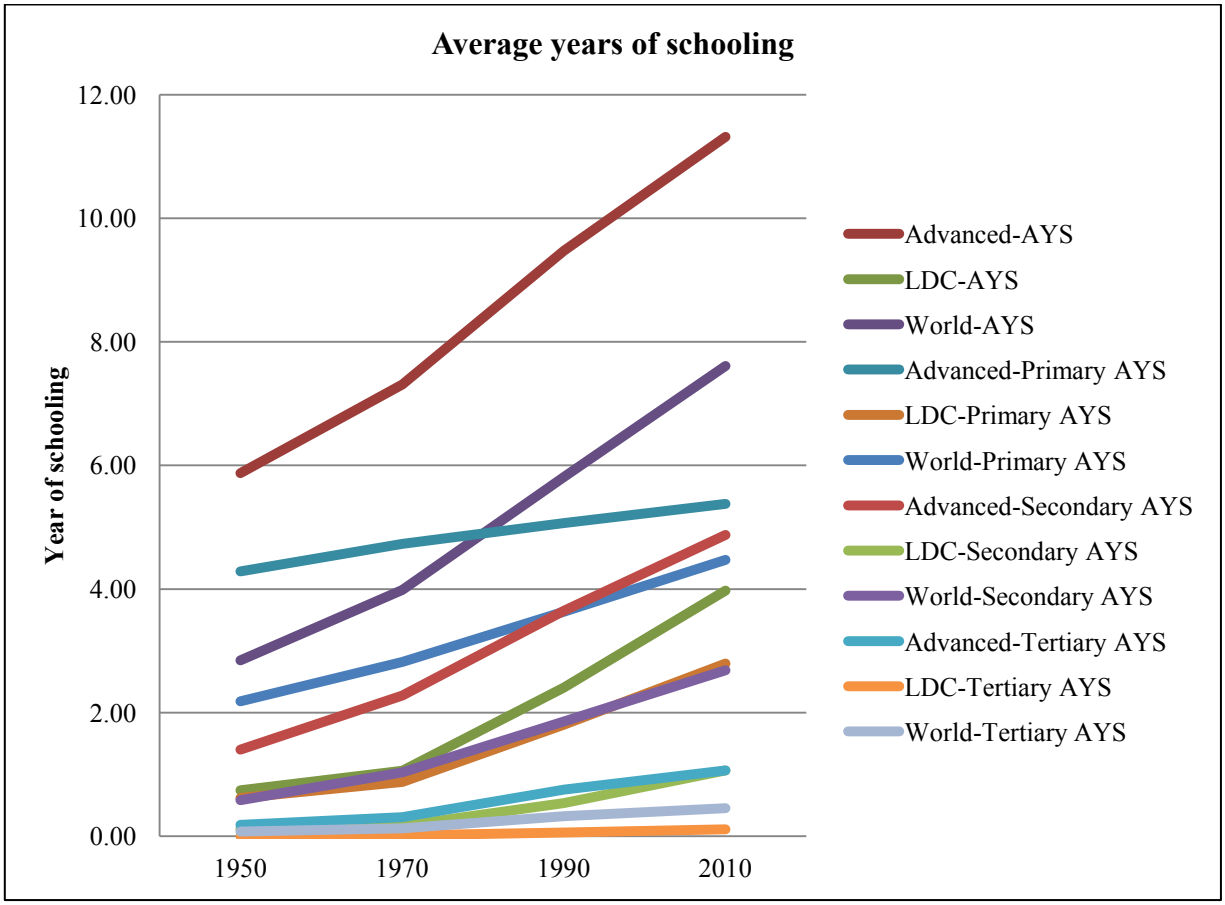
Table 4-4: The summary of pairwise-comparisons of education Lorenz curves

	Bangladesh	China	Fiji	India	Indonesia	Iran	Iraq	Japan	Jordan	Korea	Malaysia	Myanmar	Nepal	Singapore	Thailand
Bangladesh		--	--	-	--	-	-	--	--	--	--	-	++	--	--
China			-	++	**0**	++	++	--	**0**	--	--	++	++	**0**	--
Fiji				++	**0**	++	++	--	**0**	--	**0**	++	++	+	**0**
India					--	--	--	--	--	--	--	-	+	--	--
Indonesia						++	++	--	**0**	--	-	++	++	**0**	--
Iran							+	--	--	--	--	**0**	++	--	--
Iraq								--	--	--	--	**0**	++	--	--
Japan									++	++	++	++	++	++	++
Jordan										--	**0**	++	++	+	**0**
Korea											++	++	++	++	**0**
Malaysia												++	++	++	**0**
Myanmar													++	--	--
Nepal														--	--
Singapore															**0**
Thailand															

Source: tabled by Author

Note: ++ the country in the row strongly dominates the country in the column (no crossing), + the country in the row weakly dominates the country in the column, -- the country in the row is strongly dominated the country in the column, - the country in the row is weakly dominated the country in the column, 0 there is an ambiguous relationship between both Lorenz curves (crossing).

Figure 4-3: Trend of educational attainment[8]



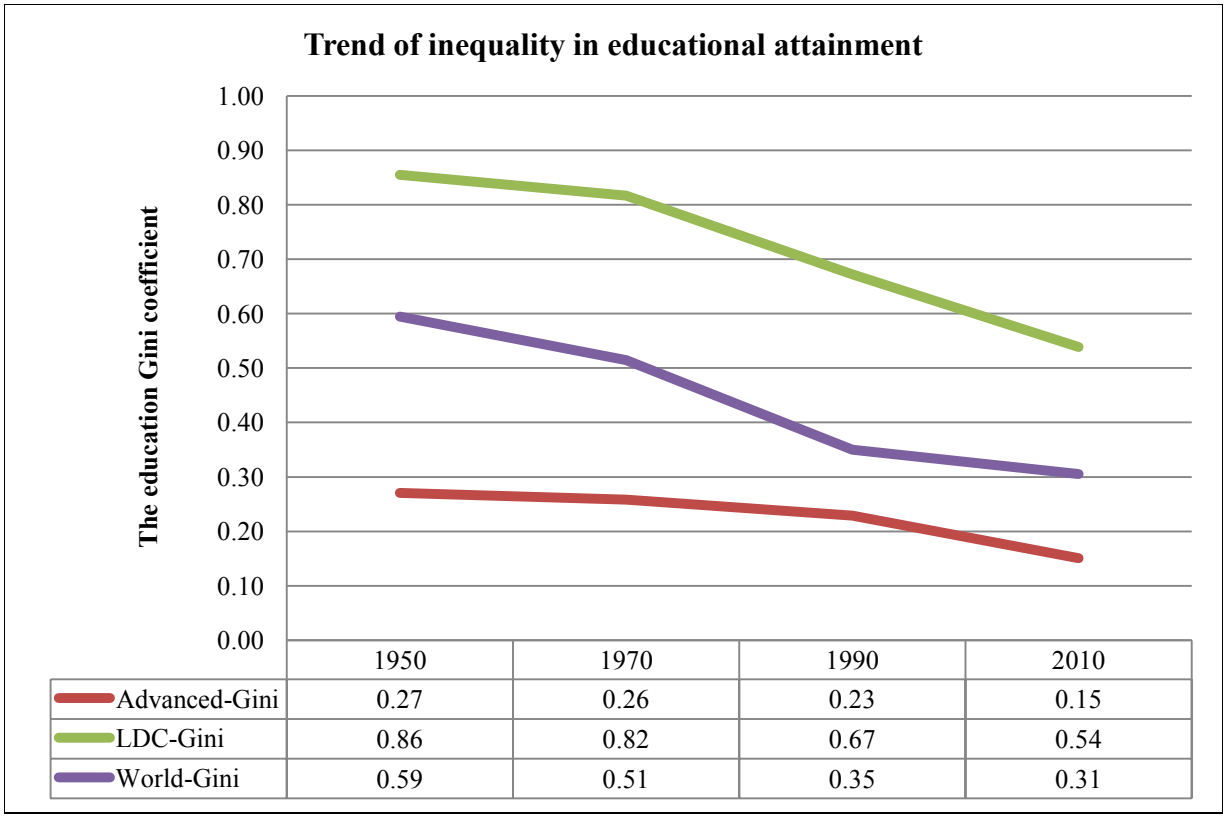
Source: Author's calculations based on Barro and Lee (2011).
Note: AYS is an average number of years of schooling.

[8] Informative Data corresponding Figure4-3

year	1950	1970	1990	2010
Advanced-AYS	5.87	7.31	9.47	11.32
LDC-AYS	0.75	1.06	2.41	3.97
World-AYS	2.84	3.99	5.81	7.61

Source: Author's calculations based on Barro and Lee (2011).

Figure 4-4: Trend of inequality in educational attainment

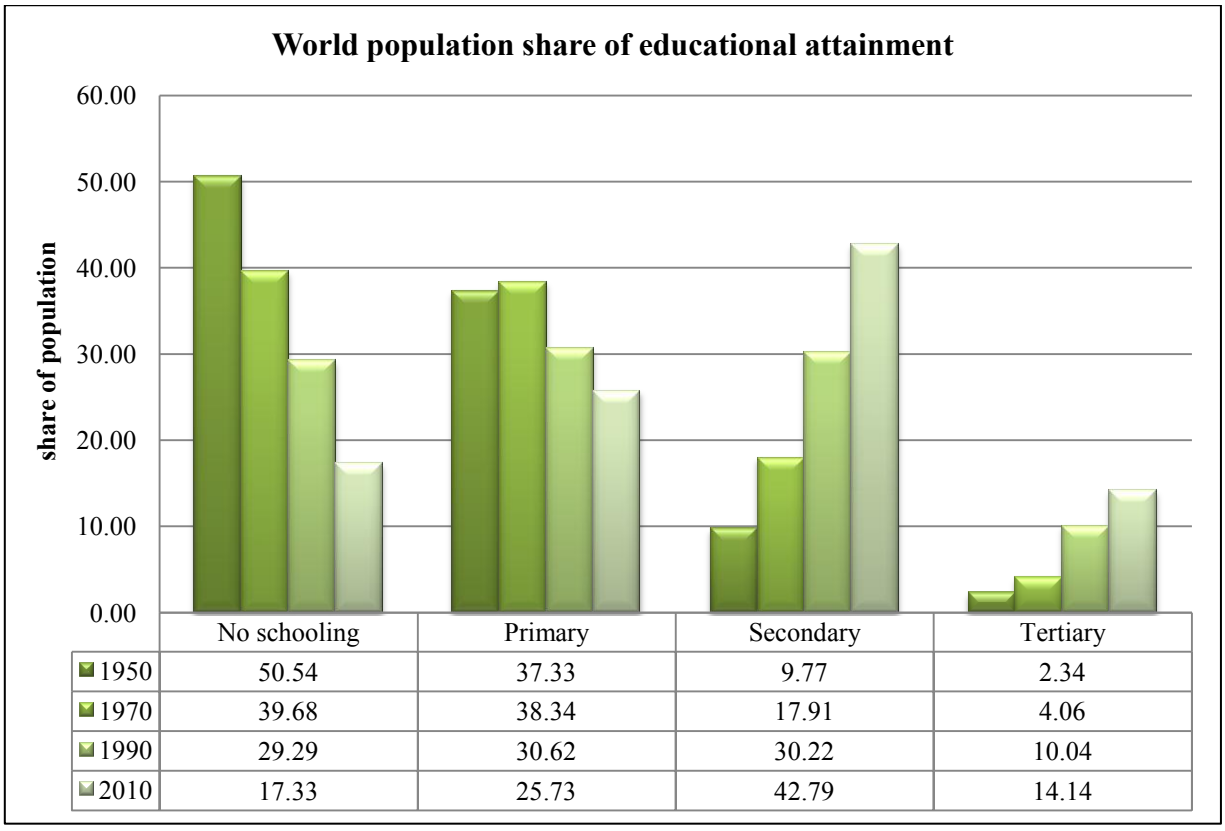


	1950	1970	1990	2010
Advanced-Gini	0.27	0.26	0.23	0.15
LDC-Gini	0.86	0.82	0.67	0.54
World-Gini	0.59	0.51	0.35	0.31

Source: Author's calculations based on Barro and Lee (2011).
Note: Gini is the education Gini coefficient.

The author separates population into education level, Figure 4-5 shows the world's proportion of population. The figure describes that a share of population without schooling has dramatically decreased overtime from half of the world in 1950 to approximately 17 percent in 2010. On the contrary, a share of population with secondary education has vividly increased from 1950 to 2010. Still, a share of population with primary education has also slightly decreased while share of population with tertiary education has lightly increased overtime. Thus, greater world equality in educational attainment overtime causes a decline in population without schooling and expansion of people with secondary education.

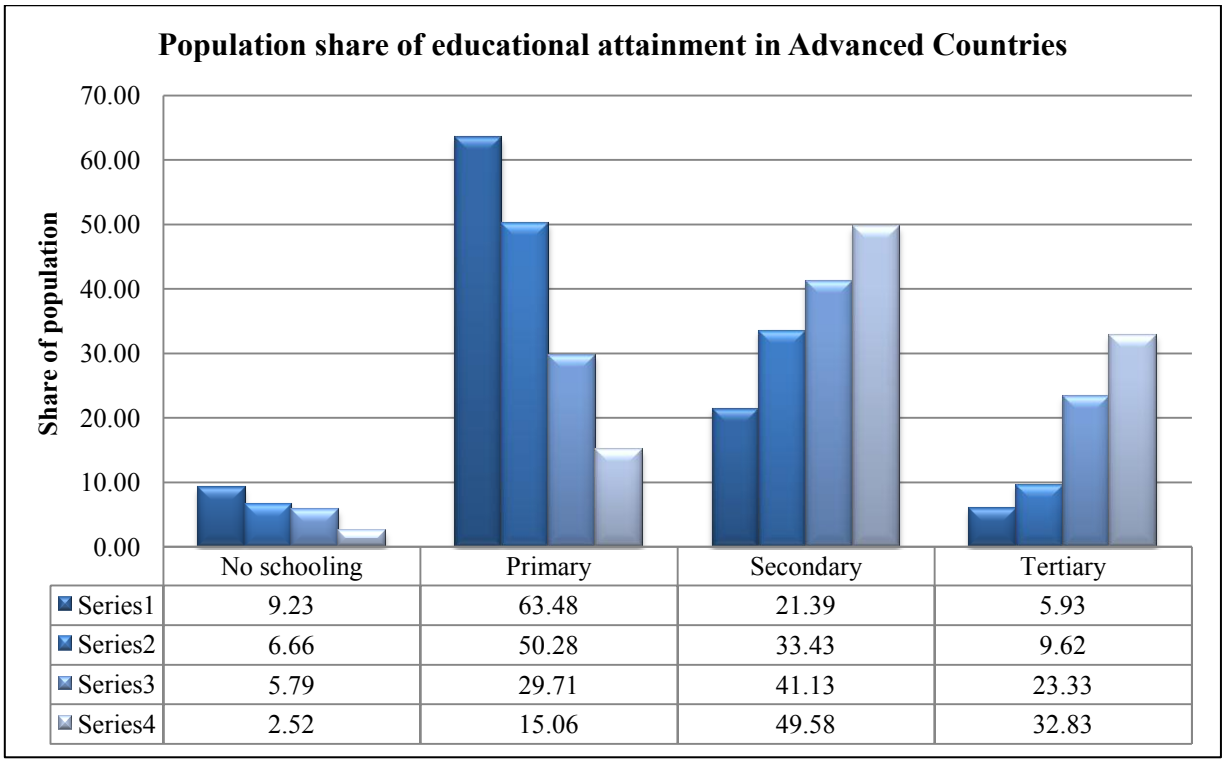
Figure 4-5: Proportion of world population with highest level of education



	No schooling	Primary	Secondary	Tertiary
1950	50.54	37.33	9.77	2.34
1970	39.68	38.34	17.91	4.06
1990	29.29	30.62	30.22	10.04
2010	17.33	25.73	42.79	14.14

Source: Author's calculations
Note: Share of population is weighted by country's population. There are 146 countries in Barro-Lee dataset.

Figure 4-6: Share of population with highest level of education in advanced countries



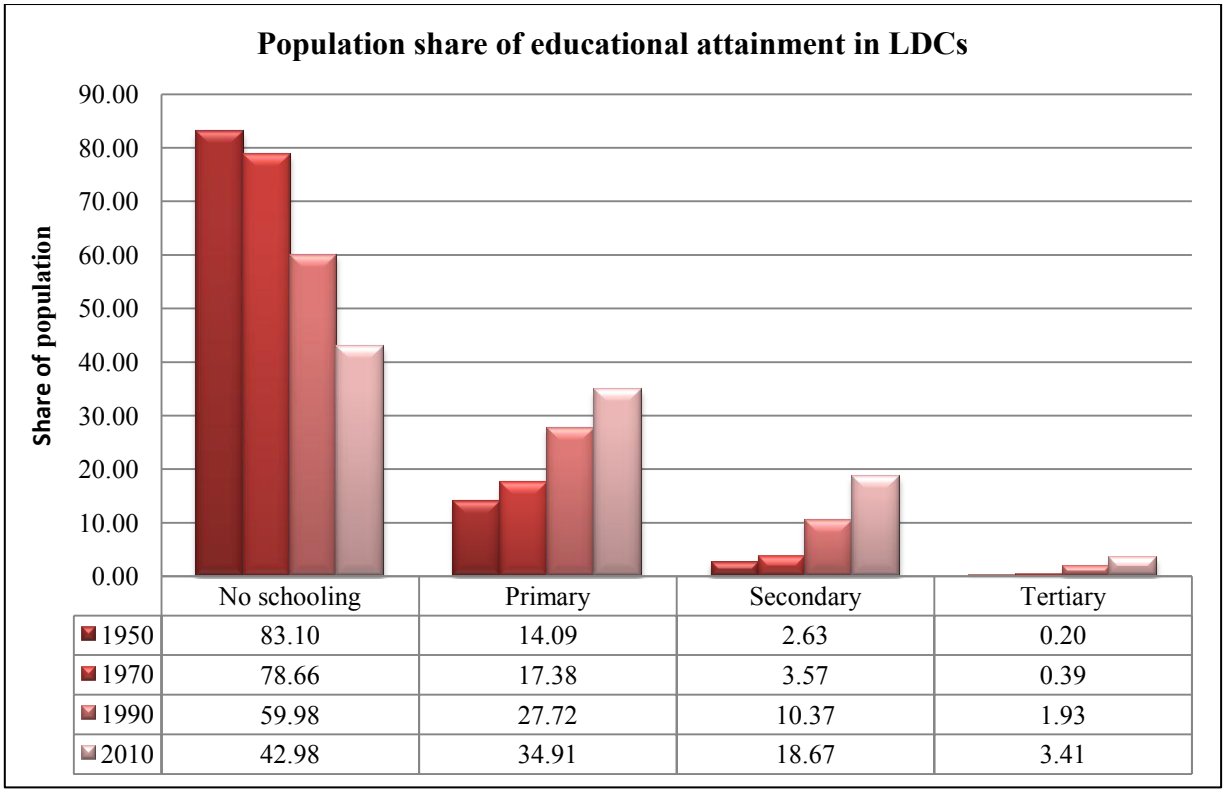
	No schooling	Primary	Secondary	Tertiary
Series1	9.23	63.48	21.39	5.93
Series2	6.66	50.28	33.43	9.62
Series3	5.79	29.71	41.13	23.33
Series4	2.52	15.06	49.58	32.83

Source: Author's calculations
Note: Share of population is weighted by country's population. There are 24 advanced countries in Barro-Lee dataset; Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherland, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United State of America.

Figure 4-6 presents changes of population share overtime in advanced countries. The figure shows that, an improvement of equality in educational attainment overtime mainly caused the drastic decline in a share of people with primary education and the continuous increases in proportions of population with secondary and tertiary education. On the other hand, in the case of less developed countries (figure 4-7), a decrease in inequality in educational attainment is from a reduction of people with no schooling and the boost of

population with primary and secondary education. Population with tertiary education slightly increased overtime.

Figure 4-7: Share of population with highest level of education in LDCs



	No schooling	Primary	Secondary	Tertiary
1950	83.10	14.09	2.63	0.20
1970	78.66	17.38	3.57	0.39
1990	59.98	27.72	10.37	1.93
2010	42.98	34.91	18.67	3.41

Source: Author's calculations
Note: Share of population is weighted by country's population. There are 28 less developed countries (by United Nation) in Barro-Lee dataset; Afghanistan, Bangladesh, Benin, Burundi, Cambodia, Central African Republic, Democratic Republic of the Congo, Gambia, Haiti, Lao PDR, Lesotho, Liberia, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Senegal, Sierra Leone, Sudan, Togo, Uganda, United Republic of Tanzania, Yemen, and Zambia.

4.6.Concluding remarks

The objectives of this chapter are to analyze the method of measuring the degree of inequality in educational attainment and to decompose population groups with given level of education in order to find a cause of enhancement of equality in educational attainment. The author uses the data of educational attainment from two sources; Barro-Lee and Soto-Cohen and found the empirical evidence for supporting the infeasibility of using the education Lorenz curves in the analysis. The main reason is from the limitation of macroeconomic data on educational attainment.

The author also found that the pattern of diminishment in inequality in educational attainment overtime is different between advanced countries and less developed countries. The greater equality in educational attainment of the former comes from an abatement of population with primary education and the additions of population with secondary and tertiary educations. On the contrary, in the case of the latter group, a lessening of inequality in educational attainment causes from the shrinkage of people with no schooling and the rise of population with primary and secondary levels of education.

CHAPTER 5

EDUCATIONAL ATTAINMENT AND ITS INEQUALITY: DETERMINANTS AND IMPACTS ON LABOR PRODUCTIVITY

5.1. Introduction

The purpose of this chapter is to investigate macroeconomic factors influencing the country's inequality in educational attainment and to examine a role of educational attainment and its inequality on labor productivity at a country level by employing Cobb-Douglas production function from the period of 1950 to 2010, with five-year intervals. Nowadays, an equal access to education is basic rights that everyone should have and the public push towards making primary and lower secondary school attendance compulsory in most countries around the World but inequality in education still remains.

In a part of determinants, the two sided driving forces influence educational inequality by two-sided main elements. One is describing the household behavior as the demand of schooling and the other is government provision as the supply of schooling (Checchi, 2006).

Since achieving equality between the rich and the poor within education markets necessitates government intervention, macroeconomic policy implication should take into account all significant determinants of educational inequalities. In this study, the author focuses on analyses of important macroeconomic factors determining levels of educational inequalities. Although most countries have already passed the law of compulsory education to solve literacy problem, governments are still expected to put the law into practice.

Understanding historical trends of educational inequality in the world economy, Morrisson and Murtin (2007) pointed out a dramatically decreasing trend of the world inequality in years of schooling from 1870 and the consequently crucial reduction of the illiteracy. The Gini coefficients of educational inequality have decreased over 50 percent (from 0.8 to 0.4).

Although the author previously concerned that there is a difference between ***educational attainment*** and ***human capital***, despite the fact that investment in education is obviously observed and it provided clear image of ***educated labor***[9]. The role of educational attainment or human capital on economic productivity is empirically ambiguous. Barro and Lee (1994) found a strong association between human capital and economic growth. On the contrary, Benhabib and Spiegel (1994), Bils and Klenow (2000) found an insignificant relationship between the two.

This chapter is divided into five sections. The next section investigates a relationship between an average number of years of schooling and its inequality. Section 5.3 presents the determinants of inequality in educational attainment. Section 5.4 presents the impact of educational attainment and its inequality on labor productivity. Due to the different scopes and sources of data between sections 5.3 and 5.4, sources of data and time range are individually described in each section. Section 5.5, the last section, concludes this chapter.

5.2. Relationship between years of schooling and its inequality

After choosing Gini coefficient as a measure of inequality in educational attainment, levels of the education Gini coefficients of all countries for total and female populations are shown in

[9] Generally, four sources of human capital are mentioned; health, education, on-the-job training, and migration.

the appendix. Based on education data from Barro- Lee, the proportion of population without schooling has dramatically declined over the period 1950 to 2010. In addition, in year 2010, there is none of population with no schooling and the proportion of population without education approaches zero in most advanced-economy countries. Not only the case of population without schooling, but also the case of population with primary schooling, the proportion of population with highest primary level of education attained has become less over time in advanced-economy countries. Still, there is a huge proportion of population with primary level as the final education in Sub-Saharan Africa countries (over 40 percent of total population).

In this section, the author provides an empirical trend of international inequality in educational attainment covering the period of 1950-2010. The education Gini coefficient is computed based on two famous sources of educational data mentioned earlier; Barro-Lee, and Cohen-Soto[10]. Two age-range groups of populations are mentioned in the estimations; the first is the group of population aged 15 years and over, and the second is the group of population aged 25 years and over. Most of previous studies apply the latter group in their discussions since this age group is supposed to have completed schooling while some studies choose the former group for the reason that a large share of labor force who starts working is younger than 25 years old in many developing countries.

Figures 5-1 and 5-2 present the relationships between an average number of years of schooling and its inequality. These show an existence of negative monotonic relationship of an average number of years of schooling on its inequality. The author further looks into the

[10] The reason that we use two sources of data instead of selecting one source is each source is criticized to be biased. We would like to compare the different degree of inequality in education between both sources.

estimation between them across countries over time. The specification of the simple linear relationship is mentioned as follows;

$$G_{EDUCit} = \beta_0 + \beta_1 S_{it} + u_{it} \quad \text{..... (5.1)}$$

Where G_{EDUCit} is the education Gini coefficient of country *i* at time *t*; value between zero (perfect equality) to unity (perfect inequality)*;* S presents an average number of years of schooling. From equation (5.1), β_0 is intercept of equation. The intercept is expected to be positive and between zero to unity. β_1 presents the slope of equation or marginal effect of the average number of years of schooling on the education Gini coefficient. The parameter implies that if expanding an average number of years of schooling higher by one year, it will affect a degree of inequality in educational attainment. The sign of the coefficient is expected to be negative.

Table 5-1: Summary of estimations of educational attainment on its inequality

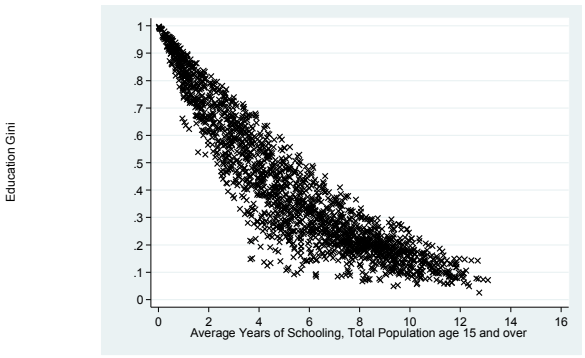
	The education Gini coefficient					
	(Barro-Lee)				**(Cohen-Soto)**	
	Female Population		**Total Population**		**Total Population**	
	Age ≥ 15	Age ≥ 25	Age ≥ 15	Age ≥ 25	Age ≥ 15	Age ≥ 25
Schooling	**-0.078**	**-0.080**	**-0.073**	**-0.075**	**-0.051**	**-0.051**
	(-95.40)	(-94.20)	(-91.95)	(-90.99)	(-43.54)	(-40.63)
Constant	**0.842**	**0.859**	**0.811**	**0.829**	**0.835**	**0.845**
	(171.90)	(177.85)	(162.41)	(167.93)	(107.83)	(106.84)
Adjusted R^2	0.828	0.833	0.817	0.814	0.769	0.744
No. of Obs.	1898	1898	1898	1898	570	570

Note: t-statistics are reported in the parentheses. The results from Barro-Lee are in five-year-interval from 1950-2010 with 146 countries. The results from Cohen and Soto are in ten-year-interval from 1960-2010 with 85 countries. All coefficients are significantly different from zero at 0.1% level of significance.

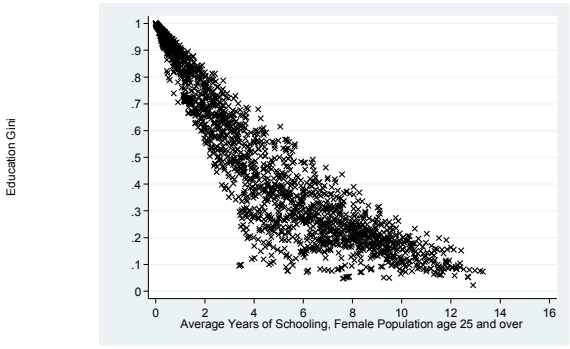
Figure 5-1: The set of scatterplots between average years of schooling and its inequality

Female population aged 15 and over

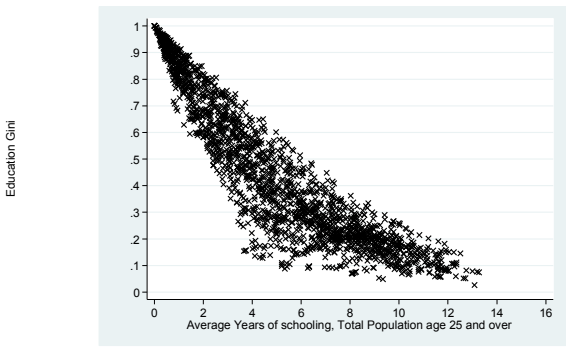
Total population aged 15 and over



Female population aged 25 and over



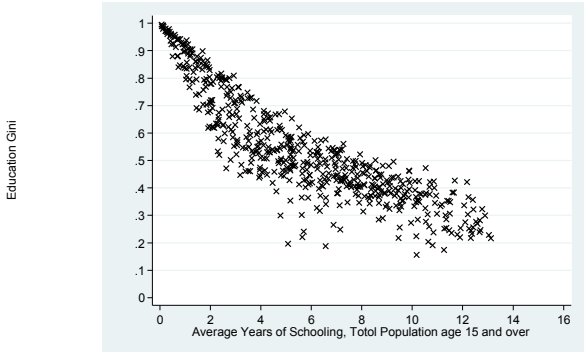
Total population aged 25 and over



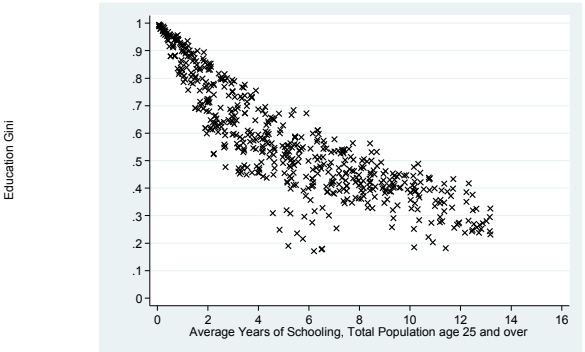
Source: Author's calculations based on Barro-Lee dataset of educational attainment from 1950-2010, five-year interval with 146 countries.

Figure 5-2: Scatterplot between average years of schooling and its inequality

Total population aged 15 and over



Total population aged 25 and over



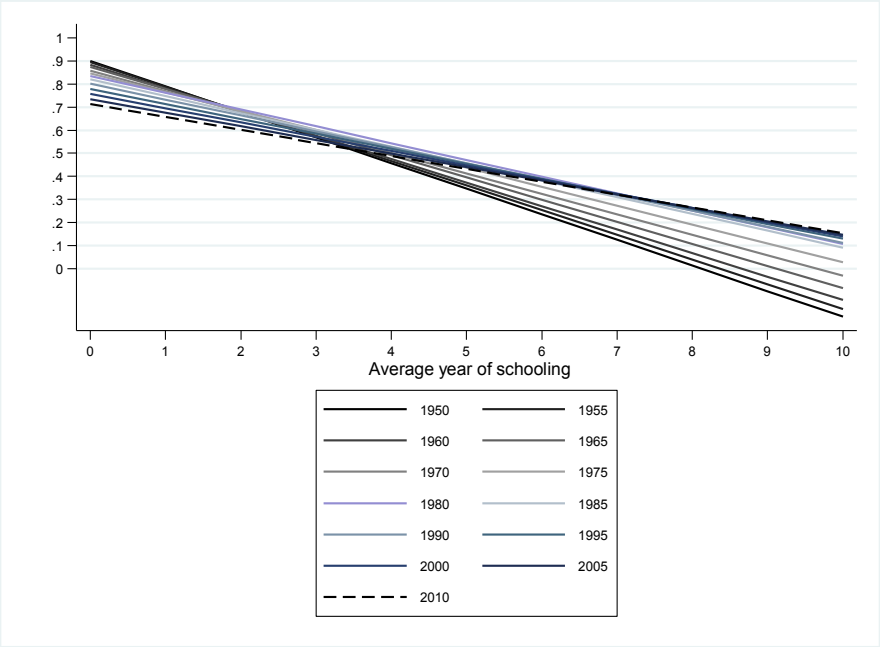
Source: Author's calculations based on Cohen-Soto dataset of educational attainment from 1960-2010, ten-year interval with 85 countries.

Table 5-1 presents the estimations of equation 5.1. The estimations support a significant equalizing power of schooling expansion (years of schooling). Tables 5-2 and 5-3 present a cross-sectional analysis based on both data-sources of educational attainment. It has been found that not only the coefficients β_1 decrease along the time but also a change of the intercept β_0 becomes lower.

The author looks in a depth of the transition of an average number of years of schooling and its inequality over time. The results of cross-sectional regressions of 146 observations in table 5-2 present lower intercepts from 1950 to 2010 (from 0.901 to 0.713) and smaller slopes of educational attainment which means the effect of education expansion is weaker when time passes. The results of estimations in table 5-2 are brought to plot graphs which are shown in figure 5-3 (for total population) and figure 5-4 (for female population). Both figures describe the similar transition of an average number of years of schooling and its inequality from 1950 to 2010. The transition shows that the world economy has more equality in educational attainment across countries. Especially in Sub-Saharan African countries and other less developed countries, the outstandingly reduction in inequality in educational attainment is found. This is possible because of international aids in those countries.

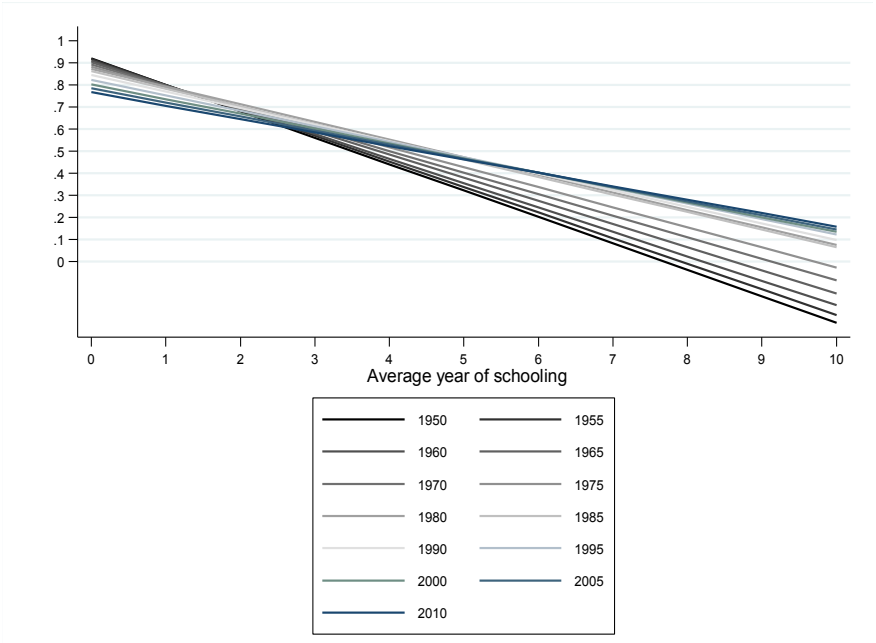
A change of marginal effect is plotted in figure 5-5 (Barro-Lee data) and figure 5-6 (Cohen-Soto data). It is also found that the marginal effect of schooling expansion decreases over time. By combining an analysis with the evidence of intercept values presented in tables 5-4 and 5-5, the levels of curve between average years of schooling and the education Gini has inward shifted.

Figure 5-3: Transition of education expansion on educational inequality



Source: Author's calculations
Note: The figure corresponds to the total population aged 15 years and over.

Figure 5-4: Transition of education expansion on educational inequality in female group



Source: Author's calculations
Note: The figure corresponds to the female population aged 15 years and over.

Table 5-2: The estimates from 1950-2010, from Barro-Lee

	Education Gini												
	1950	**1955**	**1960**	**1965**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
Total Population (age ≥ 15)													
Schooling	**-0.111**	**-0.107**	**-0.102**	**-0.096**	**-0.089**	**-0.082**	**-0.078**	**-0.073**	**-0.069**	**-0.065**	**-0.062**	**-0.059**	**-0.056**
	(-27.79)	(-27.74)	(-27.40)	(-28.75)	(-27.80)	(-28.30)	(-28.97)	(-28.61)	(-27.12)	(-26.66)	(-25.42)	(-24.64)	(-23.49)
Constants	**0.901**	**0.895**	**0.883**	**0.875**	**0.858**	**0.847**	**0.836**	**0.821**	**0.802**	**0.779**	**0.758**	**0.735**	**0.713**
	(58.18)	(56.89)	(55.01)	(56.29)	(52.77)	(52.09)	(51.12)	(48.99)	(45.09)	(42.88)	(39.78)	(37.44)	(34.98)
Adj R^2	0.842	0.841	0.838	0.851	0.842	0.847	0.853	0.849	0.835	0.830	0.817	0.807	0.792
No. of Obs	146	146	146	146	146	146	146	146	146	146	146	146	146
Total Population (age ≥ 25)													
Schooling	**-0.116**	**-0.111**	**-0.107**	**-0.101**	**-0.094**	**-0.087**	**-0.081**	**-0.077**	**-0.072**	**-0.068**	**-0.064**	**-0.061**	**-0.059**
	(-28.49)	(-28.15)	(-27.87)	(-28.93)	(-28.16)	(-27.98)	(-28.05)	(-28.70)	(-28.37)	(-28.36)	(-27.56)	(-26.64)	(-25.85)
Constants	**0.912**	**0.905**	**0.898**	**0.889**	**0.879**	**0.869**	**0.858**	**0.848**	**0.835**	**0.814**	**0.790**	**0.763**	**0.750**
	(61.07)	(59.22)	(57.67)	(58.77)	(56.08)	(54.40)	(52.61)	(51.91)	(49.43)	(47.27)	(44.61)	(41.74)	(39.29)
Adj R^2	0.848	0.845	0.843	0.852	0.845	0.844	0.844	0.850	0.847	0.847	0.839	0.830	0.822
No. of Obs	146	146	146	146	146	146	146	146	146	146	146	146	146
Female Population (age ≥ 15)													
Schooling	**-0.120**	**-0.116**	**-0.111**	**-0.105**	**-0.098**	**-0.091**	**-0.085**	**-0.080**	**-0.075**	**-0.070**	**-0.067**	**-0.064**	**-0.061**
	(-29.19)	(-29.22)	(-29.34)	(-31.13)	(-30.94)	(-31.63)	(-32.17)	(-32.51)	(-31.04)	(-29.81)	(-28.53)	(-28.06)	(-26.90)
Constants	**0.921**	**0.917**	**0.910**	**0.904**	**0.893**	**0.882**	**0.873**	**0.863**	**0.846**	**0.822**	**0.803**	**0.785**	**0.767**
	(62.61)	(61.32)	(60.10)	(62.07)	(59.73)	(59.29)	(57.84)	(56.57)	(52.22)	(48.54)	(45.15)	(42.96)	(40.23)
Adj R^2	0.854	0.855	0.856	0.869	0.868	0.873	0.877	0.879	0.869	0.860	0.850	0.844	0.833
No. of Obs	146	146	146	146	146	146	146	146	146	146	146	146	146
Female Population (age ≥ 25)													
Schooling	**-0.124**	**-0.121**	**-0.117**	**-0.111**	**-0.104**	**-0.097**	**-0.090**	**-0.084**	**-0.079**	**-0.074**	**-0.069**	**-0.065**	**-0.064**
	(-30.12)	(-29.91)	(-30.31)	(-31.45)	(-31.15)	(-31.06)	(-30.89)	(-32.12)	(-32.26)	(-31.47)	(-30.19)	(-29.37)	(-28.84)
Constants	**0.929**	**0.925**	**0.921**	**0.915**	**0.908**	**0.899**	**0.890**	**0.885**	**0.876**	**0.855**	**0.830**	**0.807**	**0.796**
	(66.29)	(64.52)	(64.16)	(65.18)	(63.22)	(61.52)	(59.05)	(59.11)	(57.12)	(53.37)	(49.79)	(46.74)	(44.39)
Adj R^2	0.862	0.860	0.864	0.872	0.870	0.870	0.868	0.877	0.878	0.872	0.863	0.856	0.851
No. of Obs	146	146	146	146	146	146	146	146	146	146	146	146	146

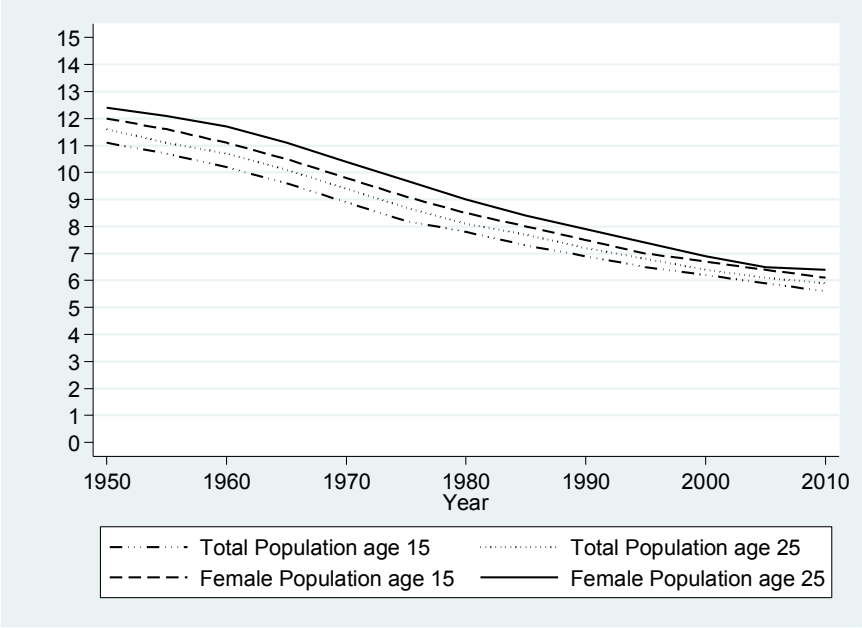
Note: t-statistics are reported in the parentheses. All coefficients are significantly different from zero at 0.1% level of significance.

Table 5-3: The estimates for 1960-2010, from Cohen-Soto

	Education Gini					
	1960	**1970**	**1980**	**1990**	**2000**	**2010**
***Total Population (age* ≥ 15)**						
Schooling	**-0.069**	**-0.062**	**-0.055**	**-0.050**	**-0.043**	**-0.039**
	(-17.78)	(-18.24)	(-20.56)	(-19.45)	(-17.30)	(-14.92)
Constants	**0.884**	**0.877**	**0.856**	**0.834**	**0.792**	**0.753**
	(48.19)	(48.00)	(52.39)	(46.61)	(41.20)	(35.63)
Adj R^2	0.770	0.779	0.818	0.801	0.760	0.702
No. of Obs	95	95	95	95	95	95
***Total Population (age* ≥ 25)**						
Schooling	**-0.074**	**-0.064**	**-0.056**	**-0.051**	**-0.045**	**-0.040**
	(-17.17)	(-16.52)	(-17.13)	(-19.70)	(-18.29)	(-16.11)
Constants	**0.891**	**0.880**	**0.868**	**0.851**	**0.825**	**0.786**
	(47.80)	(46.03)	(46.63)	(50.54)	(45.17)	(39.13)
Adj R^2	0.758	0.743	0.757	0.805	0.780	0.733
No. of Obs	95	95	95	95	95	95

Note: t-statistics are reported in the parentheses. All coefficients are significantly different from zero at 0.1% level of significance.

Figure 5-5: trend of marginal change in average years of schooling on its inequality



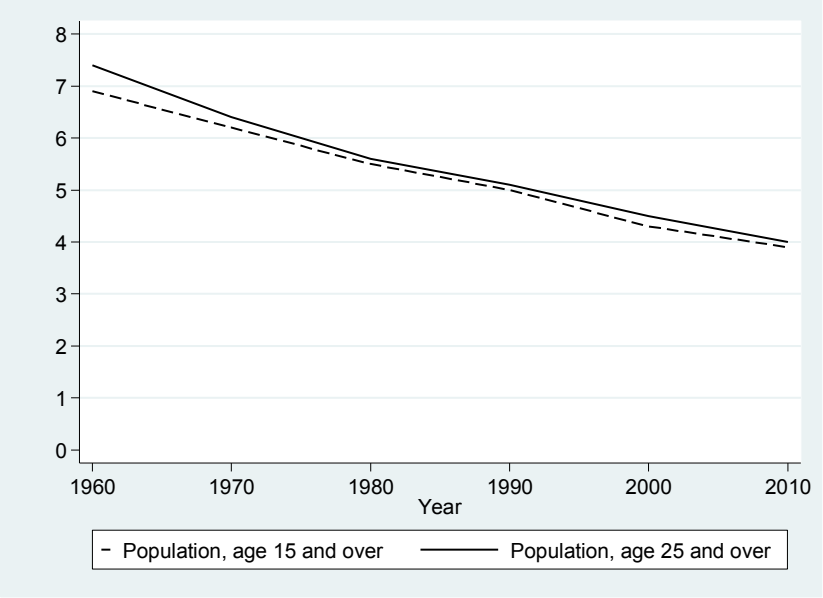
Source: figure by Author, computing from Barro- Lee data

Table 5-4: The change of Intercept, 1950-2010, Barro-Lee data

Year	Population							
	Total, age ≥ 15		Total, age≥ 25		Female, age ≥ 15		Female, age ≥ 25	
	Intercept	Change	Intercept	Change	Intercept	Change	Intercept	Change
1950	0.901		0.912		0.921		0.929	
		Δ = -0.006		Δ = -0.007		Δ = -0.004		Δ = -0.004
1955	0.895		0.905		0.917		0.925	
		Δ = -0.012		Δ = -0.007		Δ = -0.007		Δ = -0.004
1960	0.883		0.898		0.910		0.921	
		Δ = -0.008		Δ = -0.009		Δ = -0.006		Δ = -0.006
1965	0.875		0.889		0.904		0.915	
		Δ = -0.017		Δ = -0.010		Δ = -0.011		Δ = -0.007
1970	0.858		0.879		0.893		0.908	
		Δ = -0.011		Δ = -0.010		Δ = -0.011		Δ = -0.009
1975	0.847		0.869		0.882		0.899	
		Δ = -0.009		Δ = -0.011		Δ = -0.009		Δ = -0.009
1980	0.836		0.858		0.873		0.890	
		Δ = -0.015		Δ = -0.010		Δ = -0.010		Δ = -0.005
1985	0.821		0.848		0.863		0.885	
		Δ = -0.019		Δ = -0.013		Δ = -0.017		Δ = -0.009
1990	0.802		0.835		0.846		0.876	
		Δ = -0.023		Δ = -0.021		Δ = -0.024		Δ = -0.021
1995	0.779		0.814		0.822		0.855	
		Δ = -0.021		Δ = -0.024		Δ = -0.019		Δ = -0.025
2000	0.758		0.790		0.803		0.830	
		Δ = -0.023		Δ = -0.027		Δ = -0.018		Δ = -0.023
2005	0.735		0.763		0.785		0.807	
		Δ = -0.024		Δ = -0.013		Δ = -0.018		Δ = -0.011
2010	0.713		0.750		0.767		0.796	

Source: Author's calculations

Figure 5-6: trend of marginal change in average years of schooling on its inequality



Source: Author's calculations based on Cohen and Soto, 1960-2010

In conclusion, the author found a constant negative monotonic relationship between average years of schooling and Gini coefficients of education distribution. By examining the relationship between them, a continuous decreasing trend of world educational inequality is found from 1950 to 2010. Estimating year by year, our finding shows that the marginal rate of inequality in educational attainment is in a decreasing manner. The elasticity of curve is higher over the period.

In addition, the intercept of an average number of years of schooling decreased at an increasing rate. This implies that the level of education Gini with zero average year of schooling declines over time. Equality in educational attainment is permanently greater from 1950 to 2010.

Table 5-5: The change of Intercept, 1960-2010, Cohen-Soto data

Year	Total Population			
	Age ≥ 15		Age ≥ 25	
	Intercept	Change	Intercept	Change
1960	0.884		0.891	
		Δ = -0.007		Δ = -0.011
1970	0.877		0.880	
		Δ = -0.021		Δ = -0.012
1980	0.856		0.868	
		Δ = -0.022		Δ = -0.017
1990	0.834		0.851	
		Δ = -0.042		Δ = -0.026
2000	0.792		0.825	
		Δ = -0.039		Δ = -0.039
2010	0.753		0.786	

Source: Author's calculations

5.3. Determinants of inequality in educational attainment

5.3.1 Data and sample

In the analysis of determinants of inequality in educational attainment, the author uses the data on educational attainment from Barro-Lee. The observation is population aged 15 years and over. The data on income inequality obtains from UNU-WIDER, and other remaining variables are from the World Bank. The data are in an unbalanced panel referring to 69 countries from the period 1975 to 2005, with five-year intervals period. This section relies on 201 observations (average 2.9 observations per country). Descriptive statistics of all variables are reported in table 5-6.

Table 5-6: Descriptive statistics of variables

variable	Mean	Std. Dev.	Min	Max
Education Gini, total	0.2360	0.1561	0.0259	0.8564
Education Gini, female	0.2541	0.1801	0.0230	0.9126
Lagged Education Gini, total	0.2548	0.1687	0.0585	0.8959
Lagged Education Gini, female	0.2734	0.1937	0.0631	0.9379
Avg. Years of sch, total	8.2931	2.4480	1.3670	12.7490
Avg. Years of sch, female	7.9884	2.6595	0.8290	12.6090
Lagged income Gini	0.3630	0.0943	0.1900	0.6180
Fertility rate	2.3474	1.2266	1.1000	7.4350
GDP Growth rate	3.4845	3.5512	-11.3628	13.8657
Log of real per capita income	3.7266	0.5986	2.1629	4.6110
Ratio of Capital to GDP	22.5012	5.3312	9.6308	43.5862
Life expectancy	71.9553	6.2113	43.5153	80.5805
Education expenditure	4.4567	1.5786	0.9376	8.2987
Ratio of F/M primary enrollment	96.4501	8.7758	51.3350	103.3030
Rural Pop. Growth	-0.1372	1.3377	-5.4852	3.3113
Square of rural Pop. growth	1.7994	3.3168	0.0002	30.0873
Primary enrollment	101.8118	11.2020	52.0660	136.6627

Note: The unbalanced panel of 69 countries, the number of observations is 201 covering the five-year interval period during 1975 to 2005.

5.3.2 Framework of determinants of inequality in educational attainment

In this sub-section, the author will investigate the factors influencing the inequality in educational attainment. The specification of econometric model is as follows;

$$G_{EDUC_{it}} = \alpha + \beta X_{i,t-T} + \gamma Z_{it} + u_{it} + e_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5.2)$$

Where the subscripts i and t are the country and the time period of the panel respectively; T refers to a time lag, taken to be five years; G_{EDUC} is the standard indicator of

inequality in educational attainment – the Gini coefficients of the distribution of corresponding (total and female) population's educational attainments, where zero means everybody has the same highest level of schooling that individuals attain (perfect equality) and unity means only one individual accesses to education and others are unable to access to formal education or without schooling (perfect inequality); X is a vector of the five-year lagged explanatory variables taken in account for estimation which includes two variables – lagged dependent variable and lagged income inequality (measure by the Gini index of income distribution). Past educational and income inequalities are focused to affect future educational inequality (Gregorio and Lee, 2002); Z is a vector of ten current-year independent variables which comprises of (1) educational factors; average years of schooling and primary enrolment rate, (2) demographic factors; fertility rate and annual rural population growth rate, (3) social environment factors; life expectancy and gender disparity (ratio of female to male primary enrolment), these variables explain households behavior or a demand for schooling, (4) ratio of public spending on education to GDP as government gives a support on education or supply of schooling, (5) ratio of capital to GDP describing a demand for skilled workers in the labor market, (6) GDP annual growth rate and per capita real income are contained as control variables for the stage of economic development process; u is a time-invariant country's fixed effect; and e is an error term.

The author avoids misspecification of the equation by constructing scatterplots of correlations between independent and dependent variables which are shown in the Appendix for simply observing the linear relationship. The author firstly notices in the previous section that there is a negative linear relationship[11] between an average number of years of schooling

[11]Gregorio and Lee (2002) found the nonlinear (inverted-U shape) relationship between educational attainment and its inequality (standard deviations of schooling) with the turning points of 4.2 years.

and educational inequality which is delineated by figure 5-7 and figure 5-8. So it is expected to have a negative coefficient of education expansion on educational inequality. Secondly, the author points out a positive linear relationship between schooling inequality in the previous year and the schooling inequality in the current year which is shown in figure 5-9 and 5-10. Surprisingly, the author also notices a nonlinear relationship between rural growth rate and the Gini coefficients of education distribution which are shown in figure 5-11 and figure 5-12. The annual rural growth rate in squared term is added in the regressions. Since the data range of rural population growth rate changes from negative to positive values (minimum is -5.485 and maximum is 3.113), the author expected the positive coefficients of both variables of rural population growth rate.

For other explanatory variables not shown in figures, income inequality in previous year is expected as to be a disequalizer of educational inequality (positive relationship). On the contrary, primary enrolment rate, gender parity, education expenditure, and capital are expected to be an equalizer of inequality in educational attainment (negative relationship).

5.3.3 Empirical results of determinants of inequality in educational attainment

In this section, determinants of inequality in educational attainment are examined. Table 5-7 contains results of three regressions. The difference in model 1 and models 2 & 3 is dependent variables. The former (Model 1) use the Gini coefficients of educational attainment of total population aged 15 years and over as the explained variable while the latter (Models 2& 3) uses the educational Gini coefficients for female population in the same range of age as the regressant.

Figure 5-7: Scatterplot of the average number of years of schooling and inequality in education: total population

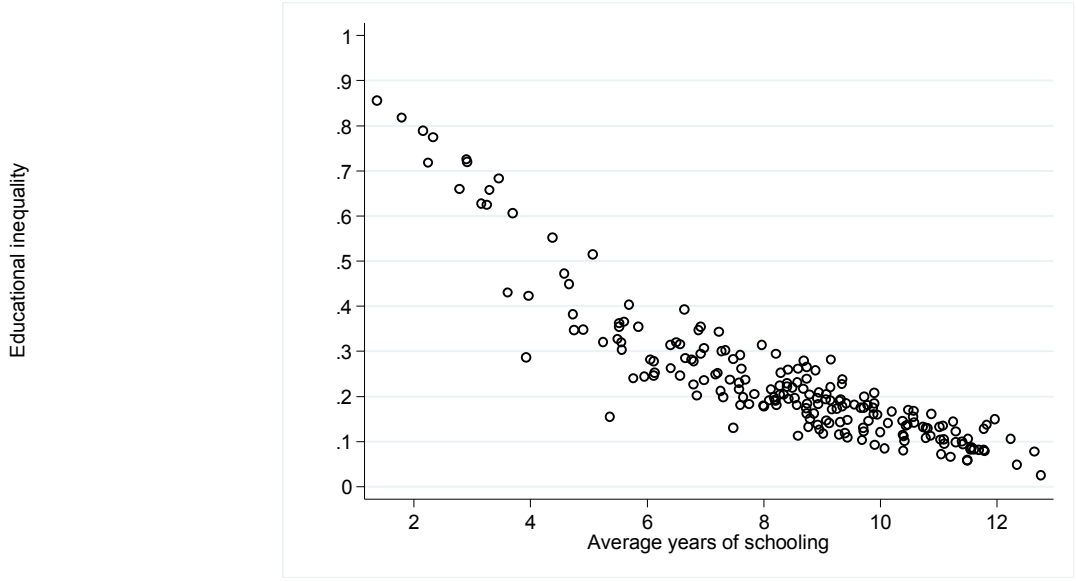


Figure 5-8: Scatterplot of the average number of years of schooling and inequality in education: female

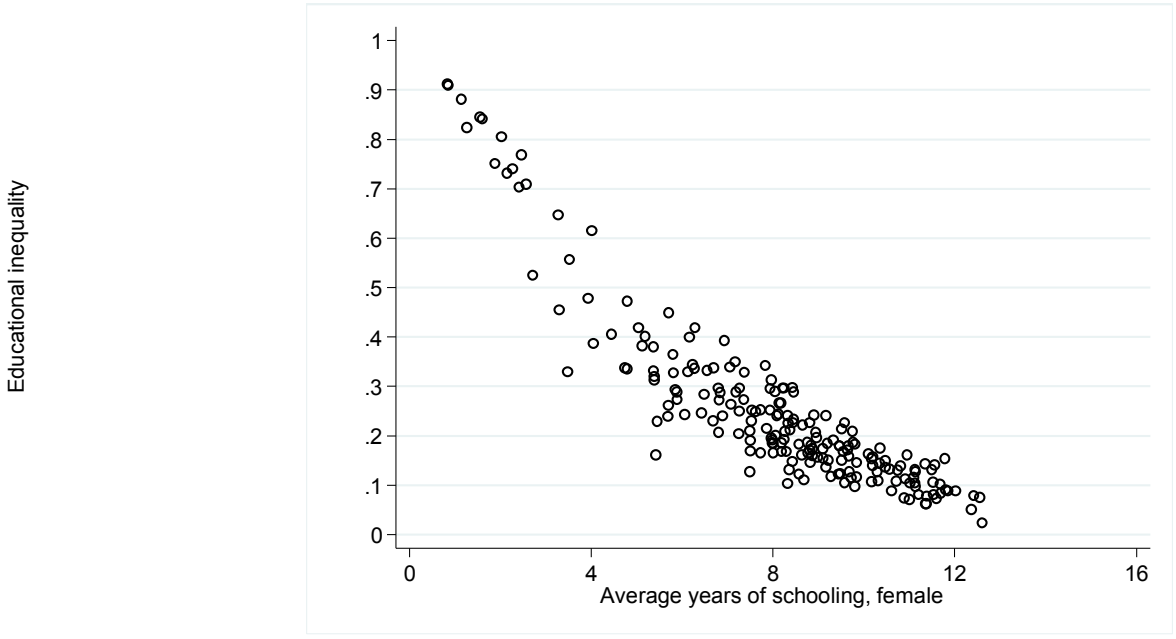


Figure 5-9: Scatterplot of past and current inequalities in education: total population

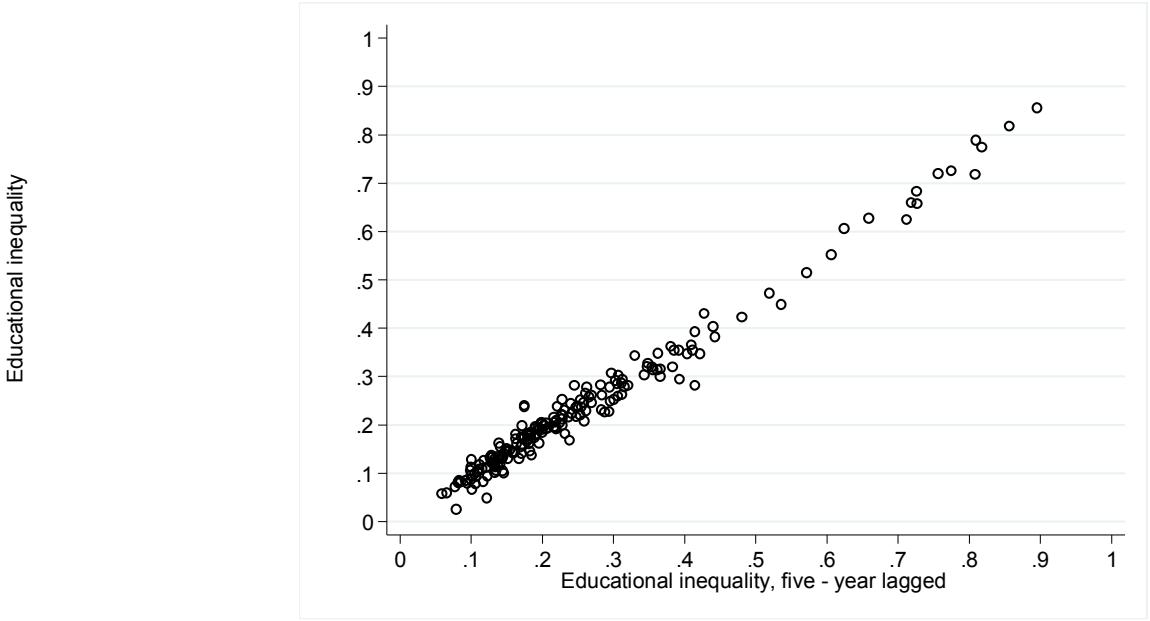


Figure 5-10: Scatterplot of past and current inequalities in education: female population

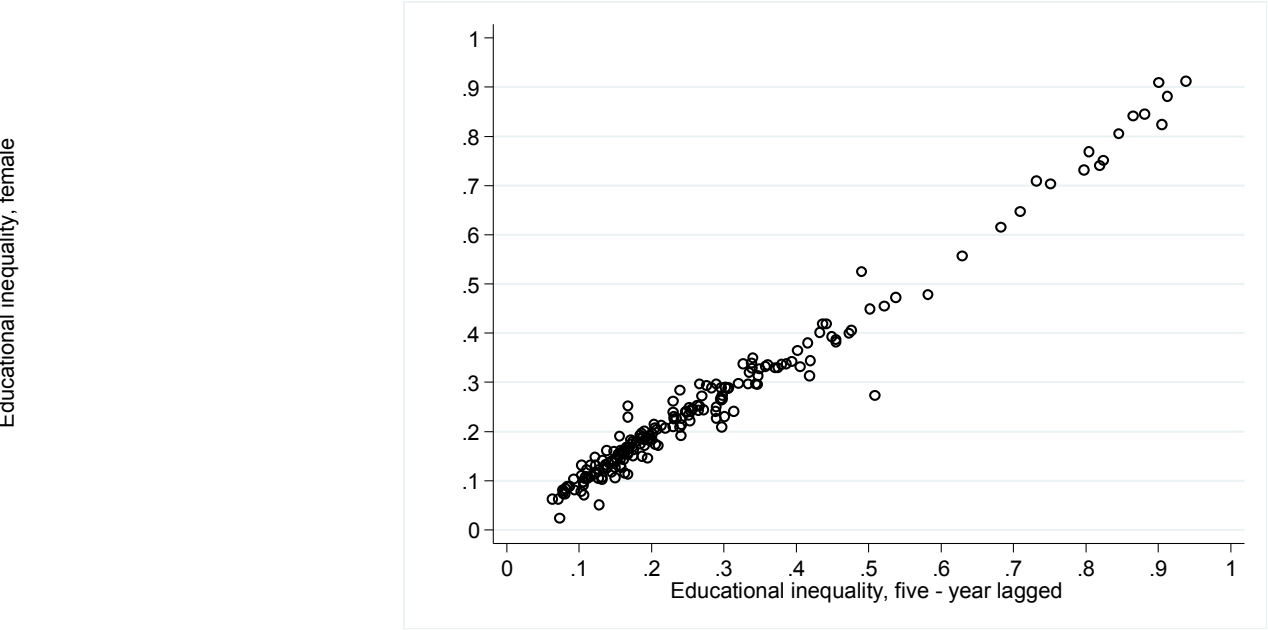


Figure 5-11: Scatterplot of rural population growth rate and current inequality in education: total population

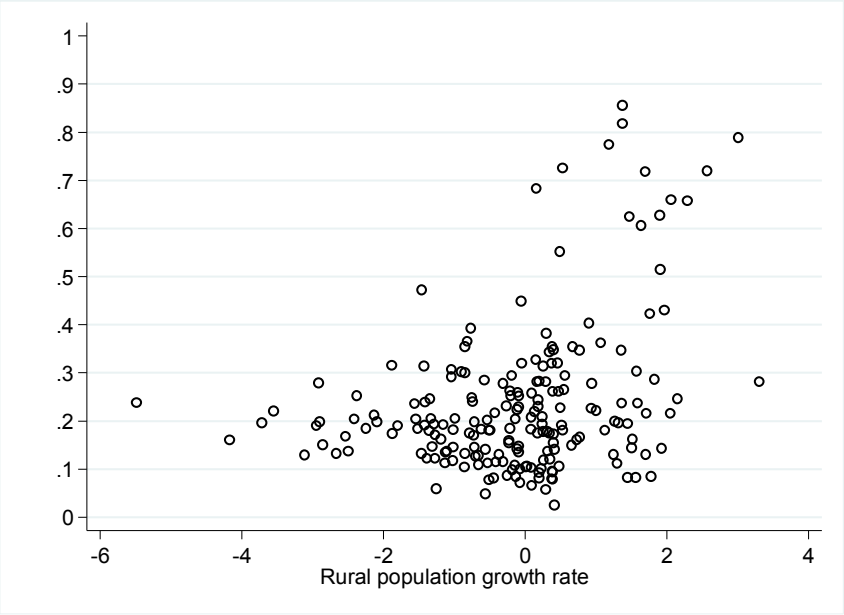
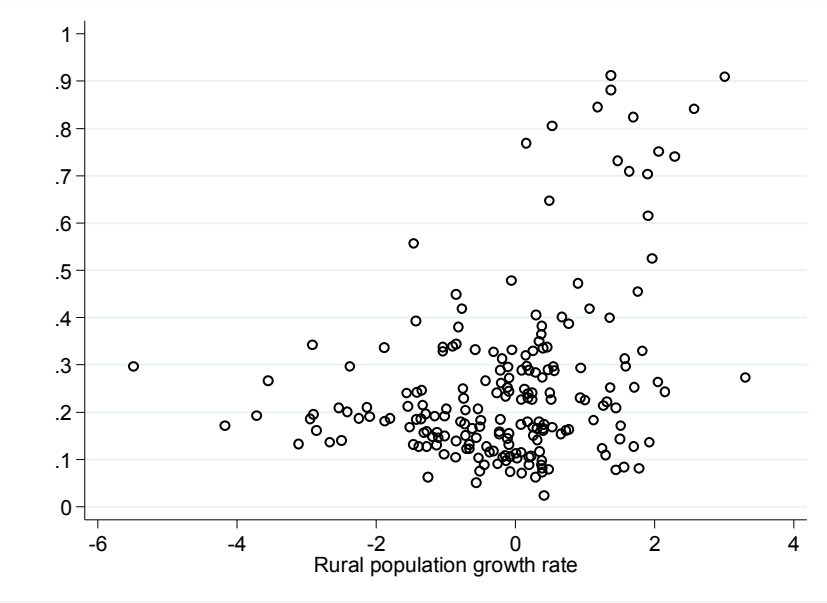


Figure 5-12: Scatterplot of rural population growth rate and current inequality in education: female population



Source: figure 5-7 to figure 5-12 are constructed by Author.

Concentrating on the result of regression of model 1, we find a strong effect of five-year lagged educational inequality on the current educational inequality. Although the coefficient is positive as we previously expected, there is an insignificant positive effect of five-year lagged income inequality. Hence, the effect of educational inequality seems to be long lasting persistent compared to the effect of past income inequality.

Considering other factors on the demand side for schooling, fertility rate, annual rural population growth rate, and ratio of female to male primary enrollment weakly affect schooling inequality while there is an insignificant effect of life expectancy.

Fertility rate is negatively associated with educational inequality. Bigger number of family member leads to better education distribution due to a supportive effect among family members (Checchi, 2006). Ratio of female to male for primary enrolment is also negatively correlated to educational inequality. This presents an availability of disparity in gender. The better parity in gender brings the greater equality in education.

Expectedly and importantly, the result confirms the quadratic (U-shape) relationship between annual rural growth rate and inequality in educational attainment[12] (the coefficients of rural population growth rate and square of rural population growth rate are both positive and statistically significant). This implies that the higher growth rate of rural population is positively and negatively associated with inequality in educational attainment depending on the initial growth rate of rural population with turning point at -1.88.

On the supply side of education, public spending on education equalizes inequality in educational attainment but it is statistically insignificant. The author also found insignificance

[12] Note that data on annual rural growth rate is negative value. This made the coefficient of annual rural growth rate becomes positive sign.

of primary schooling enrolment rate on inequality in educational attainment. This is because there is a compulsory schooling attendance law utilizing in most countries of the world.

Last but not least for a result of model 1, ratio of capital to GDP equalizes inequality in educational attainment. The requirement of skilled labor will induce higher demand for schooling of individuals.

Moving on to models 2 & 3, the author found that there is no significant effect of fertility rate on female inequality in educational attainment There is a stronger effect of gender parity on female inequality in educational attainment than that of total inequality in educational attainment.

Differing from model 2, model 3 uses an average number of female years of schooling instead of total average years of schooling, the author consistently found a significant equalizing power of education expansion in both variables.

As we observed the U-shape relationship between rural population growth rate and schooling Gini coefficients, the turning point of the curve can be computed as follows;

$$GEDUC = \alpha_0 + \alpha_1 RP + \alpha_2 RP^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5.3)$$

Where RP is rural population annual growth; and $RP^2$is rural population annual growth in squared term; finding the critical point (turning point) by the first condition;

$$0 = \alpha_1 + 2\alpha_2 RP$$

$$RP = -\alpha_1/2\alpha_2, \qquad \text{at turning point}$$

α_1 and α_2 are from the OLS estimate as shown in table 5.8.

Table 5-7: Estimations of educational inequality: fixed effects, 1975-2005

Gini coefficients of inequality in education	Total (1)	Female (2)	Female (3)
Five-year lagged sch. Gini, total	0.4696***	0.4995***	-
	(0.0521)	(0.0583)	
Five-year lagged sch. Gini, female	-	-	0.4631***
			(0.0556)
Average years of sch., total	-0.0253***	-0.0249***	-0.0251***
	(0.0028)	(0.0032)	(0.0032)
Gross primary school enrollment rate	0.0002	0.00002	0.00003
	(0.0002)	(0.0003)	(0.0003)
Five-year lagged income inequality	0.0131	-0.0164	-0.0075
	(0.0286)	(0.320)	(0.0325)
Total life expectancy at birth	-0.0002	0.0007	-0.0007
	(0.0011)	(0.0012)	(0.0012)
Ratio of female to male primary enrollment	-0.0012	-0.0015*	-0.0016*
	(0.0006)	(0.0007)	(0.0007)
Total fertility rate	-0.0083	-0.0059	-0.0095
	(0.0043)	(0.0049)	(0.0051)
Annual rural population growth	0.0039	0.0045*	0.0045*
	(0.0020)	(0.0022)	(0.0022)
Square of annual rural population growth	0.0014*	0.0018**	0.0017**
	(0.0005)	(0.0006)	(0.0006)
Ratio of public spending on education to GDP	-0.0016	-0.0017	-0.0017
	(0.0015)	(0.0017)	(0.0017)
Ratio of capital to GDP	-0.0012**	-0.0017***	-0.0015**
	(0.0004)	(0.0004)	(0.0004)
GDP Growth rate	0.0003	0.0004	0.0002
	(0.0004)	(0.0005)	(0.0005)
Log of real per capita income	0.0473*	0.0407[a]	0.0600*
	(0.0206)	(0.0230)	(0.0235)
Constant	0.3093**	0.3315**	0.3758**
	(0.0976)	(0.1093)	(0.1088)
No. of Obs./ No. of country	201/69	201/69	201/69
Corr (u_i, Xb)	0.6406	0.6977	0.7019
R^2 overall	0.9567	0.9411	0.9477
R^2 between	0.9567	0.9404	0.9445
R^2 within	0.8630	0.8391	0.8358
F-test	57.68	47.75	46.58
	(0.00)	(0.00)	(0.00)

Note: Standard Errors are reported in the parentheses. The symbols *, **, and *** correspond the significance levels of T statistics differing from zero at 5%, 1%, and 0.1% respectively. Corresponding population in panel are total and female population age 15 years and over in model 1 and model 2&3 respectively. Dummies of region are automatically omitted from the regressions due to the multicollinearity. Hausman tests are in used to verify the fixed-effects estimator is suitable in analyses instead of random-effects estimator. The null hypotheses are significantly rejected showing the inconsistent random-effects models.

Table 5.8: The OLS estimate of the education Gini coefficients

	Coefficient
Constant	0.2172***
	(0.0113)
Annual rural population growth	0.0553***
	(0.0033)
Square of annual rural population growth	0.0147***
	(0.0033)
Number of Observations	201
Adjusted R-squared	0.1920

Note: the standard deviation is in parentheses. *** is significant at 0.1% from zero

So the turning point is;

$$RP = - \alpha_1/2\alpha_2,$$

$$RP = - 0.0553/2(0.0147)$$

$$\mathbf{RP = -1.88}$$

The author found that rural population growth rate has twin effects (positive and negative) on educational inequality with the turning point at -1.88 (providing a maximum of equality in educational attainment or the minimum of inequality in educational attainment). This implies that an unbalanced development between urban area and rural area exists in most countries. The opportunity to access to basic education of citizen in urban area is higher than rural area while the birth rate of rural families is greater than urban families. Children in rural poor families have difficulty to schooling accessibility. So the rural population growth positively affects inequality in educational attainment. If the rural rich families support their children's education, internal migration from rural to urban (negative change of rural population) for higher education will make lower inequality in society.

In conclusion, the author found that direct factors involved to schooling like enrolment rate or education expenditures are not significant while indirect factors have significant impacts on inequality in education.

5.4 The impact of education attainment and its inequality on labor productivity

In the previous section, the determinants of inequality in educational attainment are examined. In this section, the author moves on to investigate the impacts of educational attainment and its inequality on labor productivity by using the Cobb-Douglas production function.

5.4.1 Model specification

Educational attainment is treated as human capital in this section. Human capital is treated as an exogenous input. The Cobb-Douglas Production Function with human capital is as follows,

$$Y_{it} = A_{it} K_{it}^{\beta} L_{it}^{\alpha} H_{it}^{\gamma} \quad \text{..... (5.4)}$$

Where, Y_{it} is per capita GDP in the real value; L_{it} is labor; K_{it} is physical capital; H_{it} is human capital; and A_{it} is time-variant technology level in country *i* at time *t*. The author assumes that that is a constant return to scale in the production function. Equation 5.5 is transformed into a form of labor productivity by dividing by labor (L_{it}) both sides of production function and taking the natural logarithm as shown in equation 5.6 as follows;

$$\frac{Yit}{Lit} = \frac{Ait}{Lit} \frac{*K_{it}^{\beta}}{L_{it}^{\beta}} \frac{*L_{it}^{\alpha}}{L_{it}^{\alpha}} \frac{*H_{it}^{\gamma}}{L_{it}^{\gamma}} \quad \text{..... (5.5)}$$

$$\log y_{it} = \log a_{it} + \beta \log k_{it} + \gamma \log h_{it} + X'\delta + \varepsilon_{it} \quad \text{..... (5.6)}$$

Where y_{it} is labor productivity (Y_{it}/L_{it}) ; a_{it} is A_{it}/L_{it} ; k_{it} is physical per worker (K_{it}/L_{it}); h_{it} is human capital per worker measured by an average number of years of schooling (H_{it}/L_{it}); X is the set of seven region dummies controlling the region effect on log labor productivity; Advanced Economies, South Asia, Europe and Central Asia, Middle East and North Africa, Latin America and the Caribbean, Sub-Saharan Africa, and East Asia and the Pacific (Barro and Lee, 2011); and ε_{it} is a disturbance term. The dependent variable of inequality in educational attainment (the educational Gini coefficient; $Geduc_{it}$) is added into equation 5.6 in order to examine an impact of inequality in educational attainment on labor productivity as follows;

$$\log y_{it} = \log a_{it} + \beta \log k_{it} + \gamma \log h_{it} + \lambda\, Geduc_{it} + X'\delta + \log \varepsilon_{it} \quad \text{..... (5.7)}$$

5.4.2. Data

Data on educational attainment is obtained from Barro-Lee. The data is with five-year interval. Data on real per capita GDP, physical capital per worker (per capita investment) are obtained from Penn World Table 7.1.

The unbalanced panel data is used in the regression equations. 1,322 observations of 92 countries are observed (14.4 observations per countries) from 1950 to 2010; with five-year intervals.

5.4.3. Results

In this section, empirical results are shown in table 5-9. The author uses Ordinary Least Squares (OLS) to regress the estimation[13]. Columns 1 and 2 correspond to equations 5.6 and 5.7 respectively. The result shows that physical capital per worker and human capital per worker play significant roles and have positive impacts on labor productivity in both columns. Region dummies are significantly associated with labor productivity except Sub-Saharan Africa. Dummy of South Asia is significantly and negatively related to the dependent. On the other hand, other significant dummy variables are positively related to labor productivity.

When adding the other regressor, the education Gini coefficient, into model 2, the result shows that there is an insignificant relationship between inequality in educational attainment and labor productivity. The estimates can explain approximately 93 percent of observations.

Even though inequality in educational attainment does not significantly contribute to labor productivity, it does have a meaningful implication for other economic outcomes as income inequality. According to a previous study, equality in educational attainment is an equalizer of income inequality (Park, 1996).

[13] Heteroskedasticity test and Huasman's test are applied for post testing Homoskedasticity and a functional form. The result identifies Homoskedasticity in the regression. In addition, Huasman's test is insignificant. There are not different between OLS and fixed-effect estimates.

Table 5-9: The OLS estimates of labor productivity

log y_{it}	(1)		(2)	
	Coefficient	Standard error	Coefficient	Standard error
log k	1.421*	0.023	1.421*	0.023
log h	0.150*	0.017	0.162*	0.029
Geduc			0.050	0.103
Advanced	0.582*	0.037	0.584*	0.037
Europe	0.276*	0.045	0.281*	0.046
Latin	0.270*	0.036	0.270*	0.036
Mid Africa	0.245*	0.042	0.239*	0.044
South Asia	-0.194*	0.050	-0.198*	0.051
Sub-Saharan	-0.059	0.038	-0.061	0.038
East Asia	Omitted		Omitted	
Constant	3.779*	0.065	3.742*	0.101
Adj R-squared	0.9311		0.9310	
Observations	1322		1322	

Note: *, 0.1% confidence level. The dummy of East Asia and the pacific is omitted due to perfect multicollinearity.

5.5. Concluding remarks

The main objective of this chapter is to investigate macroeconomic factors influencing inequality in educational attainment across 69 countries during the period of 1975 to 2005 and to examine the effects of educational attainment and its inequality on labor productivity across 92 countries during the period of 1950 to 2010. The author found that education expansion, ratio of capital to GDP, and ratio of female to male primary enrollment significantly play as

equalizers of education in equality (negative correlations). Past educational inequality, per capita real income, and growth rate of rural population play as significant disequalizers of educational inequality (positive association).

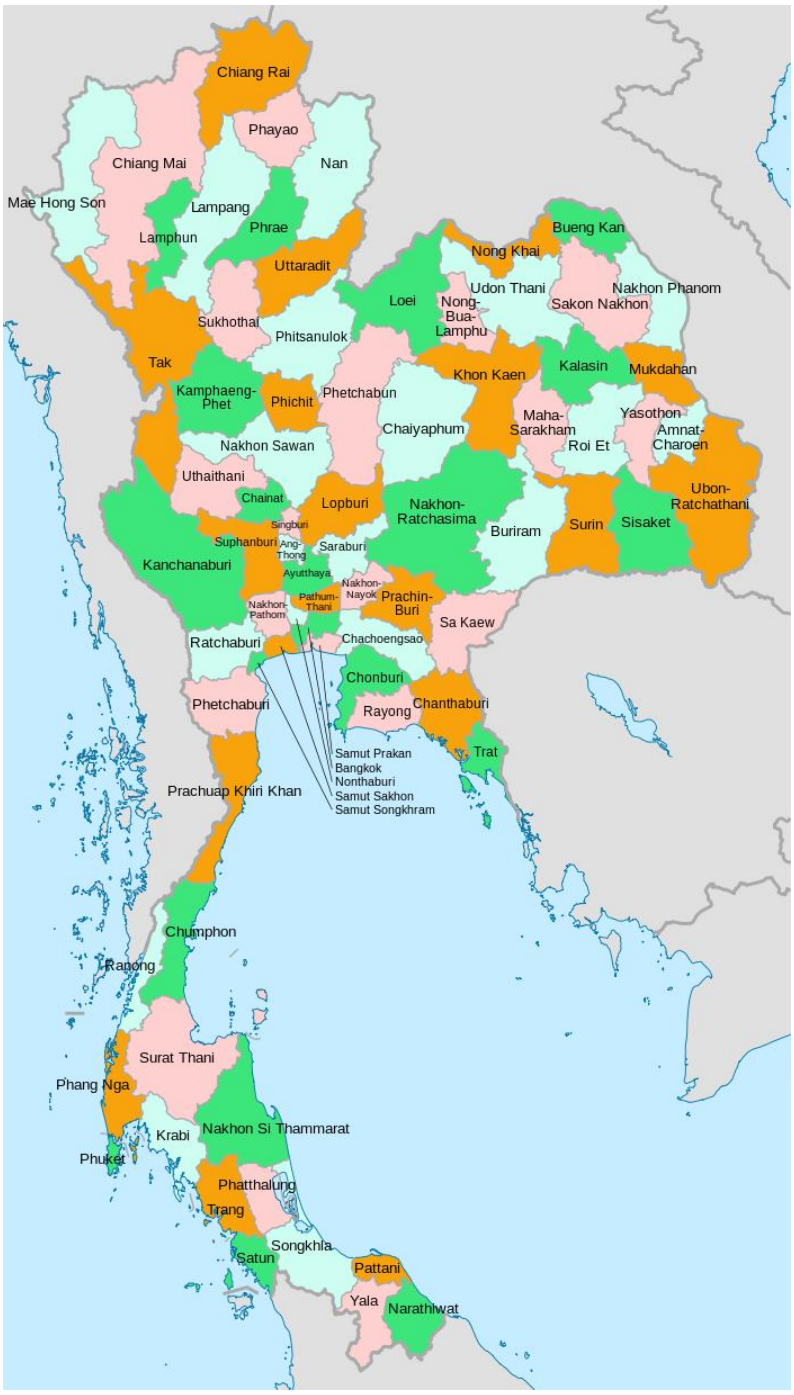
The author was unable to find a significant effect of past income inequality, GDP growth rate, life expectancy and the education expenditure on educational inequality. The impact of inequality in income distribution is no longer persisting over five years. The remaining issue of gender disparity will cause an inequality in educational attainment.

In conclusion of determinant of inequality in educational attainment, there are two major findings. Firstly, it has been found that direct factors involved to schooling are not significant while indirect factors have significant impacts on inequality in educational attainment. Secondly, the author found a quadratic (U-shape) relationship between rural growth rate and educational inequality. So the higher rural growth rate brings increasing and decreasing of educational inequality with turning point at rate -1.88.

In the analysis of the impact on labor productivity, the author found that educational attainment strongly and positively affects level of labor productivity. On the contrary, an insignificant association between inequality in educational attainment and labor productivity is found. Therefore, a change in degree of inequality in educational attainment does not affect the national labor productivity.

Individual and Provincial Analyses

THAILAND



Source: Wikipedia, retrieved 20th April 2013 from http://en.wikipedia.org/wiki/Template:Provinces_of_Thailand_Image_Map.
Note: The numbers of provinces in the map are 77 provinces. '*Bueng Kan*' is the 77th province, which separated from '*Nong Khai*', a province in the northeastern part of Thailand. In the Household Socioeconomic Survey for 2011, Bueng Kan was not counted as a new province.

CHAPTER 6

ASSESSING AND DECOMPOSING INEQUALITY IN EDUCATIONAL ATTAINMENT IN THAILAND

6.1. Introduction

People know well about various great benefits of education. In many countries, governments drive long-run economic development by investing in human capital, especially in the form of education for their citizens. The author strongly believes that everyone should be entitled to an access to education as a part of basic human rights. As an outcome of an investment in education, '*inequality in education*' that is an inequality in the production of human capital has been utilized. It is a dimension that does not only measures the actual unequal distribution of education in society, but also evaluates the effectiveness of educational policies. The concept of inequality in education is influenced by the theories of earnings distribution. Milner (1972) explained the concept of inequality in his book, *The Illusion of Inequality* as:

> The concept of inequality deals with relative differences. Consequently, changes in the absolute level of resources do not necessarily have any effect on the degree or type of inequality. Inequality refers to the shape of the pyramid (distribution), not the absolute level of the pyramid. Consequently, the degree of inequality can be the same in a society that has an average annual per capita income of a hundred dollars as in one where it is ten thousand dollars (p. 36).

The concept of inequality in education also deals with relative differences which refer to a shape of educational distribution. Therefore it is possible to have the same degree of

educational inequality in societies which have five or ten years of schooling on average. A method of measuring degrees of educational inequality is also adapted from a measure of income distribution. Scholars used many educational variables for evaluating different types and degrees of inequality in education such as enrollment rates and average years of schooling.

This study was designed to measure Thai educational inequality in 2011. A case of Thailand is chosen because it is a developing country that has high potential to become a developed country. The author employs Gini coefficients which measure a gap between an actual distribution of educational attainment and a perfect equality, in order to quantitatively assess the tier of inequality in Thai education using years of schooling. Differing from earlier studies, this chapter chooses disaggregated micro-level data instead of aggregated macro-level data for computing degrees of inequality in educational attainment. The advantage of using micro level data is that an actual degree of inequality in educational attainment can be more precisely evaluated. Firstly, the author can capture actual years of schooling for dropouts or people with limited education without necessarily assuming a half duration of completion. Secondly, the author can expand a range of years of schooling without terminating at the undergraduate level of higher education[14]. Due to the fact that there has been a proportion of the population which attained graduate level education and a share of this group tends to increasingly become more in the future. An inclusion of graduate levels of education in the analysis can reduce underestimation or overestimation of inequality in education and prevent defining a misspecified shape of educational distribution which leads to inappropriate educational policies. For these reasons, this chapter can categorize levels of education into 22 levels; from the primary level to graduate level. Even if the importance of higher education in

[14] Warunsiri (2010) investigated the returns to education in Thailand. Number of years of schooling in this previous study ranges from zero (no education) to 23 years for those with PhDs. In this study, number of years of schooling is between zero (no education) and 21 years for those with PhDs.

terms of social benefits is less than primary and secondary education and investment in higher education becomes an overinvestment in the over-education of the labor market, a current upward trend of labor with graduate level in education market induces supply of more educated workforce in labor market. It signals to employers to increase their demand for educated labor.

The Thai formal education system is basically organized in five levels: pre-elementary (three years), elementary (six years), lower-secondary (three years), upper-secondary (three years), and higher education (four years or more). There was a big structural change in Thai education in 1978. The Thai formal educational cycle durations of primary and secondary levels of education were completely changed by legislation from "seven and five" to "six and six" in this year (Hawley, 2004). Under the Thai National Education Act, free basic education was expanded from nine years to twelve years in 1999, while in 2003 compulsory education was expanded to nine years (UIS, 2013). Among all three levels of education, primary education and higher education are the most heavily subsidized by the state, while secondary education is barely subsidized (Blaug, 1976). The scheme of Thai government policies for education after institutional and political revolution in 1932 can be roughly divided into two periods. In 1932-1974, the first period of government educational policies emphasized on laying a foundation of the education system, expanding the supply of schooling, and education reform. In 1975, the government under Prime Minister Seni Pramoj raised an issue of educational equality in education policy. Afterward, equality in educational attainment has become an ongoing issue of Thai education policy.

This chapter comprises of six sections. The next section outlines a source of data and summary statistics. Section 6.3 presents the Gini coefficient, a measure of inequality in educational attainment which is partly used in this chapter. Sections 6.4 and 6.5 are the main

sections of analysis. The former applies the method identified in the previous section to quantify inequality in Thai educational attainment from individual-level data to national, regional, and provincial-level calculations. The author presents the inequality in educational attainment of each province in Thailand by its geographic information. The author further computes inequality in educational attainment by gender group. A comparison of degrees of inequality in educational attainment among four, seven, 17 and 22-year levels of education are provided. The latter decomposes the inequality in educational attainment of Thailand by using Theil's index. The last section, Section 6.6, summarizes the main conclusions and suggests policy implications.

6.2. Data source and summary statistics

The data set used in this chapter comes from the Household Socioeconomic Survey (SES) which was conducted in 2011 by Thailand's National Statistics Office. The SES has several advantages that greatly benefit a study of the situation of educational inequality in Thailand. Firstly, the survey represents individual demographic information. Secondly, it is possible to identify the highest level of educational attainment from the survey. Table 6-1 reports the total number of people (column 2) and people aged 25 years and older (column 3) at the regional level.

Focusing on educational data, table 6-2 shows a portion of current status of schooling. Approximately, 98 percent of sample of the whole country were not currently attending school (93.73 percent of sample attained their highest education. 4.16 percent of sample have no schooling). When there are 2.11 percent of sample who are still attending school.

Table 6-3 describes a share of people with the highest level of educational attainment. In the whole of Thailand, approximately six per cent of people have no schooling. The biggest proportion of people's highest level of educational attainment is a primary school education, which makes up over 50 percent of the total. The area where the largest number of people has never attended school is the northern part of Thailand.

Table 6-1: Structure of people by region in 2011

By location(1)	Number of People (2)	Number of People, ages 25 and over (3)
Bangkok metropolis	7,740 (6.04)	5,529 (6.26)
Central (25)	36,523 (28.52)	25,549 (28.90)
North (17)	29,758 (23.24)	21,408 (24.22)
Northeast (19)	35,173 (27.46)	23,621 (26.72)
South (14)	18,877 (14.74)	12,290 (13.90)
Total (76)	128,071 (100)	88,397 (100)

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.
Note: The classification of regions is provided by Thailand's National Statistics Office. In the same year (2011), the number of provinces in Thailand changed from 76 to 77 provinces. '*Bueng Kan*' is the 77th province, which separated from '*Nong Khai*', a province in the northeastern part of Thailand. In the Household Socioeconomic Survey for 2011, Bueng Kan was not counted as a new province. In column 1, the number in parenthesis shows the number of provinces corresponding to each region of Thailand. In column 2 and column 3, the percentage of people in each region is in parenthesis. The ratio of people aged 25 years and over to the overall population is 69.02 per cent.

Table 6-2: A current status of schooling of sample by region

Condition		All			Bangkok			Central			North			Northeast			South		
		M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Never attending school		1,584	3,458	5,042	64	153	217	380	936	1,316	639	1,318	1,957	232	475	707	269	576	845
Attending school	Private	22	19	41	5	3	8	5	8	13	4	1	5	8	5	13	0	2	2
	Public	194	268	462	18	25	43	41	61	102	44	73	117	75	90	165	16	19	35
	Total	216	287	503	23	28	51	46	69	115	48	74	122	83	95	178	16	21	37
Not attending school		38,504	44,348	82,852	2,426	2,835	5261	11,083	13,035	24,118	9,068	10,261	19,329	10,569	12,167	22,736	5,358	6,050	11,408
Total		40,304	48,093	88,397	2,513	3,016	5,529	11,509	14,040	25,549	9,755	11,653	21,408	10,884	12,737	23,621	5,643	6,647	12,290

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.

Table 6-3: Educational levels attained by region

By education level	By location					
	Total	Bangkok	Central	North	Northeast	South
No schooling	5,042	217	1,316	1,957	707	845
	(5.72%)	(3.93%)	(5.15%)	(9.19%)	(3.00%)	(6.89%)
Primary	48,609	1,966	13,982	12,263	14,431	5,967
	(55.10%)	(35.58%)	(54.76%)	(57.57%)	(61.16%)	(48.68%)
Secondary	19,204	1,488	6,286	3,908	4,448	3,074
	(21.77%)	(26.93%)	(24.62%)	(18.35%)	(18.85%)	(25.08%)
Higher	15,360	1,855	3,950	3,173	4,011	2,371
	(17.41%)	(33.57%)	(15.47%)	(14.90%)	(17.00%)	(19.34%)
Total	88,215	5,526	25,534	21,301	23,597	12,257
	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)

Source: Author's calculations based on the Household Socioeconomic Survey, 2011
Note: People with religious study (Buddhism-Bali), unidentified educational level, and incommensurable education level are not reckoned in this table.

Table 6-4: Summary statistics

Area part		Variable: Education (Years of Schooling)				
		Sample	Mean	S.D.	Min	Max
Thailand						
	Total	88,215	7.63	4.86	0	21
	Male	40,185	8.00	4.73	0	21
	Female	48,030	7.32	4.95	0	21
Central						
	Total	25,534	7.57	4.69	0	21
	Male	11,500	7.98	4.55	0	21
	Female	14,034	7.25	4.77		
North						
	Total	21,301	6.90	4.87	0	21
	Male	9,691	7.31	4.75	0	21
	Female	11,610	6.56	4.95	0	21
Northeast						
	Total	23,597	7.57	4.71	0	21
	Male	10,861	7.91	4.65	0	21
	Female	12,736	7.28	4.73	0	21
South						
	Total	12,257	8.06	4.94	0	21
	Male	5,623	8.37	4.74	0	21
	Female	6,634	7.80	5.09	0	21
Bangkok						
	Total	5,526	10.07	5.24	0	21
	Male	2,510	10.43	4.98	0	21
	Female	3,016	9.76	5.42	0	21

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.

Table 6-4 presents a descriptive analysis of educational attainment by gender and region. An average number of years of educational attainment of Thai people is 7.63, which is lower than basic education and compulsory education in Thailand. For all parts of Thailand, a minimum number of years of educational attainment is zero (no schooling) while a maximum number of years of educational attainment is 21 (obtained a doctoral degree). In contrast to, Hawley (2004) who noticed that women had a greater average number of years of educational attainment in 1985, 1995, and 1998, the author observes that men had a greater average

number of years of educational attainment in all areas of Thailand. The controversy comes from different scopes of samples[15]. In addition, an average level of education at the regional level in 2011 provided in this analysis is lower than an average number of years of educational attainment in 1995 provided by Hawley (2004) which is depicted in table 6-5. Among the four regions of Thailand, similar to Chiangkul (2008), The South had the highest average number of years of educational attainment, while the North had the lowest average number of years of educational attainment.

Table 6-5: Average years of educational attainment by background characteristics

(Sample limited to men and women, ages 24-35, working for wages)

	Male			Female		
	1985	1995	1998	1985	1995	1998
Sample	8.49	9.09	9.66	9.15	10.11	10.45
Region of residence						
Bangkok	9.04	10.30	10.50	9.38	10.89	10.67
Center	7.43	8.60	9.20	8.12	9.21	9.59
South	8.94	9.16	9.83	10.55	10.87	10.99
Northeast	9.28	9.86	10.25	10.33	11.20	11.76
North	7.74	8.68	9.43	8.45	9.72	10.30
Sample size	2717	7655	6493	2161	6645	6109

Source: Hawley (2004), p. 277.

6.3. Measuring inequality in educational attainment

The Gini coefficient, the standard relative measure of inequality, was chosen as a measure of inequality in Thai education for this study. Deaton (1997) defined a direct method of measuring the Gini coefficient of inequality as "the ratio to the mean of half the average over all pairs of the absolute deviations between people; there are N(N-1)/2 distinct pairs in all"

[15] Hawley limited his sample of men and women, ages between 24 to 35 years old. This study scopes the sample of men and women, ages 25 years and older. The maximum of age in the sample is 99 years old.

(p.139). Haughton and Khandker (2009) mentioned that the Gini coefficient satisfies four out of six criteria that make a good measure of inequality. These are mean independence, population size independence, symmetry, and Pigou-Dalton transfer sensitivity. Hence the specification of Gini coefficient advocated by Deaton (1997) is as follows:

$$\text{Geduc} = \frac{1}{\mu N(N-1)} \sum_i \sum_j \left| x_i - x_j \right| . \quad (6.1)$$

Where Geduc is the education Gini coefficients representing an unequal distribution of education which lies between zero (perfect equality) and one (perfect inequality); μ is the mean number of years of schooling with the highest educational attainment; N is the total number of individuals. In this analysis, individuals aged 25 years and over are included for capturing the workforce; x_i and x_j are the cumulative number of years of schooling of individuals which are between zero (no formal schooling or having never attended school) and 21 (completion of a doctoral degree) years of schooling which cover a primary level until a doctoral level. An amount of years of schooling initially starts counting from a primary level of education. Due to the elasticity of using the individual data, the author is able to group 22 levels of education what were conducted in previous researches. A number of years of schooling for dropouts is neither assumed to be half completion, nor takes the average number of years of a partial education level. The author captures the difference in years of educational attainment for dropouts. Table 6.6 outlines levels of education and corresponds years of schooling. Regarding a modification of Thai education structure in 1978, the effect of structural change is taken into account because individuals aged 47 years and over are treated as having seven years of elementary education and five years of secondary education, while

individuals aged between 25 and 46 years are considered to have six years of primary education and six years of secondary education.

Since a range of number of years of schooling is narrow (between zero and 21 years), this study can also apply the education Gini formula suggested by Thomas, et al. (2000), Checchi (2001), and Castelló and Domenéch (2002) as follow:

$$\text{Geduc} = \frac{1}{\mu} \sum_{i}^{21} {}_{j} \sum_{j=0}^{20} |x_i - x_j| \; n_i \, n_j. \quad \text{.....(6.2)}$$

Where n_i and n_j are the proportions of people with given years of schooling. In the folowwing section, the Gini coefficients of Thai education will be computed.

6.4. Inequality in Thai educational attainment

In this section, the author will compute the education Gini coefficients which were introduced in the previous section by the national, regional, and provincial-level based on educational attainment distribution. Table 6-7 clarifies classifications of educational attainment by four, seven, 17, and 22 levels of education. Table 6-8 reports levels of the Gini coefficients by gender and region. The Gini coefficient of education in the whole of Thailand is at 0.349. At the regional level, the author found that the northern area of Thailand has the highest unequal distribution of educational attainment due to more ratios of minority groups while in each remaining parts of Thailand; Gini coefficients are similar and not very different from Gini value of the nation as a whole.

Table 6-6: Schooling cycle durations of Thai formal education

Educational Level (1)		Years of schooling (s) (2)		
		Age 25 – 46 (2.1)		Age ≥ (2.2)
1	No schooling/ Never attending school	0		0
2	*Primary education (Prathom)*			
	Grade 1	1		1
	Grade 2	2		2
	Grade 3	3		3
	Grade 4	4		4
	Grade 5	5		5
	Grade 6	6		6
	Grade 7	-		7
3	*Secondary education (Mattayom)*			
	-Lower-secondary education			
	Lower-secondary, 1st year	7		8
	Lower-secondary, 2nd year	8		9
	Lower-secondary, 3rd year	9		10
	-Upper secondary education	General	Vocational	
	Upper-secondary, 1st year	10	10	11
	Upper-secondary, 2nd year	11	11	12
	Upper-secondary, 3rd year	12	12	-
4	*Higher education*			
	-Post-secondary education	General	Vocational	
	Post-secondary education, 1st year	13	13	13
	Post-secondary education, 2nd year	14	14	14
	Post-secondary education, 3rd year	-	15	-
	-Bachelor level			
	Bachelor level, 1st year	13		
	Bachelor level, 2nd year	14		
	Bachelor level, 3rd year	15		
	Bachelor level, 4th year	16		
	-Master level			
	Master level, 1st year	17		
	Master level, 2nd year	18		
	-Doctoral level			
	Doctoral level, 1st year	19		
	Doctoral level, 2nd year	20		
	Doctoral level, 3rd year	21		

Source: Author's table based on the Household Socioeconomic Questionnaire, 2011.
Note: The number of years of schooling starts enumerating from primary education level. The number of years of educational attainment also implies the number of levels of educational attainment.

The author provide a comparison of the education Gini coefficients among categorizations of four, seven, 17, and 22 levels[16] of people's highest educational attainment, which is also shown in Table 6-8[17]. In this analysis, a share of people with a graduate level of education is approximately 1.7 percent of the total and 9.8 percent of people with a higher education. The author found that a classification of the four and 17 levels of educational attainment underestimates a factual degree of inequality in educational attainment while an assortment of seven levels of education possibly underestimates or overestimates an actual level due to a confutation of two associated wedges. Firstly, a limitation of the number of years of schooling excluding the graduate level of education will reduce the gap in inequality in educational attainment between minimum and maximum years of educational attainment. This affects an underestimation of inequality in educational attainment. Secondly, owing to the assumption of dropouts' cycle duration, this can overestimate or underestimate the degree of Gini coefficients depending on an actual average year of education of dropouts.

[16] Four levels of educational attainment compound with (1) no schooling, (2) primary, (3) secondary, and (4) tertiary education while seven levels of educational attainment unify (1) no schooling, (2) partial-primary, (3) complete-primary, (4) partial-secondary, (5) complete-secondary, (6) partial-tertiary, and (7) complete-tertiary. The cycle durations of dropouts are assumed to be half-completion. We apply the methods of Castelló and Doménech (2002), and Thomas, *et al.* (2000) for the former and the latter, respectively, for computing the education Gini coefficients. The maximum number of years of schooling for both previous studies ends at 16 years. People with graduate levels of education are treated as having the highest educational attainment, equal to people with complete-undergraduate levels of higher education. The number of years of schooling of the graduates is 16 years. For the subject of the 17 and 22 levels of educational attainment, partial levels in each educational level are classified as being higher than the previous level.

[17]Correlations of the education Gini coefficients corresponds the number of levels of educational attainment

Level of educational attainment	4 levels	7 levels	17 levels	22 levels
4 levels	1.0000			
7 levels	0.9740*	1.0000		
17 levels	0.9917*	0.9858*	1.0000	
22 levels	0.9916*	0.9896*	0.9995*	1.0000

Source: Author's estimations
Note: A symbol *; corresponds to the significance levels of T-statistics differing from zero at 1%.

Table 6-7: The classifications of educational attainment

Level of educational attainment	Educational attainment							
	0	No schooling	**0**	No schooling	**0**	No schooling	**0**	No schooling
	1	Primary	**1**	Uncompleted primary	**1**	Primary, Grade 1	**1**	Primary, Grade 1
					2	Primary, Grade 2	**2**	Primary, Grade 2
					3	Primary, Grade 3	**3**	Primary, Grade 3
					4	Primary, Grade 4	**4**	Primary, Grade 4
					5	Primary, Grade 5	**5**	Primary, Grade 5
			2	Completed primary	**6**	Primary, Grade 6	**6**	Primary, Grade 6
	2	Secondary	**3**	Uncompleted secondary	**7**	Lower-secondary, 1st year	**7**	Lower-secondary, 1st year
					8	Lower-secondary, 2nd year	**8**	Lower-secondary, 2nd year
					9	Lower-secondary, 3rd year	**9**	Lower-secondary, 3rd year
					10	Upper-secondary, 1st year	**10**	Upper-secondary, 1st year
					11	Upper-secondary, 2nd year	**11**	Upper-secondary, 2nd year
			4	Completed secondary	**12**	Upper-secondary, 3rd year	**12**	Upper-secondary, 3rd year
	3	Tertiary	**5**	Uncompleted tertiary	**13**	Bachelor level, 1st year	**13**	Bachelor level, 1st year
					14	Bachelor level, 2nd year	**14**	Bachelor level, 2nd year
					15	Bachelor level, 3rd year	**15**	Bachelor level, 3rd year
			6	Completed tertiary	**16**	Bachelor level, 4th year and the graduate levels of higher education	**16**	Bachelor level, 4th year
							17	Master level, 1st year
							18	Master level, 2nd year
							19	Doctoral level, 1st year
							20	Doctoral level, 2nd year
							21	Doctoral level, 3rd year
Total	**4**		**7**		**17**		**22**	

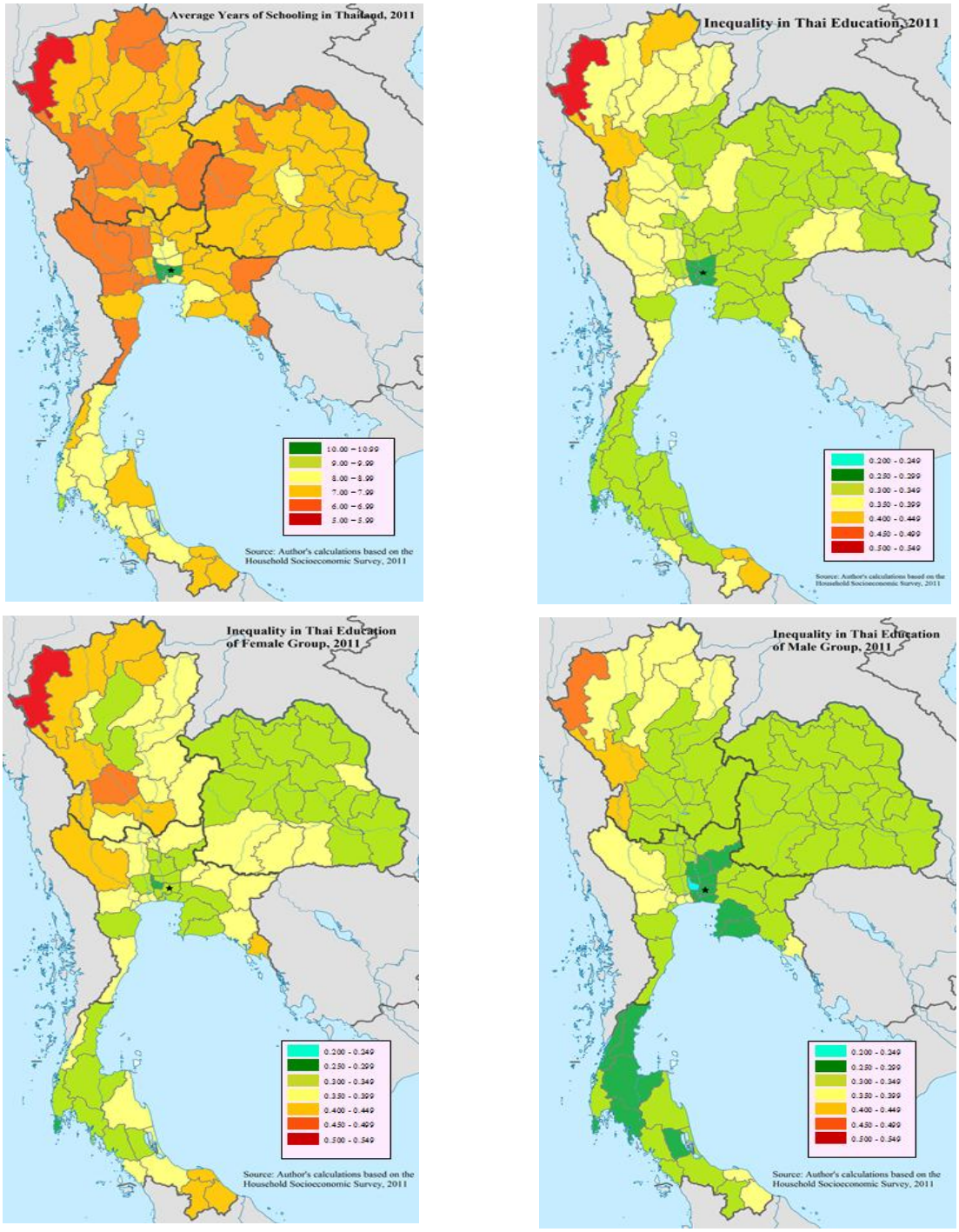
Source: Outlined by Author

Table 6-8: The Gini Coefficients of education by gender and region

Sample	Number of educational levels	Whole	Central	North	Northeast	South
All	22	0.349	0.340	0.381	0.332	0.345
	17	0.346	0.338	0.378	0.328	0.343
	7	0.363	0.355	0.393	0.351	0.354
	4	0.265	0.253	0.294	0.248	0.266
Male	22	0.328	0.316	0.355	0.319	0.320
	17	0.325	0.314	0.352	0.315	0.318
	7	0.341	0.330	0.368	0.337	0.328
	4	0.243	0.230	0.267	0.236	0.240
Female	22	0.366	0.358	0.401	0.341	0.365
	17	0.363	0.356	0.398	0.337	0.363
	7	0.381	0.373	0.411	0.361	0.376
	4	0.282	0.270	0.316	0.256	0.287

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.

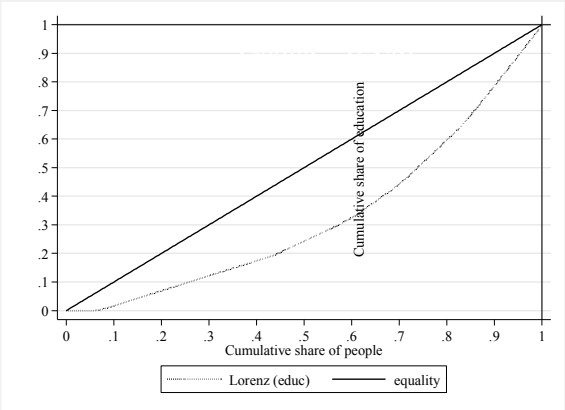
Figure 6-1: Geographic information of Thai educational inequality

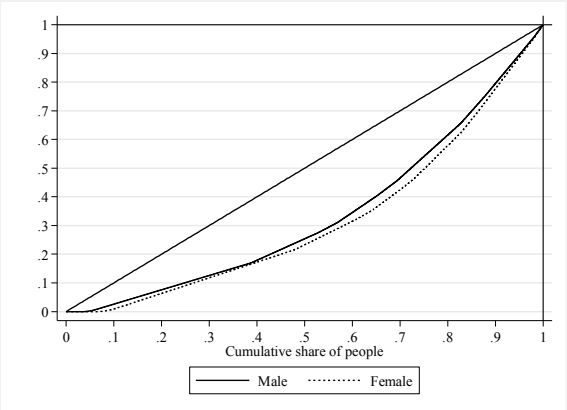


Source: Author's calculations based on the Household Socioeconomic Survey, 2011.
Note: The symptom 'star' in the maps presents the location of the Bangkok metropolis.

Figure 6-2: Comparisons of the education Lorenz curves by gender

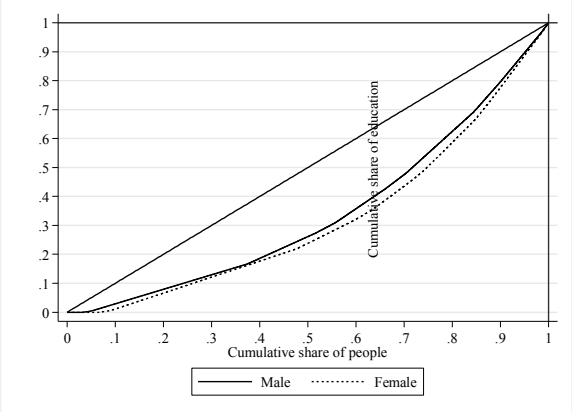
Whole nation

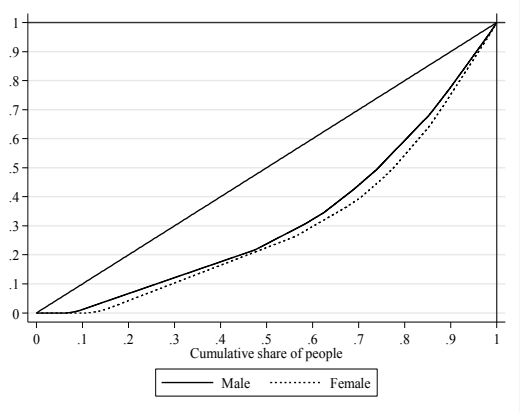




Region: *Central*

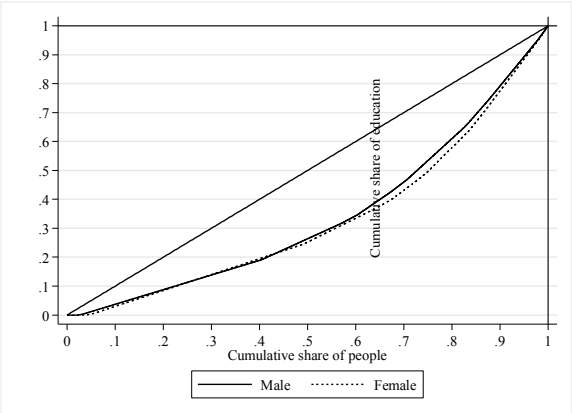
Region: *North*

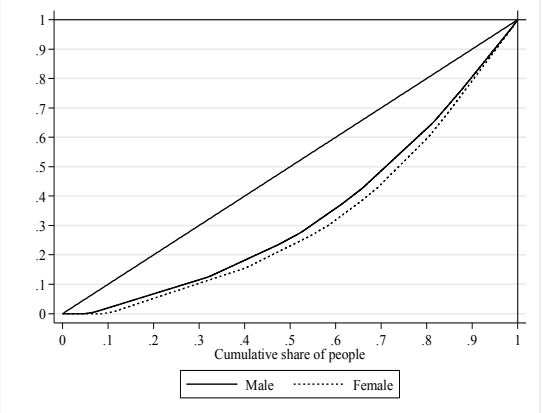




Region: *Northeast*

Region: *South*





Source: Author's calculations based on the Household Socioeconomic Survey, 2011.

The Gini coefficients of each province in Thailand are reported in the Appendix by gender group. The Gini coefficients are at a range between 0.272 and 0.521. Bangkok metropolis is not the province with the greatest equality in educational attainment, instead provinces like Nonthaburi, which is located near Bangkok, have the smallest inequality in educational attainment. On the contrary, Mae hong son, a province located in the northern part of Thailand, has the biggest inequality in education. The Gini coefficients of educational attainment show that due to the impact of Bangkok's prosperity, provinces located near the metropolis also have greater equality in educational attainment.

Figure 6-1 presents a set of geographic information on inequality in Thai educational attainment. The above-left picture describes an average number of years of educational attainment in 2011. It shows that only Bangkok and provinces around Bangkok have an average number of years of schooling greater than 10 years. The remaining maps depict the degrees of inequality in Thai educational attainment. The above-right depiction describes the northern provinces, especially those border provinces, Chiang rai, Mae hong son, and Tak, and three southern border provinces, Naratiwat, Pattani, and Yala, as having severe inequality in education because of ethnic minorities and terrorism, respectively.

The two bottom images render educational inequalities in female and male groups consecutively. These demonstrate there was unequal distribution of educational attainment, more biased against woman, which was distinctly present in the northern area of Thailand. This implied an underinvestment in the education of woman (Tilak, 1987).

The comparisons of the education Lorenz curves in national and regional levels are provided and shown in figure 6-2. The set of figure 6-2 demonstrates the education Lorenz curves for males are over the education Lorenz curves for females in all regions of Thailand. This confirms that males had more equal distribution of educational attainment than females.

6.5. Decomposition of inequality in educational attainment

In the previous section, inequality in educational attainment of Thailand is measured by Gini coefficient. The weak point of Gini coefficient is that it is unable to be decomposable. In this section we employ Theil index which is decomposable to measure inequality in educational attainment. The general form of Theil's entropy measure of inequality; *T,* is given (Deaton, 1997) as follows;

$$T = \frac{1}{N}\sum_{i=1}^{N}\frac{x_i}{\mu}\ln\left(\frac{x_i}{\mu}\right). \quad \text{..... (6.3)}$$

Where *x* is the number of years of educational attainment, ranging between zero to 21 years; *N* is the number of sample; and μ is the mean number of years of educational attainment. Theil index (*T*) is between zero, when all individuals has the same number of years of educational attainment, and ln *N,* when only an individual attends the school and others have no schooling (Deaton, 1997).

Theil index can be decomposed into the between and the within components of the distribution of educational attainment as follows;

$$T = Tb + Tw \quad \text{..... (6.4)}$$

$$T = \sum\left(\frac{x_j}{x}\right)\ln\left(\frac{x_j/x}{N_j/N}\right) + \sum_j\left(\frac{x_j}{x}\right)T_j \quad \text{..... (6.5)}$$

Where *Tb* is the 'between' component; and *Tw* is the 'within' component for Theil entropy measure of inequality; and Nj is the population in subgroup. We disaggregate the observations by gender, region, province, age (25-34 years, 35-44 years, 45-54 years, and 55 years and older), and education level (no schooling, primary, secondary, and tertiary).

Table 6-9: Decomposition of inequality in educational attainment

Subgroup		***T***	***Tb***	***Tw***
Region		**0.21470**	**0.00427** (2% of total)	**0.21044**
	Bangkok	0.15824		
	Central	0.20228		
	North	0.26426		
	Northern	0.19059		
	South	0.21158		
Province		**0.21470**	**0.00778** (~4% of total)	**0.20692**
Gender		**0.21470**	**0.00099** (~0.5% of total)	**0.21372**
	Male	0.18466		
	Female	0.24029		
Education level		**0.21470**	**0.20095** (~94% of total)	**0.01376**
	No schooling	0.00000		
	Primary	0.03172		
	Secondary	0.00870		
	Tertiary	0.00155		
Age		**0.21470**	**0.04093** (~19% of total)	**0.17377**
	25-34 years	0.09224		
	35-44 years	0.13159		
	45-54 years	0.20626		
	55 years and over	0.28198		

Source: Author's calculation based on the SES, 2011

Table 6-9 presents the decomposition of inequality in educational attainment in 'between-group' and 'within-group' components corresponding region, province, gender, educational level, and age groups. In the subgroup of region, two percent of the total inequality in educational attainment is attributable to the difference in educational attainment

among regions. The remaining 98 percent of all inequality is influenced by inequality in educational attainment that occurs within region. By looking at different gender groups, 0.5 percent of all inequality assigns to between-group inequality, and the remaining 99.5 percent of the total inequality is from the inequality that occurs within individual gender. Among age groups, 19 percent of the total inequality is from a difference in educational attainment among age groups. The remaining 81 percent is caused by an inequality that happens within each age group.

6.6.Concluding remarks

This chapter mainly aims to investigate inequalities of educational attainment in Thailand. The cross-sectional data come from the Household Socioeconomic Survey conducted in 2011. The author employs Gini coefficient and Theil index to assess unequal distribution of Thai educational attainment. At the national level, an average number of years of schooling is 7.63, Gini coefficient is 0.349, and Theil index is 0.215.

At the regional level, we found that the northern part of Thailand has the largest inequality in education due to more ratios of minority groups while the levels of educational inequalities are slightly different in other parts of Thailand. The biggest Gini coefficient is from Mae hong son (North) and the smallest is from Nonthaburi (Central). The biggest (0.521) is nearly double the smallest (0.272). Comparing between gender groups, there is a more equal distribution of education in the male group.

On the decomposition of inequality in educational attainment, in subgroups of gender, age group, province, and region, the between-group inequality is smaller than the within-group

inequality while in the sub group of an educational level, the between-group inequality is larger than the within-group inequality.

The advantage of this study is that educational inequality is more precisely computed by using the individual data in the analysis. This freed us from two constraints from the previous studies. Firstly, the author can drop years of schooling for dropouts at many levels without assuming half completion. Secondly, the range of education levels becomes wider. The author includes a graduate (master and doctoral) level of educational attainment in the analysis. By expanding the variety of education, it reflects real numbers of years of schooling. This prevents an underestimation of educational inequality.

CHAPTER 7

EDUCATIONAL ATTAINMENT AND ITS INEQUALITY IN THAILAND: DETERMINANTS, RATES OF RETURN, AND ROLE OF INTERGENERATIONAL TRANSMISSION

7.1. Introduction

In the previous chapter of this dissertation, degree of inequality in educational attainment in Thailand is depicted and analyzed based on the Thai Household Socioeconomic Survey in 2011. Based on the same data source, the author will further investigate the determinants of educational attainment[18] and its inequality and examine rate of private return to education of the Thai people between twenty-five to sixty years of age in the individual level and provincial level. Three objectives can be specified in this chapter. Firstly, the author attempts to investigate the determinants of educational attainment in Thailand. Secondly, the author moves to examine the determinants of inequality in educational attainment in the same country. Last but not least, the impact of educational attainment on individual's earnings will be investigated. First two objectives focus on the impact of intergenerational transmission[19] of educational attainment and its inequality.

As the author mentioned in the previous chapters, education plays many crucial roles in the society, not only on driving the economy via human capital but also on raising the standard of living of citizen. As economists regard 'education' as the public goods, the government has

[18] Note that educational attainment is measured by the number of years that individual had used in schooling system till the highest educational attainment. The measure is consistent in a whole dissertation.
[19] Lochner (2008) defined the meaning of intergenerational transmission as 'the transfer of individual abilities, traits, behaviors and outcomes from parents to their children' (p. 1).

an important duty in allocating some certain education to the population. Although providing an access to education of the citizen is the government's task, the household is the side that creates demand for schooling as 'households make decisions on child education by weighing the expected returns against the costs of additional years of schooling' (Zhao and Glewwe, 2010, p. 452).

Checchi (2006) mentioned four channels of intergenerational persistence in educational choices. There are (1) individual unobservable abilities, (2) family cultural background, (3) family financial resources, and (4) public resources. His explanations concentrate more on the second, the third, and the fourth sources of intergenerational persistence. Believing that the unobservable abilities are able to be transmitted by genetic, however, they are scarcely contributed to intergenerational mobility (Checchi, 2006). The second channel is through an educational system. 'The cultural background within a family is made more homogenous, and the influences received by each parent reinforce one another' (p.216). Financial resources link to public resources. Poor families have more opportunities in enjoying education and choosing better school quality thanks to greater public resource allocation.

In the analysis of effect on individual's earnings, returns to education in Thailand were observed by Blaug (1976) in year 1970 by using a method of present value at arbitrary discount rates. He found that the completion of lower elementary education maximizes the social rate of returns to education. Hawley (2003, 2004) and Warunsiri and Mcnown (2010) used Mincerian wage regression for investigating returns to Thai education. The rate of returns to education depends on the level of education and gender.

This chapter unfolds as follows; sections 7.2 and 7.3 specify models of intergenerational transmission and earning function respectively. Section 7.4 describes a source of data and summarizes descriptive statistics. Section 7.5 presents empirical results and discussions on

educational attainment. Section 7.6 presents a relationship between educational attainment and its inequality. Section 7.7 presents the analyses of inequality in educational attainment. Section 7.8 presents rates of return to education in Thailand. Section 7.9 concludes this chapter.

7.2. A model of intergenerational transmission in educational outcomes

In this section, the author presents a theoretical model of intergenerational transmission of educational attainment introduced by Checchi (2006). The earnings (Y) of individual *i* in generation *t* (children's generation) are identified by their education (E) and ability (A) as follows;

$$Y_{it} = \beta E_{it} + \varepsilon A_{it} + w_{it} \quad \text{..... (7.1)}$$

From equation (7.1), the generational effect from the parent's generation (*t-1*) can be transferred to children's generation (*t*) by two factors which are ***education*** and ***genetic ability***. Checchi indicated a relationship between two generations of both variables as follows;

$$A_{it} = \delta + \alpha A_{it-1} + e_{it} \quad \text{..... (7.2)}$$

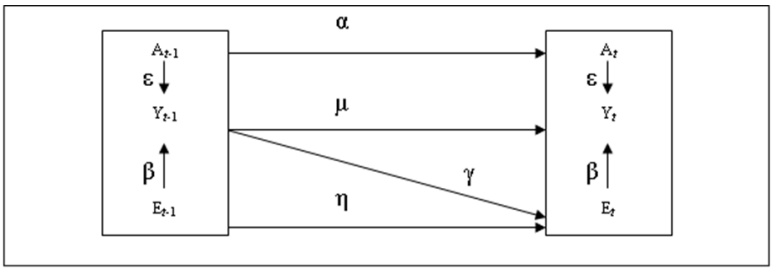
$$E_{it} = \eta E_{it-1} + \gamma Y_{it-1} \quad \text{..... (7.3)}$$

The impact of family networking on earnings of individual *i* belonging to children's generation was also mentioned as follows;

$$Y_{it} = \beta E_{it} + \varepsilon A_{it} + \mu Y_{it-1} w_{it} \quad \text{..... (7.4)}$$

Figure 7-1 depicts the channels influencing the intergenerational mobility by Checchi (2006) which corresponds to equation (7.1) – (7.4) previously;

Figure 7-1: Intergenerational transmission



Source: Checchi (2006), p. 222.

Moving on to the empirical model specifications of the study, theoretically the effect of intergenerational transmission will persist between continuous generations. However, due to data limitation, the author assume that there are only two generations; parents' generation and children's generation, and the unobservable abilities are low in contribution to intergenerational mobility. Grandparents' generation can influence children's generation in a form of the household wealth (Huang, 2012). The educational attainment of children's generation depends on their parents' educational background (EDU_{iht-1}), individual's characteristics (IND_{ihj}), household's characteristics (HOU_{ihk}), provincial characteristic (PRO_{ihl}), and regional characteristics (REG_{im}) as follows;

$$EDU_{iht} = f(EDU_{iht-1}, IND_{ihj}, HOU_{ihk}, PRO_{ihl}, REG_{im}) \quad \text{..... (7.5)}$$

The parametric relationship between regressors and regressand is specified by identifying a nonlinear form of difference in age between household's head and children (DIF) in the model while specifying individual's age (AGE) in a linear form due to a wide age range of samples (from 25 to 60 years old). It is considered that due to the improvement in institutional setting (as the development of educational system), younger generations could enjoy better education and more incentives to continue going to school compared to older generations. So individual's age is expected to be negatively associated with the educational attainment of individuals. The empirical specification model in this analysis is shown as follows;

$$\mathrm{EDU}_{iht} = \beta_0 + \beta_1\,\mathrm{AGE}_{iht} + \beta_2\,\mathrm{DIF}_{ih} + \beta_3\,\mathrm{DIFSQ}_{ih} + \beta_4\,\mathrm{EDU}^{HH}_{iht\text{-}1} + \beta_5\,\mathrm{GOV}_{ih} + \beta_6\,\mathrm{INC}_{ih} + \sum_{j=1}^{n}\beta_j\,\mathrm{IND}_{ihj} + \sum_{k=1}^{q}\beta_k\,\mathrm{HOU}_{ihk} + \mathrm{PRO}_{ih} + \sum_{m=1}^{4}\beta_m\,\mathrm{REG}_{im} + u_i \quad \ldots\ldots\ldots\ldots \quad (7.6)$$

Where household *h* contains parents' generation *t-1* and children's generation *t*; EDU_{iht} is the educational attainment measured by number of years that individual used in schooling system until the highest educational attainment for individual *i* of household *h* belonging to generation *t* (children's generation); AGE_{iht} is age of individual *i* at year 2011; DIF_{ih} is difference in age between household's head and children (household's head's age minus individual's age)*;* DIFSQ_{ih} is the difference in age between household's head (parent) and children in the form of squared term; $\mathrm{EDU}^{HH}_{iht\text{-}1}$ is household's head's educational attainment (either father or mother) for individual *i* of household *h* belonging to generation *t-1* (parents' generation); GOV_{ih} is a dummy variable of the government loan for education that individual ever borrowed from the government; INC_{ih} is an average monthly household' incomes per capita in the form of natural logarithm. Due to an availability of negative values of per capita

household's incomes in the raw data, per capita household's expenditure is utilized as a proxy of permanent per capita household's income (Tansel, 2002). In addition, because of the data is cross-sectional, the author assumes that behavior of household's consumption is consistent and reflects household's income overtime; IND_{ihj} refers to the independent variables identifying the individual characteristics; gender and disability; HOU_{ihk} represents the household-characteristic variables; household's head's sex, the number of household size, household's wealth, parental marital status, household religion and so on; PRO_{ihl} demonstrates the provincial-characteristic variable. In the analysis, the author employs the density of population at year 2000 as a provincial characteristic which identifies supply of schooling. Densely-populated province tends to have a greater number of schools. Larger supply of schooling facilitates children in accessing to education. Thenceforward density of population is expected to be positively associated with children's educational attainment; REG_{im} identifies a set of regional-specific binary variables; and u_i is an error term. The equation 7.6 indicates the generational effect of household's head's educational attainment on their children's educational attainment. The author further separately examines the roles of fathers' and mothers' educational backgrounds on their children's educational attainment as follows;

$$EDU_{iht} = \delta_0 + \delta_1 AGE_{iht} + \delta_2 DIF^f_{ih} + \delta_3 DIFSQ^f_{ih} + \delta_4 DIF^m_{ih} + \delta_5 DIFSQ^m_{ih} + \delta 6\ EDU^f_{iht-1} + \delta_7 EDU^m_{iht-1} + \beta_8 GOV_{ih} + \delta_9 INC_{ih} + \sum_{j=1}^{n} \delta_j IND_{ihj} + \sum_{k=1}^{q} \delta_k HOU_{ihk} + PRO_{ih} + \sum_{m=1}^{4} \delta_m REG_{im} + e_i \quad \ldots\ldots (7.7)$$

Where the superscripts *f* and *m* belong to father and mother severally; EDU^f_{iht-1} is father's educational attainment for individual *i* of household *h* belonging to generation *t-1*

(parents' generation); EDU^{m}_{iht-1} is mother's educational attainment for individual *i* of household *h* belonging to generation *t-1*.

Moving on to the second analysis of the section, the author investigates determinants of inequality in educational attainment and the generational impact of inequality in educational attainment. Inequality in educational attainment is consistently measured the education Gini coefficient which was introduced in the previous chapters[20]. The education Gini coefficient ($Geduc_{pt}$) is computed at the provincial level[21]. Firstly, the author focuses on a simple relationship between an average number of years of schooling and its inequality by employing a bivariate linear regression model for predicting the impact of educational attainment on its inequality as follows:

$$Geduc_p = \alpha_0 + \alpha_1 AYS_p + w_p \quad (7.8)$$

Where $Geduc_p$ is the education Gini coefficient of province *p*; AYS is an average number of years of schooling of Thai people aged 25 years and older; and *w* is a disturbance. Further the author concentrates on the intergenerational transmission of inequality in educational attainment between both generations. The model specification is as follows;

$$Geduc_{pt} = \gamma_0 + \gamma_1 Geduc_{pt-1} + \gamma_2 AVS_{pt} + \gamma_3 AVS_{pt-1} + \sum_{l=1}^{5} \gamma_l PRO_{pl} + \sum_{m=1}^{4} \gamma_m REG_{pm} + u_p \quad (7.9)$$

[20] *see* chapters 4 and 6

[21] Note that provincial level is the smallest reference group of sample that we accumulate for calculating degree of inequality in educational attainment.

$Geduc_{pt}$ is the education Gini coefficient of province *p* in Thailand[22] for generation t (children's generation); $Geduc_{pt-1}$ is the education Gini coefficient of province *p* for generation t-1 (parents' generation); AVS_{pt} is an average number of years of schooling of province *p* for generation t; AVS_{pt-1} is an average number of years of schooling of province *p* for generation t-1; PRO_p is a set of variables controlling the provincial characteristics of province *p* like the population's density and Gini coefficient of income and location's characteristics as border province and Bangkok and provinces located near[23]; REG_p is a set of binary variables mentioning region that province *p* belongs to; and *u* is a disturbance term.

7.3. Model of earning function

In order to investigate rates of return to Thai education, two educational variables are employed in this section. The first is number of years of schooling and the second is educational dummy variables. The empirical specification of Mincerian earnings function is as follows;

$$\ln(w_i) = \alpha_0 + \alpha_1 EDU_i + \alpha_2 EXP_i + \alpha_3 EXPSQ_i + \alpha_4 Z_i + e_i \quad \text{.....(7.10)}$$

Where $\ln(w_i)$ is the hourly earnings[24] of individual *i* at year 2011 in a form of natural logarithm; EDU_i refers to number of years of schooling belongs to individual *i.* A range of number of years of schooling is between zero and 21; EXP_i is number of years of individual's work experience; $EXPSQ_i$ is a squared term of number of years of individual's work

[22] There were 76 provinces in Thailand in year 2011.

[23] Six provinces where are located near Bangkok are Nonthaburi, Samut prakan, Samut sakhon, Nakhonpathom, Pathumthani, and Chacheongsao.

[24] hourly earnings = $\frac{\text{Monthly earnings}}{\text{(number of working days per month x number of working hours per day)}}$

experience. Due to the invalidity of specific number of years of individual's experience, the author assumes that individual either choose either going to school or going to work. Number of years of experience is calculated from [individual's age - (number of years of schooling + six years[25])]; Z_i is a set of binary variables which affect the regressand. Dummies of place of residence, gender, and working for public sector, are included as control variables; and e_i is a disturbance term.

The author separately examines private returns to education correspond each level of education by employing educational dummy variables instead of number of years of schooling (Hawley, 2004). An educational attainment is separated into seven levels; no schooling (NOS), primary (PRI), secondary (SEC), vocational (VOC), undergraduate (UND), master (MAS), and doctoral (DOC) levels of education. An empirical specification is shown as follows;

$$\ln (w_i) = \beta_0 + \beta_1 EXP_i + \beta_2 EXPSQ_i + \beta_3 NOS_i + \beta_4 PRI_i + \beta_5 SEC_i + \beta_6 VOC_i + \beta_7 UND_i + \beta_8 MAS_i + \beta_9 DOC_i + \beta_{10} Z_i + e_i \quad \text{.....(7.11)}$$

Table 7-1 presents description and measurement of variables which are mentioned in the analyses of this chapter.

[25] Six years refers to the first six years of age before attending primary education.

Table 7-1: Description of variables

Variables	Description
Dependent variables	
Educational attainment (EDU_{iht})	The number of years of schooling of children's generation; ranges between zero (without schooling) to 21 years (obtain doctoral degree)
Education Gini coefficients ($Geduc_{pt}$)	The education Gini coefficients relatively measuring the inequality of education of province p belongs to generation t (children's generation). The value of the education Gini coefficients range between zero and unity.
ln w	Hourly wage of individual in the natural logarithm form
Independent variables and control variables	
Educational Dummies	
Doctoral	1 if individual attained the highest education at doctoral level, 0 if not
Master	1 if individual attained the highest education at master level, 0 if not
Undergraduate	1 if individual attained the highest education at undergraduate level, 0 if not
Vocational	1 if individual attained the highest education at vocational level, 0 if not
Secondary	1 if individual attained the highest education at secondary level, 0 if not
Primary	1 if individual attained the highest education at primary level, 0 if not
No schooling	1 if individual never attended school, 0 if not
Experience (EXP)	The number of year of work experience (age – (years of schooling + 6))
Experience squared (EXPSQ)	The number of year of work experience in squared form
Public	1 if individual work for government or state enterprise
Household's head's educational attainment (EDU^{HH}_{ht-1})	The number of years of schooling of household's head; ranges between zero to 21 years
Father's education educational attainment (EDU^{f}_{iht-1})	The number of years of schooling of father; ranges between zero to 21 years
Mother's education educational attainment (EDU^{m}_{iht-1})	The number of years of schooling of mother; ranges between zero to 21 years
Education Gini coefficients ($Geduc_{pt-1}$)	The education Gini coefficients relatively measuring the inequality of education of province p belongs to generation t-1(parents' generation). The value of the education Gini coefficients range between zero and unity.
Mother's high education	1 if mother obtained higher education (undergraduate and graduate), 0 if not
Mother works outside	1 if mother works outside, 0 if not
Housewife	1 if mother is pure housewife, 0 if not
Father's job in agricultural sector	1 if father works in agricultural sector, 0 if not

Continued on next page

Variables	**Description**
Individual's characteristics	
SEX	1if individual is male, 2 if individual is female
AGE (AGE)	The number of age of individual belongs to children's generation
AGE squared (AGESQ)	The number of age of individual belongs to children's generation in squared term
Disability at birth	1 if individual is disable at birth (physical or/and intellectual) , 0; otherwise
Disability after birth	1 if individual is disable after birth (physical or/and intellectual) , 0; otherwise
Household's characteristics	
Difference in age (DIF)	The number of difference in years between household head's age and children's age
Marital status of parents	1 if the marital status of parents is 'married', 0; otherwise
Single-parent household	1 if children are in the single-parent household, 0 if not
Household size	The number of household members excluding household workers
Wealth of household	The amount of Assets describing household's economic wellbeing
-Land and house assets	The value of land and house (dwelling and business) assets (Baht) in the form of the natural logarithm
-Financial assets	The rank means of the degrees of value of financial assets in the form of the natural logarithm 0 (0 Baht) – 0 Baht 1 (less than – 10,000 Baht) – 5,000 Baht 2 (10,001 – 30,000 Baht) – 20,000 Baht 3 (30,001 – 50,000 Baht) – 40,000 Baht 4 (50,001 – 100,000 Baht) – 75,000 Baht 5(100,001 – 500,000 Baht) – 250,000 Baht 6 (500,001 – 1,000,000 Baht) – 750,000 Baht 7 (1,000,001 – 5,000,000 Baht) – 3,000,000 Baht 8 (5,000,001 – 10,000,000 Baht) – 7,500,000 Baht 9 (More than 10 million) – 10,000,000 Baht
Household incomes (INC)	The average amount of household monthly expenditure per capita in form of natural logarithm
Sex of household's head	1 if the household's head is male, 2 if the household's head is female

Continued on next page

Variables	Description
Religious background[26]	Set of dummy variables
- Buddhist (BUD)	1 if the household of individual is Buddhist, 0; otherwise
- Islam (ISL)	1 if the household of individual is Islam; otherwise
Language spoken in household[27]	Set of dummy variables
- Mon	1 if household's members used Mon language for communicating in household, 0; otherwise
- Cambodian/Souy	1 if household's members used Cambodian/Souy language for communicating in household, 0; otherwise
- Karen	1 if household's members used Karen language for communicating in household, 0; otherwise
Community's characteristics	
Municipal (MUN)	1 if individual stayed in the municipal area, 0; otherwise
Provincial characteristics	
Population densities 2000	The density of population per one square kilometer (km^2) in year 2000; the information obtained from the National Statistics Office.
Income Gini coefficient 2000	The Gini coefficient of income of province p in year 2000; the information obtained from the National Statistics Office.
Income Gini coefficient 2009	The Gini coefficient of income of province p in year 2009; the information obtained from the National Statistics Office.
Location and Regional characteristics	
-Bangkok	1if household of individual settled in Bangkok , 0 if not
-Bangkok and suburban	1if household of individual settled in Bangkok and provinces located near Bangkok , 0 if not
-Border provinces	1if household of individual settled in Border provinces , 0 if not
-Central	1 if household of individual settled in central-region provinces, 0 if not.
-North	1 if household of individual settled in northern-region provinces, 0 if not.
-Northeast	1 if household of individual settled in northeastern-region provinces, 0 if not.
-South	1 if household of individual settled in southern-region provinces, 0 if not.
Government loan for education	1 if children ever took education's loan from the government recently, 0 if not.

[26] Note that the national religion of Thailand is Buddhism. In the dataset, all sample are with three religious background; Buddhist, Islam, and Christian.
[27] Language spoken in household refers to the origin of household.

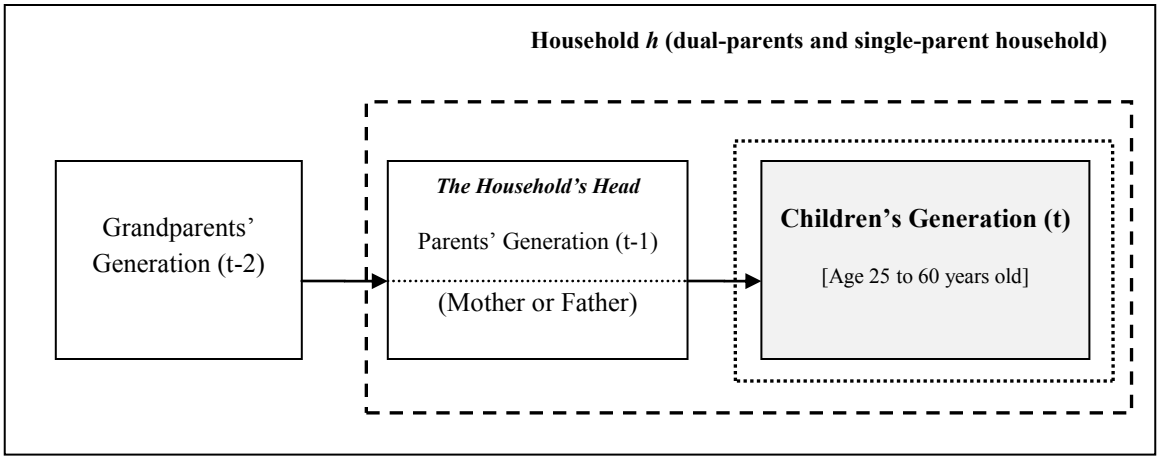
7.4. Data and sample

The cross-sectional data used in this study comes from Thailand 2011 Household Socioeconomic Survey (SES) which was conducted by Thailand's National Statistics Office (NSO). The SES has several advantages in studying determinants of educational attainment and inequality in educational attainment in Thailand. Firstly, the survey represents household's demographic backgrounds. Secondly, the author can identify the individuals' highest levels of educational attainment for both parents' and children's generations from the survey. The author chooses SES data in 2011 which is the latest collected data in both expenditure and income sides[28] of household.

As Deaton (1997) mentioned that 'there is no uniformity in definitions of the household across different surveys' (p.23). The definition of ***'household'*** in Thai Household Socioeconomic Survey refers to any relationships which two persons are living together. Those also include family relationships, friend-friend, and employer-employee relationships. In this chapter, the author attempts to investigate the generational effect of educational attainment and its inequality of parents' generation on both factors of children's generation in Thailand. Within a term of family relationship (parents-children); both dual-parents household and single-parent household, are chosen as the sample group of the analysis.

[28] Note that the SES data on income side is collected every two years.

Figure 7-2: The scope of restricted sample in the analysis



Source: outlined by Author
Note: The long-dash box is the scope of the households in this study.

In the SES, a relationship between household's members and household's head is observed. Figure 7-2 depicts a scope of sample in the study. Even though the author is able to classify a household into three generations which are grandparents' generation (t-2), parents' generation (t-1), and children's generation (t) as shown in this figure. The author observes that there are limitations of the SES data. Firstly, the SES questionnaire provides an unclear parental relation of the members with the household's head. Grandparents and grandparents-in-law are included in the same category of the status to household's head (parent). It is unable to truly identify genetic parental relationship to the household's head. Therefore, this study is able to capture only two generations which are parents' generation and children's generation. So there is an effect of intergenerational persistence from grandparents' generation to children's generation, not in a form of educational background but in a form of household wealth. Sample corresponds to the number of households in which the household's head has sons/daughters who aged between 25 to 60 years old (age of workforce). The box with long-dashed lines in figure 7-2 demonstrates a scope of sample in the analysis.

An analysis of returns to education captures a group of individuals aged between 25 to 60 years (either parents or children) who work as employees for either private or public sectors.

In the SES data, levels of education which people attained as the highest are mentioned. It turns to number of years of schooling. Table 7-2 describes classifications of educational attainment into number of years of schooling. Due to the highlighted structural change of Thai education system in 1978, the impact of structural change is taken into account by individuals who had been aged 47 years and older in year 2011. They are to be treated as having seven years of elementary education (four years of lower elementary education: three years of upper elementary education) and five years of secondary education (three years of lower secondary education: two years of upper secondary education), while individuals aged between 25 and 46 years are considered to have six years of primary education and also six years of secondary education as shown in table 7-3.

Table 7-2: The classifications of educational attainment

Level of educational attainment	Educational attainment			
	Classification of educational attainment		Year of schooling	
	0	No schooling	**0**	No schooling
	1	Partial primary education	**1**	Primary, Grade 1
			2	Primary, Grade 2
			3	Primary, Grade 3
			4	Primary, Grade 4
			5	Primary, Grade 5
	2	Completed primary education	**6**	Primary, Grade 6
	3	Lower-secondary education	**7**	Lower-secondary,1st year
			8	Lower-secondary,2nd year
			9	Lower-secondary,3rd year
	4	Upper-secondary education	**10**	Upper-secondary,1st year
			11	Upper-secondary,2nd year
			12	Upper-secondary,3rd year
	5	Uncompleted undergraduate level of higher education	**13**	Bachelor level,1st year
			14	Bachelor level,2nd year
			15	Bachelor level,3rd year
	6	Completed undergraduate level of higher education	**16**	Bachelor level,4th year
	7	Graduate level of higher education	**17**	Master level, 1st year
			18	Master level, 2nd year
			19	Doctoral level, 1st year
			20	Doctoral level, 2nd year
			21	Doctoral level, 3rd year
Total	**8**		**22**	

Source: Author's table

Table 7-3: Schooling cycle durations of Thai formal education

Educational Level (1)		Years of schooling (s) (2)		
		Age 25 – 46		Age ≥ 47
1	No schooling/ Never attending school	0		0
2	***Primary education (Prathom)***			
	Grade 1	1		1
	Grade 2	2		2
	Grade 3	3		3
	Grade 4	4		4
	Grade 5	5		5
	Grade 6	6		6
	Grade 7	-		7
3	***Secondary education (Mattayom)***			
	-Lower-secondary education			
	Lower-secondary, 1st year	7		8
	Lower-secondary, 2nd year	8		9
	Lower-secondary, 3rd year	9		10
	-Upper secondary education	General	Vocational	
	Upper-secondary, 1st year	10	10	11
	Upper-secondary, 2nd year	11	11	12
	Upper-secondary, 3rd year	12	12	-
4	***Higher education***			
	-Post-secondary education	General	Vocational	
	Post-secondary education, 1st year	13	13	13
	Post-secondary education, 2nd year	14	14	14
	Post-secondary education, 3rd year	-	15	-
	-Bachelor level			
	Bachelor level, 1st year	13		
	Bachelor level, 2nd year	14		
	Bachelor level, 3rd year	15		
	Bachelor level, 4th year	16		
	-Master level			
	Master level, 1st year	17		
	Master level, 2nd year	18		
	-Doctoral level			
	Doctoral level, 1st year	19		
	Doctoral level, 2nd year	20		
	Doctoral level, 3rd year	21		

Source: Author's table based on the Household Socioeconomic Questionnaire, 2011.
Note: Years of schooling start from primary education level. Number of years of educational attainment also presents the level of educational attainment.

Table 7-4: The summary of sample by age

household	Dual-parents and single-parent			Dual-parents		
Age Group	Daughter	Son	Total	Daughter	Son	Total
Total	5,849	5,468	11,317	3,079	3,172	6,251
25-36	3,253	3,546	6,799			4,491
37-48	1,942	1,578	3,520			1,535
49-60	654	344	998			225

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.

Table 7-5: Descriptive statistics of educational attainment

Sample		Variable	Sample	Gini	Theil	Mean	S.D.	Min	Max
Total	All	Children's education	11,317	0.249	0.112	10.567	4.657	0	21
		Head's education	11,317	0.336	0.257	5.128	3.803	0	21
	Daughter	Children's education	5,849			10.876	4.862	0	21
		Head's education	5,849			5.083	3.794	0	21
	Son	Children's education	5,468			10.236	4.403	0	21
		Head's education	5,468			5.177	3.812	0	21
Dual-parents Household	All	Children's education	6,251			11.241	4.478	0	21
		Father's education	6,251			5.819	4.040	0	21
		Mother's education	6,251			5.053	3.609	0	21
	Daughter	Children's education	3,079			11.707	4.627	0	18
		Father's education	3,079			5.814	4.049	0	18
		Mother's education	3,079			5.010	3.578	0	18
	Son	Children's education	3,172			10.789	4.281	0	21
		Father's education	3,172			5.825	4.033	0	21
		Mother's education	3,172			5.096	3.639	0	21
	25-36 years	Children's education	4,491			11.829	4.147	0	21
		Father's education	4,491			6.032	4.100	0	21
		Mother's education	4,491			5.295	3.704	0	21
	37-48 years	Children's education	1,535			9.795	4.841	0	18
		Father's education	1,535			5.322	3.801	0	18
		Mother's education	1,535			4.478	3.291	0	18
	49-60 years	Children's education	225			9.373	5.441	0	18
		Father's education	225			4.960	4.039	0	16
		Mother's education	225			4.156	3.165	0	16

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.

In an analysis of intergenerational effect of educational attainment and its inequality, regressions are considered under subgroups of household types, gender, and age groups. Table

7-4 reports number of sample under those subgroups. The majority of sample is in the age group of 25-36 years old. A hundred per cent of sample completes their education already. Table 7-5 presents the descriptive statistics of number of years of schooling. Averagely, number of years of schooling for children is around twice as great as those of their parents. Comparing the mean number of years of schooling between genders, the data shows that parents' generation, fathers had greater number of years of schooling than mothers. On the other hand, female children had bigger number of years of schooling than male children. A larger average number of years of schooling of Thai women than Thai men were ever observed by Hawley (2004) in 1985, 1995, and 1998.

Table 7-6: Share of population with their highest education in year 2011

	No. of Sample	Average years of schooling	Share of employees with highest education attained (percentage)						
			No schooling	Primary	Secondary	Vocational	Undergraduate	Master	Doctoral
Total	**4,714**	**11.94**	**0.49%**	**22.83%**	**30.23%**	**8.99%**	**32.35%**	**4.96%**	**0.15%**
Female	**2,355**	**12.87**	**0.42%**	**18.09%**	**23.48%**	**7.13%**	**44.08%**	**6.67%**	**0.13%**
Male	**2,359**	**11.01**	**0.55%**	**27.55%**	**36.96%**	**10.85%**	**20.64%**	**3.26%**	**0.17%**

Source: Author's calculation based on the SES data, 2011

In an analysis of return to education, table 7-6 describes a share of population with their highest education in 2011. A sample size is 4,714 observations (both parents' and children's generations). An average number of years of schooling are almost 12. Females have greater average number of years of schooling than males. Within a group of total samples; approximately 0.50 percent is never attending school; almost 23 percent attained primary

education; 30 percent attained secondary education; almost nine per cent is from vocational school; and approximately 37 percent attained higher education (undergraduate + graduate). The biggest portion of samples attained an undergraduate level of education (32.35 percent). Comparing between genders, a share of female samples with higher education is twice as much as a share of male samples with higher education.

Table 7-7: Descriptive analysis of return to education

	Variable	Mean	Standard Deviation	Min	Max
Total	Hourly earnings	79.71	351.91	0.51	19230.77
	Years of schooling	11.94	4.45	0	21
	experience	16.89	9.56	1	50
Female	Hourly earnings	79.26	175.87	0.51	5458
	Years of schooling	12.87	4.38	0	21
	experience	16.51	10.00	1	50
Male	Hourly earnings	80.16	465.45	0.91	19230.77
	Years of schooling	11.01	4.33	0	21
	experience	17.26	9.10	1	50

Source: Author's calculation.

Table 7-7 presents descriptive statistic of some variables. An average hourly wages of total samples is approximately 80 Baht per hour. Mean years of experience are almost 17 years. Although there is no significant difference in average per hour wages between males and females, dispersion of male's hourly earnings (standard deviation) is larger than female's hourly earnings substantially.

7.5. Intergenerational transmission of educational attainment

In this section, the empirical results of the ordinary least squares (OLS), and feasible weighted least squares (WLS) estimates and the marginal effects of educational attainment are presented. The author separates the analysis into three regression equations categorized by the

role of parents, gender, and age group. Table 7-8 presents results of estimates examining the intergenerational correlation of educational attainment between household's head and children. Columns 1&2 correspond to a group of all children while columns 3&4 and columns 5&6 correspond to female children and male children respectively. Table 7-10 shows results of feasible WLS estimates of educational attainment of dual-parents-household children. It shares the same structure as table 7-8; columns 1&2 correspond to all children while columns 3&4 and columns 5&6 correspond to daughter and son severally. Last but not least, table 7-12 demonstrates results of feasible WLS estimates of educational attainment of dual-parents-household children by three age groups; (1) 25-36 years old (columns 1&2), (2) 37-48 year old (columns 3&4), and (3) 49-60 years old (columns 5&6). A range of each age-group is 12 years.

7.5.1. The intergenerational transmission of educational attainment and wealth

In this subsection, the author discusses on the roles of parents and household's wealth in order to confirm the intergenerational transmission. The former is investigated in a form of educational background from parents to children while the latter mentioned the generational effect of wealth from grandparents to children. The interaction term between them is examined. The author further discusses how household's head with high education and wealth affects their children's educational attainment.

Table 7-8: The weighted least squares (WLS) estimates of educational attainment

Educational Attainment	Total Sample					
	All		Daughter		Son	
	(1)	(2)	(3)	(4)	(5)	(6)
Head's sex (male =1)	0.198* (0.091)	0.215* (0.092)	0.278* (0.124)	0.307* (0.124)	0.084 (0.134)	0.092 (0.134)
Children's sex (male =1)	0.715*** (0.065)	0.714*** (0.065)				
Different age	-0.0002 (0.005)	0.112*** (0.032)	-0.005 (0.007)	0.131** (0.046)	0.004 (0.007)	0.081 (0.044)
Different age squared		-0.002*** (0.0005)		-0.002** (0.0007)		-0.001 (0.0007)
Head's education	0.735*** (0.051)	0.732*** (0.051)	0.871*** (0.078)	0.872*** (0.078)	0.607*** (0.067)	0.601*** (0.067)
Head's education * log (financial assets)	-0.107*** (0.010)	-0.106*** (0.010)	-0.138*** (0.014)	-0.139*** (0.014)	-0.0756*** (0.013)	-0.074*** (0.013)
Head's education * log (land assets)	-0.005 (0.006)	-0.005 (0.006)	-0.005 (0.010)	-0.004 (0.010)	-0.007 (0.008)	-0.007 (0.008)
Marital status	0.149 (0.175)	0.170 (0.175)	0.192 (0.238)	0.199 (0.239)	0.124 (0.249)	0.145 (0.249)
Single parent	-0.431* (0.182)	-0.412* (0.182)	-0.532* (0.247)	-0.531* (0.249)	-0.285 (0.261)	-0.264 (0.260)
age	-0.134*** (0.005)	-0.134*** (0.005)	-0.160*** (0.006)	-0.161*** (0.006)	-0.105*** (0.007)	-0.105*** (0.007)
Bangkok	-1.128 (0.726)	-1.137 (0.725)	-1.130 (0.988)	-1.176 (0.989)	-1.338 (1.058)	-1.330 (1.057)

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Educational Attainment	Total Sample					
	All		Daughter		Son	
	(1)	(2)	(3)	(4)	(5)	(6)
Central	0.106	0.106	0.010	0.012	0.194	0.195
	(0.0916)	(0.092)	(0.131)	(0.131)	(0.127)	(0.127)
South	0.646***	0.653***	0.767***	0.779***	0.538**	0.542**
	(0.117)	(0.117)	(0.164)	(0.163)	(0.165)	(0.166)
North	0.670***	0.665***	0.448***	0.451***	0.847***	0.841***
	(0.092)	(0.092)	(0.127)	(0.127)	(0.131)	(0.131)
Municipal	1.094***	1.093***	1.058***	1.055***	1.127***	1.128***
	(0.072)	(0.071)	(0.101)	(0.101)	(0.100)	(0.100)
Log (land assets)	0.151**	0.150**	0.148*	0.145*	0.163*	0.162*
	(0.047)	(0.047)	(0.071)	(0.071)	(0.063)	(0.063)
Household size	0.071**	0.073**	0.012	0.013	0.141***	0.142***
	(0.022)	(0.022)	(0.031)	(0.031)	(0.031)	(0.031)
Log (expenditure per capita)	5.914***	5.907***	6.455***	6.438***	5.446***	5.438***
	(0.170)	(0.170)	(0.239)	(0.239)	(0.239)	(0.239)
Population density 2000	0.0005**	0.0005**	0.0004	0.0004	0.0006*	0.0006*
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Buddhist	0.200	0.181	1.146*	1.089	-0.739	-0.723
	(0.424)	(0.427)	(0.541)	(0.560)	(0.606)	(0.608)
Islam	0.017	0.006	0.881	0.836	-0.865	-0.848
	(0.450)	(0.453)	(0.581)	(0.598)	(0.644)	(0.646)
Souy	-0.224	-0.237	-0.103	-0.149	-0.357	-0.360
	(0.367)	(0.369)	(0.517)	(0.528)	(0.526)	(0.525)
Mon	-2.303*	-2.206*	-4.331**	-4.083**	0.770***	0.748***
	(1.137)	(1.065)	(1.488)	(1.551)	(0.198)	(0.199)
Karen	-1.087*	-1.042*	-1.024	-0.991	-1.190	-1.156
	(0.500)	(0.497)	(0.573)	(0.581)	(0.850)	(0.846)
Disable at birth	-0.713*	-0.616**	-0.881*	-0.758*	-0.602*	-0.539
	(0.229)	(0.229)	(0.356)	(0.355)	(0.293)	(0.294)

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Educational Attainment	Total Sample					
	All		Daughter		Son	
	(1)	(2)	(3)	(4)	(5)	(6)
Disable after birth	-0.027 (0.219)	0.004 (0.218)	0.252 (0.281)	0.266 (0.282)	-0.295 (0.324)	-0.261 (0.323)
Government loan	0.473 (0.483)	0.477 (0.484)	0.038 (0.771)	0.051 (0.772)	0.960 (0.526)	0.955 (0.527)
Log (financial assets)	1.305*** (0.083)	1.292*** (0.083)	1.678*** (0.118)	1.674*** (0.118)	0.917*** (0.114)	0.906*** (0.114)
Constant	-16.763*** (0.830)	-18.366*** (0.945)	-18.490*** (1.165)	-20.413*** (1.329)	-13.219*** (1.168)	-14.326*** (1.329)
No. of Observation	11317	11317	5848	5848	5468	5468
Adj R-squared	0.4567	0.4572	0.4851	0.4863	0.4931	0.4931
Root MSE	3.4128	3.4116	3.4455	3.4426	5.1000	5.4000

Note: Standard errors are reported in parenthesis. A symbol *, **, and ***; corresponds to the significance levels of T-statistics differing from zero at 5%, 1%, 0.1% respectively. Dummy of Northeast is omitted due to multicollinearity. According to the strong rejection of tests for homoskedasticity, feasible weighted least squares (WLS) are applied in the analysis. Some observations are dropped on the WLS estimates. The regressions have evidence of near-collinearity due to microeconomic variables and a narrow range of household's head's years of schooling.

Table 7-9: The marginal effect of educational attainment

Educational Attainment	All	Daughter	Son
	Y = Fitted values (predicted) = 10.837	**Y = Fitted values (predicted) = 11.185**	**Y = Fitted values (predicted) = 12**
Head's sex (male =1)	0.028(0.012)*	0.039(0.016)*	0.015(0.022)
Children's sex (male =1)	0.099(0.009)***		
Different age	0.299(0.085)***	0.340(0.118)**	0.249(0.135)
Different age squared	-0.156(0.041)***	-0.172(0.057)**	-0.142(0.079)
Head's education * log (financial assets)	-0.282(0.026)***	-0.356(0.036)***	-4.550(0.000)***
Head's education * log (land assets)	-0.017(0.020)	-0.013(0.032)	-4.970(0.000)
Marital status	0.010(0.010)	0.010(0.013)	1.940(0.000)
Single parent	-0.016(0.007)*	-0.021(0.010)*	-0.022(0.22)
Head's education	0.397(0.028)***	0.455(0.041)***	7.580(0.000)***
age	-0.430(0.015)***	-0.509(0.020)***	-0.244(0.016)***
Bangkok	-0.009(0.006)	-0.009(0.008)	-2.550(0.000)
Central	0.003(0.002)	0.0003(0.003)	1.270(0.000)
South	0.006(0.001)***	0.007(0.002)***	1.240(0.000)**
North	0.0134(0.002)***	0.009(0.003)***	3.930*(0.000)**
Municipal	0.0598(0.004)***	0.056(0.005)***	0.094(0.008)***
Log (land assets)	0.078(0.025)**	0.074(0.036)*	0.089(0.034)**
Household size	0.030(0.009)**	0.006(0.013)	0.071(0.016)***
Log (expenditure per capita)	1.981(0.057)***	2.095(0.078)***	1.708(0.075)***
Population density 2000	0.024(0.009)**	0.020(0.012)	0.006(0.002)*
Buddhist	0.016(0.037)	0.092(0.047)	-0.060(0.051)
Islam	0.00003(0.002)	0.003(0.002)	-7.810(0.000)
Souy	-0.0002(0.0003)	-0.0001(0.0004)	-5.830(0.000)
Mon	-0.0002(0.0001)*	-0.0003(0.0001)**	0.0623(0.017)***
Karen	-0.0004(0.0002)*	-0.0006(0.0003)	-8.130(0.000)
Disable at birth	-0.001(0.0005)**	-0.001(0.0006)*	-2.980(0.000)
Disable after birth	7.720(0.0005)	0.0006(0.0007)	-1.150(0.000)
Government loan	0.0002(0.0002)	0.00002(0.0002)	1.540(0.000)
Log (financial assets)	0.553(0.035)***	0.701(0.049)***	0.368(0.000)***

Note: Standard errors are reported in parenthesis. Bangkok metropolis is excluded from the central region. A symbol *, **, and ***; corresponds to the significance levels of Z-statistics differing from zero at 5%, 1%, 0.1% respectively.

The author starts the discussions from parental educational backgrounds. It is consistently found positive effects of parental educational attainment on their children's educational attainment which are shown in tables 7-8, 7-10, and 7-12. An increase in household's head's educational attainment induces a greater children's educational attainment (table 7-8, columns 1 and 2). Its contribution is higher in female children (0.872) rather than male children (0.601); that are shown in table 7-8, columns 4 and 6 respectively. As a result of an individual investigation on the impact of parental educational attainment on children's educational attainment, contradiction to previous literatures, the author found that the effect of father's educational attainment on all children's educational attainment roughly twice as much as than mother's educational attainment (0.155 vs. 0.078, shown in table 7-10, column 2). The evidence is also found in daughter's and son's groups. In addition, Parental educational attainment (both father and mother) has a bigger effect on son's educational attainment than daughter's educational attainment (column 6 vs. column 4 in table 7.10). A gap of difference in the coefficients between father's educational attainment and mother's educational attainment is smaller in female children (0.125 – 0.082 = 0.043) than male children (0.166 – 0.088 = 0.078). In subgroups of cohort, we found that parental educational attainment becomes less important on their younger age of children (table 7-12, columns 2 and 4). The parameter of father's educational attainment (0.248) and mother's educational attainment (0.092) for children aged 37-48 years old is bigger than the parameter for children aged 25-36 years old (0.122 and 0.069 severally); which is shown in table 7-12, columns 4 and 2 respectively. Thus, the intergenerational transmission of educational attainment is at least partly found in Thailand. This also proves that 'boosting the educational level of the present generation will facilitate the task of having a more education population in the generations to come' (Psacharopoulos and Yang, 1991). Hence the spillover effect of educational attainment on later generations is

valid (Black et al., 2005). The results confirm more important role of father in an issue of children's education (Birdsall and Meesook, 1986). Mother has more significant role than in the past but still less than father.

In order to support the result why father's educational attainment has more important role on children's educational attainment rather than mother's, the interaction between mother's high education and outside working is analyzed and found to be significantly negatively associated with children's educational attainment. This result can be interpreted that mother's high education and inside working (or staying at home) is more greatly associated to children's educational attainment than mother with higher education and outside working. Even though mother has high education, she spends less time with her children. She is busy to take care her children. Especially, in a case of daughter, if mother with higher education works outside and face the glass ceiling of job promotion, mother might feel education is not meaningful to daughter. Consequently the generational effect of educational attainment will be lower. Additionally, mother with lower education and outside working is more sensitive on children's educational attainment compared to mother with higher education and outside working. One possible explanation is that when mother with lower education goes for working outside, she will realize better how importance of education on individual earnings.

Moving on to the discussion on a term of household's wealth expressed by two independent variables as land assets (referring to dwelling and business assets) and financial assets, the household's wealth refers to the intergenerational transmission from the grandparents' generation (t-2) to children's generation (t). In table 7-8, land assets and financial assets both in the natural logarithm form are significantly and positively related to children's educational attainment. The coefficients of financial assets are stronger and larger

than the coefficients of land assets in all groups of sample. In tables 7-8 and 7-10, the financial assets affect daughter's educational attainment rather than son's educational attainment (columns 4 and 6 respectively in both tables). This implies that whichever rich or poor households are supposed to support son's education more evenly compared with daughter's education. Daughters have higher opportunity in accessing to higher education if she comes from rich families. Therefore there is a gender selecting occurred in Thai household.

Two interaction terms of (1) household's head's educational attainment and financial assets, and (2) household's head's educational attainment and land assets are included in the regression as shown in table 7-8[29]. The author found a significantly negative association of "the interaction of household's educational attainment and financial assets" with children's educational attainment, while individual predictor variables are related to children's educational attainment positively. Household's head with low educational attainment is more affected by the amount of financial assets to influence greater children's educational attainment, compared with the case of household's head with high educational attainment. That is because household's financial assets are not inherited from grandparents' generation but parents build up their financial assets in their generation. In the case, when parents were young, they did not get high educational attainment due to liquidity constraint. Afterwards parents become rich and have higher potential to support their children to get higher education.

[29] Due to obscure share of household's wealth belongs to mother or father, both interaction terms are incorporated only in the regression equations corresponding to household's educational attainment in table 7-7.

7.5.2. The role of individual and household characteristics

In the previous subsection, the intergenerational transmission of educational and wealth are discussed. In this subsection, the author discusses the role of individual and household characteristics on children's educational attainment. In the analyses, household's head's sex, difference in age between parents and children, parental marital status, single-parent household, household size, household's income, religion, minority group, children's age and disability are in the regression equations.

The analyses confirm a significantly negative monotonic curve between children's age and their educational attainment in tables 7-8, 7-10, and in table 7-12 due to the institutional (the development of Thai education system) and time effects. The nonlinear (inverted U shape) relationship between difference in years of household's head and children ages are newly found in all samples and a group of female children (columns 2 and 4 in table 7-8) with the turning points at 31.21 years[30] and 30.15 years[31] respectively. However, it is not available in group of male children (column 6). For the first two groups of sample, this result can be interpreted more understandingly by dividing the inverted-U-shape curve into two parts. Firstly, relatively within the range of younger household's head's age, the larger the difference, the more children's years of schooling will be till the turning point of household's head's age between household's head and children. On the contrary, within the range of older age of

[30]The turning point of the nonlinear curve between difference in age of household's head and all children and the children's educational attainment

Range of DIF	= [12, 71]
DIF+DIF2 has maximum in argext	= 31.211
Std Error of argext (delta method)	= 1.418
95% confidence interval for argext	= (28.431, 33.991)

[31]The turning point of the nonlinear curve between difference in age of household's head and female children and the female children's educational attainment

Range of DIF	= [12, 71]
DIF+DIF2 has maximum in argext	= 30.145
Std Error of argext (delta method)	= 1.702
95% confidence interval for argext	= (26.809, 33.481)

household's head, the larger the difference, the fewer children years of schooling will be. One possible explanation is that the mature household's head realizes the advantages of education and preferably invests in their children's education which explains the upward curve of the difference in age. While a bigger gap of difference in parental age and children's age causes the generation gap and the inefficient family communication. This could be negative on children's educational attainment. The availability of this inverted-U curve concerning an effect of the age of mother and father is also tested for daughter, son, and the whole children respectively in table 7-10. Among different groups of sample, it is found that the significantly nonlinear relationships of difference in years of mother's age and son's age at the turning point of 29.54 years[32] and mother's age and whole children's age at the turning point of 29.61 years[33] while we fail to find the nonlinear relationship of difference in years of father's age and children's age (column 6). In table 7-12, the inverted-U curve of difference in years of parental age (both father and mother) and children's age is found in the 25 to 36 years of age group at the turning points 28.14 years of difference in mother's age[34] and 32.83 years of

[32] The turning point of the nonlinear curve between difference in age of mother and son and the son's educational attainment

Range of DIF^m	= [12, 52]
$DIF^m + DIFSQ^m$ has maximum in argext	= 29.538
Std Error of argext (delta method)	= 2.267
95% confidence interval for argext	= (25.095, 33.982)

[33] The turning point of the nonlinear curve between difference in age of mother and children and the children's educational attainment

Range of DIF^m	= [12, 52]
$DIF^m + DIFSQ^m$ has maximum in argext	= 29.614
Std Error of argext (delta method)	= 2.430
95% confidence interval for argext	= (24.851, 34.376)

[34] The turning point of the nonlinear curve between difference in age of mother and children aged 25-36 years and the children's educational attainment

range of DIF^m	= [12,52]
$DIF^m + DIFSQ^m$ has maximum in argext	= 28.135
Std Error of argext (delta method)	= 2.316
95% confidence interval for argext	= (23.596, 32.675)

difference in father's age[35] (column 2). So the difference in parental age and children's age at approximately 30 years maximizes children's educational attainment.

In tables 7-8, 7-10, and 7-12, household size is significantly and positively associated with children's educational attainment. The more children in household, the more they help their siblings in education (Checchi, 2006). Tribal (Mon and Karen) and disable person at birth are significantly and negatively related to children's educational attainment, which imply less opportunity for the specific groups concerning the access to education. Religions, either Buddhism or Islam, are not significant to predict children's educational attainment.

The household incomes are significantly and positively associated with children's educational attainment shown in tables 7-8, 7-10, and 7-12. The parameters of the per capita household incomes are the largest in regressions. An increase in parental incomes strongly influences better children's educational attainment.

The parental marital status is added into the regressions as well. The author found that there is an insignificant effect of the marital status on children's educational attainment. Single parent has a significantly negative impact on daughter's education.

7.5.3. The role of government loan for education

The dummy variable of the government loan for education is included in the regression equations in order to examine the government role on education. Due to the data limitation, the government loan for education is only one government policy in education which is able to be

[35] The turning point of the nonlinear curve between difference in age of father and children aged 25-36 years and the children's educational attainment
range of DIF^f = [13,62]
$DIF^f + DIFSQ^f$ has maximum in argext = 32.823
Std Error of argext (delta method) = 2.687
95% confidence interval for argext = (27.558, 38.089)

included in the analysis. The author found that the government loan for education significantly increases son's educational attainment from the dual-parents household which is shown in table 8-9, columns 5 and 6, while it is significantly and positively correlated to all children's educational attainment inconsistently (columns 1 and 2). For other cases, we had insignificant results.

7.5.4. Analysis of the marginal effects

Tables 7-9 and 7-11 present the results of marginal effects corresponding to tables 7-8 and 7-10 respectively. The tables show that only the regressor income per capita in natural logarithm form is outstandingly elastic, with an increase in income per capita having almost twice to triple as large effect as on children's educational attainment. Other some variables are inelastic.

In a marginal effects of parental education, an increase in mother's educational attainment has an effect on children's educational attainment by 134 percent; daughter's educational attainment by 4.7 percent; and son's educational attainment by 4.7 percent (table 8-10) while a partial increase in father's educational attainment has an impact on children's educational attainment by ten percent; daughter's educational attainment by 8.7 percent; and son's educational attainment by ten percent (table 8-10). Hence the independent variable of mother's educational attainment is elastic to the whole children's educational attainment.

Table 7-10: The feasible WLS estimates of educational attainment of dual-parents-household's children by gender

Educational Attainment	Dual-parents household					
	All		Daughter		Son	
	(1)	(2)	(3)	(4)	(5)	(6)
Mother 's high education * outside work	-1.270*** (0.298)	-1.329*** (0.233)	-0.178 (0.373)	0.288 (0.358)	-1.922*** (0.425)	-1.826*** (0.426)
Mother's high education	-0.470 (0.266)	-0.513 (0.262)	-1.083** (0.334)	-1.763*** (0.312)	0.361 (0.372)	0.211 (0.374)
Mother works outside	0.399** (0.145)	0.366* (0.144)	0.382 (0.198)	0.593** (0.194)	0.370 (0.208)	0.318 (0.209)
age	-0.120*** (0.008)	-0.121*** (0.008)	-0.138*** (0.010)	-0.124*** (0.010)	-0.104*** (0.010)	-0.103*** (0.011)
Children's sex (male =1)	0.888*** (0.085)	0.876*** (0.084)				
Mother different age	0.011 (0.011)	0.150* (0.059)	0.005 (0.016)	0.060 (0.090)	0.015 (0.015)	0.213** (0.078)
Mother different age squared		-0.003* (0.001)		-0.001 (0.002)		-0.004** (0.001)
Father different age	0.005 (0.010)	0.107* (0.053)	0.006 (0.015)	0.124 (0.078)	0.001 (0.015)	0.068 (0.071)
Father different age squared		-0.002 (0.001)		-0.002 (0.001)		-0.001 (0.001)
Mother's education	0.078*** (0.018)	0.078*** (0.019)	0.071** (0.025)	0.082** (0.025)	0.088*** (0.025)	0.088*** (0.025)
Father's education	0.154*** (0.014)	0.155*** (0.014)	0.134*** (0.020)	0.125*** (0.078)	0.168*** (0.020)	0.166*** (0.020)
Housewife (=1)	0.325* (0.148)	0.285 (0.147)	0.521** (0.99)	0.744*** (0.193)	0.163 (0.214)	0.108 (0.215)

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Educational Attainment	Dual-parents household					
	All		Daughter		Son	
	(1)	(2)	(3)	(4)	(5)	(6)
Father's job in agriculture (=1)	-0.226* (0.110)	-0.252* (0.110)	-0.201 (0.159)	-0.230 (0.160)	-0.253 (0.150)	-0.273 (0.150)
Bangkok	-1.072 (0.984)	-0.945 (0.979)	0.337 (1.283)	-0.372 (1.288)	-1.331 (1.421)	-1.285 (1.418)
Central	0.218 (0.122)	0.231 (0.122)	0.165 (0.180)	0.187 (0.181)	0.274 (0.162)	0.264 (0.161)
South	0.506** (0.154)	0.519** (0.154)	0.556* (0.218)	0.577** (0.217)	0.456* (0.216)	0.486* (0.216)
North	0.812*** (0.119)	0.802*** (0.120)	0.506** (0.168)	0.515** (0.169)	0.996*** (0.166)	0.991*** (0.165)
Municipal	1.032*** (0.097)	1.020*** (0.097)	1.049*** (0.140)	1.067*** (0.140)	1.034*** (0.132)	1.019*** (0.132)
Log (land assets)	0.112** (0.043)	0.112** (0.043)	0.123 (0.067)	0.071 (0.066)	0.090 (0.055)	0.087 (0.055)
Household size	0.071* (0.029)	0.074** (0.029)	0.035 (0.041)	0.061 (0.041)	0.129** (0.040)	0.124** (0.040)
Log (expenditure per capita)	5.537*** (0.227)	5.493*** (0.227)	5.929*** (0.316)	6.034*** (0.313)	5.234*** (0.312)	5.160*** (0.311)
Population density 2000	0.0004 (0.0002)	0.0004 (0.0002)	-0.0001 (0.0003)	-0.00003 (0.0003)	0.001 (0.0004)	0.0006 (0.0004)
Buddhist	0.761 (0.599)	0.707 (0.591)	0.371 (0.736)	0.274 (0.742)	0.629 (0.937)	0.581 (0.923)
Islam	0.675 (0.634)	0.624 (0.632)	0.277 (0.792)	0.226 (0.797)	0.448 (0.983)	0.438 (0.969)
Souy	-0.571 (0.481)	-0.581 (0.486)	-0.403 (0.731)	-0.433 (0.750)	-0.651 (0.591)	-0.606 (0.571)
Mon	-5.208*** (0.239)	-5.087*** (0.241)	omitted	omitted	omitted	omitted

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Educational Attainment	Dual-parents household					
	All		Daughter		Son	
	(1)	(2)	(3)	(4)	(5)	(6)
Karen	-1.310	-1.212	-5.004***	-4.949***	0.017	0.054
	(0.842)	(0.825)	(0.864)	(0.830)	(0.895)	(0.877)
Disable at birth	-0.771**	-0.666*	-0.929*	-0.802	-0.544	-0.439
	(0.283)	(0.282)	(0.423)	(0.418)	(0.371)	(0.369)
Disable after birth	-0.194	-0.157	0.327	0.339	-0.697	-0.665
	(0.301)	(0.300)	(0.399)	(0.401)	(0.434)	(0.431)
Government loan	0.395	0.397	0.060	0.054	1.105**	0.972**
	(0.348)	(0.322)	(0.953)	(0.924)	(0.399)	(0.356)
Log (financial assets)	0.435***	0.423***	0.553***	0.462***	0.249**	0.258**
	(0.070)	(0.069)	(0.099)	(0.097)	(0.094)	(0.094)
Constant	-12.832***	-15.878***	-11.489***	-14.500***	-10.718***	-13.991***
	(1.059)	(1.251)	(1.435)	(1.749)	(1.520)	(1.750)
No. of Observation	6251	6251	3077	3077	3171	3171
Adj R-squared	0.7941	0.7975	0.4803	0.5069	0.4233	0.4271
Root MSE	0.00013	0.00013	3.2299	3.0991	3.2460	3.2298

Note: Standard errors are reported in parenthesis. A symbol *, **, and ***; corresponds to the significance levels of T-statistics differing from zero at 5%, 1%, 0.1% respectively. Dummy of Northeast is omitted due to multicollinearity. According to the strong rejection of tests for homoskedasticity, feasible weighted least squares (WLS) are applied in the analysis. Some observations are dropped on the process of WLS estimates. The regressions have evidence of near-collinearity due to microeconomic variables and a narrow range of household's head's years of schooling.

Table 7-11: The marginal effect of educational attainment of dual-parents-household's children

Educational Attainment	All	Daughter	Son
	Y = Fitted values (predicted) = 6	Y = Fitted values (predicted) = 12.8580	Y = Fitted values (predicted) = 11.2516
Mother with high education * outside work	-1.830(0.000)***	-0.001(0.001)	-0.006(0.001)***
Mother with higher education	-1.410(0.000)	-0.028(0.005)***	0.002(0.003)
Mother works outside	0.061(0.024)**	0.023(0.007)**	0.017(0.011)
age	-0.604(0.039)***	-0.309(0.025)**	-0.298(0.032)***
Children's sex (male =1)	0.292(0.028)***		
Mother different age	0.451(0.178)*	0.124(0.185)	0.486(0.177)**
Mother different age squared	-0.137(0.058)*	-0.046(0.092)	-0.222(0.085)**
Father different age	0.715(0.353)*	0.286(0.179)	0.176(0.182)
Father different age squared	-0.420(0.225)	-0.134(0.088)	-0.079(0.087)
Mother's education	1.340(0.000)***	0.047(0.014)**	0.047(0.013)***
Father's education	0.102(0.009)***	0.087(0.013)***	0.100(0.012)***
Housewife (=1)	1.730(0.000)	0.012(0.003)***	0.002(0.004)
Father's job in agriculture (=1)	-1.990(0.000)*	-0.004(0.003)	-0.007(0.004)
Bangkok	-2.540(0.000)	-0.006(0.021)	-0.008(0.009)
Central	0.038(0.020)	0.003(0.003)	0.007(0.005)
South	1.510(0.000)**	0.004(0.002)**	0.004(0.002)*
North	4.950(0.000)***	0.008(0.003)**	0.021(0.003)***
Municipal	0.170(0.016)***	0.056(0.007)***	0.053(0.007)***
Log (land assets)	0.086(0.033)**	0.033(0.031)	0.044(0.028)
Household size	0.087(0.033)**	0.024(0.016)	0.053 (0.017)**
Log (expenditure per capita)	3.222(0.133)***	1.748(0.091)***	1.673(0.101)***
Population density 2000	0.010(0.007)	0.002(0.025)	0.021(0.014)
Buddhist	0.118(0.100)	0.020(0.055)	0.049(0.079)
Islam	6.880(0.000)	0.001(0.002)	0.001(0.003)
Souy	-1.200(0.000)	-0.0002(0.0004)	-0.001(0.0005)
Mon	-0.848(0.040)***		
Karen	-9.290(0.000)	-0.002(0.0003)***	0.00002(0.0004)
Disable at birth	-4.330(0.000)*	-0.001(0.001)	-0.001(0.001)
Disable after birth	-8.720(0.000)	0.001(0.001)	-0.001(0.001)
Government loan	2.120(0.000)	0.00002(0.0003)	0.003(0.001)***
Log (financial assets)	0.303(0.050)***	0.179(0.038)***	0.107(0.039)**

Note: Standard errors are reported in parenthesis. Bangkok metropolis is excluded from the central region. A symbol *, **, and ***; corresponds to the significance levels of Z-statistics differing from zero at 5%, 1%, 0.1% respectively.

Table 7-12: The feasible WLS estimates of educational attainment of dual-parents-household's children by age group

Educational Attainment	Dual-parents household					
	25-36 years old		37-48 years old		49-60 years old	
	WLS (1)	WLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)
Mother's high education * outside work	-0.496 (0.344)	-0.500 (0.341)	-0.197 (1.783)	-1.188 (1.784)	omitted	omitted
Mother's high education	-0.576 (0.318)	-0.643* (0.313)	-1.322 (0.746)	-1.327 (0.746)	-2.352 (4.065)	-2.951 (4.058)
Mother working outside	0.286 (0.188)	0.196 (0.188)	0.477 (0.259)	0.492 (0.259)	0.582 (0.834)	0.530 (0.831)
age	-0.086*** (0.015)	-0.082*** (0.015)	-0.129*** (0.031)	-0.131*** (0.031)	-0.167 (0.095)	-0.183 (0.095)
Children's sex (male =1)	1.120*** (0.096)	1.112*** (0.096)	0.202 (0.190)	0.202 (0.190)	0.398 (0.594)	0.295 (0.596)
Mother different age	0.004 (0.013)	0.157* (0.068)	0.040 (0.025)	0.159 (0.133)	-0.118 (0.079)	-0.726 (0.453)
Mother different age squared		-0.003* (0.001)		-0.002 (0.002)		0.012 (0.009)
Father different age	0.002 (0.011)	0.141* (0.059)	-0.008 (0.023)	-0.015 (0.128)	0.174* (0.073)	1.094* (0.487)
Father different age squared		-0.002* (0.001)		0.0001 (0.002)		-0.016 (0.008)
Mother's education	0.068** (0.020)	0.069*** (0.020)	0.093* (0.044)	0.092* (0.044)	0.149 (0.124)	0.185 (0.124)
Father's education	0.124*** (0.016)	0.122*** (0.016)	0.250*** (0.035)	0.248*** (0.035)	0.115 (0.101)	0.962 (0.102)
Housewife (=1)	0.253 (0.192)	0.160 (0.191)	0.389 (0.273)	0.395 (0.274)	-0.062 (0.898)	-0.042 (0.895)

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Educational Attainment	Dual-parents household					
	25-36 years old		37-48 years old		49-60 years old	
	WLS (1)	WLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)
Father's job in agriculture (=1)	-0.260* (0.122)	-0.308* (0.124)	-0.585 (0.255)	-0.589* (0.255)	1.654 (1.075)	1.473 (1.084)
Bangkok	-0.201 (1.139)	-0.059 (1.125)	-3.946 (2.299)	-3.886 (2.302)	0.438 (7.207)	1.110 (7.182)
Central	0.339* (0.139)	0.354* (0.138)	-0.102 (0.267)	-0.106 (0.267)	-0.065 (0.789)	-0.266 (0.791)
South	0.624*** (0.171)	0.624*** (0.171)	0.409 (0.369)	0.429 (0.371)	-1.102 (1.089)	-1.274 (1.099)
North	0.879*** (0.138)	0.864*** (0.139)	0.481 (0.257)	0.480 (0.257)	1.568* (0.767)	1.361 (0.771)
Municipal	0.913*** (0.112)	0.900*** (0.112)	1.549*** (0.207)	1.541*** (0.207)	1.270* (0.619)	1.151 (0.623)
Log (land assets)	0.119** (0.044)	0.121** (0.044)	-0.014 (0.112)	-0.016 (0.112)	-0.448 (0.260)	-0.470 (0.259)
Household size	-0.015 (0.034)	-0.015 (0.034)	0.137* (0.061)	0.138* (0.061)	0.150 (0.193)	0.179 (0.193)
Log (expenditure per capita)	4.812*** (0.259)	4.742*** (0.259)	6.715*** (0.499)	6.716*** (0.500)	8.657*** (1.331)	8.551*** (1.326)
Population density 2000	0.0002 (0.0003)	0.0002 (0.0003)	0.001 (0.001)	0.001 (0.001)	0.0005 (0.002)	0.0004 (0.002)
Buddhist	0.746 (0.677)	0.664 (0.671)	0.623 (1.878)	0.688 (1.880)	-3.839 (2.381)	-3.607 (2.377)
Islam	0.521 (0.715)	0.443 (0.709)	0.837 (1.929)	0.892 (1.931)	omitted	omitted
Souy	-0.080 (0.506)	-0.042 (0.507)	-3.498** (1.304)	-3.528** (1.305)	0.581 (2.633)	0.255 (2.628)
Mon	-5.443*** (0.267)	-5.310*** (0.270)	omitted	omitted	omitted	omitted

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Educational Attainment	Dual-parents household					
	25-36 years old		37-48 years old		49-60 years old	
	WLS (1)	WLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)
Karen	-1.934 (1.257)	-1.764 (1.238)	0.282 (2.067)	0.324 (2.070)	omitted	omitted
Disable at birth	-0.944** (0.301)	-0.804** (0.300)	0.269 (1.163)	0.336 (1.165)	-1.982 (3.975)	-1.917 (3.957)
Disable after birth	-0.332 (0.313)	-0.269 (0.311)	0.003 (0.859)	-0.030 (0.860)	6.987 (4.062)	6.920 (4.097)
Government loan	0.933 (0.742)	0.946 (0.680)	0.359 (1.061)	0.358 (1.062)	0.304 (2.067)	0.328 (2.059)
Log (financial assets)	0.428*** (0.080)	0.413*** (0.080)	0.530** (0.154)	0.527** (0.154)	0.563 (0.475)	0.629 (0.476)
Constant	-10.418*** (1.266)	-14.107*** (1.474)	-16.948*** (2.863)	-18.378*** (3.347)	-16.015* (7.329)	-20.258* (9.164)
No. of Observation	4491	4491	1535	1535	225	225
Adj R-squared	0.8242	0.8269	0.4345	0.4342	0.5048	0.5093
Root MSE	3.8e-05	4.3e-05	3.64	3.6412	3.8287	3.8111

Note: Standard errors are reported in parenthesis. A symbol *, **, and ***; corresponds to the significance levels of T-statistics differing from zero at 5%, 1%, 0.1% respectively. Dummy of Northeast is omitted due to multicollinearity. According to the strong rejection of tests for Homoskedasticity, feasible weighted least squares (WLS) are applied in the analysis. Some observations are dropped on the process of WLS estimates. The regressions have evidence of near-collinearity due to microeconomic variables and a narrow range of household's head's years of schooling.

7.6. Relationship between educational attainment and its inequality

In this section, the author analyzes the determinants of inequality in educational attainment without the effect of intergenerational transmission by focusing on the relationship between an average number of years of schooling and its inequality. The samples corresponding to this analysis aged 25 years and over.

Table 7-13 presents the results of OLS estimations of the relationship between mean years of schooling and its inequality from provincial-level data into national and regional-levels of analysis. This table demonstrates that, at the national level, a very significant negative association between average number of years of schooling and educational inequality is observed not only in the total group but also in female and male groups. This result implies that provinces with a higher education attainment level are likely to achieve better equality in educational attainment than those with lower educational attainment. The magnitude of the coefficient in the female group (-0.034) is greater than in the male group (-0.030). This result can explain approximately half of the differences in inequality among all provinces in Thailand (R-squared = 50.24 percent).

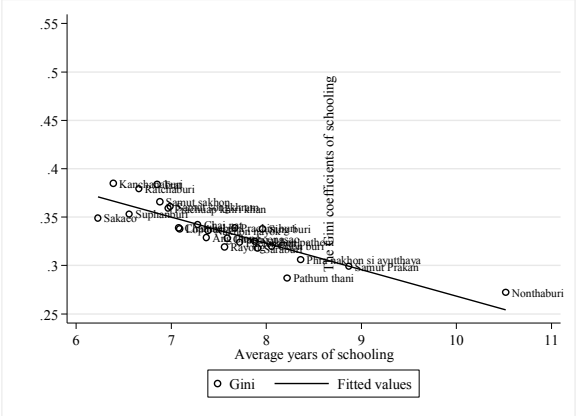
Preceding to regional analysis, in the same table, three out of the four regions of Thailand; central, northern, northeastern, and southern, the negative relationship between educational attainment and its inequality was observed, the central, northern, and southern parts of Thailand. There is no significant association in the northeastern area of Thailand. In addition, the author found that absolute magnitudes of coefficients of mean years of schooling (β_1) in the North and South (-0.051 and -0.054, respectively) are twice as many as the absolute magnitude of the coefficient of the central part of Thailand (-0.027). Both of these observations were found in female and male groups.

Two further questions arise from these findings. Firstly, why does only the northeastern part of Thailand have no statistical negative relationship between the average number of years of educational attainment and its inequality? Secondly, why does the relationship between the average number of years of educational attainment and inequality in education in the northern and southern parts of Thailand slope twice as steeply as in the central part of Thailand? In Figure 7-3, we depict scatter plots of average years of schooling and inequalities in education by regions, accounting for an additional support for these questions.

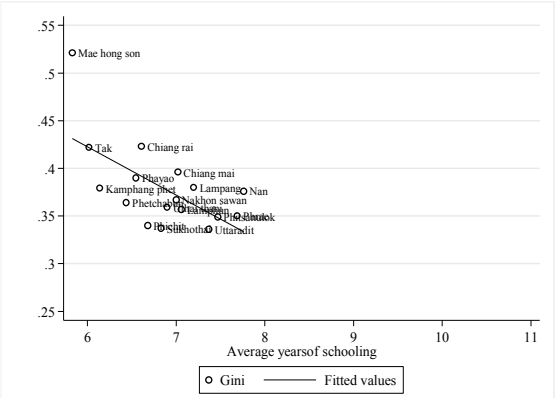
In Figure 7-3, comparing four regions of Thailand, we notice that degrees of inequality in educational attainment in provinces, located in the Northeast, fluctuate and are at a narrow level of the Gini coefficients (mostly within 0.30 to 0.35) while degrees of educational inequality move in a broader range in other regions. This implies that the allocation of education is at best or worst throughout the northeastern area. Therefore, in cross-sectional analysis, the author could not find a negative relationship between educational attainment and its inequality in the Northeast. It is possible that due to a unique attitude of the northeastern people. In addition, comparing three regions, the graph of the central area is flatter, compared to the North and the South and the constant of the former (0.541) is smaller than the latter (0.727 and 0.775, respectively).

Figure 7-3: Relationships between educational attainment and its inequalities: regional analysis

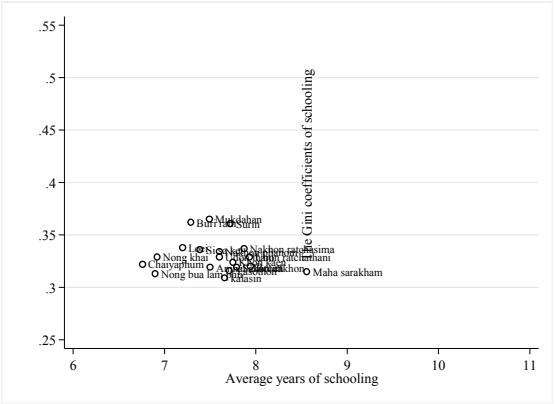
Region: Central



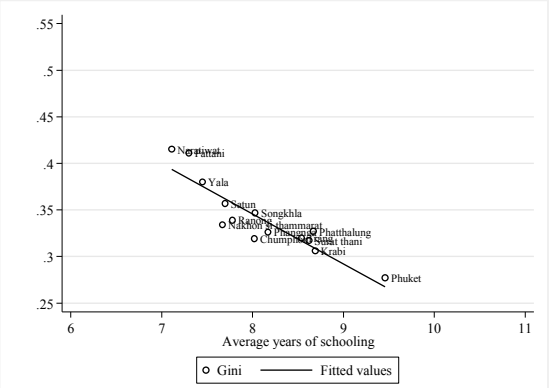
Region: North



Region: Northeast



Region: South



Source: Author's calculations

Table 7-13: The OLS estimates of inequality in educational attainment

Region		Dependent variable: the Gini coefficients of schooling			
		Coefficient of schooling	Constant	R-squared (%)	Observations
National	Total	**-0.032*** (0.004)	**0.585*** (0.028)	50.24	76
	Female	**-0.034*** (0.004)	**0.605*** (0.031)	44.70	
	Male	**-0.030*** (0.003)	**0.561*** (0.027)	51.48	
Central	Total	**-0.027*** (0.003)	**0.541*** (0.025)	75.36	25
	Female	**-0.028*** (0.003)	**0.557*** (0.025)	74.37	
	Male	**-0.025*** (0.004)	**0.511*** (0.029)	67.50	
North	Total	**-0.051*** (0.016)	**0.727*** (0.111)	39.51	17
	Female	**-0.056*** (0.018)	**0.766*** (0.116)	40.09	
	Male	**-0.053*** (0.016)	**0.741*** (0.115)	43.32	
Northeast	Total	**-0.006** (0.009)	**0.375*** (0.072)	2.26	19
	Female	**-0.007** (0.012)	**0.392*** (0.088)	2.05	
	Male	**-0.005** (0.007)	**0.359*** (0.051)	3.57	
South	Total	**-0.054*** (0.007)	**0. 775*** (0.061)	81.05	14
	Female	**-0.059*** (0.009)	**0.823*** (0.067)	80.04	
	Male	**-0.045*** (0.007)	**0.691*** (0.058)	77.55	

Note: Standard errors are reported in parenthesis. Bangkok metropolis is excluded from the central region. A symbol *; corresponds to the significance levels of T-statistics differing from zero at 1%. Observation is at the provincial level, which is calculated from individual-level data.

7.7. Intergenerational transmission of inequality in educational attainment

Tables 7-14 and 7-15 show the regressions of inequality in educational attainment and the marginal effect corresponding to table 7-14 respectively. Inequality in educational attainment is measured by the education Gini coefficient at the provincial level. The result in table 7-14 confirms the significantly negative and linear relationship between children's average number

of years of schooling and its inequality which is examined in the previous section. The regression shows that reducing inequality in educational attainment in parent's generation significantly but mildly induces better equality in educational attainment in children's generation (0.067). Thus the intergenerational transmission of inequality in educational attainment persists between both generations.

In addition, the author found that household's head's average number of years of schooling is insignificantly related to the degree of its inequality of children's generation. So an increase in an average number of years of schooling of parents is unable to relieve the level of its inequality in children's generation.

Population density is found to be significantly and negatively associated with the degree of inequality in educational attainment in children's generation. Provinces that are highly-populated tend to have more schools in which individuals are easier to get their education. On the contrary, inequalities in income both years 2000 and 2009 are not significantly related to inequality in educational attainment of children's generation. Moreover, both location-characteristic variables are insignificantly associated with the inequality in educational attainment of children's generation.

Table 7-15 represents the partial effect of inequality in educational attainment. All significant regressors are inelastic[36]. An increase in children's number of years of schooling has a small effect of approximately 0.7 percent on the degree of children's inequality in educational attainment while an increase in parents' level of inequality in educational attainment has a small impact of 0.08 percent on the degree of children's inequality in educational attainment.

[36] Baum (2006) identified the Elasticities within the unit interval is mentioned as inelastic.

Table 7-14: The WLS estimate of inequality in educational attainment

The education Gini coefficient of Children's generation	Number of observation = 72 F (11, 60) = 110.37 Prob > F = 0.0000 R-Squared = 0.9529 Adj R-squared = 0.9443 Root MSE = 0.70078	
	Coefficient	Standard Error
Parents' education Gini coefficients	0.067**	0.024
Children's average years of educational attainment	-1.584***	0.298
Household's head's average years of educational attainment	-0.726	0.366
Central (=1)	-1.407**	0.427
South (=1)	-2.712***	0.733
Northeast (=1)	-0.344	0.436
Bangkok and provinces located near (=1)	0.334	0.705
Border provinces (=1)	-0.465	0.262
Population density 2000	-0.001***	0.0003
Income Gini coefficients 2000	3.067	2.425
Income Gini coefficients 2009	0.084	2.050
Constant	42.725***	2.516

Note: Standard errors are reported in parenthesis. A symbol *, **, and ***; corresponds to the significance levels of T-statistics differing from zero at 5%, 1%, 0.1% respectively. Dummy of Northern provinces is omitted due to multicollinearity. Four observations are dropped on the WLS estimate.

Table 7-15: The marginal effect of inequality in educational attainment

Elasticities after regress y = Fitted values (predicted) = 24.283		
Variable	ey/ex	Standard Error
Parents' education Gini coefficients	0.080**	0.029
Children's average years of schooling	-0.678***	0.128
Household head's average years of schooling	-0.166*	0.084
Central (=1)	-0.011**	0.003
South (=1)	-0.002***	0.0005
Northeast (=1)	-0.010	0.012
Bangkok and provinces located near (=1)	0.001	0.003
Border provinces (=1)	-0.004	0.002
Population density 2000	-0.017***	0.004
Income Gini coefficients 2000	0.045	0.036
Income Gini coefficients 2009	0.002	0.041

Note: Standard errors are reported in parenthesis. A symbol *, **, and ***; corresponds to the significance levels of Z-statistics differing from zero at 5%, 1%, 0.1% respectively

7.8. Private rates of return to education in Thailand

Table 7-16 provides the OLS and WLS estimates of the predicted log of hourly earnings in the previous section. Columns 1, 3, and column 5 correspond to equation 7.10 while columns 2, 4, and column 6 correspond to equation 7.11. The author found that return to an additional year of schooling increases 12.4 percent of log hourly earnings for total sample. In addition, the author found that the rate of private return to education is higher for females than for males (14.6 percent vs. 9.5 percent respectively). This evidence was ever found in Thailand by Hawley (2004) and Warunsiri and Mcnown (2010). The gap of return to education between genders in this study is wider than previous studies of Hawley (2004) and Warunsiri and

Mcnown (2010). It is possible that male-female differential in parameters of years of schooling in education presents females more occupational choices (Dougherty, 2005), 'education helps women find employment outside the traditional low-paying female occupations' (Warunsiri and Mcnown, 2010, p.1621).

Columns 2, 4, and column 6 present the evidence of educational dummy variables on log hourly wages. The author found that higher education significantly brings higher returns to education for total, female and male groups. In female group (column 6), primary and secondary education are not significantly associated with individual's wage. Rate of returns to vocational secondary education (0.95) is higher than rate of returns to general secondary education (0.59). This confirms the findings of Hawley (2003). In addition, doctoral-master differential of coefficients of years of schooling for male is outstandingly bigger than female's. In contrast to previous regressions, the impact of higher education on men's hourly wages is bigger than those on women's hourly wages.

Dummies of working for public sector are significantly and positively associated with log hourly earnings in total and female sample groups while there is insignificant result in male groups. Residence in Bangkok metropolis and Central region play significant and positive roles on log per hour wages. Residence in Southern region is significantly and positively related to male's log hourly earnings but insignificantly related to female's log hourly earnings.

Table 7-16: The estimates of the private return to education in Thailand

ln Y	Coefficient					
	Total		Male		Female	
	OLS estimates		WLS estimates		OLS	WLS
	(1)	(2)	(3)	(4)	(5)	(6)
S	0.124***		0.095***		0.146***	
	(0.002)		(0.004)		(0.004)	
Doctoral		2.174***		2.412***		1.825***
		(0.278)		(0.517)		(0.410)
Master		1.999***		2.031***		1.823***
		(0.144)		(0.185)		(0.287)
Undergraduate		1.490***		1.463***		1.352***
		(0.138)		(0.173)		(0.284)
Vocational		0.945***		1.089***		0.740*
		(0.141)		(0.177)		(0.286)
Secondary		0.588***		0.714***		0.446
		(0.138)		(0.170)		(0.284)
Primary		0.214		0.454**		-0.048
		(0.136)		(0.167)		(0.282)
EXP	0.036***	0.048***	0.028***	0.038***	0.035***	0.048***
	(0.004)	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)
EXP^2	-0.0002**	-0.0006***	-0.0002[a]	-0.0005***	-0.0001[a]	-0.0006***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Sex (male =1)	-0.072***	-0.117***				
	(0.020)	(0.019)				
Bangkok	0.506 ***	0.464***	0.637***	0.545***	0.427***	0.426***
	(0.036)	(0.035)	(0.058)	(0.055)	(0.049)	(0.042)
Central	0.078 **	0.110***	0.127***	0.159***	0.0412	0.079*
	(0.026)	(0.025)	(0.033)	(0.032)	(0.036)	(0.034)
North	-0.077**	-0.049	-0.062	-0.043	-0.083*	-0.045
	(0.029)	(0.028)	(0.039)	(0.038)	(0.040)	(0.038)
South	0.064	0.091**	0.116**	0.122**	0.005	0.045
	(0.034)	(0.033)	(0.043)	(0.041)	(0.050)	(0.041)
Public	0.080**	0.067*	0.023	0.018	0.119**	0.097*
	(0.027)	(0.027)	(0.039)	(0.037)	(0.037)	(0.038)
Constant	1.860***	2.456***	2.196***	2.327***	1.421***	2.378***
	(0.066)	(0.144)	(0.094)	(0.179)	(0.085)	(0.286)
No. of Sample	4714	4714	2359	2359	2355	2355
Adj R-squared	0.3505	0.3915	0.2610	0.3149	0.4130	0.4459
Root MSE	0.6588	0.6377	0.6387	0.6158	0.6506	0.5902

Note: Standard errors are reported in parenthesis. A symbol [a], *, **, and ***; corresponds to the significance levels of T-statistics differing from zero at 10%, 5%, 1%, 0.1% respectively. Breusch-Pagan/Cook-Weisberg test for heteroskedasticity is checked in the estimates. We can conclude that heteroskedasticity is not a problem in the estimates. The dummy of Northeast and the educational dummy of no schooling are omitted in the estimates because of multicollinearity.

7.9. Concluding remarks

The objectives of this chapter are to investigate the determinants of educational attainment and its inequality, particularly the intergenerational transmission of educational attainment and its inequality and to examine returns to education of workforce age (25 to 60 years old) in Thailand. The analyses are based on the data obtained from the Socioeconomic Survey in 2011. The OLS and WLS estimates of educational attainment and its inequality are undertaken into the analyses.

The findings of this study are that, the intergenerational transmission of educational attainment is at least partly found in Thailand when the intergenerational transmission of inequality in educational attainment is also clearly found in Thailand. Father's educational attainment plays more significantly important role twice on inducing in children's educational attainment than mother's educational attainment. This implies that an increase in educational attainment and its equality in the current generation will induce the larger children's educational attainment and greater equality in educational attainment.

The author found the interaction term between household's educational attainment and financial assets is negatively associated to children's educational attainment while individually regressors are positively related to children's educational attainment. The liquidity constraint plays the most significant role on children's educational attainment.

In addition, the author found the nonlinear relationship (inverted-U-shape) between the difference in age between parents and children at the turning point approximately 30 years due to mature age and generation gap. The negative relationship of children's age and their educational attainment is confirmed. That is because of institutional and time effects. The

author found the unequal opportunity of accessing in education in the specific groups as disable-at-birth people and tribal.

In an analysis of returns to education, the findings are that rate of private returns to education is 12.4 percent. The impact of education on log hourly earnings for women is higher than for men under the regressor years of schooling. On the other hand, under the regressor educational dummy variables, rates of return to higher education (undergraduate, master, and doctoral) for males are greater than for females.

CHAPTER 8

CONCLUSIONS

8.1. Overall concluding remarks

The main objective of this dissertation is to analyze an inequality in educational attainment. The author hopes to shed the light on the following questions: 1) what factors determine educational attainment and its inequality? 2) How does educational attainment and its inequality affect economic outcome? 3) Are there any existences of intergenerational transmission of educational attainment and its inequality? The dissertation covers national, provincial, and individual analyses. For national analysis (chapters four and five), the author uses the data of educational attainment from Barro-Lee and Cohen- Soto. For provincial and individual analyses (chapters six and seven), the cross-sectional data from the Household Socioeconomic Survey (SES) which was conducted in 2011 by Thailand's National Statistics Office was obtained for estimations.

After the introductory discussion in Chapter one, Chapter two provides theoretical discussion. Definition of the key concept, inequality in education is identified in comparison with similar terms while its measurement is argued. In addition, theoretical approaches concerned such as the human capital approach, the intergenerational persistence in educational choices, and the wage regression are introduced. Next, more specific review on the empirical literature is conducted, followed by introducing the research methodology and the overall conceptual framework of this dissertation.

Chapter three overviews Thai education. More specifically, education systems, major education indicators including school enrollment and educational attainment as well as educational policies and expenditures are discussed with focusing on historical transition and current status.

Chapter four analyzes the method of measuring degree of inequality in educational attainment in order to splits the whole observations into sub-groups based on given level of educational attainment for finding the degree of contribution by different sub-groups to total inequality in educational attainment. Firstly, the author discovers the empirical evidence for supporting the infeasibility of using the education Lorenz curves in the analysis. The main reason is due to the limitation of macroeconomic data on educational attainment. Secondly, the author found that the pattern of diminishment in inequality in educational attainment overtime is different between advanced countries and less developed countries. The greater equality in educational attainment of the former comes from an abatement of population with primary education and the additions of population with secondary and tertiary educations. On the contrary, in the case of the latter group, a decrease in an inequality in educational attainment is caused by the shrinkage of people with no schooling and the rise of population with primary and secondary levels of education.

Chapter five investigates a macroeconomic factors influencing inequality in educational attainment during the period of 1975 to 2005 with five-year intervals and examines the impacts of educational attainment and its inequality on labor productivity on a national level from 1950 to 2010 with five-year intervals. In a part of determinants, there are two major findings. Firstly, the author found that direct factors to schooling are not significant while indirect factors to schooling have significant impacts on inequality in educational attainment. Secondly, the author found quadratic (U-shape) relationship between rural growth rate and

inequality in educational attainment. So the higher rural growth rate brings both an increase and a decrease in inequality in educational attainment with turning point at rate -1.88. In a part of impact on labor productivity, according to our findings, educational attainment strongly and positively affects a level of labor productivity. On the contrary, the insignificant association between inequality in educational attainment and labor productivity is found as expected. Therefore, a change in degree of inequality in educational attainment does not affect the national labor productivity.

For the provincial and individual analyses, a case study of Thailand, begin with chapter six. This chapter aims to investigate inequality in educational attainment in Thailand. The author employs Gini coefficients and Theil index to assess and decompose the unequal distribution of Thai educational attainment. At national level, an average number of years of schooling are 7.63, Gini coefficient is 0.349, and Theil index is 0.215. At regional level, the author found that the northern part of Thailand shows the largest inequality in educational attainment while in other parts of Thailand the levels of inequality in educational attainment are slightly lower. The biggest Gini coefficient is from Mae hong son (Northern) and the smallest is from Nonthaburi (Central). The biggest (0.521) is nearly double the smallest (0.272). When comparing gender groups, there is more equal distribution of educational attainment in the male group. If breaking inequality in educational attainment down into subgroups of gender, age group, province, and region; the between-group inequality in educational attainment is smaller than that of the within-group while among the sub groups of educational level the former is larger than the latter.

The advantage of the study in chapter six is that inequality in educational attainment is more precisely computed by using individual data in the analysis. This freed us in two constraints from the previous studies. Firstly, the author can measure years of schooling for

dropouts at many levels without assuming half completion. Secondly, range of education levels becomes wider. The author includes the graduate (master and doctoral) level of educational attainment in the analysis. Expanding the variety of education reflects real numbers of years of schooling. This prevents an underestimation of inequality in educational attainment.

Passing on to chapter seven, its objectives are to investigate the determinants of educational attainment and its inequality, particularly the intergenerational transmission of educational attainment and its inequality as well as examine private returns to education of workforce age (25 to 60 years old) in Thailand. The findings of this chapter are that, the intergenerational transmission of educational attainment is at least partly found in Thailand when the intergenerational transmission of inequality in educational attainment is also clearly found in Thailand. Father's educational attainment is almost twice as important on influencing children's educational attainment as mother's educational attainment. The author also found that interaction term between household's educational attainment and financial assets is negatively associated to children's educational attainment while individually regressors are positively related to children's educational attainment. The liquidity constraint plays the most significant role on children's educational attainment.

In addition, the author found a nonlinear relationship (inverted-U-shape) between the difference in age between parents and children at the turning point approximately 30 years due to mature age and generation gap. The negative relationship of children's age and their educational attainment is confirmed. That is because of institutional and time effects. The author found the unequal opportunity of accessing in education in the specific groups as disable-at-birth people and tribal.

Last but not least, in this chapter, the average number of years of schooling for females is larger than that for males. The author found improvement of gender parity in Thailand. The findings are that the rate of private returns to education is 12.4 percent. The impact of education on log hourly earnings for females is higher than for males under the regressor years of schooling. On the other hand, under the regressor educational dummy variables, rates of return to higher education (undergraduate, master, and doctoral) for males are greater than for females.

Based on all those analytical results, the author answered three research questions of the dissertation as follows. Firstly, at national level, past inequality in educational attainment, educational attainment, and ratio of capital to GDP significantly determine current level of inequality in educational attainment. In a case of Thailand, parental inequality in educational attainment, educational attainment, and population density significantly influence degree of inequality in educational attainment. In addition, the author found parental educational attainment, household wealth, household incomes, and difference in age between parents and children are significantly associated with children's educational attainment.

Secondly, the results of analyses show that educational attainment plays a significant role of increase in labor productivity and individual earnings while the author could not find the significance of inequality in educational attainment on labor productivity. Last but not least, the author found existences of intergenerational transmission of educational attainment and its inequality.

8.2. Limitations of dissertation

The study has several limitations. Firstly, due to data limitation, the author holds many assumptions in the analyses. In chapter six, Cobb-Douglas production function is assumed to be constant return to scale. In chapter eight, the analysis is in an assumption of availability of two generations; parents' and children's generations.

Secondly, observations in the study are people above twenty-five years of age who already completed their schooling. The policy recommendation corresponding to this group of people is difficult due to the fact that the workforce who entered labor market has less motivation to shift to access to school again. The policy implication is able to go for the people in school age for reducing inequality in education.

Last but not least, the estimates in chapter seven face econometric problems of near-collinearity and heteroskedasticity

8.3. Policy recommendation

As the author found the availability of the intergenerational transmission of educational attainment and its inequality in case of Thailand, an addition of educational attainment in the current generation will persuade higher educational attainment in future generation. At the same time, a reduction in the degree of inequality in educational attainment in the current generation will boost greater equality in educational attainment in the next generation. Hence, it is important to increase educational attainment and decrease the level of inequality in educational attainment due to a long-lasting impact on future generation. Since the policy for increasing educational attainment and reducing inequality in educational attainment could not

directly affect the people above twenty-five years of age and immediately solve the problem of inequality in educational attainment, the author recommends the policies as follows;

1. As the author consistently found the negative relationship between educational attainment and its inequality. Enhancing higher educational attainment (average number of years of schooling) will influence greater equality in educational attainment. At the individual level, for a specific case of Thailand, the author suggests that the factor of inducing educational attainment increases parental educational attainment.

2. As the author mentioned that an increase in educational attainment can reduce inequality itself, in the national level, for less developed countries, abating the population without schooling and enhancing population with primary education is the first stage for increasing equality in educational attainment. In a case of advanced countries, reducing population with primary education and inducing people with secondary and tertiary education will improve greater equality in educational attainment.

3. At the national level, a control of the rural population growth rate can influence greater equality in educational attainment.

4. In a specific case of Thailand, The economic condition and social problems also bear on the issue of inequality in educational attainment; the study found that many social and economic indicators affect level of inequality in educational attainment. By solving the economic and social problems, it can increase equality in educational attainment. In addition, the result shows a highly unequal opportunity of accessing in educational attainment for specific groups such as disable-at-birth people and tribal.

Thus, it is vital that more opportunity of accessing in educational attainment should be provided to those groups.

5. From empirical results of educational attainment in Thailand, government loan for education significantly increase male children's educational attainment from dual-parents household but it is insignificant in female children's educational attainment. For female children, the government should provide more information to make female children's parents understand individual benefit of government loan for education.

6. Last but not least, the author found that the liquidity constraint plays the most significant role on educational attainment. The government should firmly guarantee a more certain range of free basic education for all citizens.

8.4. Recommendations on further studies

1. Due to some limitations, this study does not cover the effect of inequality in educational attainment on income inequality. The author further suggests on investigating the relationship between the two.

2. Since the pattern of distribution of educational attainment would slightly be different between years, the comparison of inequality in educational attainment in Thailand for every five or ten years is suggested for clearly observing a change of inequality in educational attainment.

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ACADEMIC ACHEIVEMENT

- **List of publication in Journal**

1) Jirada Prasartpornsirichoke and Yoshi Takahashi. (2013). Assessing inequalities in Thai education. *The International Journal of East Asian Studies*, *18*(1), forthcoming.

- **List of Publications in International Conference Proceeding**

(1) Jirada Prasartpornsirichoke, Yoshi Takahashi, and Peera Charoenporn. (2012). The ranking of inequality in human capital: evidence from Asian countries. The 13th International Convention of the East Asian Economic Association (October, 19-20, 2012, Singapore).

- **Lists of Discussion paper**

(1) Jirada Prasartpornsirichoke, Yoshi Takahashi, and Peera Charoenporn. (October, 2012). The ranking of inequality in human capital: evidence from Asian countries. IDEC DP2 Series (2-14).

(2) Jirada Prasartpornsirichoke and Yoshi Takahashi. (November, 2012). On the determinants of inequality in education. IDEC DP2 Series (2-16).

(3) Jirada Prasartpornsirichoke and Yoshi Takahashi. (March, 2013). Assessing inequalities in Thai education. IDEC DP2 Series (3-2).

APPENDIX

Table 1: Education Gini coefficients of population aged 15 and over, based on Barro-Lee educational attainments data-set

Country	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	trends
Afghanistan	0.958	0.953	0.946	0.939	0.916	0.893	0.865	0.828	0.805	0.785	0.733	0.695	0.626	⇩
Albania	0.609	0.598	0.407	0.391	0.364	0.319	0.260	0.211	0.163	0.127	0.080	0.061	0.056	⇩
Algeria	0.827	0.833	0.855	0.846	0.789	0.716	0.644	0.561	0.488	0.422	0.366	0.322	0.293	⇩
Argentina	0.210	0.214	0.213	0.205	0.199	0.201	0.199	0.205	0.204	0.189	0.174	0.165	0.164	⇧
Armenia	0.268	0.258	0.234	0.219	0.199	0.176	0.141	0.118	0.101	0.094	0.083	0.079	0.079	⇩
Australia	0.201	0.192	0.182	0.170	0.147	0.117	0.083	0.085	0.082	0.082	0.081	0.079	0.079	⇩
Austria	0.147	0.151	0.193	0.278	0.287	0.262	0.240	0.237	0.228	0.220	0.209	0.194	0.178	⇧
Bahrain	0.887	0.880	0.865	0.815	0.673	0.580	0.505	0.464	0.401	0.279	0.189	0.164	0.145	⇩
Bangladesh	0.820	0.818	0.813	0.815	0.818	0.808	0.718	0.659	0.628	0.589	0.539	0.483	0.428	⇩
Barbados	0.108	0.112	0.117	0.149	0.093	0.130	0.156	0.130	0.106	0.076	0.071	0.048	0.053	⇧
Belgium	0.170	0.171	0.175	0.172	0.177	0.190	0.196	0.198	0.185	0.184	0.180	0.169	0.172	⇧
Belize	0.242	0.238	0.254	0.208	0.164	0.169	0.172	0.204	0.225	0.211	0.200	0.192	0.194	⇧
Benin	0.908	0.904	0.900	0.892	0.884	0.876	0.855	0.815	0.780	0.740	0.706	0.674	0.635	⇩
Bolivia	0.717	0.679	0.640	0.585	0.542	0.490	0.423	0.361	0.302	0.269	0.248	0.198	0.177	⇩
Botswana	0.727	0.723	0.718	0.670	0.610	0.561	0.509	0.447	0.366	0.247	0.195	0.156	0.128	⇩
Brazil	0.705	0.669	0.628	0.580	0.524	0.460	0.475	0.414	0.374	0.340	0.295	0.248	0.233	⇩
Brunei Darussalam	0.738	0.705	0.657	0.607	0.509	0.450	0.392	0.360	0.323	0.307	0.303	0.301	0.294	⇩
Bulgaria	0.234	0.212	0.191	0.163	0.158	0.154	0.153	0.149	0.150	0.147	0.128	0.122	0.120	⇩
Burundi	0.925	0.907	0.885	0.862	0.828	0.799	0.782	0.771	0.746	0.683	0.632	0.602	0.569	⇩
Cambodia	0.263	0.264	0.259	0.244	0.229	0.215	0.201	0.185	0.172	0.160	0.144	0.142	0.142	⇩
Cameroon	0.876	0.849	0.822	0.776	0.723	0.650	0.587	0.523	0.462	0.409	0.375	0.366	0.351	⇩
Canada	0.194	0.194	0.190	0.180	0.158	0.143	0.131	0.121	0.112	0.108	0.104	0.097	0.091	⇩
Central African Republic	0.919	0.916	0.909	0.902	0.872	0.833	0.789	0.758	0.703	0.670	0.642	0.622	0.615	⇩
Chile	0.342	0.331	0.312	0.284	0.258	0.247	0.236	0.227	0.222	0.217	0.204	0.185	0.168	⇩
China	0.730	0.684	0.628	0.562	0.480	0.422	0.348	0.321	0.312	0.262	0.219	0.197	0.180	⇩
Colombia	0.496	0.464	0.431	0.406	0.382	0.362	0.348	0.327	0.318	0.312	0.294	0.277	0.249	⇩
Congo	0.866	0.840	0.816	0.767	0.712	0.631	0.569	0.505	0.472	0.432	0.398	0.375	0.354	⇩

Country	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	trends
Costa Rica	0.281	0.277	0.283	0.284	0.287	0.269	0.246	0.234	0.231	0.230	0.214	0.208	0.187	⇩
Cote Divoire	0.901	0.894	0.887	0.877	0.858	0.828	0.793	0.762	0.727	0.658	0.591	0.555	0.525	⇩
Croatia	0.324	0.316	0.302	0.283	0.264	0.244	0.225	0.206	0.196	0.183	0.174	0.160	0.156	⇩
Cuba	0.317	0.315	0.318	0.314	0.285	0.254	0.186	0.191	0.175	0.162	0.149	0.141	0.136	⇩
Cyprus	0.438	0.394	0.335	0.309	0.304	0.289	0.277	0.229	0.217	0.224	0.218	0.256	0.222	⇩
Czech Republic	0.067	0.071	0.073	0.094	0.097	0.100	0.100	0.121	0.123	0.095	0.079	0.026	0.063	⇧
Demo. Rep. of the Congo	0.865	0.835	0.800	0.771	0.740	0.702	0.661	0.624	0.585	0.564	0.552	0.547	0.561	⇩
Denmark	0.209	0.208	0.207	0.199	0.193	0.196	0.191	0.176	0.170	0.175	0.175	0.175	0.178	⇩
Dominican Rep.	0.452	0.441	0.396	0.439	0.440	0.413	0.381	0.362	0.333	0.305	0.284	0.264	0.247	⇩
Ecuador	0.529	0.477	0.425	0.405	0.389	0.371	0.342	0.338	0.323	0.330	0.342	0.320	0.297	⇩
Egypt	0.944	0.929	0.913	0.888	0.859	0.822	0.733	0.625	0.571	0.515	0.458	0.414	0.374	⇩
El Salvador	0.675	0.653	0.613	0.577	0.529	0.492	0.456	0.435	0.410	0.365	0.315	0.270	0.236	⇩
Estonia	0.213	0.213	0.215	0.214	0.213	0.209	0.204	0.196	0.182	0.146	0.100	0.087	0.080	⇩
Fiji	0.333	0.307	0.283	0.238	0.251	0.227	0.200	0.176	0.153	0.114	0.134	0.150	0.137	⇩
Finland	0.092	0.097	0.109	0.144	0.171	0.199	0.204	0.199	0.190	0.194	0.192	0.180	0.170	⇧
France	0.124	0.134	0.137	0.180	0.175	0.240	0.245	0.281	0.283	0.232	0.181	0.160	0.130	⇧
Gabon	0.909	0.896	0.872	0.825	0.774	0.720	0.664	0.592	0.523	0.437	0.372	0.326	0.281	⇩
Gambia	0.961	0.958	0.954	0.950	0.944	0.926	0.905	0.877	0.821	0.766	0.757	0.715	0.669	⇩
Germany	0.274	0.281	0.286	0.288	0.294	0.314	0.329	0.338	0.320	0.281	0.244	0.117	0.118	⇧
Ghana	0.884	0.870	0.814	0.768	0.673	0.606	0.554	0.505	0.472	0.455	0.425	0.392	0.351	⇩
Greece	0.381	0.345	0.254	0.293	0.295	0.278	0.270	0.269	0.261	0.266	0.258	0.208	0.180	⇩
Guatemala	0.725	0.733	0.734	0.732	0.710	0.677	0.569	0.535	0.503	0.476	0.463	0.441	0.368	⇩
Guyana	0.231	0.228	0.225	0.226	0.224	0.226	0.229	0.236	0.239	0.234	0.221	0.205	0.180	⇨
Haiti	0.915	0.900	0.877	0.854	0.825	0.791	0.740	0.581	0.536	0.491	0.473	0.462	0.454	⇩
Honduras	0.667	0.649	0.622	0.593	0.559	0.519	0.449	0.383	0.343	0.303	0.271	0.245	0.218	⇩
Hong Kong	0.523	0.494	0.470	0.415	0.392	0.355	0.315	0.280	0.258	0.275	0.293	0.256	0.224	⇩
Hungary	0.084	0.087	0.090	0.088	0.100	0.112	0.118	0.127	0.133	0.101	0.066	0.059	0.062	⇧
Iceland	0.128	0.140	0.155	0.168	0.180	0.196	0.205	0.209	0.210	0.209	0.209	0.206	0.199	⇧
India	0.776	0.766	0.751	0.749	0.710	0.717	0.711	0.647	0.588	0.549	0.508	0.457	0.415	⇩
Indonesia	0.779	0.746	0.700	0.607	0.509	0.460	0.415	0.497	0.536	0.450	0.361	0.338	0.323	⇩

Country	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	trends
Iran	0.932	0.921	0.893	0.840	0.788	0.737	0.673	0.598	0.550	0.427	0.351	0.300	0.271	⇩
Iraq	0.979	0.966	0.946	0.915	0.851	0.805	0.743	0.655	0.571	0.516	0.476	0.464	0.437	⇩
Ireland	0.163	0.163	0.162	0.158	0.159	0.158	0.144	0.140	0.146	0.164	0.162	0.144	0.131	⇘
Israel	0.347	0.341	0.328	0.312	0.287	0.257	0.223	0.213	0.205	0.196	0.186	0.175	0.162	⇩
Italy	0.258	0.258	0.253	0.237	0.228	0.253	0.254	0.252	0.241	0.224	0.204	0.191	0.171	⇘
Jamaica	0.215	0.212	0.222	0.191	0.140	0.155	0.174	0.198	0.200	0.204	0.189	0.167	0.160	⇘
Japan	0.210	0.204	0.190	0.185	0.183	0.183	0.174	0.171	0.170	0.155	0.148	0.140	0.131	⇩
Jordan	0.846	0.800	0.730	0.683	0.651	0.608	0.558	0.502	0.430	0.373	0.333	0.297	0.269	⇩
Kazakhstan	0.535	0.501	0.481	0.456	0.423	0.379	0.324	0.284	0.244	0.173	0.092	0.091	0.096	⇩
Kenya	0.798	0.774	0.740	0.722	0.679	0.610	0.524	0.431	0.354	0.305	0.273	0.240	0.210	⇩
Korea	0.344	0.319	0.517	0.426	0.366	0.300	0.252	0.221	0.238	0.168	0.158	0.144	0.129	⇩
Kuwait	0.771	0.734	0.689	0.641	0.608	0.666	0.584	0.524	0.486	0.464	0.407	0.317	0.293	⇩
Kyrgyzstan	0.429	0.417	0.406	0.391	0.371	0.335	0.286	0.253	0.219	0.195	0.163	0.180	0.179	⇩
Lao PDR	0.763	0.745	0.722	0.699	0.664	0.625	0.587	0.559	0.526	0.495	0.466	0.440	0.414	⇩
Latvia	0.264	0.273	0.279	0.281	0.279	0.271	0.241	0.213	0.185	0.137	0.116	0.074	0.075	↷
Lesotho	0.468	0.424	0.380	0.331	0.325	0.329	0.314	0.304	0.297	0.287	0.274	0.242	0.213	⇩
Liberia	0.929	0.924	0.907	0.890	0.875	0.825	0.771	0.715	0.671	0.660	0.633	0.585	0.507	⇩
Libyan Arab Jamahiriya	0.872	0.858	0.843	0.791	0.717	0.643	0.588	0.536	0.476	0.438	0.410	0.386	0.365	⇩
Lithuania	0.501	0.474	0.438	0.410	0.373	0.332	0.275	0.225	0.181	0.163	0.134	0.115	0.098	⇩
Luxembourg	0.199	0.200	0.207	0.205	0.197	0.203	0.209	0.215	0.215	0.218	0.211	0.200	0.188	↷
Macao	0.380	0.374	0.363	0.334	0.300	0.281	0.275	0.252	0.241	0.234	0.211	0.186	0.178	⇩
Malawi	0.662	0.648	0.636	0.623	0.538	0.530	0.539	0.530	0.490	0.466	0.412	0.314	0.265	⇩
Malaysia	0.660	0.628	0.579	0.532	0.472	0.440	0.404	0.347	0.306	0.259	0.233	0.202	0.181	⇩
Maldives	0.624	0.609	0.596	0.575	0.553	0.525	0.498	0.467	0.478	0.488	0.455	0.393	0.316	⇩
Mali	0.963	0.959	0.956	0.951	0.942	0.915	0.893	0.870	0.853	0.842	0.822	0.777	0.706	⇩
Malta	0.610	0.538	0.461	0.407	0.393	0.379	0.273	0.255	0.233	0.255	0.221	0.170	0.165	⇩
Mauritania	0.673	0.670	0.669	0.665	0.663	0.662	0.662	0.648	0.623	0.590	0.548	0.480	0.411	⇩
Mauritius	0.574	0.549	0.512	0.454	0.399	0.387	0.385	0.354	0.320	0.277	0.256	0.232	0.216	⇩
Mexico	0.515	0.493	0.472	0.451	0.421	0.429	0.413	0.361	0.314	0.284	0.261	0.230	0.198	⇩

Country	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	trends
Moldova	0.611	0.571	0.527	0.484	0.421	0.357	0.302	0.254	0.210	0.170	0.141	0.119	0.100	⇩
Mongolia	0.746	0.707	0.641	0.579	0.569	0.344	0.281	0.227	0.168	0.178	0.178	0.174	0.156	⇩
Morocco	0.971	0.968	0.949	0.928	0.896	0.856	0.818	0.775	0.726	0.683	0.645	0.603	0.555	⇩
Mozambique	0.860	0.818	0.777	0.737	0.742	0.764	0.731	0.732	0.784	0.808	0.795	0.774	0.717	⇘⇗
Myanmar	0.840	0.826	0.814	0.782	0.779	0.757	0.671	0.600	0.494	0.440	0.402	0.384	0.360	⇩
Namibia	0.698	0.659	0.615	0.561	0.504	0.458	0.425	0.387	0.347	0.335	0.346	0.332	0.330	⇩
Nepal	0.988	0.988	0.985	0.967	0.937	0.910	0.877	0.795	0.713	0.685	0.616	0.541	0.473	⇩
Netherlands	0.084	0.090	0.094	0.162	0.151	0.154	0.148	0.146	0.141	0.137	0.133	0.129	0.119	⇘⇗
New Zealand	0.145	0.137	0.131	0.120	0.117	0.100	0.129	0.137	0.150	0.150	0.147	0.144	0.142	⇘⇗
Nicaragua	0.672	0.646	0.610	0.594	0.587	0.574	0.567	0.550	0.524	0.499	0.462	0.417	0.371	⇩
Niger	0.927	0.925	0.925	0.925	0.919	0.914	0.904	0.887	0.865	0.842	0.825	0.809	0.777	⇩
Norway	0.110	0.104	0.099	0.128	0.139	0.163	0.171	0.159	0.142	0.132	0.122	0.049	0.058	⇘⇗
Pakistan	0.882	0.879	0.863	0.847	0.838	0.810	0.789	0.756	0.720	0.702	0.673	0.545	0.491	⇘⇗
Panama	0.421	0.388	0.349	0.351	0.352	0.329	0.299	0.275	0.257	0.249	0.239	0.221	0.208	⇩
Papua New Guinea	0.923	0.908	0.880	0.848	0.801	0.772	0.733	0.680	0.627	0.577	0.522	0.472	0.453	⇩
Paraguay	0.425	0.370	0.312	0.306	0.282	0.267	0.262	0.254	0.254	0.244	0.258	0.204	0.185	⇩
Peru	0.507	0.487	0.467	0.447	0.408	0.369	0.327	0.312	0.309	0.288	0.248	0.216	0.186	⇩
Philippines	0.543	0.386	0.379	0.346	0.303	0.258	0.248	0.232	0.214	0.215	0.215	0.201	0.187	⇩
Poland	0.190	0.179	0.169	0.157	0.143	0.137	0.122	0.117	0.114	0.115	0.109	0.103	0.101	⇩
Portugal	0.515	0.484	0.450	0.467	0.459	0.411	0.355	0.324	0.297	0.307	0.302	0.292	0.265	⇩
Qatar	0.836	0.796	0.768	0.715	0.679	0.635	0.594	0.557	0.528	0.482	0.451	0.410	0.378	⇩
Reunion	0.629	0.693	0.573	0.478	0.434	0.379	0.337	0.304	0.273	0.245	0.219	0.196	0.173	⇩
Romania	0.235	0.229	0.216	0.195	0.177	0.175	0.151	0.129	0.114	0.107	0.092	0.085	0.087	⇩
Russian Federation	0.351	0.330	0.316	0.290	0.259	0.247	0.222	0.202	0.178	0.144	0.105	0.099	0.093	⇩
Rwanda	0.952	0.924	0.853	0.820	0.786	0.735	0.694	0.668	0.645	0.616	0.586	0.567	0.529	⇩
Saudi Arabia	0.670	0.665	0.659	0.651	0.642	0.597	0.551	0.477	0.415	0.403	0.351	0.299	0.247	⇩
Senegal	0.619	0.619	0.614	0.610	0.595	0.577	0.561	0.542	0.516	0.483	0.443	0.408	0.372	⇩
Serbia	0.386	0.357	0.330	0.295	0.265	0.254	0.234	0.215	0.209	0.192	0.182	0.175	0.169	⇩
Sierra Leone	0.959	0.955	0.951	0.938	0.918	0.892	0.863	0.832	0.796	0.751	0.726	0.704	0.674	⇩

Country	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	trends
Singapore	0.679	0.638	0.582	0.527	0.448	0.442	0.424	0.338	0.255	0.259	0.256	0.255	0.230	⇩
Slovakia	0.077	0.077	0.074	0.091	0.091	0.096	0.092	0.105	0.104	0.098	0.099	0.096	0.096	↷
Slovenia	0.321	0.296	0.271	0.227	0.193	0.179	0.164	0.119	0.077	0.072	0.059	0.058	0.061	⇩
South Africa	0.543	0.529	0.522	0.488	0.455	0.408	0.363	0.287	0.226	0.175	0.236	0.192	0.162	⇩
Spain	0.614	0.592	0.567	0.538	0.453	0.473	0.430	0.414	0.393	0.294	0.227	0.200	0.167	⇩
Sri Lanka	0.409	0.384	0.365	0.342	0.255	0.237	0.216	0.216	0.196	0.184	0.167	0.157	0.150	⇩
Sudan	0.923	0.909	0.897	0.876	0.852	0.826	0.783	0.742	0.703	0.671	0.642	0.626	0.616	⇩
Swaziland	0.805	0.766	0.727	0.669	0.581	0.496	0.459	0.419	0.358	0.314	0.262	0.222	0.202	⇩
Sweden	0.197	0.201	0.202	0.200	0.195	0.200	0.185	0.178	0.167	0.131	0.135	0.106	0.102	↷
Switzerland	0.213	0.216	0.218	0.235	0.240	0.212	0.175	0.228	0.256	0.275	0.276	0.271	0.259	↘
Syrian Arab Republic	0.761	0.749	0.726	0.701	0.646	0.592	0.517	0.441	0.381	0.316	0.297	0.264	0.249	⇩
Taiwan	0.512	0.474	0.444	0.402	0.367	0.333	0.297	0.262	0.233	0.201	0.172	0.147	0.130	⇩
Tajikistan	0.560	0.522	0.480	0.440	0.379	0.311	0.246	0.192	0.147	0.105	0.096	0.104	0.103	∪
Tanzania	0.710	0.703	0.674	0.648	0.606	0.575	0.505	0.450	0.405	0.373	0.340	0.288	0.225	⇩
Thailand	0.530	0.467	0.412	0.350	0.311	0.286	0.261	0.268	0.251	0.262	0.278	0.286	0.285	∪
Togo	0.927	0.916	0.898	0.881	0.844	0.783	0.706	0.636	0.570	0.534	0.498	0.470	0.445	⇩
Tonga	0.322	0.311	0.296	0.276	0.249	0.207	0.186	0.180	0.132	0.097	0.113	0.132	0.130	∪
Trinidad and Tobago	0.212	0.206	0.194	0.186	0.181	0.151	0.131	0.147	0.153	0.137	0.120	0.108	0.101	⇩
Tunisia	0.924	0.907	0.890	0.850	0.796	0.712	0.624	0.606	0.552	0.492	0.438	0.396	0.360	⇩
Turkey	0.827	0.780	0.717	0.662	0.623	0.565	0.520	0.473	0.439	0.403	0.329	0.294	0.280	⇩
Uganda	0.818	0.796	0.771	0.717	0.643	0.580	0.555	0.504	0.440	0.381	0.347	0.293	0.248	⇩
Ukraine	0.375	0.365	0.348	0.323	0.303	0.258	0.224	0.194	0.167	0.144	0.134	0.112	0.110	⇩
United Arab Emirates	0.925	0.896	0.864	0.816	0.780	0.739	0.665	0.584	0.488	0.378	0.293	0.234	0.220	⇩
United Kingdom	0.142	0.146	0.146	0.165	0.179	0.181	0.183	0.179	0.181	0.183	0.183	0.178	0.173	↷
Uruguay	0.287	0.277	0.267	0.257	0.251	0.247	0.228	0.213	0.217	0.220	0.191	0.179	0.164	⇩
USA	0.201	0.194	0.185	0.149	0.122	0.100	0.083	0.099	0.106	0.078	0.076	0.073	0.071	∨
Venezuela	0.542	0.509	0.472	0.471	0.443	0.383	0.320	0.329	0.337	0.322	0.311	0.302	0.282	⇩
Viet Nam	0.564	0.564	0.522	0.481	0.434	0.385	0.336	0.313	0.251	0.243	0.243	0.248	0.248	∪
Yemen	0.997	0.996	0.994	0.991	0.989	0.990	0.964	0.927	0.874	0.820	0.757	0.701	0.633	⇩

Country	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	trends
Zambia	0.600	0.565	0.520	0.472	0.427	0.430	0.427	0.417	0.415	0.282	0.282	0.271	0.242	⇩
Zimbabwe	0.566	0.536	0.499	0.467	0.417	0.403	0.420	0.396	0.328	0.254	0.202	0.177	0.154	⇩

Source: Author's calculations by utilizing educational attainment data based on Barro and Lee (2011).
Note: The calculations cover 146 countries from 1950 to 2010, five-year intervals period. The arrows present the trend of each country's educational inequality over time.

Table 2: Gini index of education distribution, Total population aged 25 and over, from Barro-Lee educational attainments data-set

COUNTRY	Gini Index of Education Distribution, total population aged 25 and over, by five-year-interval													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Afghanistan	0.983	0.977	0.971	0.964	0.956	0.933	0.920	0.887	0.858	0.819	0.796	0.774	0.719	⇩
Albania	0.679	0.646	0.424	0.404	0.400	0.374	0.336	0.280	0.212	0.151	0.097	0.076	0.065	⇩
Algeria	0.816	0.823	0.868	0.901	0.870	0.825	0.760	0.682	0.603	0.522	0.450	0.390	0.341	↷
Argentina	0.223	0.217	0.222	0.214	0.204	0.203	0.214	0.210	0.217	0.207	0.194	0.180	0.167	↘
Armenia	0.276	0.266	0.256	0.231	0.217	0.195	0.172	0.147	0.119	0.106	0.092	0.084	0.076	⇩
Australia	0.212	0.207	0.199	0.194	0.173	0.140	0.097	0.097	0.089	0.085	0.082	0.083	0.081	⇩
Austria	0.154	0.156	0.157	0.284	0.296	0.268	0.246	0.235	0.224	0.216	0.210	0.200	0.180	↷
Bahrain	0.912	0.904	0.894	0.871	0.815	0.739	0.607	0.516	0.464	0.336	0.225	0.183	0.159	⇩
Bangladesh	0.826	0.825	0.825	0.830	0.840	0.853	0.752	0.710	0.667	0.622	0.596	0.563	0.520	⇩
Barbados	0.098	0.104	0.110	0.148	0.119	0.149	0.165	0.151	0.127	0.088	0.081	0.053	0.049	↷
Belgium	0.159	0.165	0.168	0.167	0.167	0.185	0.194	0.198	0.193	0.191	0.188	0.173	0.175	↗
Belize	0.246	0.241	0.259	0.221	0.182	0.187	0.190	0.219	0.253	0.241	0.230	0.213	0.205	↘
Benin	0.914	0.913	0.912	0.912	0.912	0.911	0.911	0.876	0.836	0.793	0.760	0.732	0.716	⇩
Bolivia	0.758	0.733	0.698	0.670	0.624	0.588	0.521	0.455	0.385	0.333	0.317	0.260	0.221	⇩
Botswana	0.748	0.749	0.748	0.748	0.732	0.618	0.583	0.544	0.476	0.380	0.306	0.251	0.198	⇩
Brazil	0.726	0.697	0.658	0.610	0.559	0.512	0.525	0.487	0.478	0.421	0.367	0.310	0.264	⇩
Brunei	0.772	0.740	0.704	0.676	0.617	0.561	0.448	0.406	0.341	0.304	0.292	0.290	0.290	⇩
Bulgaria	0.262	0.231	0.215	0.193	0.177	0.168	0.165	0.160	0.156	0.138	0.135	0.129	0.120	⇩
Burundi	0.955	0.947	0.929	0.906	0.885	0.860	0.832	0.805	0.791	0.771	0.741	0.677	0.627	⇩
Cambodia	0.162	0.167	0.171	0.173	0.174	0.174	0.173	0.167	0.162	0.161	0.158	0.158	0.148	↷
Cameroon	0.879	0.865	0.840	0.818	0.783	0.754	0.688	0.612	0.545	0.481	0.421	0.369	0.338	⇩
Canada	0.206	0.206	0.204	0.194	0.182	0.172	0.155	0.137	0.124	0.118	0.113	0.104	0.096	⇩
Central African Republic	0.906	0.907	0.904	0.896	0.889	0.871	0.849	0.813	0.773	0.739	0.693	0.652	0.625	⇩
Chile	0.366	0.345	0.339	0.314	0.285	0.277	0.270	0.256	0.245	0.236	0.229	0.213	0.197	⇩
China	0.856	0.799	0.735	0.660	0.589	0.509	0.430	0.398	0.375	0.301	0.241	0.218	0.197	⇩

COUNTRY	Gini Index of Education Distribution, total population aged 25 and over, by five-year-interval													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Colombia	0.526	0.494	0.466	0.437	0.416	0.397	0.386	0.374	0.357	0.343	0.320	0.311	0.277	⇩
Congo	0.921	0.919	0.896	0.876	0.833	0.795	0.725	0.669	0.570	0.509	0.478	0.437	0.406	⇩
Costa Rica	0.292	0.297	0.298	0.308	0.314	0.305	0.277	0.261	0.248	0.237	0.228	0.237	0.212	↷
Cote Divoire	0.960	0.954	0.947	0.936	0.924	0.906	0.873	0.835	0.799	0.750	0.672	0.625	0.579	⇩
Croatia	0.348	0.335	0.326	0.306	0.290	0.267	0.244	0.223	0.205	0.180	0.169	0.161	0.154	⇩
Cuba	0.332	0.316	0.308	0.298	0.289	0.271	0.276	0.232	0.213	0.188	0.166	0.152	0.143	⇩
Cyprus	0.524	0.449	0.387	0.354	0.333	0.304	0.287	0.262	0.245	0.251	0.256	0.293	0.254	⇩
Czech Republic	0.071	0.075	0.070	0.093	0.103	0.104	0.105	0.124	0.132	0.102	0.079	0.026	0.059	↘
DR Congo	0.924	0.896	0.875	0.842	0.816	0.787	0.757	0.718	0.675	0.637	0.597	0.577	0.568	⇩
Denmark	0.208	0.207	0.206	0.205	0.205	0.204	0.203	0.197	0.177	0.177	0.174	0.170	0.169	⇩
Dominican Rep.	0.476	0.477	0.477	0.492	0.508	0.470	0.436	0.421	0.397	0.372	0.339	0.313	0.288	↷
Ecuador	0.559	0.515	0.460	0.446	0.434	0.421	0.396	0.380	0.374	0.362	0.374	0.357	0.342	⇩
Egypt	0.953	0.948	0.937	0.929	0.909	0.888	0.800	0.709	0.664	0.617	0.561	0.504	0.443	⇩
El Salvador	0.698	0.675	0.662	0.635	0.609	0.565	0.524	0.502	0.494	0.441	0.386	0.336	0.279	⇩
Estonia	0.208	0.211	0.212	0.217	0.218	0.216	0.212	0.204	0.191	0.149	0.102	0.084	0.080	↷
Fiji	0.414	0.374	0.342	0.281	0.292	0.268	0.235	0.208	0.182	0.140	0.145	0.163	0.153	↘
Finland	0.089	0.096	0.105	0.143	0.166	0.204	0.212	0.210	0.199	0.194	0.202	0.180	0.167	↘
France	0.130	0.139	0.136	0.164	0.197	0.235	0.249	0.294	0.304	0.247	0.198	0.180	0.143	↘
Gabon	0.915	0.915	0.907	0.890	0.858	0.820	0.746	0.675	0.601	0.534	0.468	0.404	0.351	⇩
Gambia	0.966	0.964	0.963	0.962	0.958	0.955	0.935	0.910	0.887	0.838	0.819	0.786	0.747	⇩
Germany	0.257	0.261	0.266	0.274	0.270	0.281	0.296	0.315	0.317	0.273	0.225	0.108	0.107	↘
Ghana	0.894	0.889	0.884	0.850	0.803	0.742	0.685	0.611	0.546	0.494	0.462	0.431	0.391	⇩
Greece	0.435	0.382	0.293	0.314	0.311	0.298	0.287	0.285	0.281	0.295	0.291	0.227	0.191	↘
Guatemala	0.756	0.754	0.766	0.773	0.772	0.754	0.632	0.597	0.569	0.540	0.519	0.506	0.458	↘
Guyana	0.253	0.247	0.241	0.230	0.222	0.226	0.233	0.240	0.248	0.248	0.237	0.226	0.207	↘
Haiti	0.925	0.916	0.903	0.884	0.867	0.840	0.818	0.674	0.626	0.579	0.531	0.484	0.469	⇩
Honduras	0.676	0.666	0.657	0.649	0.630	0.601	0.529	0.463	0.416	0.383	0.343	0.300	0.267	⇩

COUNTRY	Gini Index of Education Distribution, total population aged 25 and over, by five-year-interval													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Hong Kong	0.557	0.533	0.500	0.479	0.474	0.437	0.388	0.342	0.307	0.317	0.335	0.289	0.250	
Hungary	0.094	0.093	0.092	0.089	0.101	0.107	0.118	0.131	0.142	0.109	0.075	0.059	0.057	
Iceland	0.109	0.129	0.141	0.156	0.171	0.187	0.202	0.216	0.220	0.219	0.218	0.212	0.211	
India	0.804	0.792	0.781	0.771	0.764	0.772	0.770	0.708	0.649	0.617	0.587	0.547	0.505	
Indonesia	0.838	0.807	0.772	0.695	0.596	0.547	0.491	0.547	0.633	0.514	0.414	0.382	0.356	
Iran	0.958	0.947	0.932	0.907	0.870	0.832	0.801	0.742	0.665	0.532	0.457	0.373	0.321	
Iraq	0.984	0.982	0.970	0.960	0.944	0.914	0.858	0.799	0.735	0.643	0.553	0.498	0.460	
Ireland	0.164	0.162	0.162	0.160	0.157	0.159	0.158	0.158	0.157	0.167	0.170	0.156	0.141	
Israel	0.366	0.359	0.353	0.349	0.337	0.299	0.265	0.237	0.215	0.202	0.191	0.181	0.159	
Italy	0.277	0.273	0.269	0.244	0.234	0.263	0.282	0.283	0.271	0.252	0.229	0.215	0.188	
Jamaica	0.265	0.254	0.246	0.188	0.129	0.139	0.161	0.186	0.206	0.221	0.218	0.203	0.178	
Japan	0.211	0.213	0.210	0.196	0.189	0.196	0.193	0.188	0.180	0.170	0.161	0.150	0.140	
Jordan	0.890	0.858	0.832	0.800	0.778	0.743	0.726	0.647	0.573	0.479	0.409	0.362	0.324	
Kazakhstan	0.608	0.561	0.532	0.489	0.458	0.420	0.372	0.315	0.267	0.188	0.114	0.094	0.087	
Kenya	0.853	0.825	0.791	0.797	0.784	0.717	0.636	0.583	0.514	0.415	0.342	0.297	0.263	
Korea	0.394	0.362	0.640	0.528	0.457	0.381	0.332	0.283	0.276	0.205	0.186	0.162	0.139	
Kuwait	0.826	0.780	0.736	0.686	0.661	0.739	0.647	0.573	0.552	0.531	0.434	0.340	0.323	
Kyrgyzstan	0.457	0.440	0.424	0.407	0.391	0.366	0.326	0.281	0.239	0.203	0.161	0.151	0.145	
Lao PDR	0.834	0.816	0.797	0.771	0.744	0.707	0.663	0.629	0.582	0.547	0.514	0.483	0.457	
Latvia	0.259	0.271	0.278	0.283	0.282	0.278	0.268	0.252	0.218	0.149	0.118	0.070	0.069	
Lesotho	0.539	0.494	0.446	0.425	0.376	0.376	0.344	0.320	0.308	0.299	0.292	0.285	0.271	
Liberia	0.939	0.939	0.939	0.919	0.903	0.890	0.858	0.812	0.754	0.696	0.652	0.650	0.625	
Libyan Arab Jamahiriya	0.889	0.882	0.868	0.856	0.800	0.771	0.699	0.678	0.577	0.502	0.443	0.417	0.388	
Lithuania	0.522	0.500	0.474	0.446	0.415	0.377	0.334	0.286	0.230	0.183	0.138	0.112	0.087	
Luxembourg	0.177	0.183	0.188	0.194	0.197	0.205	0.209	0.210	0.216	0.214	0.213	0.209	0.201	
Macao	0.424	0.404	0.392	0.370	0.353	0.321	0.298	0.286	0.270	0.251	0.235	0.216	0.198	
Malawi	0.717	0.707	0.691	0.681	0.629	0.595	0.589	0.595	0.556	0.518	0.493	0.452	0.371	

COUNTRY	Gini Index of Education Distribution, total population aged 25 and over, by five-year-interval													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Malaysia	0.724	0.686	0.653	0.604	0.567	0.511	0.458	0.417	0.370	0.314	0.283	0.240	0.218	⇩
Maldives	0.619	0.610	0.597	0.587	0.566	0.548	0.523	0.505	0.545	0.569	0.579	0.506	0.432	⩛
Mali	0.980	0.977	0.974	0.971	0.965	0.961	0.939	0.911	0.889	0.865	0.848	0.835	0.814	⇩
Malta	0.646	0.579	0.489	0.386	0.377	0.378	0.285	0.265	0.244	0.274	0.236	0.191	0.179	⩘
Mauritania	0.654	0.651	0.648	0.650	0.651	0.657	0.661	0.662	0.661	0.650	0.620	0.587	0.540	⩛
Mauritius	0.583	0.575	0.565	0.511	0.476	0.446	0.430	0.417	0.364	0.312	0.290	0.252	0.238	⇩
Mexico	0.523	0.522	0.503	0.488	0.466	0.471	0.469	0.422	0.376	0.340	0.297	0.274	0.241	⩛
Mongolia	0.911	0.859	0.815	0.733	0.664	0.440	0.362	0.284	0.193	0.193	0.174	0.156	0.157	⇩
Morocco	0.972	0.967	0.961	0.947	0.963	0.911	0.873	0.833	0.794	0.750	0.699	0.656	0.619	⩛
Mozambique	0.926	0.875	0.833	0.797	0.766	0.785	0.819	0.807	0.818	0.839	0.822	0.793	0.776	⩛
Myanmar	0.849	0.818	0.843	0.838	0.832	0.831	0.748	0.668	0.577	0.531	0.476	0.425	0.388	⩛
Namibia	0.667	0.648	0.622	0.601	0.571	0.542	0.504	0.464	0.410	0.379	0.369	0.334	0.321	⇩
Nepal	0.994	0.994	0.992	0.981	0.967	0.946	0.923	0.861	0.784	0.756	0.722	0.666	0.590	⇩
Netherlands	0.090	0.094	0.097	0.161	0.170	0.172	0.164	0.154	0.144	0.139	0.134	0.134	0.125	⌒
New Zealand	0.144	0.136	0.131	0.123	0.124	0.112	0.137	0.146	0.155	0.150	0.150	0.150	0.146	⩛
Nicaragua	0.674	0.675	0.658	0.638	0.634	0.614	0.600	0.589	0.577	0.557	0.532	0.504	0.465	⇩
Niger	0.918	0.915	0.914	0.913	0.916	0.918	0.919	0.913	0.903	0.885	0.861	0.839	0.822	⩛
Norway	0.099	0.096	0.098	0.117	0.138	0.161	0.174	0.165	0.146	0.136	0.128	0.052	0.052	⩛
Pakistan	0.897	0.896	0.895	0.877	0.862	0.844	0.830	0.801	0.787	0.755	0.731	0.602	0.569	⇩
Panama	0.452	0.428	0.388	0.389	0.386	0.367	0.347	0.323	0.298	0.280	0.267	0.249	0.231	⇩
Papua New Guinea	0.949	0.936	0.926	0.901	0.879	0.857	0.841	0.780	0.721	0.660	0.600	0.545	0.484	⇩
Paraguay	0.457	0.404	0.352	0.338	0.315	0.302	0.290	0.277	0.276	0.262	0.286	0.232	0.209	⇩
Peru	0.566	0.535	0.519	0.487	0.468	0.425	0.395	0.367	0.349	0.342	0.306	0.269	0.229	⇩
Philippines	0.624	0.469	0.449	0.396	0.344	0.299	0.285	0.257	0.240	0.234	0.234	0.223	0.207	⇩
Poland	0.220	0.201	0.185	0.170	0.161	0.148	0.139	0.127	0.126	0.122	0.117	0.101	0.093	⇩
Portugal	0.567	0.534	0.509	0.518	0.521	0.447	0.395	0.355	0.326	0.332	0.328	0.318	0.285	⩘

COUNTRY	Gini Index of Education Distribution, total population aged 25 and over, by five-year-interval													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Qatar	0.914	0.888	0.850	0.806	0.745	0.712	0.649	0.601	0.561	0.514	0.485	0.448	0.415	⇩
Réunion	0.651	0.702	0.616	0.552	0.510	0.474	0.420	0.367	0.322	0.282	0.249	0.222	0.195	∩
Republic of Moldova	0.678	0.646	0.607	0.549	0.503	0.446	0.376	0.311	0.255	0.206	0.165	0.135	0.110	⇩
Romania	0.222	0.194	0.200	0.193	0.187	0.211	0.175	0.151	0.134	0.110	0.101	0.089	0.078	⩛
Russian Federation	0.360	0.349	0.334	0.318	0.301	0.295	0.277	0.248	0.208	0.160	0.109	0.093	0.085	⇩
Rwanda	0.966	0.945	0.928	0.892	0.863	0.817	0.791	0.726	0.687	0.660	0.640	0.614	0.585	⇩
Saudi Arabia	0.663	0.659	0.653	0.647	0.641	0.636	0.591	0.545	0.486	0.448	0.404	0.364	0.318	⇩
Senegal	0.600	0.597	0.597	0.597	0.600	0.601	0.593	0.574	0.555	0.537	0.510	0.475	0.437	⩛
Serbia	0.425	0.390	0.367	0.339	0.320	0.288	0.260	0.231	0.207	0.186	0.175	0.164	0.155	⇩
Sierra Leone	0.959	0.958	0.955	0.954	0.944	0.931	0.908	0.879	0.849	0.815	0.776	0.730	0.704	⇩
Singapore	0.735	0.696	0.661	0.611	0.571	0.559	0.544	0.396	0.287	0.276	0.274	0.275	0.244	⇩
Slovakia	0.073	0.076	0.069	0.091	0.097	0.097	0.097	0.105	0.111	0.099	0.100	0.085	0.083	⩘
Slovenia	0.333	0.308	0.295	0.251	0.217	0.197	0.176	0.132	0.084	0.072	0.064	0.059	0.059	⇩
South Africa	0.582	0.563	0.553	0.523	0.494	0.449	0.406	0.345	0.257	0.187	0.290	0.246	0.208	⩛
Spain	0.627	0.601	0.577	0.550	0.527	0.510	0.486	0.475	0.452	0.332	0.248	0.214	0.178	⇩
Sri Lanka	0.467	0.439	0.411	0.387	0.312	0.269	0.239	0.229	0.209	0.199	0.186	0.173	0.164	⇩
Sudan	0.946	0.931	0.918	0.896	0.882	0.868	0.838	0.824	0.783	0.736	0.696	0.662	0.635	⇩
Swaziland	0.852	0.831	0.792	0.764	0.679	0.598	0.548	0.512	0.457	0.402	0.350	0.307	0.258	⇩
Sweden	0.198	0.201	0.205	0.207	0.208	0.225	0.208	0.200	0.187	0.171	0.149	0.120	0.115	∩
Switzerland	0.211	0.215	0.217	0.239	0.248	0.222	0.191	0.235	0.256	0.266	0.259	0.257	0.240	⩘
Syrian Arab Republic	0.829	0.806	0.790	0.754	0.736	0.684	0.611	0.542	0.473	0.395	0.368	0.316	0.281	⇩
Taiwan	0.560	0.526	0.494	0.469	0.449	0.421	0.375	0.325	0.277	0.236	0.199	0.168	0.144	⇩
Tajikistan	0.649	0.602	0.561	0.500	0.460	0.401	0.335	0.263	0.206	0.151	0.105	0.086	0.086	⇩
Thailand	0.682	0.591	0.512	0.451	0.392	0.335	0.303	0.282	0.275	0.270	0.279	0.281	0.287	∪
Togo	0.947	0.939	0.932	0.920	0.908	0.863	0.810	0.753	0.697	0.625	0.559	0.528	0.491	⇩
Tonga	0.268	0.264	0.262	0.259	0.257	0.255	0.239	0.225	0.186	0.130	0.137	0.152	0.137	⇩

COUNTRY	Gini Index of Education Distribution, total population aged 25 and over, by five-year-interval													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Trinidad and Tobago	0.239	0.231	0.221	0.208	0.198	0.159	0.131	0.155	0.171	0.161	0.147	0.131	0.115	
Tunisia	0.941	0.935	0.923	0.914	0.890	0.862	0.778	0.732	0.653	0.598	0.529	0.464	0.414	
Turkey	0.867	0.807	0.757	0.687	0.681	0.662	0.618	0.542	0.487	0.462	0.376	0.327	0.304	
Uganda	0.838	0.813	0.793	0.773	0.729	0.674	0.614	0.560	0.522	0.468	0.439	0.389	0.353	
Ukraine	0.359	0.375	0.374	0.356	0.334	0.308	0.273	0.233	0.194	0.158	0.148	0.116	0.104	
United Arab Emirates	0.946	0.924	0.887	0.848	0.805	0.757	0.697	0.625	0.535	0.419	0.321	0.257	0.242	
United Kingdom	0.141	0.144	0.146	0.164	0.181	0.189	0.185	0.194	0.191	0.188	0.189	0.189	0.188	
United Republic of Tanzania	0.712	0.711	0.712	0.687	0.668	0.629	0.597	0.536	0.486	0.430	0.389	0.351	0.308	
Uruguay	0.314	0.296	0.281	0.278	0.262	0.260	0.242	0.229	0.234	0.238	0.206	0.195	0.174	
USA	0.216	0.210	0.201	0.168	0.137	0.113	0.093	0.107	0.112	0.082	0.079	0.077	0.074	
Venezuela	0.581	0.549	0.549	0.538	0.560	0.463	0.379	0.365	0.370	0.348	0.332	0.314	0.301	
Viet Nam	0.586	0.586	0.585	0.541	0.500	0.463	0.418	0.366	0.295	0.270	0.250	0.246	0.250	
Yemen	1.000	1.000	1.000	1.000	1.000	1.000	0.993	0.986	0.965	0.932	0.882	0.811	0.747	
Zambia	0.688	0.640	0.600	0.548	0.446	0.508	0.536	0.478	0.466	0.303	0.334	0.310	0.283	
Zimbabwe	0.599	0.582	0.557	0.530	0.505	0.477	0.448	0.424	0.404	0.332	0.281	0.228	0.200	

Sources: Authors' calculations by utilizing educational attainment data based on Barro and Lee (2011).
Note: The calculations cover 146 countries from 1950 to 2010, five-year intervals period. The arrows present the trend of each country's educational inequality over time.

Table 3: Education Gini coefficients of female population aged 15 and older, based on Barro-Lee education data-set

COUNTRY	Gini Index of Education Distribution, Female Population aged 15 and over, by five-year intervals													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Afghanistan	0.990	0.989	0.988	0.987	0.980	0.971	0.959	0.944	0.929	0.913	0.881	0.870	0.833	⇩
Albania	0.683	0.674	0.439	0.417	0.393	0.344	0.286	0.234	0.179	0.138	0.086	0.067	0.063	⇩
Algeria	0.854	0.861	0.892	0.914	0.899	0.840	0.779	0.706	0.636	0.568	0.503	0.444	0.392	↷
Argentina	0.221	0.221	0.216	0.208	0.204	0.207	0.203	0.214	0.212	0.198	0.180	0.170	0.166	⇩
Armenia	0.275	0.263	0.243	0.227	0.203	0.178	0.144	0.123	0.107	0.098	0.086	0.088	0.091	⇩
Australia	0.195	0.186	0.176	0.163	0.130	0.102	0.077	0.081	0.083	0.088	0.088	0.087	0.086	⇩
Austria	0.089	0.095	0.136	0.229	0.267	0.260	0.249	0.254	0.252	0.249	0.241	0.226	0.213	↷
Bahrain	0.953	0.944	0.917	0.847	0.757	0.642	0.563	0.509	0.428	0.326	0.256	0.201	0.170	⇩
Bangladesh	0.930	0.926	0.915	0.915	0.912	0.905	0.824	0.751	0.704	0.646	0.577	0.518	0.458	⇩
Barbados	0.108	0.110	0.116	0.151	0.100	0.132	0.153	0.132	0.110	0.079	0.070	0.051	0.059	↘
Belgium	0.157	0.161	0.163	0.161	0.168	0.184	0.192	0.197	0.187	0.186	0.184	0.175	0.179	↷
Belize	0.234	0.231	0.248	0.201	0.163	0.166	0.167	0.202	0.226	0.209	0.199	0.193	0.195	↘
Benin	0.955	0.953	0.951	0.946	0.941	0.933	0.915	0.885	0.851	0.821	0.795	0.765	0.720	⇩
Bolivia	0.785	0.757	0.733	0.686	0.642	0.588	0.511	0.439	0.368	0.326	0.300	0.241	0.214	⇩
Botswana	0.695	0.690	0.689	0.641	0.581	0.529	0.469	0.420	0.341	0.239	0.193	0.162	0.137	⇩
Brazil	0.725	0.687	0.645	0.593	0.541	0.470	0.484	0.409	0.359	0.320	0.290	0.249	0.233	⇩
Brunei	0.897	0.869	0.832	0.775	0.633	0.565	0.453	0.412	0.362	0.323	0.306	0.300	0.288	⇩
Bulgaria	0.307	0.276	0.240	0.201	0.187	0.168	0.165	0.162	0.162	0.156	0.134	0.128	0.124	⇩
Burundi	0.968	0.963	0.935	0.910	0.896	0.885	0.863	0.844	0.826	0.754	0.701	0.666	0.630	⇩
Cambodia	0.266	0.262	0.251	0.237	0.221	0.206	0.190	0.173	0.158	0.144	0.120	0.127	0.130	⇩
Cameroon	0.955	0.941	0.923	0.883	0.833	0.753	0.679	0.604	0.532	0.467	0.426	0.408	0.390	⇩
Canada	0.186	0.186	0.182	0.171	0.149	0.136	0.124	0.117	0.109	0.108	0.104	0.097	0.093	⇩
Central African Republic	0.939	0.940	0.939	0.938	0.929	0.906	0.872	0.847	0.799	0.769	0.741	0.719	0.709	⇩
Chile	0.350	0.336	0.316	0.284	0.256	0.247	0.240	0.231	0.225	0.219	0.207	0.189	0.173	⇩
China	0.817	0.765	0.702	0.618	0.521	0.455	0.386	0.338	0.307	0.289	0.272	0.244	0.220	⇩

COUNTRY	Gini Index of Education Distribution, Female Population aged 15 and over, by five-year intervals													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Colombia	0.513	0.475	0.431	0.398	0.379	0.361	0.335	0.319	0.311	0.305	0.287	0.272	0.242	⇩
Congo	0.948	0.945	0.939	0.900	0.843	0.739	0.667	0.596	0.531	0.490	0.475	0.474	0.472	⇩
Costa Rica	0.284	0.279	0.280	0.280	0.283	0.265	0.243	0.235	0.231	0.230	0.214	0.209	0.185	
Cote Divoire	0.946	0.944	0.941	0.937	0.924	0.907	0.881	0.851	0.819	0.740	0.669	0.638	0.612	⇩
Croatia	0.359	0.352	0.335	0.316	0.297	0.276	0.257	0.238	0.227	0.211	0.203	0.190	0.185	⇩
Cuba	0.298	0.286	0.274	0.258	0.245	0.240	0.194	0.202	0.189	0.177	0.164	0.153	0.149	⇩
Cyprus	0.570	0.494	0.413	0.376	0.356	0.332	0.314	0.257	0.243	0.255	0.248	0.316	0.273	⇩
Czech Republic	0.047	0.052	0.057	0.075	0.083	0.094	0.096	0.100	0.094	0.081	0.073	0.023	0.062	
DR Congo	0.972	0.960	0.939	0.917	0.879	0.826	0.778	0.728	0.680	0.655	0.641	0.634	0.641	⇩
Denmark	0.190	0.191	0.193	0.188	0.183	0.187	0.187	0.175	0.174	0.179	0.179	0.179	0.181	
Dominican Rep.	0.407	0.413	0.397	0.448	0.461	0.450	0.436	0.418	0.386	0.357	0.332	0.303	0.277	
Ecuador	0.575	0.519	0.460	0.439	0.421	0.400	0.361	0.356	0.340	0.340	0.350	0.326	0.305	⇩
Egypt	0.978	0.967	0.957	0.938	0.914	0.886	0.825	0.739	0.683	0.615	0.544	0.488	0.440	⇩
El Salvador	0.698	0.681	0.645	0.612	0.563	0.527	0.483	0.447	0.416	0.380	0.336	0.292	0.257	⇩
Estonia	0.209	0.210	0.219	0.221	0.221	0.217	0.212	0.203	0.187	0.150	0.106	0.090	0.084	
Fiji	0.430	0.395	0.358	0.295	0.303	0.269	0.233	0.196	0.168	0.130	0.144	0.156	0.141	⇩
Finland	0.098	0.092	0.091	0.134	0.156	0.190	0.201	0.195	0.186	0.196	0.191	0.182	0.173	
France	0.116	0.125	0.122	0.163	0.168	0.229	0.239	0.283	0.289	0.241	0.191	0.171	0.139	
Gabon	0.812	0.796	0.768	0.729	0.686	0.623	0.563	0.504	0.451	0.397	0.354	0.324	0.298	⇩
Gambia	0.971	0.972	0.971	0.970	0.966	0.957	0.943	0.925	0.882	0.833	0.823	0.780	0.725	⇩
Germany	0.248	0.254	0.260	0.264	0.266	0.295	0.312	0.324	0.320	0.297	0.269	0.115	0.116	
Ghana	0.946	0.938	0.902	0.864	0.781	0.715	0.678	0.636	0.598	0.566	0.522	0.476	0.414	⇩
Greece	0.464	0.429	0.339	0.354	0.349	0.327	0.310	0.302	0.290	0.296	0.289	0.226	0.195	⇩
Guatemala	0.781	0.786	0.786	0.777	0.749	0.715	0.628	0.597	0.560	0.528	0.510	0.485	0.416	
Guyana	0.299	0.288	0.265	0.242	0.235	0.235	0.240	0.255	0.253	0.236	0.207	0.188	0.163	⇩
Haiti	0.929	0.918	0.903	0.887	0.863	0.821	0.766	0.730	0.691	0.651	0.633	0.621	0.616	⇩
Honduras	0.698	0.680	0.650	0.618	0.582	0.531	0.454	0.383	0.347	0.313	0.282	0.255	0.228	⇩

COUNTRY	Gini Index of Education Distribution, Female Population aged 15 and over, by five-year intervals													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Hong Kong	0.684	0.647	0.616	0.541	0.502	0.449	0.393	0.342	0.308	0.312	0.321	0.277	0.246	⇩
Hungary	0.073	0.075	0.079	0.079	0.092	0.103	0.111	0.123	0.131	0.107	0.071	0.062	0.066	↷
Iceland	0.106	0.126	0.142	0.156	0.170	0.182	0.192	0.199	0.203	0.201	0.196	0.192	0.189	↷
India	0.905	0.895	0.879	0.863	0.835	0.839	0.822	0.771	0.715	0.675	0.632	0.577	0.529	⇩
Indonesia	0.866	0.842	0.804	0.720	0.613	0.547	0.488	0.563	0.582	0.478	0.369	0.341	0.320	⇩
Iran	0.967	0.960	0.940	0.904	0.865	0.817	0.756	0.684	0.637	0.530	0.457	0.412	0.365	⇩
Iraq	0.992	0.986	0.977	0.961	0.921	0.891	0.848	0.771	0.672	0.605	0.555	0.536	0.507	⇩
Ireland	0.167	0.164	0.161	0.155	0.151	0.149	0.140	0.138	0.143	0.157	0.161	0.143	0.132	⋀
Israel	0.397	0.391	0.376	0.354	0.320	0.287	0.251	0.232	0.215	0.203	0.191	0.182	0.166	⇩
Italy	0.262	0.260	0.255	0.238	0.229	0.261	0.270	0.272	0.266	0.251	0.234	0.226	0.203	⋀
Jamaica	0.203	0.195	0.197	0.175	0.138	0.161	0.174	0.198	0.198	0.200	0.186	0.171	0.167	⋀
Japan	0.211	0.199	0.186	0.166	0.166	0.168	0.166	0.165	0.167	0.154	0.149	0.142	0.134	⇩
Jordan	0.928	0.906	0.860	0.819	0.774	0.718	0.655	0.575	0.502	0.435	0.389	0.339	0.300	⇩
Kazakhstan	0.567	0.531	0.521	0.492	0.454	0.404	0.355	0.310	0.265	0.190	0.107	0.103	0.104	⇩
Kenya	0.887	0.871	0.845	0.826	0.776	0.712	0.623	0.508	0.411	0.340	0.297	0.260	0.224	⇩
Kuwait	0.906	0.875	0.821	0.758	0.694	0.693	0.586	0.500	0.474	0.470	0.413	0.322	0.286	⇩
Kyrgyzstan	0.435	0.424	0.426	0.412	0.386	0.349	0.309	0.273	0.239	0.209	0.171	0.183	0.176	⇩
Lao PDR	0.902	0.891	0.874	0.853	0.817	0.773	0.724	0.682	0.638	0.596	0.556	0.517	0.483	⇩
Latvia	0.253	0.262	0.273	0.278	0.278	0.273	0.247	0.221	0.194	0.145	0.118	0.080	0.078	↷
Lesotho	0.405	0.350	0.302	0.246	0.227	0.220	0.206	0.200	0.197	0.197	0.200	0.184	0.170	⇩
Liberia	0.968	0.966	0.958	0.948	0.936	0.911	0.882	0.842	0.806	0.798	0.782	0.742	0.662	⇩
Libyan Arab Jamahiriya	0.993	0.989	0.982	0.957	0.922	0.852	0.774	0.682	0.593	0.506	0.435	0.379	0.338	⇩
Lithuania	0.531	0.504	0.467	0.442	0.405	0.366	0.309	0.258	0.214	0.188	0.150	0.128	0.107	⇩
Luxembourg	0.168	0.173	0.182	0.183	0.180	0.192	0.202	0.210	0.215	0.219	0.217	0.212	0.202	↷
Macao	0.436	0.432	0.416	0.386	0.341	0.329	0.326	0.293	0.273	0.261	0.233	0.207	0.194	⇩
Malawi	0.768	0.754	0.743	0.731	0.658	0.639	0.662	0.654	0.594	0.555	0.486	0.378	0.312	⋀
Malaysia	0.853	0.815	0.753	0.690	0.601	0.538	0.473	0.400	0.347	0.295	0.265	0.227	0.200	⇩
Maldives	0.653	0.641	0.627	0.602	0.579	0.551	0.521	0.480	0.497	0.505	0.463	0.415	0.327	⋀

COUNTRY	Gini Index of Education Distribution, Female Population aged 15 and over, by five-year intervals													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Mali	0.978	0.975	0.974	0.970	0.967	0.948	0.927	0.907	0.890	0.878	0.858	0.817	0.751	⇩
Malta	0.622	0.534	0.453	0.391	0.389	0.384	0.274	0.261	0.243	0.273	0.241	0.178	0.189	⇩
Mauritania	0.703	0.699	0.697	0.697	0.697	0.695	0.689	0.683	0.670	0.655	0.628	0.574	0.505	⇩
Mauritius	0.672	0.637	0.593	0.530	0.472	0.451	0.432	0.402	0.364	0.314	0.289	0.258	0.238	⇩
Mexico	0.550	0.525	0.496	0.499	0.481	0.453	0.422	0.375	0.329	0.297	0.272	0.244	0.212	⇩
Mongolia	0.757	0.720	0.650	0.591	0.577	0.363	0.301	0.248	0.179	0.190	0.179	0.167	0.143	⇩
Morocco	0.977	0.974	0.964	0.956	0.938	0.913	0.881	0.846	0.805	0.768	0.733	0.690	0.640	⇩
Mozambique	0.902	0.896	0.890	0.883	0.885	0.896	0.871	0.850	0.869	0.874	0.860	0.847	0.799	⇘
Myanmar	0.850	0.838	0.836	0.825	0.810	0.788	0.701	0.629	0.495	0.448	0.411	0.386	0.358	⇩
Namibia	0.743	0.706	0.661	0.602	0.543	0.492	0.454	0.410	0.362	0.342	0.345	0.313	0.308	⇩
Nepal	0.998	0.997	0.996	0.993	0.986	0.979	0.971	0.915	0.850	0.818	0.746	0.670	0.594	⇩
Netherlands	0.068	0.071	0.079	0.151	0.151	0.159	0.155	0.151	0.146	0.140	0.136	0.133	0.123	⇧
New Zealand	0.139	0.133	0.125	0.115	0.117	0.103	0.132	0.141	0.154	0.154	0.152	0.149	0.147	⇩
Nicaragua	0.660	0.661	0.662	0.666	0.674	0.675	0.666	0.644	0.611	0.581	0.540	0.492	0.442	⇩
Niger	0.989	0.989	0.989	0.989	0.984	0.976	0.965	0.948	0.927	0.910	0.897	0.884	0.855	⇩
Norway	0.086	0.084	0.084	0.104	0.122	0.148	0.160	0.158	0.145	0.139	0.128	0.051	0.058	⇧
Pakistan	0.952	0.952	0.944	0.935	0.919	0.900	0.909	0.865	0.842	0.813	0.785	0.667	0.609	⇩
Panama	0.426	0.389	0.346	0.333	0.320	0.314	0.304	0.281	0.262	0.254	0.242	0.222	0.205	⇩
Papua New Guinea	0.954	0.946	0.913	0.868	0.838	0.825	0.786	0.758	0.708	0.654	0.598	0.546	0.522	⇩
Paraguay	0.500	0.426	0.351	0.341	0.316	0.296	0.284	0.273	0.267	0.255	0.272	0.218	0.197	⇩
Peru	0.617	0.598	0.576	0.545	0.492	0.445	0.398	0.371	0.358	0.335	0.298	0.267	0.234	⇩
Philippines	0.580	0.423	0.400	0.370	0.324	0.270	0.260	0.246	0.218	0.219	0.215	0.194	0.176	⇩
Poland	0.215	0.194	0.178	0.164	0.152	0.143	0.129	0.125	0.113	0.127	0.122	0.115	0.110	⇩
Portugal	0.551	0.527	0.494	0.525	0.514	0.455	0.382	0.357	0.326	0.338	0.339	0.329	0.297	⇩
Qatar	0.842	0.777	0.784	0.775	0.710	0.649	0.577	0.525	0.486	0.444	0.408	0.373	0.326	⇩
Réunion	0.609	0.677	0.548	0.454	0.432	0.403	0.373	0.345	0.306	0.275	0.249	0.227	0.203	⇩
Republic of Korea	0.415	0.381	0.602	0.490	0.420	0.344	0.296	0.267	0.297	0.209	0.200	0.185	0.169	⇩
Republic of Moldova	0.661	0.621	0.573	0.531	0.463	0.401	0.344	0.294	0.247	0.205	0.174	0.151	0.129	⇩

COUNTRY	Gini Index of Education Distribution, Female Population aged 15 and over, by five-year intervals													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
Romania	0.274	0.265	0.246	0.224	0.208	0.223	0.195	0.163	0.139	0.127	0.105	0.098	0.096	⇩
Russian Federation	0.352	0.343	0.328	0.311	0.284	0.267	0.241	0.219	0.194	0.167	0.112	0.104	0.099	⇩
Rwanda	0.977	0.974	0.950	0.932	0.894	0.842	0.792	0.755	0.714	0.668	0.619	0.588	0.543	⇩
Saudi Arabia	0.746	0.744	0.744	0.746	0.748	0.725	0.703	0.635	0.569	0.505	0.434	0.353	0.290	⇩
Senegal	0.743	0.740	0.736	0.729	0.715	0.698	0.678	0.660	0.636	0.606	0.568	0.528	0.483	⇩
Serbia	0.460	0.434	0.399	0.357	0.324	0.304	0.279	0.256	0.245	0.223	0.206	0.194	0.184	⇩
Sierra Leone	0.970	0.971	0.970	0.964	0.951	0.933	0.910	0.885	0.847	0.815	0.795	0.776	0.748	⇩
Singapore	0.835	0.795	0.728	0.659	0.557	0.521	0.484	0.394	0.300	0.300	0.295	0.296	0.262	⇩
Slovakia	0.060	0.059	0.059	0.076	0.081	0.093	0.093	0.108	0.109	0.109	0.106	0.098	0.095	⇘⇗
Slovenia	0.362	0.338	0.313	0.262	0.226	0.208	0.189	0.134	0.078	0.074	0.063	0.063	0.066	⇩
South Africa	0.556	0.537	0.520	0.493	0.461	0.407	0.354	0.301	0.230	0.167	0.252	0.201	0.169	⇩
Spain	0.639	0.616	0.591	0.561	0.467	0.498	0.453	0.441	0.418	0.313	0.241	0.214	0.179	⇩
Sri Lanka	0.563	0.520	0.485	0.443	0.334	0.296	0.263	0.252	0.222	0.206	0.183	0.171	0.160	⇩
Sudan	0.987	0.981	0.969	0.953	0.931	0.903	0.877	0.835	0.795	0.760	0.728	0.707	0.691	⇩
Swaziland	0.813	0.776	0.740	0.677	0.597	0.514	0.455	0.402	0.347	0.301	0.256	0.226	0.213	⇩
Sweden	0.191	0.195	0.198	0.196	0.190	0.198	0.185	0.176	0.163	0.116	0.131	0.102	0.103	⇨
Switzerland	0.188	0.194	0.198	0.223	0.232	0.212	0.183	0.230	0.258	0.276	0.289	0.273	0.263	⇦
Syrian Arab Republic	0.913	0.905	0.885	0.864	0.821	0.773	0.683	0.591	0.509	0.392	0.352	0.321	0.294	⇩
Taiwan	0.659	0.607	0.568	0.512	0.457	0.408	0.351	0.302	0.266	0.229	0.206	0.177	0.161	⇩
Tajikistan	0.596	0.562	0.530	0.491	0.425	0.357	0.281	0.224	0.176	0.123	0.082	0.060	0.043	⇩
Thailand	0.622	0.550	0.488	0.416	0.370	0.329	0.291	0.289	0.267	0.276	0.294	0.296	0.292	⇩
Togo	0.979	0.974	0.965	0.952	0.926	0.879	0.823	0.766	0.700	0.656	0.612	0.576	0.539	⇩
Tonga	0.325	0.324	0.313	0.286	0.259	0.219	0.195	0.188	0.141	0.098	0.109	0.131	0.136	⇩
Trinidad and Tobago	0.263	0.254	0.234	0.218	0.200	0.158	0.128	0.149	0.159	0.142	0.123	0.112	0.111	⇩
Tunisia	0.964	0.957	0.947	0.916	0.873	0.797	0.732	0.709	0.647	0.578	0.522	0.475	0.432	⇩
Turkey	0.900	0.874	0.832	0.801	0.768	0.679	0.629	0.556	0.512	0.476	0.399	0.357	0.343	⇩
Uganda	0.906	0.890	0.868	0.845	0.783	0.713	0.669	0.611	0.533	0.461	0.409	0.342	0.281	⇩
Ukraine	0.396	0.388	0.373	0.351	0.337	0.296	0.265	0.232	0.199	0.168	0.158	0.131	0.124	⇩

COUNTRY	Gini Index of Education Distribution, Female Population aged 15 and over, by five-year intervals													
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	Trend
United Arab Emirates	0.968	0.947	0.922	0.874	0.831	0.771	0.664	0.566	0.468	0.351	0.268	0.198	0.184	⇩
United Kingdom	0.145	0.145	0.144	0.159	0.168	0.169	0.166	0.165	0.168	0.172	0.174	0.168	0.164	⇘
United Republic of Tanzania	0.846	0.843	0.820	0.799	0.758	0.721	0.652	0.563	0.492	0.455	0.402	0.350	0.275	⇩
Uruguay	0.291	0.280	0.269	0.257	0.253	0.253	0.230	0.210	0.206	0.200	0.184	0.186	0.166	⇩
USA	0.193	0.184	0.174	0.140	0.113	0.093	0.080	0.079	0.078	0.075	0.075	0.072	0.069	⇩
Venezuela	0.579	0.559	0.529	0.503	0.476	0.405	0.331	0.342	0.343	0.334	0.330	0.324	0.305	⇩
Viet Nam	0.641	0.643	0.596	0.549	0.498	0.445	0.392	0.351	0.279	0.269	0.267	0.265	0.260	⇩
Yemen	0.997	0.997	0.997	0.997	0.996	0.997	0.987	0.977	0.958	0.923	0.886	0.838	0.768	⇩
Zambia	0.694	0.658	0.610	0.556	0.490	0.525	0.532	0.517	0.509	0.273	0.329	0.314	0.282	⇩
Zimbabwe	0.633	0.602	0.561	0.525	0.464	0.444	0.445	0.432	0.364	0.291	0.231	0.200	0.173	⇩

Sources: Authors' calculation by utilizing educational attainments data from Barro and Lee (2011).
Note: The calculations cover 146 countries from 1950 to 2010, five-year intervals period. The arrows present the trend of educational inequality over time of each country.

Table 4: Education Gini coefficients of female population aged 25 and over, based on Barro-lee education data-set

COUNTRY	Gini Index of Education Distribution, Female population aged 25 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Afghanistan	0.999	0.998	0.998	0.996	0.995	0.988	0.982	0.971	0.958	0.941	0.926	0.909	0.876
Albania	0.745	0.715	0.456	0.433	0.426	0.399	0.361	0.304	0.232	0.166	0.107	0.083	0.072
Algeria	0.839	0.853	0.895	0.930	0.966	0.928	0.873	0.809	0.745	0.672	0.602	0.534	0.468
Argentina	0.235	0.222	0.225	0.217	0.207	0.206	0.209	0.218	0.225	0.216	0.202	0.187	0.173
Armenia	0.290	0.279	0.271	0.245	0.230	0.208	0.184	0.158	0.127	0.112	0.098	0.087	0.082
Australia	0.197	0.193	0.187	0.179	0.152	0.112	0.084	0.084	0.084	0.086	0.088	0.091	0.090
Austria	0.094	0.098	0.099	0.226	0.272	0.264	0.255	0.255	0.254	0.250	0.245	0.235	0.218
Bahrain	0.960	0.952	0.947	0.922	0.886	0.825	0.725	0.593	0.523	0.411	0.342	0.247	0.204
Bangladesh	0.935	0.935	0.935	0.934	0.936	0.938	0.861	0.815	0.759	0.696	0.643	0.610	0.561
Barbados	0.100	0.105	0.111	0.152	0.123	0.149	0.161	0.153	0.128	0.090	0.080	0.051	0.050
Belgium	0.145	0.151	0.158	0.151	0.152	0.176	0.187	0.194	0.195	0.192	0.190	0.179	0.179
Belize	0.235	0.232	0.250	0.213	0.173	0.178	0.178	0.212	0.247	0.237	0.228	0.212	0.206
Benin	0.954	0.953	0.954	0.953	0.953	0.953	0.953	0.932	0.907	0.874	0.841	0.823	0.805
Bolivia	0.833	0.817	0.791	0.770	0.728	0.695	0.623	0.549	0.466	0.404	0.380	0.315	0.267
Botswana	0.733	0.733	0.732	0.732	0.700	0.584	0.540	0.517	0.453	0.362	0.294	0.244	0.204
Brazil	0.752	0.722	0.682	0.634	0.581	0.527	0.536	0.498	0.463	0.401	0.354	0.312	0.267
Brunei Darussalam	0.927	0.907	0.871	0.847	0.779	0.713	0.556	0.485	0.408	0.336	0.308	0.306	0.297
Bulgaria	0.354	0.306	0.274	0.238	0.213	0.182	0.179	0.174	0.169	0.148	0.140	0.135	0.126
Burundi	0.992	0.990	0.984	0.951	0.923	0.913	0.899	0.877	0.880	0.841	0.810	0.747	0.689
Cambodia	0.198	0.201	0.205	0.201	0.193	0.183	0.173	0.164	0.155	0.148	0.131	0.137	0.128
Cameroon	0.956	0.951	0.936	0.922	0.891	0.860	0.796	0.711	0.632	0.553	0.481	0.421	0.382
Canada	0.197	0.197	0.196	0.183	0.171	0.163	0.146	0.133	0.121	0.117	0.114	0.104	0.098
Central African Republic	0.926	0.929	0.930	0.929	0.929	0.924	0.916	0.892	0.863	0.836	0.797	0.759	0.732
Chile	0.378	0.352	0.345	0.316	0.282	0.276	0.270	0.259	0.249	0.239	0.233	0.217	0.201
China	0.969	0.916	0.840	0.759	0.669	0.577	0.480	0.424	0.370	0.329	0.303	0.274	0.245
Colombia	0.551	0.515	0.479	0.440	0.417	0.398	0.384	0.368	0.350	0.340	0.315	0.305	0.273

COUNTRY	Gini Index of Education Distribution, Female population aged 25 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Congo	0.958	0.962	0.957	0.954	0.929	0.905	0.835	0.772	0.675	0.601	0.534	0.492	0.479
Costa Rica	0.296	0.299	0.298	0.303	0.309	0.299	0.273	0.261	0.248	0.237	0.227	0.237	0.212
Cote Divoire	0.989	0.987	0.986	0.984	0.979	0.972	0.953	0.924	0.894	0.841	0.757	0.709	0.664
Croatia	0.386	0.373	0.364	0.344	0.328	0.305	0.283	0.260	0.242	0.214	0.201	0.191	0.183
Cuba	0.304	0.290	0.282	0.268	0.260	0.250	0.264	0.236	0.223	0.202	0.182	0.168	0.157
Cyprus	0.684	0.576	0.490	0.439	0.402	0.358	0.325	0.292	0.272	0.286	0.290	0.364	0.312
Czech Republic	0.048	0.052	0.054	0.071	0.085	0.093	0.099	0.100	0.098	0.085	0.073	0.023	0.059
DR Congo	0.992	0.987	0.980	0.963	0.950	0.926	0.886	0.831	0.781	0.728	0.680	0.657	0.645
Denmark	0.180	0.181	0.182	0.184	0.187	0.192	0.195	0.193	0.182	0.184	0.180	0.176	0.174
Dominican Rep.	0.476	0.476	0.477	0.501	0.526	0.484	0.469	0.460	0.447	0.429	0.394	0.365	0.328
Ecuador	0.606	0.559	0.497	0.485	0.472	0.456	0.420	0.404	0.396	0.377	0.384	0.363	0.348
Egypt	0.984	0.981	0.976	0.972	0.958	0.941	0.886	0.824	0.782	0.735	0.678	0.606	0.531
El Salvador	0.731	0.709	0.701	0.675	0.648	0.610	0.570	0.528	0.500	0.455	0.406	0.361	0.306
Estonia	0.218	0.221	0.222	0.227	0.226	0.226	0.220	0.210	0.196	0.155	0.109	0.089	0.083
Fiji	0.506	0.462	0.424	0.342	0.360	0.326	0.280	0.235	0.205	0.161	0.161	0.173	0.160
Finland	0.076	0.075	0.097	0.128	0.155	0.193	0.204	0.205	0.194	0.196	0.201	0.183	0.169
France	0.120	0.124	0.166	0.150	0.181	0.219	0.239	0.291	0.308	0.256	0.207	0.191	0.152
Gabon	0.848	0.849	0.834	0.806	0.766	0.721	0.660	0.599	0.534	0.480	0.418	0.371	0.336
Gambia	0.975	0.975	0.976	0.977	0.976	0.974	0.964	0.949	0.934	0.898	0.885	0.854	0.817
Germany	0.233	0.238	0.242	0.249	0.243	0.257	0.273	0.296	0.318	0.293	0.258	0.107	0.106
Ghana	0.956	0.953	0.950	0.927	0.899	0.854	0.795	0.721	0.665	0.610	0.563	0.529	0.485
Greece	0.555	0.480	0.389	0.385	0.374	0.350	0.328	0.319	0.308	0.328	0.326	0.246	0.207
Guatemala	0.800	0.810	0.816	0.819	0.816	0.796	0.684	0.658	0.632	0.600	0.572	0.556	0.508
Guyana	0.286	0.279	0.270	0.255	0.243	0.239	0.240	0.254	0.266	0.259	0.227	0.211	0.190
Haiti	0.940	0.932	0.925	0.913	0.902	0.876	0.848	0.810	0.775	0.738	0.697	0.657	0.643
Honduras	0.721	0.708	0.698	0.680	0.656	0.623	0.540	0.462	0.416	0.389	0.353	0.311	0.279
Hong Kong	0.732	0.704	0.659	0.631	0.616	0.564	0.495	0.423	0.367	0.361	0.368	0.315	0.274
Hungary	0.083	0.080	0.078	0.075	0.085	0.094	0.106	0.123	0.139	0.112	0.080	0.064	0.061
Iceland	0.090	0.110	0.122	0.138	0.157	0.176	0.190	0.201	0.208	0.208	0.209	0.200	0.196

COUNTRY	Gini Index of Education Distribution, Female population aged 25 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
India	0.933	0.921	0.908	0.897	0.886	0.884	0.878	0.829	0.781	0.749	0.715	0.674	0.630
Indonesia	0.938	0.911	0.881	0.817	0.721	0.662	0.594	0.629	0.695	0.558	0.434	0.393	0.361
Iran	0.983	0.976	0.967	0.950	0.930	0.903	0.870	0.816	0.762	0.658	0.584	0.503	0.437
Iraq	0.995	0.993	0.989	0.985	0.977	0.960	0.926	0.888	0.843	0.763	0.658	0.588	0.539
Ireland	0.172	0.168	0.166	0.160	0.157	0.158	0.154	0.155	0.156	0.166	0.170	0.156	0.141
Israel	0.420	0.412	0.404	0.394	0.376	0.338	0.301	0.263	0.234	0.215	0.198	0.191	0.164
Italy	0.281	0.277	0.272	0.241	0.228	0.267	0.292	0.302	0.297	0.280	0.260	0.250	0.223
Jamaica	0.242	0.230	0.217	0.169	0.119	0.134	0.159	0.186	0.206	0.221	0.215	0.198	0.182
Japan	0.203	0.202	0.194	0.173	0.178	0.176	0.176	0.179	0.174	0.168	0.160	0.151	0.142
Jordan	0.951	0.938	0.927	0.910	0.897	0.866	0.829	0.749	0.686	0.567	0.481	0.424	0.373
Kazakhstan	0.650	0.600	0.573	0.531	0.500	0.462	0.411	0.351	0.297	0.209	0.130	0.108	0.098
Kenya	0.936	0.917	0.889	0.892	0.880	0.827	0.756	0.698	0.612	0.486	0.396	0.332	0.287
Kuwait	0.942	0.909	0.880	0.822	0.778	0.784	0.682	0.566	0.560	0.557	0.454	0.357	0.327
Kyrgyzstan	0.480	0.460	0.446	0.432	0.417	0.397	0.359	0.312	0.265	0.223	0.175	0.162	0.148
Lao PDR	0.962	0.953	0.943	0.925	0.903	0.865	0.816	0.770	0.712	0.665	0.621	0.578	0.539
Latvia	0.247	0.262	0.271	0.279	0.281	0.279	0.272	0.258	0.225	0.157	0.121	0.077	0.076
Lesotho	0.504	0.445	0.382	0.351	0.284	0.276	0.226	0.202	0.192	0.190	0.189	0.192	0.196
Liberia	0.972	0.972	0.972	0.965	0.958	0.952	0.938	0.917	0.886	0.845	0.807	0.806	0.791
Libyan Arab Jamahiriya	0.992	0.991	0.988	0.986	0.967	0.960	0.897	0.840	0.739	0.650	0.558	0.480	0.408
Lithuania	0.552	0.528	0.500	0.475	0.445	0.409	0.367	0.320	0.261	0.211	0.157	0.127	0.098
Luxembourg	0.147	0.154	0.160	0.169	0.177	0.192	0.201	0.207	0.215	0.218	0.220	0.216	0.211
Macao	0.487	0.466	0.453	0.429	0.403	0.376	0.355	0.342	0.316	0.285	0.264	0.240	0.214
Malawi	0.823	0.815	0.798	0.789	0.739	0.706	0.709	0.736	0.677	0.624	0.591	0.541	0.452
Malaysia	0.922	0.884	0.849	0.788	0.726	0.653	0.570	0.491	0.431	0.364	0.327	0.275	0.246
Maldives	0.655	0.648	0.635	0.623	0.600	0.586	0.556	0.532	0.570	0.595	0.595	0.528	0.453
Mali	0.996	0.995	0.994	0.992	0.987	0.984	0.968	0.949	0.926	0.906	0.889	0.875	0.856
Malta	0.660	0.581	0.480	0.368	0.365	0.376	0.282	0.265	0.250	0.287	0.250	0.199	0.199
Mauritania	0.714	0.711	0.707	0.708	0.708	0.709	0.711	0.709	0.706	0.695	0.680	0.664	0.636
Mauritius	0.697	0.677	0.656	0.605	0.569	0.525	0.502	0.473	0.421	0.358	0.333	0.283	0.266

COUNTRY	Gini Index of Education Distribution, Female population aged 25 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Mexico	0.558	0.558	0.535	0.526	0.515	0.495	0.474	0.432	0.390	0.354	0.312	0.288	0.256
Mongolia	0.909	0.858	0.811	0.726	0.659	0.451	0.379	0.305	0.211	0.214	0.192	0.164	0.154
Morocco	0.981	0.980	0.980	0.972	0.969	0.950	0.929	0.903	0.873	0.835	0.793	0.755	0.720
Mozambique	0.926	0.920	0.916	0.912	0.909	0.918	0.819	0.923	0.918	0.914	0.892	0.863	0.849
Myanmar	0.866	0.849	0.853	0.855	0.856	0.858	0.779	0.699	0.577	0.533	0.484	0.437	0.399
Namibia	0.726	0.708	0.680	0.658	0.627	0.593	0.550	0.505	0.440	0.395	0.372	0.332	0.308
Nepal	1.000	0.999	0.999	0.997	0.995	0.992	0.988	0.957	0.911	0.885	0.850	0.798	0.726
Netherlands	0.071	0.075	0.077	0.146	0.165	0.172	0.167	0.159	0.151	0.143	0.139	0.139	0.128
New Zealand	0.138	0.133	0.126	0.119	0.123	0.116	0.141	0.151	0.160	0.155	0.156	0.155	0.152
Nicaragua	0.670	0.666	0.665	0.664	0.667	0.675	0.687	0.690	0.679	0.653	0.619	0.586	0.543
Niger	0.988	0.988	0.988	0.987	0.987	0.985	0.983	0.974	0.962	0.944	0.922	0.906	0.894
Norway	0.089	0.082	0.080	0.097	0.115	0.140	0.158	0.160	0.148	0.140	0.134	0.052	0.054
Pakistan	0.961	0.961	0.960	0.953	0.945	0.934	0.947	0.909	0.903	0.871	0.844	0.739	0.701
Panama	0.458	0.431	0.386	0.375	0.365	0.357	0.348	0.329	0.305	0.286	0.272	0.253	0.235
Papua New Guinea	0.963	0.952	0.943	0.924	0.910	0.892	0.883	0.833	0.801	0.770	0.701	0.638	0.573
Paraguay	0.599	0.468	0.397	0.382	0.352	0.335	0.315	0.299	0.294	0.277	0.306	0.249	0.224
Peru	0.681	0.653	0.628	0.595	0.567	0.519	0.475	0.443	0.415	0.404	0.362	0.321	0.286
Philippines	0.654	0.504	0.476	0.419	0.362	0.312	0.300	0.267	0.247	0.239	0.236	0.225	0.206
Poland	0.235	0.212	0.191	0.177	0.168	0.154	0.143	0.135	0.123	0.135	0.132	0.115	0.105
Portugal	0.623	0.588	0.564	0.572	0.584	0.499	0.436	0.390	0.356	0.370	0.370	0.360	0.322
Qatar	0.936	0.930	0.895	0.878	0.813	0.787	0.679	0.615	0.549	0.492	0.462	0.436	0.390
Réunion	0.640	0.693	0.598	0.526	0.485	0.457	0.423	0.396	0.358	0.317	0.283	0.254	0.224
Republic of Korea	0.503	0.449	0.727	0.604	0.519	0.434	0.385	0.337	0.348	0.254	0.231	0.205	0.181
Republic of Moldova	0.735	0.702	0.663	0.602	0.553	0.497	0.426	0.357	0.296	0.242	0.199	0.166	0.138
Romania	0.272	0.237	0.234	0.220	0.212	0.258	0.224	0.191	0.164	0.132	0.119	0.103	0.090
Russian Federation	0.364	0.360	0.350	0.336	0.322	0.314	0.294	0.263	0.226	0.189	0.119	0.099	0.089
Rwanda	0.980	0.979	0.978	0.964	0.953	0.920	0.894	0.838	0.790	0.750	0.710	0.663	0.615
Saudi Arabia	0.823	0.821	0.819	0.817	0.815	0.814	0.776	0.732	0.648	0.591	0.524	0.451	0.389
Senegal	0.728	0.724	0.723	0.722	0.723	0.721	0.711	0.691	0.673	0.653	0.628	0.596	0.557

COUNTRY	Gini Index of Education Distribution, Female population aged 25 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Serbia	0.509	0.480	0.455	0.419	0.391	0.349	0.315	0.280	0.250	0.223	0.204	0.189	0.175
Sierra Leone	0.966	0.966	0.968	0.971	0.967	0.960	0.946	0.925	0.901	0.873	0.832	0.799	0.777
Singapore	0.895	0.858	0.826	0.766	0.719	0.670	0.626	0.469	0.353	0.325	0.316	0.319	0.282
Slovakia	0.048	0.053	0.054	0.071	0.083	0.091	0.096	0.108	0.117	0.111	0.109	0.092	0.087
Slovenia	0.383	0.362	0.351	0.296	0.253	0.230	0.202	0.146	0.084	0.074	0.069	0.065	0.062
South Africa	0.593	0.572	0.555	0.531	0.506	0.459	0.408	0.361	0.261	0.180	0.311	0.261	0.225
Spain	0.653	0.627	0.604	0.577	0.553	0.532	0.506	0.500	0.480	0.353	0.265	0.229	0.189
Sri Lanka	0.629	0.592	0.549	0.517	0.421	0.353	0.300	0.281	0.250	0.229	0.208	0.191	0.176
Sudan	0.994	0.993	0.986	0.977	0.968	0.955	0.934	0.912	0.879	0.835	0.791	0.756	0.725
Swaziland	0.868	0.847	0.808	0.785	0.696	0.616	0.541	0.480	0.428	0.375	0.331	0.294	0.258
Sweden	0.185	0.190	0.193	0.197	0.200	0.212	0.207	0.197	0.183	0.166	0.145	0.115	0.115
Switzerland	0.187	0.191	0.196	0.224	0.238	0.219	0.191	0.234	0.256	0.269	0.276	0.261	0.247
Syrian Arab Republic	0.952	0.941	0.933	0.910	0.895	0.857	0.793	0.717	0.627	0.500	0.429	0.390	0.345
Taiwan	0.741	0.703	0.653	0.613	0.577	0.523	0.449	0.379	0.318	0.272	0.239	0.202	0.178
Tajikistan	0.692	0.650	0.613	0.560	0.524	0.466	0.392	0.312	0.247	0.180	0.124	0.092	0.065
Thailand	0.811	0.703	0.610	0.534	0.465	0.394	0.342	0.311	0.297	0.285	0.294	0.294	0.308
Togo	0.989	0.986	0.982	0.976	0.969	0.939	0.897	0.864	0.823	0.763	0.698	0.654	0.608
Tonga	0.273	0.271	0.268	0.267	0.265	0.263	0.246	0.231	0.190	0.128	0.135	0.152	0.143
Trinidad and Tobago	0.274	0.264	0.256	0.238	0.224	0.168	0.124	0.157	0.180	0.167	0.152	0.135	0.118
Tunisia	0.977	0.976	0.973	0.968	0.949	0.926	0.880	0.832	0.753	0.691	0.627	0.559	0.504
Turkey	0.931	0.895	0.865	0.818	0.802	0.779	0.740	0.644	0.583	0.551	0.456	0.394	0.366
Uganda	0.922	0.904	0.889	0.886	0.865	0.818	0.760	0.699	0.643	0.576	0.523	0.466	0.416
Ukraine	0.368	0.389	0.394	0.380	0.363	0.341	0.310	0.273	0.230	0.184	0.175	0.132	0.116
United Arab Emirates	0.977	0.967	0.943	0.918	0.875	0.813	0.730	0.646	0.542	0.419	0.320	0.236	0.216
United Kingdom	0.148	0.145	0.144	0.159	0.174	0.177	0.174	0.174	0.173	0.173	0.177	0.178	0.177
United Republic of Tanzania	0.865	0.865	0.865	0.842	0.824	0.781	0.747	0.677	0.618	0.544	0.475	0.434	0.379
Uruguay	0.309	0.293	0.280	0.275	0.265	0.265	0.243	0.222	0.224	0.217	0.195	0.202	0.177
USA	0.207	0.200	0.190	0.157	0.128	0.105	0.088	0.084	0.082	0.080	0.077	0.075	0.073
Venezuela	0.626	0.611	0.601	0.588	0.582	0.499	0.398	0.387	0.383	0.364	0.342	0.324	0.316

COUNTRY	Gini Index of Education Distribution, Female population aged 25 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Viet Nam	0.665	0.666	0.665	0.613	0.565	0.530	0.483	0.418	0.336	0.298	0.275	0.267	0.265
Yemen	1.000	1.000	1.000	1.000	1.000	1.000	0.998	0.995	0.988	0.980	0.959	0.921	0.883
Zambia	0.781	0.730	0.688	0.630	0.557	0.610	0.665	0.613	0.597	0.291	0.398	0.369	0.337
Zimbabwe	0.672	0.655	0.630	0.599	0.572	0.536	0.500	0.472	0.445	0.378	0.324	0.267	0.234

Sources: Authors' calculation by utilizing educational attainments data based on Barro and Lee (2011).

Note: The calculations cover 146 countries from 1950 to 2010, five-year intervals period. The arrows present the trend of educational inequality over time of each country.

Table 5: Gini index of education distribution, Male population aged 15 and over, from Barro-Lee educational attainments data-set

Country	Gini Index of Education Distribution, Male population aged 15 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Afghanistan	0.929	0.921	0.910	0.896	0.858	0.821	0.779	0.720	0.690	0.665	0.591	0.525	0.422
Albania	0.535	0.523	0.375	0.363	0.334	0.292	0.235	0.189	0.146	0.115	0.073	0.054	0.048
Algeria	0.801	0.805	0.816	0.777	0.666	0.580	0.505	0.414	0.340	0.275	0.228	0.198	0.193
Argentina	0.200	0.207	0.209	0.202	0.193	0.195	0.194	0.196	0.195	0.178	0.167	0.159	0.160
Armenia	0.259	0.251	0.223	0.210	0.194	0.173	0.136	0.113	0.095	0.091	0.078	0.066	0.047
Australia	0.204	0.193	0.183	0.173	0.156	0.129	0.088	0.089	0.081	0.074	0.071	0.066	0.065
Austria	0.205	0.206	0.245	0.300	0.270	0.233	0.206	0.199	0.187	0.176	0.165	0.151	0.136
Bahrain	0.829	0.829	0.823	0.782	0.606	0.535	0.471	0.437	0.385	0.249	0.144	0.139	0.127
Bangladesh	0.728	0.724	0.720	0.722	0.729	0.718	0.618	0.569	0.556	0.531	0.502	0.451	0.400
Barbados	0.108	0.115	0.117	0.146	0.083	0.128	0.158	0.127	0.102	0.073	0.072	0.045	0.045
Belgium	0.181	0.180	0.184	0.180	0.184	0.193	0.199	0.198	0.183	0.182	0.175	0.163	0.164
Belize	0.250	0.245	0.260	0.214	0.165	0.172	0.175	0.207	0.224	0.214	0.201	0.192	0.194
Benin	0.859	0.851	0.843	0.831	0.822	0.812	0.788	0.739	0.703	0.655	0.614	0.582	0.549
Bolivia	0.648	0.597	0.544	0.479	0.436	0.387	0.330	0.279	0.232	0.208	0.195	0.153	0.139
Botswana	0.766	0.757	0.749	0.704	0.641	0.595	0.553	0.474	0.393	0.254	0.196	0.150	0.119
Brazil	0.683	0.651	0.611	0.567	0.508	0.450	0.467	0.419	0.390	0.361	0.301	0.247	0.233
Brunei Darussalam	0.589	0.542	0.482	0.467	0.392	0.339	0.344	0.313	0.288	0.291	0.297	0.300	0.297
Bulgaria	0.160	0.147	0.140	0.123	0.128	0.139	0.140	0.136	0.138	0.136	0.122	0.115	0.114
Burundi	0.879	0.846	0.826	0.806	0.751	0.699	0.688	0.690	0.657	0.604	0.553	0.529	0.504
Cambodia	0.237	0.242	0.243	0.232	0.223	0.213	0.201	0.189	0.180	0.170	0.165	0.155	0.153
Cameroon	0.789	0.751	0.715	0.663	0.607	0.540	0.487	0.437	0.388	0.345	0.319	0.318	0.309
Canada	0.201	0.201	0.197	0.188	0.167	0.150	0.137	0.124	0.114	0.109	0.104	0.096	0.088
Central African Republic	0.897	0.890	0.874	0.861	0.805	0.747	0.696	0.658	0.595	0.559	0.531	0.514	0.513
Chile	0.333	0.324	0.306	0.283	0.258	0.246	0.232	0.223	0.218	0.214	0.202	0.181	0.163
China	0.646	0.607	0.556	0.508	0.439	0.387	0.307	0.301	0.315	0.234	0.167	0.151	0.139
Colombia	0.477	0.452	0.430	0.413	0.385	0.363	0.360	0.334	0.324	0.320	0.300	0.283	0.256
Congo	0.773	0.726	0.679	0.623	0.573	0.517	0.463	0.408	0.411	0.370	0.318	0.269	0.230

Country	Gini Index of Education Distribution, Male population aged 15 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Costa Rica	0.278	0.275	0.284	0.288	0.290	0.272	0.249	0.233	0.231	0.230	0.215	0.207	0.189
Cote Divoire	0.858	0.847	0.835	0.823	0.798	0.755	0.713	0.682	0.643	0.580	0.514	0.474	0.439
Croatia	0.280	0.271	0.257	0.240	0.222	0.203	0.185	0.166	0.158	0.148	0.139	0.125	0.123
Cuba	0.333	0.340	0.358	0.363	0.320	0.264	0.177	0.179	0.160	0.145	0.134	0.127	0.123
Cyprus	0.298	0.282	0.249	0.232	0.247	0.242	0.238	0.198	0.190	0.191	0.185	0.190	0.168
Czech Republic	0.083	0.085	0.085	0.106	0.097	0.096	0.097	0.140	0.149	0.109	0.085	0.029	0.063
D. R. Congo	0.735	0.685	0.640	0.605	0.585	0.565	0.530	0.503	0.467	0.451	0.446	0.446	0.468
Denmark	0.216	0.213	0.210	0.199	0.195	0.198	0.188	0.175	0.163	0.169	0.169	0.171	0.174
Dominican Rep.	0.494	0.466	0.395	0.426	0.414	0.373	0.324	0.307	0.280	0.252	0.233	0.221	0.210
Ecuador	0.480	0.434	0.389	0.370	0.356	0.341	0.322	0.319	0.306	0.320	0.335	0.313	0.288
Egypt	0.908	0.886	0.868	0.836	0.803	0.758	0.641	0.512	0.459	0.415	0.373	0.340	0.308
El Salvador	0.651	0.623	0.580	0.540	0.495	0.458	0.428	0.422	0.402	0.352	0.293	0.247	0.213
Estonia	0.219	0.215	0.210	0.205	0.204	0.198	0.194	0.189	0.176	0.141	0.092	0.082	0.074
Fiji	0.247	0.225	0.214	0.184	0.198	0.187	0.166	0.154	0.137	0.099	0.124	0.145	0.133
Finland	0.085	0.103	0.129	0.154	0.188	0.207	0.206	0.202	0.193	0.191	0.192	0.178	0.167
France	0.131	0.142	0.153	0.197	0.182	0.247	0.247	0.278	0.275	0.221	0.170	0.147	0.120
Gabon	0.981	0.985	0.972	0.926	0.867	0.824	0.772	0.683	0.599	0.476	0.382	0.319	0.256
Gambia	0.951	0.942	0.936	0.930	0.921	0.892	0.865	0.825	0.756	0.696	0.688	0.649	0.613
Germany	0.296	0.303	0.309	0.310	0.320	0.332	0.345	0.349	0.316	0.259	0.211	0.119	0.119
Ghana	0.822	0.802	0.726	0.673	0.565	0.494	0.426	0.369	0.340	0.340	0.328	0.309	0.289
Greece	0.284	0.251	0.160	0.225	0.234	0.223	0.224	0.232	0.230	0.234	0.227	0.188	0.164
Guatemala	0.669	0.681	0.684	0.687	0.671	0.642	0.510	0.475	0.445	0.422	0.412	0.393	0.314
Guyana	0.159	0.164	0.183	0.209	0.211	0.215	0.218	0.215	0.221	0.228	0.233	0.221	0.197
Haiti	0.897	0.880	0.849	0.816	0.785	0.761	0.711	0.420	0.368	0.321	0.305	0.297	0.288
Honduras	0.635	0.618	0.593	0.568	0.537	0.505	0.446	0.383	0.339	0.294	0.260	0.235	0.209
Hong Kong	0.366	0.345	0.328	0.288	0.282	0.265	0.243	0.220	0.211	0.237	0.262	0.230	0.198
Hungary	0.095	0.098	0.093	0.097	0.108	0.120	0.121	0.128	0.132	0.094	0.060	0.055	0.059
Iceland	0.148	0.153	0.167	0.178	0.190	0.208	0.216	0.217	0.216	0.216	0.220	0.219	0.209
India	0.656	0.645	0.631	0.644	0.593	0.602	0.608	0.531	0.468	0.428	0.389	0.341	0.305

Country	Gini Index of Education Distribution, Male population aged 15 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Indonesia	0.690	0.649	0.594	0.492	0.400	0.368	0.329	0.422	0.487	0.415	0.349	0.331	0.321
Iran	0.897	0.884	0.846	0.776	0.712	0.658	0.593	0.515	0.463	0.326	0.248	0.191	0.179
Iraq	0.966	0.947	0.914	0.868	0.782	0.720	0.638	0.540	0.469	0.425	0.394	0.389	0.364
Ireland	0.158	0.161	0.163	0.160	0.168	0.167	0.146	0.141	0.148	0.171	0.161	0.145	0.129
Israel	0.299	0.291	0.279	0.270	0.254	0.227	0.193	0.194	0.193	0.188	0.179	0.167	0.157
Italy	0.250	0.250	0.245	0.232	0.221	0.240	0.234	0.228	0.213	0.193	0.171	0.154	0.135
Jamaica	0.229	0.231	0.251	0.209	0.143	0.148	0.174	0.197	0.202	0.209	0.191	0.161	0.151
Japan	0.202	0.203	0.178	0.199	0.196	0.194	0.178	0.173	0.171	0.154	0.146	0.136	0.129
Jordan	0.766	0.696	0.607	0.555	0.535	0.502	0.467	0.435	0.365	0.316	0.283	0.258	0.240
Kazakhstan	0.496	0.459	0.433	0.414	0.386	0.349	0.289	0.254	0.221	0.154	0.076	0.077	0.086
Kenya	0.710	0.678	0.636	0.618	0.580	0.504	0.422	0.349	0.292	0.263	0.242	0.216	0.191
Kuwait	0.695	0.656	0.626	0.583	0.549	0.645	0.581	0.538	0.494	0.460	0.403	0.311	0.294
Kyrgyzstan	0.413	0.395	0.378	0.365	0.353	0.318	0.259	0.230	0.197	0.180	0.154	0.178	0.182
Lao PDR	0.626	0.603	0.574	0.549	0.515	0.480	0.449	0.428	0.409	0.389	0.373	0.360	0.343
Latvia	0.278	0.283	0.285	0.283	0.278	0.268	0.234	0.204	0.175	0.127	0.113	0.065	0.071
Lesotho	0.544	0.512	0.476	0.443	0.452	0.472	0.455	0.440	0.427	0.403	0.371	0.317	0.267
Liberia	0.889	0.881	0.853	0.830	0.815	0.739	0.657	0.584	0.531	0.521	0.482	0.427	0.350
Libyan Arab Jamahiriya	0.760	0.734	0.714	0.644	0.539	0.469	0.431	0.410	0.370	0.372	0.378	0.382	0.380
Lithuania	0.460	0.433	0.400	0.370	0.333	0.291	0.233	0.185	0.144	0.133	0.115	0.100	0.088
Luxembourg	0.221	0.218	0.222	0.216	0.204	0.206	0.209	0.214	0.211	0.212	0.203	0.185	0.173
Macao	0.330	0.313	0.302	0.276	0.258	0.234	0.226	0.209	0.205	0.204	0.187	0.165	0.161
Malawi	0.544	0.531	0.520	0.507	0.403	0.408	0.401	0.391	0.377	0.371	0.332	0.244	0.215
Malaysia	0.485	0.452	0.414	0.379	0.345	0.342	0.332	0.293	0.267	0.223	0.201	0.179	0.162
Maldives	0.600	0.583	0.568	0.553	0.531	0.500	0.476	0.454	0.459	0.473	0.446	0.373	0.306
Mali	0.948	0.940	0.937	0.931	0.918	0.881	0.856	0.830	0.814	0.800	0.782	0.734	0.658
Malta	0.593	0.534	0.461	0.415	0.392	0.368	0.265	0.244	0.219	0.235	0.199	0.159	0.139
Mauritania	0.645	0.640	0.638	0.634	0.629	0.627	0.630	0.604	0.568	0.517	0.458	0.377	0.312
Mauritius	0.475	0.456	0.424	0.372	0.320	0.315	0.332	0.305	0.273	0.239	0.221	0.205	0.193
Mexico	0.478	0.460	0.446	0.400	0.360	0.402	0.400	0.345	0.298	0.269	0.248	0.214	0.182

Country	Gini Index of Education Distribution, Male population aged 15 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Mongolia	0.734	0.691	0.626	0.559	0.556	0.319	0.258	0.204	0.157	0.167	0.178	0.182	0.168
Morocco	0.964	0.962	0.934	0.900	0.853	0.799	0.753	0.701	0.644	0.594	0.556	0.511	0.468
Mozambique	0.816	0.736	0.658	0.582	0.591	0.624	0.580	0.604	0.686	0.735	0.719	0.693	0.627
Myanmar	0.827	0.810	0.787	0.737	0.743	0.718	0.636	0.564	0.494	0.431	0.393	0.383	0.360
Namibia	0.649	0.607	0.571	0.519	0.461	0.424	0.395	0.361	0.331	0.328	0.348	0.352	0.353
Nepal	0.977	0.978	0.970	0.940	0.887	0.838	0.783	0.671	0.571	0.545	0.478	0.403	0.344
Netherlands	0.099	0.107	0.108	0.171	0.149	0.148	0.138	0.140	0.136	0.133	0.128	0.125	0.116
New Zealand	0.152	0.142	0.136	0.125	0.116	0.096	0.124	0.132	0.144	0.144	0.141	0.138	0.137
Nicaragua	0.684	0.628	0.548	0.509	0.483	0.462	0.459	0.449	0.432	0.413	0.382	0.339	0.297
Niger	0.858	0.857	0.855	0.857	0.853	0.851	0.841	0.829	0.802	0.775	0.755	0.740	0.704
Norway	0.134	0.124	0.113	0.149	0.152	0.174	0.179	0.159	0.138	0.125	0.116	0.047	0.057
Pakistan	0.821	0.816	0.791	0.767	0.762	0.725	0.677	0.653	0.606	0.596	0.569	0.430	0.381
Panama	0.416	0.387	0.352	0.368	0.382	0.342	0.294	0.270	0.252	0.243	0.236	0.219	0.209
Papua New Guinea	0.896	0.874	0.850	0.828	0.764	0.721	0.681	0.605	0.554	0.503	0.449	0.401	0.387
Paraguay	0.341	0.307	0.268	0.267	0.245	0.236	0.240	0.234	0.241	0.234	0.245	0.190	0.173
Peru	0.397	0.377	0.359	0.348	0.323	0.292	0.257	0.254	0.260	0.242	0.196	0.165	0.136
Philippines	0.504	0.347	0.358	0.321	0.281	0.245	0.235	0.219	0.211	0.211	0.215	0.207	0.198
Poland	0.160	0.160	0.157	0.148	0.133	0.128	0.113	0.109	0.113	0.102	0.095	0.091	0.090
Portugal	0.475	0.436	0.400	0.397	0.393	0.359	0.325	0.287	0.265	0.273	0.263	0.250	0.229
Qatar	0.832	0.805	0.756	0.688	0.668	0.630	0.602	0.568	0.544	0.498	0.470	0.424	0.399
Rénion	0.648	0.711	0.601	0.505	0.436	0.351	0.291	0.240	0.210	0.183	0.157	0.134	0.114
Republic of Korea	0.267	0.238	0.414	0.345	0.297	0.246	0.202	0.170	0.175	0.124	0.114	0.102	0.087
Republic of Moldova	0.550	0.513	0.468	0.427	0.369	0.305	0.252	0.208	0.168	0.130	0.103	0.082	0.065
Romania	0.189	0.188	0.182	0.161	0.139	0.121	0.101	0.092	0.087	0.085	0.077	0.071	0.077
Russian Federation	0.310	0.287	0.294	0.258	0.221	0.220	0.195	0.180	0.157	0.116	0.097	0.092	0.085
Rwanda	0.923	0.869	0.749	0.704	0.674	0.624	0.592	0.577	0.570	0.558	0.548	0.543	0.514
Saudi Arabia	0.584	0.574	0.562	0.549	0.532	0.482	0.432	0.366	0.309	0.334	0.288	0.256	0.211
Senegal	0.494	0.494	0.491	0.490	0.474	0.450	0.435	0.414	0.387	0.350	0.309	0.279	0.253
Serbia	0.302	0.269	0.252	0.224	0.198	0.196	0.183	0.168	0.168	0.158	0.156	0.154	0.153

Country	Gini Index of Education Distribution, Male population aged 15 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Sierra Leone	0.947	0.940	0.931	0.910	0.882	0.849	0.812	0.775	0.741	0.682	0.655	0.627	0.598
Singapore	0.536	0.502	0.456	0.402	0.343	0.365	0.366	0.284	0.209	0.217	0.216	0.214	0.197
Slovakia	0.091	0.090	0.085	0.099	0.092	0.092	0.086	0.101	0.096	0.083	0.092	0.094	0.096
Slovenia	0.274	0.247	0.222	0.185	0.155	0.146	0.134	0.102	0.076	0.070	0.053	0.052	0.057
South Africa	0.530	0.521	0.523	0.483	0.447	0.410	0.373	0.274	0.222	0.182	0.220	0.182	0.154
Spain	0.584	0.563	0.539	0.512	0.435	0.445	0.404	0.385	0.364	0.273	0.213	0.185	0.155
Sri Lanka	0.275	0.263	0.256	0.250	0.183	0.182	0.173	0.182	0.172	0.164	0.151	0.145	0.141
Sudan	0.855	0.834	0.822	0.795	0.768	0.745	0.687	0.647	0.610	0.579	0.556	0.546	0.539
Swaziland	0.795	0.753	0.712	0.659	0.562	0.472	0.465	0.439	0.369	0.329	0.269	0.216	0.189
Sweden	0.202	0.204	0.205	0.205	0.198	0.200	0.184	0.180	0.170	0.146	0.138	0.108	0.101
Switzerland	0.230	0.231	0.233	0.245	0.244	0.208	0.161	0.218	0.248	0.267	0.256	0.263	0.249
Syrian Arab Republic	0.619	0.602	0.571	0.542	0.475	0.411	0.348	0.288	0.251	0.239	0.241	0.207	0.202
Taiwan	0.374	0.339	0.317	0.291	0.282	0.263	0.246	0.224	0.201	0.174	0.139	0.118	0.093
Tajikistan	0.522	0.479	0.424	0.382	0.327	0.260	0.207	0.158	0.117	0.087	0.110	0.146	0.160
Thailand	0.436	0.382	0.334	0.282	0.251	0.241	0.230	0.248	0.234	0.248	0.261	0.275	0.277
Togo	0.872	0.854	0.828	0.807	0.757	0.680	0.581	0.495	0.426	0.396	0.364	0.342	0.324
Tonga	0.319	0.297	0.278	0.265	0.240	0.195	0.178	0.172	0.122	0.097	0.117	0.132	0.124
Trinidad and Tobago	0.161	0.158	0.153	0.153	0.160	0.144	0.135	0.144	0.147	0.133	0.117	0.104	0.091
Tunisia	0.881	0.857	0.834	0.784	0.713	0.628	0.517	0.505	0.456	0.406	0.353	0.317	0.289
Turkey	0.750	0.683	0.602	0.526	0.482	0.454	0.409	0.387	0.361	0.325	0.256	0.227	0.215
Uganda	0.729	0.701	0.671	0.588	0.500	0.443	0.434	0.391	0.340	0.295	0.282	0.239	0.211
Ukraine	0.343	0.330	0.311	0.281	0.253	0.206	0.170	0.147	0.128	0.116	0.107	0.089	0.091
United Arab Emirates	0.886	0.849	0.814	0.780	0.756	0.730	0.666	0.593	0.496	0.388	0.303	0.245	0.233
United Kingdom	0.139	0.147	0.147	0.171	0.190	0.193	0.201	0.193	0.195	0.196	0.193	0.189	0.182
United Republic of Tanzania	0.564	0.553	0.517	0.485	0.446	0.420	0.349	0.332	0.314	0.286	0.276	0.223	0.175
Uruguay	0.283	0.274	0.265	0.257	0.249	0.241	0.225	0.216	0.228	0.232	0.197	0.171	0.160
USA	0.209	0.204	0.195	0.159	0.131	0.107	0.087	0.118	0.133	0.080	0.077	0.074	0.073
Venezuela	0.505	0.459	0.418	0.440	0.408	0.360	0.308	0.315	0.332	0.309	0.290	0.277	0.256
Viet Nam	0.482	0.479	0.440	0.402	0.362	0.318	0.274	0.272	0.221	0.216	0.218	0.232	0.236

Country	Gini Index of Education Distribution, Male population aged 15 and over, by five-year-interval												
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Yemen	0.997	0.995	0.991	0.985	0.982	0.983	0.939	0.874	0.789	0.717	0.630	0.565	0.501
Zambia	0.501	0.468	0.426	0.385	0.361	0.331	0.316	0.311	0.316	0.290	0.232	0.226	0.200
Zimbabwe	0.498	0.469	0.436	0.407	0.368	0.359	0.388	0.352	0.286	0.212	0.170	0.153	0.133

Sources: Authors' calculation by utilizing educational attainments data based on Barro and Lee (2011).

Note: The calculations cover 146 countries from 1950 to 2010, five-year intervals period. The arrows present the trend of educational inequality over time of each country.

Table 6: Gini index of education distribution, Male population aged 25 and over, from Barro-Lee educational attainments data-set

	Gini Index of Education Distribution, Male population aged 25 and over, by five-year-interval												
Country	**1950**	**1955**	**1960**	**1965**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
Afghanistan	0.969	0.956	0.949	0.933	0.923	0.884	0.863	0.809	0.762	0.703	0.672	0.646	0.568
Albania	0.612	0.577	0.391	0.371	0.370	0.346	0.309	0.255	0.191	0.135	0.085	0.067	0.058
Algeria	0.795	0.795	0.840	0.873	0.757	0.708	0.643	0.550	0.458	0.370	0.295	0.245	0.212
Argentina	0.212	0.211	0.219	0.211	0.201	0.199	0.219	0.201	0.209	0.197	0.185	0.172	0.160
Armenia	0.259	0.249	0.237	0.214	0.200	0.179	0.159	0.135	0.111	0.099	0.086	0.080	0.068
Australia	0.222	0.214	0.205	0.201	0.184	0.158	0.106	0.109	0.094	0.084	0.074	0.071	0.066
Austria	0.214	0.216	0.215	0.311	0.272	0.230	0.201	0.182	0.168	0.162	0.159	0.150	0.133
Bahrain	0.873	0.864	0.854	0.818	0.757	0.677	0.547	0.476	0.431	0.291	0.154	0.144	0.128
Bangladesh	0.737	0.734	0.732	0.738	0.753	0.770	0.647	0.609	0.578	0.552	0.550	0.516	0.481
Barbados	0.095	0.102	0.109	0.144	0.112	0.148	0.170	0.148	0.125	0.086	0.082	0.055	0.049
Belgium	0.172	0.177	0.178	0.179	0.179	0.192	0.197	0.199	0.190	0.188	0.185	0.167	0.170
Belize	0.256	0.250	0.268	0.229	0.193	0.195	0.200	0.226	0.257	0.245	0.232	0.214	0.204
Benin	0.871	0.867	0.867	0.864	0.865	0.863	0.863	0.815	0.754	0.704	0.671	0.638	0.625
Bolivia	0.679	0.644	0.600	0.563	0.515	0.473	0.412	0.355	0.299	0.255	0.248	0.202	0.172
Botswana	0.767	0.767	0.767	0.766	0.771	0.656	0.629	0.570	0.502	0.400	0.320	0.258	0.190
Brazil	0.698	0.670	0.634	0.586	0.535	0.495	0.511	0.475	0.493	0.442	0.383	0.308	0.263
Brunei Darussalam	0.615	0.593	0.535	0.530	0.466	0.408	0.367	0.336	0.284	0.277	0.277	0.275	0.283
Bulgaria	0.166	0.153	0.153	0.145	0.138	0.153	0.151	0.147	0.141	0.128	0.129	0.122	0.112
Burundi	0.914	0.898	0.866	0.850	0.838	0.793	0.750	0.720	0.688	0.687	0.656	0.596	0.558
Cambodia	0.125	0.131	0.135	0.144	0.152	0.161	0.166	0.165	0.165	0.170	0.181	0.174	0.164
Cameroon	0.796	0.771	0.736	0.706	0.667	0.638	0.571	0.505	0.449	0.401	0.352	0.310	0.289
Canada	0.213	0.214	0.212	0.203	0.193	0.181	0.163	0.141	0.127	0.119	0.112	0.104	0.095
Central African Republic	0.884	0.882	0.874	0.858	0.841	0.807	0.771	0.721	0.663	0.626	0.573	0.530	0.507
Chile	0.352	0.336	0.331	0.312	0.288	0.276	0.269	0.252	0.239	0.233	0.226	0.208	0.193
China	0.748	0.685	0.632	0.562	0.509	0.440	0.376	0.369	0.375	0.272	0.179	0.162	0.148
Colombia	0.499	0.470	0.451	0.431	0.415	0.394	0.387	0.380	0.363	0.348	0.325	0.318	0.282
Congo	0.881	0.873	0.830	0.791	0.730	0.675	0.606	0.554	0.457	0.410	0.419	0.378	0.328

	Gini Index of Education Distribution, Male population aged 25 and over, by five-year-interval												
Country	**1950**	**1955**	**1960**	**1965**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
Costa Rica	0.288	0.295	0.296	0.312	0.318	0.310	0.281	0.262	0.247	0.237	0.228	0.238	0.213
Cote Divoire	0.930	0.921	0.908	0.893	0.875	0.849	0.805	0.760	0.719	0.669	0.592	0.545	0.497
Croatia	0.297	0.283	0.272	0.252	0.237	0.216	0.194	0.174	0.158	0.138	0.130	0.122	0.118
Cuba	0.353	0.338	0.329	0.324	0.313	0.288	0.284	0.224	0.201	0.174	0.149	0.135	0.128
Cyprus	0.354	0.311	0.273	0.253	0.255	0.239	0.245	0.228	0.215	0.213	0.219	0.215	0.189
Czech Republic	0.087	0.091	0.084	0.103	0.101	0.100	0.099	0.144	0.164	0.118	0.086	0.030	0.060
D. R. Congo	0.837	0.784	0.747	0.697	0.659	0.629	0.611	0.590	0.557	0.525	0.485	0.474	0.470
Denmark	0.226	0.223	0.221	0.216	0.213	0.208	0.203	0.196	0.168	0.168	0.165	0.163	0.163
Dominican Rep.	0.476	0.477	0.477	0.484	0.491	0.456	0.401	0.384	0.348	0.315	0.282	0.257	0.242
Ecuador	0.507	0.467	0.420	0.405	0.395	0.385	0.370	0.356	0.351	0.346	0.364	0.350	0.335
Egypt	0.920	0.912	0.896	0.885	0.860	0.830	0.713	0.588	0.544	0.496	0.443	0.401	0.353
El Salvador	0.665	0.639	0.621	0.595	0.567	0.519	0.477	0.475	0.486	0.426	0.363	0.308	0.249
Estonia	0.189	0.194	0.198	0.201	0.205	0.203	0.201	0.195	0.184	0.143	0.091	0.077	0.074
Fiji	0.339	0.292	0.271	0.223	0.224	0.210	0.188	0.179	0.160	0.118	0.130	0.153	0.146
Finland	0.104	0.120	0.114	0.162	0.179	0.216	0.219	0.214	0.203	0.192	0.202	0.177	0.166
France	0.140	0.152	0.082	0.179	0.211	0.247	0.253	0.293	0.298	0.236	0.186	0.165	0.132
Gabon	0.983	0.985	0.983	0.981	0.959	0.928	0.835	0.753	0.670	0.587	0.516	0.430	0.351
Gambia	0.957	0.951	0.949	0.946	0.941	0.932	0.905	0.866	0.838	0.772	0.749	0.712	0.674
Germany	0.279	0.284	0.289	0.297	0.295	0.303	0.315	0.330	0.309	0.243	0.183	0.108	0.106
Ghana	0.832	0.822	0.817	0.773	0.705	0.628	0.572	0.494	0.423	0.374	0.360	0.331	0.299
Greece	0.296	0.269	0.184	0.232	0.238	0.236	0.240	0.245	0.248	0.259	0.255	0.205	0.174
Guatemala	0.712	0.697	0.716	0.727	0.729	0.713	0.581	0.537	0.504	0.475	0.461	0.449	0.399
Guyana	0.218	0.214	0.210	0.203	0.199	0.211	0.224	0.226	0.225	0.231	0.243	0.237	0.222
Haiti	0.906	0.897	0.879	0.851	0.828	0.801	0.783	0.520	0.457	0.400	0.343	0.294	0.282
Honduras	0.630	0.623	0.618	0.617	0.604	0.580	0.518	0.464	0.416	0.376	0.332	0.289	0.254
Hong Kong	0.377	0.360	0.341	0.316	0.324	0.315	0.291	0.265	0.249	0.270	0.299	0.260	0.222
Hungary	0.104	0.106	0.105	0.102	0.115	0.118	0.127	0.135	0.141	0.103	0.067	0.052	0.053
Iceland	0.126	0.145	0.158	0.172	0.185	0.197	0.212	0.229	0.231	0.228	0.225	0.223	0.224
India	0.684	0.671	0.664	0.654	0.651	0.667	0.668	0.593	0.524	0.491	0.466	0.424	0.383

	Gini Index of Education Distribution, Male population aged 25 and over, by five-year-interval												
Country	**1950**	**1955**	**1960**	**1965**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
Indonesia	0.740	0.701	0.660	0.570	0.465	0.424	0.384	0.451	0.566	0.465	0.388	0.363	0.345
Iran	0.934	0.920	0.899	0.864	0.811	0.765	0.733	0.669	0.568	0.407	0.329	0.242	0.206
Iraq	0.973	0.970	0.951	0.934	0.908	0.865	0.788	0.709	0.626	0.522	0.446	0.404	0.376
Ireland	0.156	0.155	0.158	0.159	0.156	0.161	0.162	0.161	0.159	0.167	0.171	0.155	0.141
Israel	0.313	0.304	0.302	0.302	0.295	0.258	0.227	0.209	0.194	0.188	0.184	0.170	0.154
Italy	0.268	0.264	0.261	0.242	0.236	0.254	0.266	0.259	0.240	0.219	0.193	0.176	0.150
Jamaica	0.291	0.282	0.278	0.209	0.140	0.145	0.163	0.186	0.205	0.222	0.220	0.206	0.172
Japan	0.212	0.218	0.218	0.213	0.197	0.209	0.205	0.193	0.182	0.170	0.159	0.148	0.137
Jordan	0.831	0.776	0.742	0.693	0.664	0.625	0.626	0.549	0.469	0.401	0.346	0.307	0.279
Kazakhstan	0.553	0.509	0.476	0.433	0.405	0.367	0.324	0.273	0.233	0.165	0.094	0.078	0.073
Kenya	0.769	0.735	0.696	0.702	0.689	0.605	0.518	0.460	0.407	0.333	0.278	0.253	0.232
Kuwait	0.766	0.713	0.674	0.623	0.591	0.709	0.625	0.577	0.547	0.518	0.424	0.327	0.316
Kyrgyzstan	0.427	0.410	0.392	0.371	0.353	0.323	0.284	0.244	0.210	0.181	0.145	0.140	0.143
Lao PDR	0.712	0.682	0.654	0.620	0.588	0.548	0.507	0.477	0.443	0.419	0.399	0.384	0.371
Latvia	0.271	0.279	0.283	0.285	0.281	0.274	0.263	0.245	0.208	0.139	0.114	0.060	0.059
Lesotho	0.583	0.552	0.527	0.527	0.505	0.521	0.514	0.486	0.474	0.455	0.446	0.422	0.377
Liberia	0.903	0.904	0.904	0.870	0.846	0.828	0.774	0.705	0.617	0.541	0.492	0.489	0.454
Libyan Arab Jamahiriya	0.801	0.782	0.755	0.741	0.658	0.623	0.540	0.539	0.437	0.370	0.335	0.351	0.362
Lithuania	0.480	0.461	0.437	0.407	0.376	0.335	0.292	0.244	0.191	0.149	0.114	0.092	0.073
Luxembourg	0.199	0.202	0.206	0.206	0.206	0.208	0.208	0.204	0.210	0.205	0.203	0.199	0.189
Macao	0.366	0.338	0.319	0.297	0.298	0.263	0.242	0.229	0.221	0.212	0.203	0.187	0.178
Malawi	0.601	0.587	0.570	0.562	0.504	0.469	0.452	0.433	0.420	0.400	0.383	0.353	0.285
Malaysia	0.549	0.508	0.470	0.428	0.410	0.371	0.345	0.342	0.310	0.264	0.239	0.206	0.190
Maldives	0.590	0.578	0.564	0.559	0.536	0.514	0.493	0.480	0.519	0.546	0.565	0.482	0.412
Mali	0.964	0.958	0.956	0.949	0.940	0.939	0.907	0.870	0.846	0.817	0.800	0.787	0.768
Malta	0.626	0.571	0.492	0.397	0.382	0.372	0.282	0.261	0.233	0.258	0.219	0.180	0.157
Mauritania	0.600	0.594	0.591	0.593	0.592	0.600	0.603	0.606	0.606	0.592	0.547	0.498	0.433
Mauritius	0.465	0.466	0.467	0.408	0.375	0.357	0.349	0.355	0.301	0.263	0.244	0.220	0.210
Mexico	0.484	0.484	0.468	0.448	0.414	0.443	0.459	0.406	0.359	0.322	0.280	0.258	0.224

	Gini Index of Education Distribution, Male population aged 25 and over, by five-year-interval												
Country	**1950**	**1955**	**1960**	**1965**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
Mongolia	0.908	0.852	0.809	0.726	0.654	0.415	0.334	0.257	0.172	0.171	0.155	0.147	0.159
Morocco	0.963	0.952	0.944	0.926	0.951	0.871	0.816	0.761	0.711	0.658	0.598	0.549	0.512
Mozambique	0.926	0.826	0.741	0.669	0.608	0.638	0.819	0.675	0.694	0.756	0.737	0.707	0.691
Myanmar	0.824	0.777	0.829	0.817	0.803	0.797	0.710	0.628	0.577	0.528	0.469	0.413	0.375
Namibia	0.600	0.581	0.560	0.542	0.512	0.488	0.454	0.419	0.377	0.362	0.365	0.337	0.333
Nepal	0.987	0.985	0.984	0.964	0.940	0.897	0.857	0.760	0.650	0.612	0.577	0.517	0.439
Netherlands	0.108	0.112	0.116	0.175	0.171	0.168	0.158	0.146	0.136	0.133	0.129	0.128	0.120
New Zealand	0.149	0.140	0.136	0.127	0.125	0.107	0.132	0.140	0.147	0.143	0.144	0.143	0.139
Nicaragua	0.677	0.680	0.640	0.590	0.567	0.526	0.491	0.471	0.462	0.450	0.437	0.417	0.382
Niger	0.839	0.836	0.832	0.831	0.837	0.846	0.851	0.851	0.842	0.827	0.802	0.771	0.752
Norway	0.109	0.110	0.113	0.134	0.155	0.177	0.184	0.167	0.141	0.131	0.121	0.052	0.051
Pakistan	0.845	0.842	0.839	0.809	0.786	0.759	0.717	0.700	0.678	0.643	0.623	0.471	0.443
Panama	0.446	0.424	0.390	0.402	0.405	0.375	0.345	0.316	0.292	0.273	0.263	0.244	0.225
Papua New Guinea	0.936	0.922	0.907	0.875	0.845	0.822	0.800	0.729	0.651	0.561	0.505	0.454	0.397
Paraguay	0.295	0.328	0.295	0.285	0.272	0.263	0.263	0.253	0.258	0.248	0.266	0.215	0.194
Peru	0.449	0.417	0.410	0.378	0.369	0.328	0.313	0.291	0.282	0.279	0.250	0.215	0.169
Philippines	0.590	0.429	0.420	0.370	0.326	0.284	0.270	0.248	0.234	0.230	0.231	0.222	0.208
Poland	0.199	0.186	0.174	0.160	0.151	0.140	0.131	0.117	0.125	0.107	0.100	0.087	0.080
Portugal	0.504	0.472	0.442	0.451	0.442	0.382	0.344	0.313	0.290	0.289	0.281	0.271	0.243
Qatar	0.898	0.865	0.823	0.771	0.723	0.689	0.637	0.597	0.564	0.521	0.492	0.450	0.422
Rénion	0.662	0.711	0.636	0.580	0.538	0.492	0.415	0.330	0.272	0.221	0.183	0.156	0.131
Republic of Korea	0.281	0.252	0.533	0.432	0.374	0.310	0.263	0.216	0.195	0.150	0.135	0.115	0.094
Republic of Moldova	0.607	0.575	0.537	0.481	0.438	0.382	0.315	0.254	0.205	0.162	0.126	0.098	0.075
Romania	0.161	0.144	0.159	0.160	0.151	0.155	0.118	0.106	0.101	0.085	0.082	0.072	0.065
Russian Federation	0.334	0.317	0.304	0.283	0.264	0.263	0.250	0.224	0.183	0.124	0.096	0.086	0.081
Rwanda	0.947	0.908	0.875	0.818	0.768	0.708	0.680	0.606	0.576	0.557	0.557	0.555	0.550
Saudi Arabia	0.503	0.496	0.484	0.478	0.472	0.476	0.450	0.424	0.388	0.362	0.321	0.300	0.263
Senegal	0.470	0.465	0.468	0.467	0.474	0.474	0.463	0.443	0.423	0.406	0.376	0.338	0.304
Serbia	0.327	0.289	0.267	0.247	0.236	0.215	0.195	0.174	0.156	0.144	0.142	0.136	0.132

	Gini Index of Education Distribution, Male population aged 25 and over, by five-year-interval												
Country	**1950**	**1955**	**1960**	**1965**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
Sierra Leone	0.952	0.950	0.942	0.935	0.920	0.899	0.867	0.832	0.794	0.750	0.717	0.655	0.626
Singapore	0.594	0.559	0.522	0.468	0.429	0.452	0.463	0.323	0.220	0.227	0.231	0.230	0.206
Slovakia	0.090	0.092	0.085	0.100	0.095	0.093	0.091	0.096	0.100	0.083	0.088	0.076	0.078
Slovenia	0.272	0.244	0.229	0.196	0.172	0.156	0.142	0.114	0.083	0.069	0.058	0.052	0.055
South Africa	0.569	0.552	0.551	0.513	0.483	0.438	0.405	0.329	0.252	0.194	0.267	0.230	0.189
Spain	0.596	0.569	0.545	0.518	0.495	0.483	0.460	0.447	0.420	0.308	0.231	0.197	0.165
Sri Lanka	0.336	0.311	0.292	0.273	0.213	0.193	0.183	0.182	0.171	0.172	0.166	0.155	0.151
Sudan	0.891	0.864	0.844	0.809	0.791	0.775	0.741	0.733	0.685	0.638	0.599	0.568	0.545
Swaziland	0.835	0.812	0.774	0.738	0.657	0.573	0.556	0.548	0.493	0.432	0.371	0.321	0.256
Sweden	0.209	0.212	0.217	0.217	0.215	0.236	0.208	0.203	0.190	0.177	0.154	0.122	0.115
Switzerland	0.231	0.233	0.234	0.249	0.251	0.218	0.186	0.229	0.247	0.254	0.231	0.243	0.227
Syrian Arab Republic	0.716	0.677	0.648	0.597	0.576	0.510	0.422	0.360	0.312	0.286	0.304	0.239	0.215
Taiwan	0.393	0.354	0.345	0.333	0.336	0.327	0.303	0.273	0.238	0.201	0.159	0.133	0.102
Tajikistan	0.597	0.546	0.498	0.428	0.385	0.325	0.271	0.209	0.161	0.120	0.084	0.079	0.108
Thailand	0.549	0.475	0.410	0.364	0.315	0.273	0.261	0.251	0.251	0.251	0.263	0.265	0.264
Togo	0.902	0.888	0.877	0.861	0.845	0.781	0.715	0.634	0.562	0.472	0.403	0.380	0.348
Tonga	0.261	0.253	0.256	0.248	0.250	0.246	0.231	0.219	0.180	0.130	0.139	0.152	0.130
Trinidad and Tobago	0.205	0.196	0.187	0.175	0.170	0.149	0.138	0.152	0.162	0.154	0.143	0.127	0.112
Tunisia	0.903	0.893	0.875	0.862	0.825	0.799	0.676	0.632	0.552	0.500	0.428	0.367	0.323
Turkey	0.794	0.714	0.649	0.555	0.561	0.546	0.494	0.437	0.388	0.368	0.289	0.253	0.236
Uganda	0.751	0.720	0.694	0.658	0.590	0.525	0.463	0.414	0.393	0.352	0.348	0.307	0.283
Ukraine	0.334	0.345	0.336	0.314	0.287	0.258	0.220	0.180	0.148	0.124	0.114	0.095	0.087
United Arab Emirates	0.916	0.882	0.835	0.802	0.772	0.740	0.689	0.618	0.532	0.419	0.321	0.262	0.249
United Kingdom	0.132	0.143	0.148	0.169	0.189	0.200	0.198	0.216	0.210	0.203	0.202	0.201	0.200
United Republic of Tanzania	0.544	0.544	0.544	0.520	0.498	0.464	0.436	0.384	0.344	0.307	0.297	0.264	0.236
Uruguay	0.320	0.300	0.283	0.275	0.259	0.255	0.243	0.235	0.244	0.249	0.216	0.185	0.168
USA	0.225	0.219	0.213	0.179	0.145	0.120	0.097	0.129	0.140	0.084	0.080	0.079	0.075
Venezuela	0.534	0.486	0.497	0.487	0.535	0.428	0.359	0.344	0.358	0.331	0.322	0.304	0.284
Viet Nam	0.492	0.490	0.488	0.450	0.414	0.379	0.339	0.305	0.251	0.238	0.223	0.225	0.234

	Gini Index of Education Distribution, Male population aged 25 and over, by five-year-interval												
Country	**1950**	**1955**	**1960**	**1965**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
Yemen	1.000	1.000	1.000	1.000	1.000	1.000	0.987	0.976	0.943	0.885	0.801	0.701	0.609
Zambia	0.591	0.545	0.505	0.461	0.325	0.399	0.398	0.334	0.323	0.314	0.261	0.244	0.225
Zimbabwe	0.523	0.504	0.481	0.456	0.434	0.411	0.387	0.366	0.351	0.277	0.228	0.184	0.163

Sources: Authors' calculation by utilizing educational attainments data based on Barro and Lee (2011).
Note: The calculations cover 146 countries from 1950 to 2010, five-year intervals period. The arrows present the trend of educational inequality over time of each country.

Table 7: Gini index of education distribution, total population aged 15 and over, from Cohen-Soto educational attainments data-set

COUNTRY	Gini Index of Education Distribution, total population aged 15 and over, by ten-year-interval					
	1960	1970	1980	1990	2000	2010
Algeria	0.880	0.832	0.689	0.627	0.571	0.536
Angola	0.990	0.960	0.844	0.703	0.628	0.503
Argentina	0.413	0.420	0.437	0.412	0.410	0.405
Australia	0.401	0.403	0.383	0.367	0.247	0.228
Austria	0.347	0.285	0.218	0.156	0.191	0.174
Bangladesh	0.829	0.811	0.794	0.767	0.655	0.591
Belgium	0.396	0.404	0.402	0.392	0.392	0.377
Benin	0.936	0.925	0.897	0.861	0.804	0.746
Bolivia	0.728	0.668	0.593	0.540	0.523	0.501
Brazil	0.557	0.536	0.507	0.488	0.439	0.436
Bulgaria	0.525	0.498	0.462	0.438	0.424	0.424
Burkina Faso	0.995	0.992	0.980	0.961	0.923	0.861
Burundi	0.879	0.882	0.837	0.835	0.712	0.674
Cameroon	0.822	0.783	0.665	0.552	0.541	0.544
Canada	0.414	0.419	0.401	0.383	0.322	0.299
Central African republic	0.879	0.840	0.739	0.691	0.623	0.575
Chile	0.421	0.428	0.413	0.379	0.343	0.349
China	0.648	0.566	0.510	0.464	0.453	0.428
Colombia	0.532	0.530	0.492	0.485	0.469	0.459
Costa Rica	0.461	0.438	0.446	0.466	0.478	0.473
Cote Divoire	0.973	0.958	0.879	0.817	0.768	0.729
Cuba	0.462	0.464	0.483	0.504	0.475	0.428
Cyprus	0.491	0.447	0.434	0.422	0.410	0.398
Denmark	0.345	0.319	0.285	0.238	0.236	0.220
Dominican Republic	0.627	0.606	0.572	0.550	0.555	0.549

COUNTRY	Gini Index of Education Distribution, total population aged 15 and over, by ten-year-interval					
	1960	1970	1980	1990	2000	2010
Ecuador	0.549	0.541	0.531	0.537	0.491	0.465
Egypt	0.937	0.898	0.809	0.679	0.577	0.498
El Salvador	0.680	0.631	0.549	0.537	0.501	0.479
Ethiopia	0.979	0.972	0.953	0.885	0.797	0.686
Fiji	0.444	0.474	0.469	0.430	0.393	0.366
Finland	0.266	0.372	0.407	0.356	0.371	0.348
France	0.341	0.403	0.398	0.362	0.395	0.375
Gabon	0.618	0.580	0.461	0.419	0.444	0.427
Germany	0.390	0.352	0.300	0.251	0.277	0.283
Ghana	0.842	0.718	0.651	0.611	0.574	0.534
Greece	0.402	0.410	0.427	0.442	0.437	0.430
Guatemala	0.757	0.708	0.658	0.551	0.489	0.471
Guyana	0.197	0.221	0.364	0.405	0.361	0.331
Haiti	0.889	0.861	0.804	0.669	0.626	0.507
Honduras	0.675	0.585	0.555	0.498	0.481	0.472
Hungary	0.347	0.314	0.290	0.255	0.224	0.204
India	0.796	0.839	0.797	0.730	0.646	0.586
Indonesia	0.743	0.604	0.527	0.487	0.445	0.430
Iran	0.939	0.890	0.799	0.686	0.584	0.516
Iraq	0.979	0.904	0.794	0.669	0.597	0.573
Ireland	0.336	0.377	0.389	0.380	0.378	0.367
Italy	0.365	0.406	0.411	0.373	0.379	0.333
Jamaica	0.299	0.241	0.380	0.405	0.395	0.388
Japan	0.324	0.273	0.259	0.254	0.275	0.270
Jordan	0.799	0.653	0.561	0.480	0.463	0.461
Kenya	0.769	0.701	0.603	0.462	0.365	0.316
Korea	0.586	0.534	0.438	0.379	0.352	0.357
Madagascar	0.691	0.685	0.622	0.552	0.492	0.474
Malawi	0.619	0.635	0.658	0.547	0.448	0.353

COUNTRY	Gini Index of Education Distribution, total population aged 15 and over, by ten-year-interval					
	1960	1970	1980	1990	2000	2010
Malaysia	0.653	0.603	0.535	0.473	0.419	0.366
Mali	0.971	0.969	0.942	0.924	0.906	0.861
Mauritius	0.630	0.606	0.557	0.504	0.471	0.450
Mexico	0.526	0.507	0.495	0.482	0.477	0.462
Morocco	0.913	0.898	0.843	0.790	0.727	0.671
Mozambique	0.923	0.848	0.796	0.624	0.533	0.520
Myanmar	0.839	0.793	0.677	0.592	0.531	0.501
Nepal	0.967	0.958	0.930	0.875	0.736	0.613
Netherlands	0.369	0.383	0.371	0.356	0.345	0.340
New Zealand	0.404	0.424	0.425	0.422	0.427	0.422
Nicaragua	0.635	0.599	0.566	0.541	0.506	0.490
Niger	0.988	0.987	0.969	0.942	0.925	0.905
Nigeria	0.808	0.787	0.796	0.736	0.594	0.582
Norway	0.366	0.353	0.326	0.286	0.254	0.233
Panama	0.539	0.533	0.510	0.486	0.482	0.481
Paraguay	0.457	0.458	0.464	0.446	0.450	0.443
Peru	0.612	0.572	0.530	0.491	0.455	0.448
Philippines	0.535	0.510	0.481	0.447	0.406	0.413
Portugal	0.523	0.535	0.484	0.413	0.454	0.447
Romania	0.546	0.540	0.483	0.421	0.389	0.377
Senegal	0.954	0.950	0.902	0.851	0.803	0.763
Sierra Leone	0.942	0.923	0.865	0.801	0.748	0.717
Singapore	0.669	0.568	0.582	0.544	0.495	0.472
South Africa	0.657	0.615	0.566	0.493	0.425	0.370
Spain	0.301	0.327	0.380	0.405	0.449	0.442
Sudan	0.857	0.837	0.779	0.768	0.750	0.720
Sweden	0.373	0.372	0.349	0.305	0.334	0.307
Switzerland	0.277	0.252	0.231	0.218	0.244	0.257
Syria	0.779	0.727	0.681	0.620	0.538	0.505

COUNTRY	Gini Index of Education Distribution, total population aged 15 and over, by ten-year-interval					
	1960	1970	1980	1990	2000	2010
Tanzania	0.712	0.721	0.720	0.612	0.544	0.509
Thailand	0.471	0.447	0.466	0.398	0.424	0.453
Trinidad & Tobago	0.188	0.249	0.343	0.339	0.336	0.332
Tunisia	0.912	0.848	0.768	0.711	0.642	0.611
Turkey	0.786	0.709	0.633	0.556	0.519	0.492
Uganda	0.766	0.704	0.621	0.571	0.485	0.387
United Kingdom	0.374	0.355	0.303	0.246	0.239	0.217
United States	0.416	0.381	0.354	0.337	0.303	0.323
Uruguay	0.428	0.430	0.432	0.432	0.417	0.434
Venezuela	0.584	0.549	0.521	0.538	0.531	0.525
Zambia	0.708	0.656	0.559	0.507	0.417	0.371
Zimbabwe	0.572	0.531	0.520	0.519	0.479	0.436

Sources: Authors' calculation by utilizing educational attainments data from Cohen and Soto (2011).

Table 8: Gini coefficient of education distribution, total population aged 25 and over, from Cohen-Soto dataset

COUNTRY	Gini Index of Education Distribution, Total population aged 25 and over, by ten-year-interval					
	1960	1970	1980	1990	2000	2010
Algeria	0.899	0.878	0.831	0.685	0.629	0.576
Angola	0.991	0.990	0.957	0.830	0.680	0.604
Argentina	0.412	0.410	0.425	0.414	0.421	0.420
Australia	0.391	0.423	0.416	0.385	0.266	0.243
Austria	0.397	0.330	0.258	0.184	0.203	0.182
Bangladesh	0.839	0.832	0.817	0.799	0.767	0.654
Belgium	0.388	0.408	0.422	0.416	0.410	0.392
Benin	0.936	0.936	0.922	0.893	0.853	0.800
Bolivia	0.780	0.732	0.671	0.611	0.563	0.531
Brazil	0.592	0.562	0.546	0.535	0.479	0.463
Bulgaria	0.560	0.527	0.500	0.462	0.447	0.438
Burkina Faso	0.994	0.995	0.992	0.981	0.957	0.920
Burundi	0.880	0.880	0.883	0.837	0.781	0.720
Cameroon	0.855	0.814	0.773	0.647	0.534	0.540
Canada	0.405	0.442	0.432	0.398	0.325	0.295
Central African republic	0.879	0.880	0.835	0.714	0.637	0.595
Chile	0.399	0.421	0.438	0.422	0.387	0.390
China	0.638	0.653	0.549	0.495	0.454	0.442
Colombia	0.544	0.541	0.534	0.509	0.504	0.487
Costa Rica	0.452	0.449	0.456	0.476	0.474	0.474
Cote Divoire	0.972	0.974	0.952	0.863	0.814	0.765
Cuba	0.473	0.472	0.467	0.494	0.514	0.465
Cyprus	0.513	0.484	0.435	0.423	0.428	0.429
Denmark	0.362	0.359	0.325	0.274	0.256	0.238
Dominican Republic	0.692	0.640	0.606	0.580	0.589	0.569
Ecuador	0.574	0.562	0.560	0.573	0.543	0.500

COUNTRY	Gini Index of Education Distribution, Total population aged 25 and over, by ten-year-interval					
	1960	1970	1980	1990	2000	2010
Egypt	0.956	0.936	0.895	0.755	0.684	0.578
El Salvador	0.704	0.679	0.642	0.569	0.555	0.506
Ethiopia	0.979	0.980	0.973	0.953	0.879	0.786
Fiji	0.461	0.456	0.481	0.471	0.428	0.391
Finland	0.177	0.345	0.421	0.392	0.400	0.372
France	0.275	0.380	0.427	0.402	0.421	0.396
Gabon	0.618	0.619	0.547	0.456	0.442	0.424
Germany	0.435	0.395	0.345	0.281	0.273	0.280
Ghana	0.889	0.831	0.699	0.637	0.600	0.564
Greece	0.412	0.400	0.412	0.439	0.452	0.446
Guatemala	0.790	0.755	0.713	0.646	0.553	0.492
Guyana	0.249	0.190	0.215	0.386	0.409	0.369
Haiti	0.902	0.889	0.862	0.740	0.663	0.609
Honduras	0.702	0.639	0.594	0.567	0.513	0.496
Hungary	0.382	0.360	0.327	0.291	0.252	0.222
India	0.816	0.862	0.842	0.750	0.737	0.648
Indonesia	0.796	0.662	0.594	0.524	0.480	0.457
Iran	0.958	0.937	0.890	0.797	0.687	0.585
Iraq	0.988	0.983	0.899	0.789	0.666	0.597
Ireland	0.300	0.354	0.400	0.404	0.403	0.389
Italy	0.320	0.372	0.418	0.410	0.408	0.356
Jamaica	0.309	0.235	0.316	0.390	0.416	0.406
Japan	0.385	0.320	0.283	0.276	0.274	0.270
Jordan	0.873	0.776	0.672	0.562	0.477	0.456
Kenya	0.820	0.765	0.687	0.595	0.444	0.356
Korea	0.674	0.584	0.532	0.452	0.392	0.376
Madagascar	0.691	0.692	0.686	0.621	0.547	0.480
Malawi	0.615	0.620	0.638	0.664	0.531	0.438
Malaysia	0.725	0.661	0.597	0.542	0.475	0.408

COUNTRY	Gini Index of Education Distribution, Total population aged 25 and over, by ten-year-interval					
	1960	1970	1980	1990	2000	2010
Mali	0.971	0.971	0.969	0.941	0.922	0.906
Mauritius	0.623	0.633	0.606	0.549	0.493	0.469
Mexico	0.565	0.531	0.520	0.512	0.502	0.480
Morocco	0.912	0.915	0.897	0.849	0.792	0.728
Mozambique	0.942	0.915	0.823	0.786	0.599	0.526
Myanmar	0.805	0.839	0.798	0.677	0.576	0.522
Nepal	0.961	0.969	0.959	0.928	0.871	0.726
Netherlands	0.347	0.396	0.401	0.375	0.354	0.348
New Zealand	0.392	0.430	0.445	0.436	0.433	0.418
Nicaragua	0.648	0.639	0.607	0.578	0.538	0.512
Niger	0.988	0.989	0.986	0.967	0.939	0.923
Nigeria	0.808	0.808	0.784	0.800	0.737	0.585
Norway	0.371	0.389	0.367	0.317	0.272	0.248
Panama	0.563	0.555	0.544	0.526	0.506	0.494
Paraguay	0.475	0.474	0.473	0.456	0.467	0.459
Peru	0.672	0.630	0.585	0.544	0.503	0.481
Philippines	0.594	0.545	0.516	0.488	0.453	0.451
Portugal	0.553	0.586	0.494	0.420	0.453	0.454
Romania	0.534	0.537	0.540	0.497	0.431	0.403
Senegal	0.953	0.954	0.952	0.901	0.845	0.799
Sierra Leone	0.942	0.943	0.918	0.852	0.793	0.738
Singapore	0.734	0.670	0.643	0.599	0.532	0.488
South Africa	0.682	0.658	0.611	0.536	0.499	0.462
Spain	0.308	0.296	0.328	0.390	0.457	0.454
Sudan	0.866	0.856	0.835	0.776	0.769	0.753
Sweden	0.365	0.400	0.384	0.335	0.357	0.329
Switzerland	0.322	0.296	0.268	0.243	0.238	0.252
Syria	0.806	0.775	0.731	0.696	0.611	0.541
Tanzania	0.711	0.711	0.716	0.723	0.598	0.537

COUNTRY	Gini Index of Education Distribution, Total population aged 25 and over, by ten-year-interval					
	1960	1970	1980	1990	2000	2010
Thailand	0.523	0.477	0.458	0.390	0.406	0.449
Trinidad & Tobago	0.171	0.180	0.253	0.348	0.346	0.338
Tunisia	0.939	0.916	0.858	0.795	0.714	0.651
Turkey	0.837	0.779	0.702	0.603	0.548	0.513
Uganda	0.815	0.757	0.690	0.613	0.558	0.483
United Kingdom	0.362	0.382	0.345	0.280	0.257	0.231
United States	0.445	0.422	0.387	0.350	0.320	0.326
Uruguay	0.449	0.435	0.436	0.441	0.435	0.451
Venezuela	0.623	0.593	0.557	0.557	0.544	0.530
Zambia	0.756	0.691	0.647	0.549	0.502	0.406
Zimbabwe	0.649	0.579	0.545	0.533	0.538	0.473

Sources: Authors' calculation by utilizing educational attainments data from Cohen and Soto (2011).

Figure 1: Scatterplots of bilateral correlations between independent and dependent variables

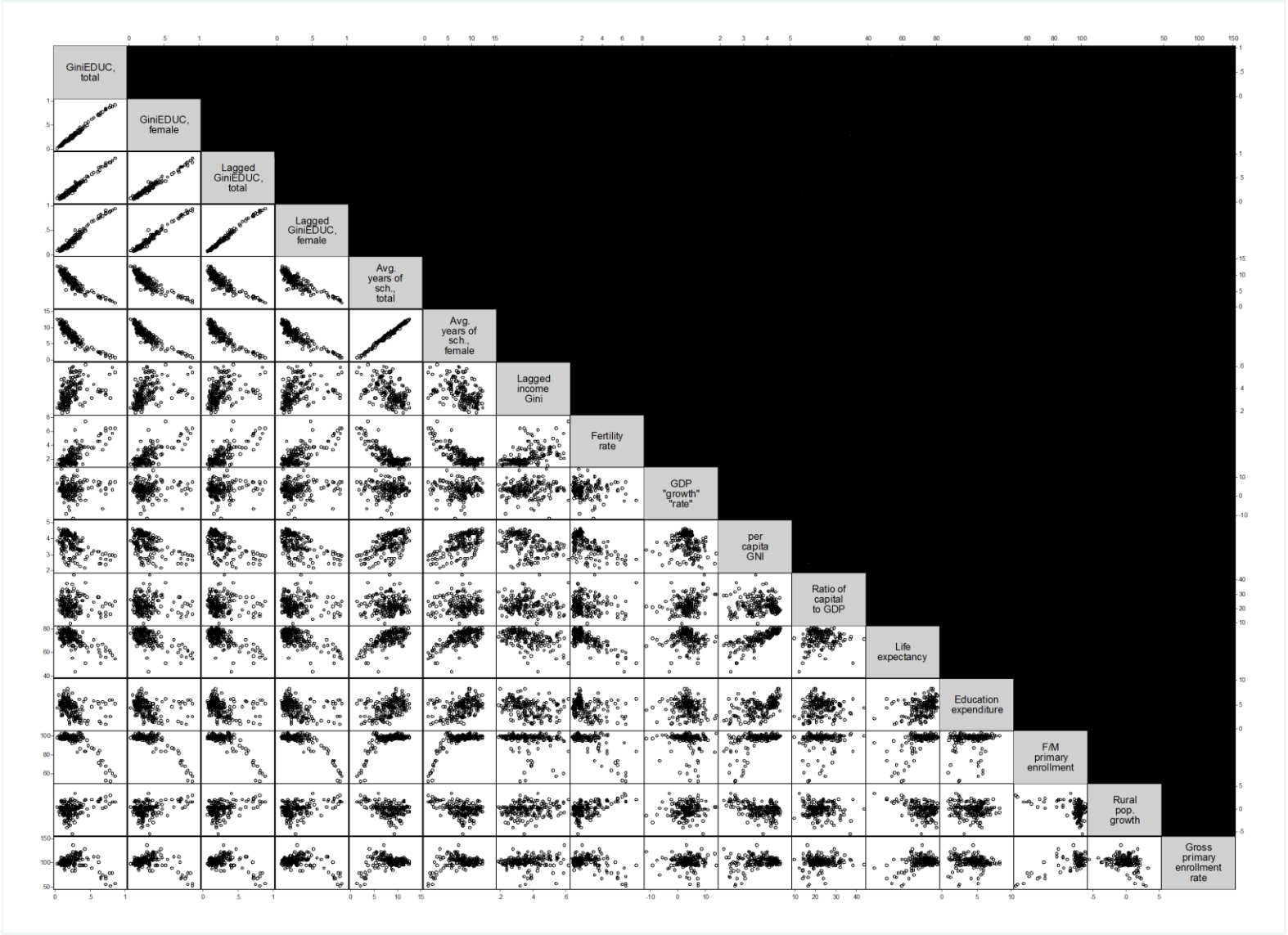

Table 9: Age structure of Thai people in year 2011

Age Range (1)	Number of Individuals		
	Male (2)	Female (3)	All (4)
0-4	**3,651** (6.0, 50.6, 2.9)	**3,563** (5.3, 49.4, 2.8)	**7,214** (5.6)
5-9	**4,105** (6.8, 51.0, 3.2)	**3,947** (5.8, 49.0, 3.1)	**8,052** (6.3)
10-14	**4,973** (8.2, 50.9, 3.9)	**4,800** (7.1, 49.1, 3.7)	**9,773** (7.6)
15-19	**4,407** (7.3, 50.8, 3.4)	**4,273** (6.3, 49.2, 3.3)	**8,680** (6.8)
20-24	**3,003** (5.0, 50.4, 2.3)	**2,952** (4.4, 49.6, 2.3)	**5,955** (4.6)
25-29	**3,517** (5.8, 47.8, 2.7)	**3,843** (5.7, 52.2, 3.0)	**7,360** (5.7)
30-34	**4,086** (6.8, 47.4, 3.2)	**4,543** (6.7, 52.6, 3.5)	**8,629** (6.7)
35-39	**4,509** (7.5, 47.3, 3.5)	**5,029** (7.4, 52.7, 3.9)	**9,538** (7.4)
40-44	**4,956** (8.2, 46.3, 3.9)	**5,754** (8.5, 53.7, 4.5)	**10,710** (8.4)
45-49	**5,137** (8.5, 46.4, 4.0)	**5,938** (8.8, 53.6, 4.6)	**11,075** (8.6)
50-54	**4,710** (7.8, 44.7, 3.7)	**5,825** (8.6, 55.3, 4.5)	**10,535** (8.2)
55-59	**3,909** (6.5, 45.2, 3.1)	**4,730** (7.0, 54.8, 3.7)	**8,639** (6.7)
60-64	**3,176** (5.3, 45.4, 2.5)	**3,824** (5.7, 54.6, 3.0)	**7,000** (5.5)
65+	**6,304** (10.4, 42.3, 4.9)	**8,607** (12.7, 57.7, 6.7)	**14,911** (11.6)
Total	**60,443** (100, 47.2, 47.2)	**67,628** (100.0, 52.8, 52.8)	**128,071** (100)

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.
Note: the numbers in parentheses in column 2 and column 3 present the percentage proportion of people which corresponding gender group, age-range group, and overall people severally. In column 4, the percentage share of people which corresponding their age group is in parentheses.

Table 10: Age structure of Thai people by region, 2011

Region	Bangkok, metropolis			Central			North			Northeast			South		
Age Range	M	F	All	M	F	All	M	F	All	M	F	All	M	F	All
0-4	153	157	**310**	992	982	**1,974**	784	736	**1,520**	1,083	1,069	**2,152**	639	619	**1,258**
5-9	192	173	**365**	1,087	1,022	**2,109**	911	867	**1,778**	1,240	1,227	**2,467**	675	658	**1,333**
10-14	227	222	**449**	1,353	1,272	**2,625**	1,082	1,055	**2,137**	1,528	1,487	**3,015**	783	764	**1,547**
15-19	261	261	**522**	1,253	1,178	**2,431**	977	881	**1,858**	1,216	1,269	**2,485**	700	684	**1,384**
20-24	280	285	**565**	897	938	**1,835**	563	494	**1,057**	722	711	**1,433**	541	524	**1,065**
25-29	293	334	**627**	1,146	1,262	**2,408**	642	732	**1,374**	818	812	**1,630**	618	703	**1,321**
30-34	313	364	**677**	1,327	1,452	**2,779**	811	830	**1,641**	1,011	1,153	**2,164**	624	744	**1,368**
35-39	330	365	**695**	1,405	1,461	**2,866**	871	1,027	**1,898**	1,239	1,407	**2,646**	664	769	**1,433**
40-44	324	382	**706**	1,448	1,700	**3,148**	1,045	1,296	**2,341**	1,374	1,565	**2,939**	765	811	**1,576**
45-49	315	347	**662**	1,383	1,673	**3,056**	1,367	1,490	**2,857**	1,417	1,620	**3,037**	655	808	**1,463**
50-54	238	323	**561**	1,270	1,563	**2,833**	1,267	1,612	**2,879**	1,318	1,554	**2,872**	617	773	**1,390**
55-59	191	257	**448**	1,013	1,324	**2,337**	1,130	1,363	**2,493**	1,072	1,250	**2,322**	503	536	**1,039**
60-64	192	201	**393**	803	1,105	**1,908**	859	963	**1,822**	916	1,108	**2,024**	406	447	**853**
65+	317	443	**760**	1,714	2,500	**4,214**	1,763	2,340	**4,103**	1,719	2,268	**3,987**	791	1,056	**1,847**
Total	3,626	4,114	**7,740**	17,091	19,432	**36,523**	14,072	15,686	**29,758**	16,673	18,500	**35,173**	8,981	9,896	**18,877**

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.
Note: F and M refer to female and male respectively

Table 11: The Gini coefficients of Thai education by Province, 2011

Region		Province	Observations			Means			Standard Deviation			The Gini coefficients		
			All	M	F	All	M	F	All	M	F	All	M	F
Central	1	Bangkok Metropolis	5,526	2510	3016	10.07	10.43	9.76	5.24	4.98	5.42	0.295	0.271	0.314
	2	Samut Prakan	1,147	541	606	8.87	9.14	8.66	4.70	4.55	4.82	0.299	0.282	0.313
	3	Nonthaburi	1,256	573	683	10.52	11.07	10.05	5.05	4.75	5.25	0.272	0.242	0.294
	4	Pathum thani	1,358	624	734	8.22	8.32	8.13	4.24	3.97	4.45	0.287	0.266	0.305
	5	Phra nakhon si ayutthaya	1,104	494	610	8.36	8.76	8.03	4.65	4.59	4.67	0.306	0.292	0.316
	6	Ang thong	945	419	526	7.37	7.85	7.00	4.51	4.44	4.53	0.329	0.310	0.341
	7	Lop buri	1,189	518	671	7.09	7.65	6.67	4.53	4.46	4.54	0.338	0.313	0.355
	8	Sing buri	1,034	450	584	7.96	8.70	7.40	4.90	4.73	4.97	0.338	0.303	0.361
	9	Chai nat	964	440	524	7.28	7.76	6.88	4.64	4.52	4.71	0.342	0.315	0.364
	10	Saraburi	895	414	481	7.91	8.50	7.41	4.54	4.51	4.52	0.318	0.296	0.333
	11	Chon buri	1,075	483	592	8.06	8.63	7.59	4.60	4.44	4.68	0.320	0.290	0.343
	12	Rayong	1,000	492	508	7.56	7.88	7.24	4.42	4.28	4.54	0.319	0.297	0.339
	13	Chanthaburi	921	420	501	7.08	7.41	6.81	4.50	4.36	4.59	0.339	0.314	0.360
	14	Trat	1,011	464	547	6.85	7.00	6.73	4.85	4.55	5.10	0.384	0.354	0.408
	15	Chachoengsao	997	452	545	7.59	8.02	7.23	4.55	4.47	4.58	0.328	0.309	0.342
	16	Prachin buri	755	332	423	7.67	8.12	7.31	4.73	4.67	4.75	0.339	0.320	0.352
	17	Nakhon nayok	880	352	528	7.39	7.79	7.12	4.61	4.36	4.76	0.336	0.307	0.355
	18	Sakaeo	1,045	472	573	6.23	6.61	5.91	4.12	3.82	4.33	0.349	0.308	0.381
	19	Ratchaburi	851	382	469	6.66	7.10	6.30	4.69	4.60	4.67	0.379	0.358	0.393
	20	Kanchanaburi	1,001	449	552	6.39	6.59	6.23	4.55	4.34	4.71	0.385	0.361	0.403
	21	Suphanburi	1,064	454	610	6.56	7.17	6.11	4.42	4.37	4.40	0.353	0.323	0.373
	22	Nakhon pathom	1,011	469	542	7.88	8.13	7.66	4.63	4.46	4.77	0.325	0.305	0.342
	23	Samut sakhon	883	412	471	6.88	6.96	6.81	4.55	4.60	4.52	0.366	0.368	0.364
	24	Samut songkhram	927	393	534	6.99	7.55	6.58	4.62	4.48	4.68	0.361	0.328	0.383
	25	Phetchaburi	1,066	483	583	7.72	7.40	7.56	4.64	4.40	4.83	0.324	0.303	0.340
	26	Prachuap khiri khan	1,155	518	637	6.97	7.40	6.63	4.60	4.50	4.65	0.359	0.336	0.377
North	27	Chiang mai	1,248	580	668	7.02	7.58	6.54	5.10	5.05	5.09	0.396	0.368	0.418
	28	Lamphun	1,383	655	728	7.06	7.50	6.67	4.67	4.66	4.66	0.357	0.342	0.368
	29	Lampang	1,619	755	864	7.20	7.73	6.74	5.00	4.94	5.01	0.380	0.355	0.340
	30	Uttaradit	1,361	615	746	7.37	7.67	7.12	4.70	4.53	4.81	0.336	0.314	0.354
	31	Phrae	1,348	623	725	7.69	7.80	7.60	4.97	4.79	5.11	0.350	0.336	0.361
	32	Nan	1,274	584	690	7.76	8.18	7.41	5.26	5.12	5.35	0.376	0.351	0.395
	33	Phayao	1,427	679	748	6.55	7.01	6.14	4.78	4.61	4.90	0.390	0.356	0.419
	34	Chiang rai	1,375	634	741	6.61	6.96	6.31	5.14	5.01	5.24	0.423	0.393	0.449

Region		Province	Observations			Means			Standard Deviation			The Gini coefficients		
			All	M	F	All	M	F	All	M	F	All	M	F
	35	Mae hong son	1,092	512	580	5.83	6.09	5.61	5.53	5.46	5.58	0.521	0.498	0.541
	36	Nakhon sawan	1,257	562	695	7.00	7.64	6.49	4.76	4.46	4.93	0.367	0.318	0.407
	37	Uthai thani	1,127	494	633	6.90	7.37	6.54	4.71	4.56	4.81	0.359	0.327	0.383
	38	Kamphang phet	1,017	444	573	6.14	6.44	5.91	4.45	4.21	4.61	0.379	0.343	0.467
	39	Tak	1,038	461	577	6.02	6.37	5.75	4.79	4.75	4.81	0.422	0.403	0.436
	40	Sukhothai	1,115	495	620	6.83	7.38	6.39	4.47	4.48	4.41	0.337	0.320	0.346
	41	Phitsanulok	1,386	615	771	7.47	7.54	7.41	4.83	4.53	5.06	0.349	0.328	0.365
	42	Phichit	1,065	455	610	6.68	7.36	6.19	4.32	4.21	4.34	0.340	0.308	0.359
	43	Phetchabun	1,169	528	641	6.44	6.92	6.05	4.54	4.46	4.57	0.364	0.338	0.384
	44	Nakhon ratchasima	1,255	572	683	7.87	8.24	7.56	4.83	4.68	4.94	0.337	0.314	0.355
	45	Buri ram	1,249	572	677	7.29	7.82	6.83	4.87	4.83	4.87	0.362	0.339	0.379
	46	Surin	1,220	546	674	7.72	8.19	7.35	5.11	5.06	5.12	0.361	0.343	0.375
	47	Si sa ket	1,101	505	596	7.39	7.64	7.18	4.64	4.60	4.67	0.336	0.326	0.344
	48	Ubon ratchathani	1,412	653	759	7.93	8.18	7.71	4.85	4.77	4.91	0.329	0.318	0.338
	49	Yasothon	1,214	572	642	7.71	8.10	7.38	4.67	4.65	4.66	0.316	0.308	0.320
	50	Chaiyaphum	1,262	567	695	6.76	7.12	6.47	4.26	4.31	4.21	0.322	0.314	0.328
	51	Amnat charoen	1,086	498	588	7.50	7.70	7.33	4.58	4.55	4.61	0.319	0.315	0.320
	52	Nong bua lam phu	1,058	495	563	6.90	7.20	6.63	4.18	4.17	4.18	0.313	0.307	0.315
Northeast	53	Khon kaen	1,324	620	704	7.75	8.21	7.35	4.73	4.73	4.70	0.324	0.311	0.333
	54	Udon thani	1,227	566	661	7.60	7.85	7.39	4.68	4.62	4.72	0.329	0.319	0.337
	55	Loei	1,277	617	660	7.20	7.55	6.88	4.58	4.59	4.56	0.338	0.327	0.347
	56	Nong khai	1,242	554	688	6.92	7.17	6.72	4.39	4.30	4.46	0.329	0.316	0.339
	57	Maha sarakham	1,150	530	620	8.56	8.99	8.20	4.96	4.86	5.01	0.315	0.300	0.325
	58	Roi et	1,467	669	798	7.94	8.28	7.65	4.77	4.73	4.78	0.320	0.310	0.326
	59	kalasin	1,482	686	796	7.66	7.93	7.43	4.52	4.52	4.52	0.309	0.304	0.312
	60	Sakon nakhon	1,373	632	741	7.79	8.07	7.55	4.66	4.59	4.72	0.319	0.309	0.327
	61	Nakhon phanom	1,164	516	648	7.60	7.99	7.29	4.74	4.62	4.81	0.334	0.317	0.346
	62	Mukdahan	1,034	491	543	7.49	7.82	7.19	4.98	4.81	5.11	0.365	0.341	0.384
	63	Nakhon si thammarat	795	367	428	7.67	7.81	7.55	4.67	4.47	4.84	0.334	0.314	0.352
	64	Krabi	780	371	409	8.69	8.97	8.43	4.75	4.61	4.86	0.306	0.290	0.319
	65	Phangnga	682	321	361	8.17	8.46	7.90	4.81	4.77	4.84	0.326	0.314	0.335
South	66	Phuket	586	257	329	9.46	9.76	9.22	4.59	4.48	4.68	0.277	0.260	0.288
	67	Surat thani	1,186	550	636	8.62	8.95	8.33	4.86	4.65	5.03	0.317	0.293	0.337
	68	Ranong	880	419	461	7.78	8.42	7.21	4.76	4.51	4.91	0.339	0.299	0.372
	69	Chumphon	879	389	490	8.02	8.22	7.86	4.59	4.38	4.74	0.319	0.299	0.332
	70	Songkhla	1,060	481	579	8.03	8.28	7.82	5.00	4.68	5.25	0.347	0.316	0.371

Region		Province	Observations			Means			Standard Deviation			The Gini coefficients		
			All	M	F	All	M	F	All	M	F	All	M	F
	71	Satun	787	379	408	7.70	8.17	7.26	4.89	4.83	4.91	0.357	0.334	0.377
	72	Trang	922	502	502	8.54	8.34	8.34	4.90	5.04	5.04	0.320	0.333	0.333
	73	Phatthalung	929	417	512	8.67	9.16	8.28	5.06	4.83	5.20	0.327	0.298	0.348
	74	Pattani	655	410	545	7.30	7.69	7.00	5.28	5.13	5.38	0.411	0.379	0.434
	75	Yala	843	390	453	7.45	7.58	7.34	5.03	4.69	5.30	0.380	0.346	0.407
	76	Narathiwat	973	452	521	7.11	7.27	6.98	5.22	4.98	5.43	0.415	0.387	0.437

Source: Author's calculations based on the Household Socioeconomic Survey, 2011.
Note: F and M refer to female and male respectively

Figure 2: the matrix correlation of the levels of educational attainment

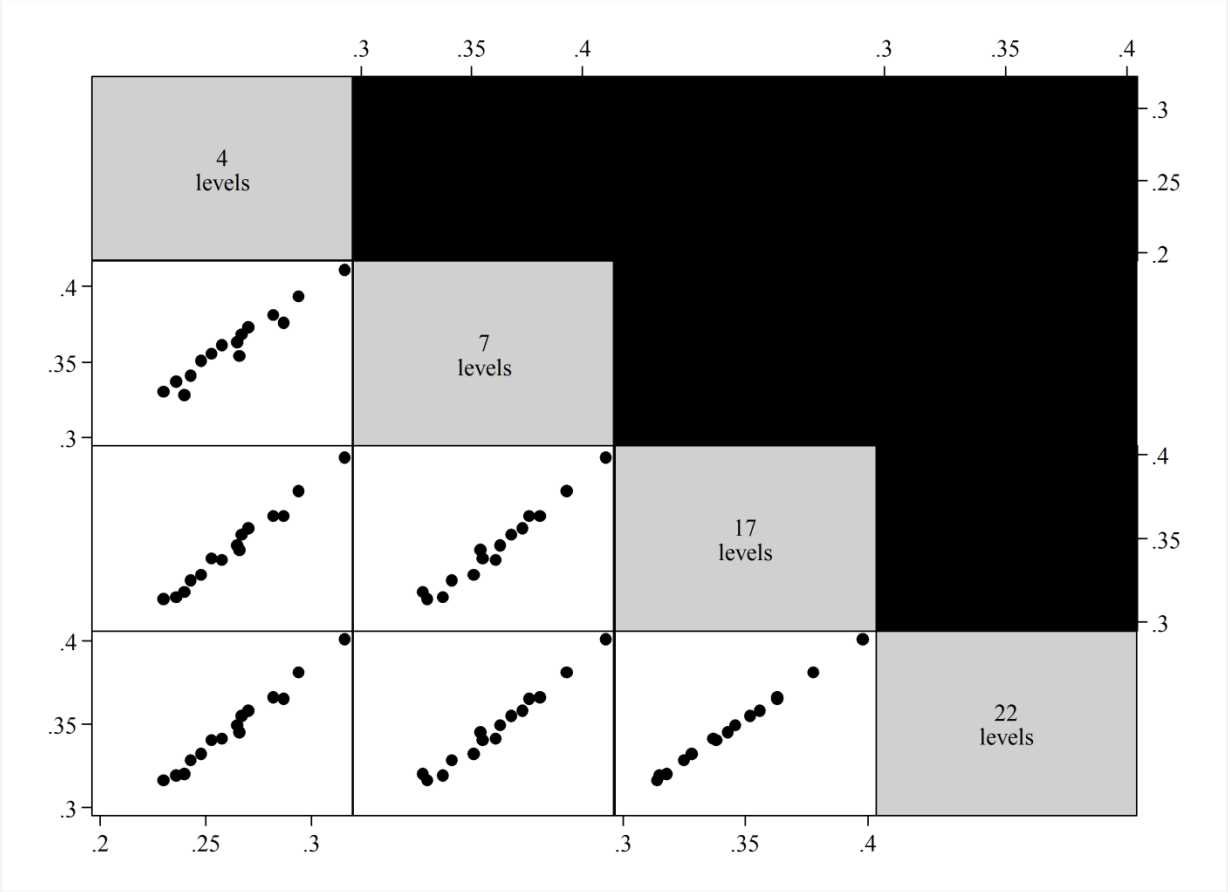

Table 12: The correlations between average years of schooling and its inequality

	$Geduc_t$	AYS_t	$Geduc_f$	AYS_f	$Geduc_m$	AYS_m
$Geduc_t$	1.0000					
AYS_t	-0.7080*	1.0000				
$Geduc_f$	0.9542*	-0.6796*	1.0000			
AYS_f	-0.6984*	0.9897*	-0.6741*	1.0000		
$Geduc_m$	0.9687*	-0.7082*	0.8779*	-0.6828*	1.0000	
AYS_m	-0.6958*	0.9796*	-0.6618*	0.9429*	-0.7175*	1.0000

Source: Author's estimations
Note: Subscripts t, f, and m refer to total, female, and male groups of Thai people.