THE INEQUALITY OF OPPORTUNITY TO PARTICIPATE IN HIGHER EDUCATION IN THAILAND

Montchai Pinitjitsamut

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สัญญาอนุญาตให้เผยแพร่วิทยานิพนธ์

ทำที่ คณะพัฒนาการเศรษฐกิจ
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สัญญาฉบับนี้ทำขึ้นระหว่าง นายมนต์ชัย พินิจจิตรสมุทร ที่อยู่เลขที่ หมู่ ถนน ตำบล อำเภอ จังหวัด ซึ่งต่อไปในสัญญานี้เรียกว่า "ผู้อนุญาต" ฝ่ายหนึ่ง กับ สถาบันบันฑิตพัฒนบริหารศาสตร์ โดย รองศาสตราจารย์ ราเชนทร์ ชินทยารังสรรค์ คณบดีคณะพัฒนาการเศรษฐกิจ สถาบันบัณฑิตพัฒนบริหารศาสตร์ ที่อยู่เลขที่ 118 หมู่ที่ 3 ถนนเสรีไทย แขวงคลองจั่น เขตบางกะปิ กรุงเทพมหานคร ซึ่งต่อไปนี้ในสัญญาเรียกว่า "ผู้รับอนุญาต" อีกฝ่ายหนึ่ง คู่สัญญาทั้งสองฝ่ายได้ตกลงทำสัญญามีข้อความดังต่อไปนี้

1. ผลงานลิขสิทธิ์

ผู้อนุญาตเป็นเจ้าของลิขสิทธิ์งานวิทยานิพนธ์เรื่อง The Inequality of Opportunity to Participate in Higher Education in Thailand. ซึ่งสร้างสรรค์โดย นายมนต์ชัย พินิจจิตรสมุทร ผู้อนุญาตรับรองว่า เป็นผู้สร้างสรรค์งานขึ้นเอง

2. เงื่อนไขการอนุญาต

ผู้อนุญาต ตกลงให้ผู้รับอนุญาตใช้สิทธิดังต่อไปนี้

2.1 ผู้รับอนุญาตมีสิทธิเผยแพร่ต่อสาธารณชน ซึ่งงานวิทยานิพนธ์ตามข้อ (1) เพื่อประโยชน์ในการวิจัย หรือศึกษา อันมิได้มีวัตถุประสงค์เพื่อหากำไร

2.2 ผู้อนุญาตอนุญาตให้ผู้รับอนุญาตใช้สิทธิตาม 2.1 เพื่อใช้ในห้องสมุด และเครือข่ายอินเตอร์เนตของห้องสมุด สถาบันบัณฑิตพัฒนบริหารศาสตร์ รวมทั้งเครือข่ายอินเตอร์เนตของโครงการพัฒนาเครือข่ายห้องสมุดในประเทศไทย (ThaiLIS)

3. การโอนสิทธิและ / หรือหน้าที่ตามสัญญานี้

ผู้อนุญาตและผู้รับอนุญาตไม่สามารถโอนสิทธิและหรือหน้าที่ ความรับผิดชอบของตนตามสัญญาฉบับนี้แก่บุคคลภายนอกได้ เว้นแต่จะได้รับความยินยอมเป็นลายลักษณ์อักษรจากอีกฝ่ายหนึ่งก่อน

4. สิทธิของเจ้าของลิขสิทธิ์

ภายใต้บังคับแห่งสัญญาฉบับนี้ ผู้อนุญาตยังคงเป็นเจ้าของลิขสิทธิ์ในงานวิทยานิพนธ์ตามสัญญานี้ทุกประการ

สัญญานี้ทำขึ้นเป็นสองฉบับมีข้อความถูกต้องครบถ้วน คู่สัญญาได้อ่านและเข้าใจข้อความในสัญญาโดยตลอดดีแล้ว จึงลงลายมือชื่อพร้อมทั้งประทับตรา (ถ้ามี) ไว้เป็นสำคัญต่อหน้าพยานและเก็บไว้ฝ่ายละหนึ่งฉบับ

ลงชื่อ .....ผู้อนุญาต
(นายมนต์ชัย พินิจจิตรสมุทร)

ลงชื่อ .....ผู้รับอนุญาต
(รองศาสตราจารย์ ราเชนทร์ ชินทยารังสรรค์)

ลงชื่อ .....พยาน
(ผู้ช่วยศาสตราจารย์ สุจิตรา ชำนิวิกย์กรณ์)

ลงชื่อ .....พยาน
(นางหทัยกาญจน์ แม็คลอลิน)

ABSTRACT

Title of Dissertation	The Inequality of Opportunity to Participate in Higher Education in Thailand
Author	Mr. Montchai Pinitjitsamut
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Previously, the understanding of changes in educational opportunity among differences households in Thailand is an undiscovered knowledge. Most studies usually focus to an enrollment rate, equality of education attendance, educational resources distribution and equality of income distribution. For the first time in Thailand, this study aims to understand the family background factors that affect participation in higher education and analyze the inequality of participation opportunity in university education. The conceptual framework employed in this study is based on the concept of educational participation which associates with the educational demand influencing by individual ability, tastes, endowment, information, socioeconomic factors and others. The relationship of probability to participate in university education and its influencing factors were analyzed through both non-parametric and parametric method by using the Labor Force Survey data set in various years. Additional framework is the concept on equality of educational opportunity in term of expected value individual probability calculating by share of university attendance and through various measures such as Gini coefficient, Lorenz curve and Atkinson index.

The empirical findings show that the distribution of participants amounted ranked by family income in kernel density distribution for university participants has longer tails to the right than that for university non-participants. It reflects those

students come from relatively high-income family decide to involve with university education more than those from low-income family. The kernel regressions present the strong relationship between university participation and family income. It expresses that the changes of family income greatly affect individual probability in 1996-1999 but lesser in 2000-2003. For probit estimation, the results reveal that family income has a strong positive influence on individuals' opportunity to participate in university education while place of residence had the most impact on the opportunity. It is found that Bangkok and urban residents have a higher probability than other region residents. Also, family size exerts a positive factor, but weak influence on. Parental schooling has no impact on their children's probability. Father's occupation as an employer has the least marginal effect on their children's probability to university education. Students from single parent homes are more likely to participate in university education than whom from married families. The findings show that the inequality of opportunity to participate in university education is improved over time but not in the beginning of the student loans policy (1996-1997). During 1998 to 2000, there is no improvement of university attendance among various family income deciles but slightly increasing in probability for some groups. The great improvement occurred during 2001 to 2003. The 40% poorest got higher opportunity to participate in university education and the rest declined. The gains from improving the inequality circumstance become lesser over time, rising from 83.27% of university attendance for all range of income deciles in 1997 to 73.94% in 2003.

This study shows the academic advancement in the study of equality of opportunity which expands to include individuals who do not participate as well. It is the first time, in Thailand, to estimate education opportunity in term of individual's probability. It is similar to many studies in Australia such as Chapman and Ryan (2005); Miller and Volker (1989) but difference in social factors. It provides the understanding on influence factors to individual opportunity to participate in university education and implies to consider more on the disadvantage groups.

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ABBREVIATIONS

Abbreviations	Equivalence
A-NET	Advanced National Educational Testing
BB	Bureau of the Budget
B-NET	Basic National Educational Testing
CHE	Commission on Higher Education
GDP	Gross Domestic Product
LFS	Labor Force Survey
MOE	Ministry of Education
NEA	National Education Act
NEDS	National Education Development Scheme
NESDB	National Economic and Social Development Board
NSO	National Statistical Office
OBEC	Office of Basic Education Commission
OEC	Office of The Education Council
ONEC	Office of National Education Commission
O-NET	Ordinary National Educational Testing
SLF	Student Loans Fund
SES	Socioeconomic Survey
WB	World Bank

CHAPTER 1

INTRODUCTION TO THE STUDY

1.1 Introduction

This study applies the model that had been used in Chapman and Ryan's study in university participation in Australia. However, the model is adjusted by adding the socioeconomic factors associated to university education in Thailand. In an analysis of the inequality of opportunity, the study extends the scope of aversion parameter in Atkinson index to verify the effect of social weighted level in details. This thesis attempts to outline the relationship between opportunity to participate in university education and family socioeconomic characteristics, including income and to examine the general pattern of inequality of opportunity to university participation across income groups with special attention given to poor families in urban and rural area. In this study, 'higher education' refers to universities and other tertiary institutions that award degrees and advanced research qualifications. Such programs in Thailand normally involve at least four years of full-time study and are designed to provide sufficient qualifications for entry to professions with high skill requirements and to research programs.

1.2 The Rationale of the Study

Higher education contributes benefits to society in term of growth, transmission of values, and the promotion of social cohesion (Barr, 2003: 322). Both national economic performance and the promotion of core values will vary across people within a country and across countries. In addition, higher education also generates social, cultural and economic benefits for both the public and individuals. In modern Thai society, higher education has four missions.

First, it selects and trains students to be competent workforce for society and labor market in order to create and retain middle and high level manpower in society. Second, higher education generates advanced knowledge as well as manpower through doing and teaching for society as a whole. These tasks also include academic services that contain the monitoring, social warning and providing alternatives for society, community and country (Office of National Education Commission (NEC), 2002: 7). Third, higher education performs as a linkage to other social systems such as agents for political socialization, economic and social developments, etc. (Wielemans, 2004 quoted in Huang, 2005: 2). Their missions will be strongly conformed to people demand and country development policy. Fourth, higher education has a mission to make their own processes and systems to be efficient and effective within the flexible manner in order to facilitate opportunities to life-long learning. This includes the preparation of the transferring among institutions such as students, knowledge, studying results, etc., by working internationally on the basis of Thai culture and society (NEC, 2002: 79).

This study aims to understand the relationship between opportunity to participate in higher education and socioeconomic characteristics of households including income. Family income is arguably the most influenced to the probability of family's members to involve in higher education and can shape the inequality structure in society. However, income is only one part of the unequal treatment of vulnerability. Another affecting factor to social opportunity is family socioeconomic factors that identify household social status.

Therefore, the comprehension on shape and characteristics of influencing factors for opportunity to participating in college education is critical to education development policy. These will make the policy clearer and more accurate, especially for university accessibility policy. The supply side policy which may not detached from demand side can be conducted efficiently and effectively.

The acceptable concept of inequality is that the inequality of opportunity brings to the inequality of social welfare and income distributions. One of the major individual opportunities is educational opportunity. Hence, looking through all levels of education, higher education closely relates to individual occupation and income which reflects family income today and in future. The improved participation also

contributes to equity that refers to equality of opportunity. It also contributes to efficiency to the extent that it minimizes the waste of talent (Barr, 2003: 322).

1.3 The Objectives of the Study

The main purpose of the study is to present an empirical pattern of the relationship between opportunity in university participation and family income, including socioeconomics factors. In addition, the study seeks to examine the contemporary educational equity in Thailand by using the predicted probability to participate in university education.

In order to understand such equity,[1] basically, the necessary, general relationship between the probability, households' income and socioeconomics factors should be recognized. Thus, the first operational objective of thesis is to collect the relevant datasets to be analyzed by econometric models and identify the relationship among probability to participate in university education, household income and household socioeconomic factors.

The second objective is to find out the level of inequality in educational opportunity over time through applicable various measures, namely, Gini coefficients, Lorenz curves, Variance, Coefficients of the Variance and Atkinson index. This is for better understanding of the roots, shape, and characteristics of higher educational inequality and its changes over time. These operational objectives are summarized below.

1. To examine the relationship between the opportunity to participate in higher education of household members and their socioeconomic characteristics including family income.

2. To examine the opportunity to participate in higher education of the low-income families and its changes overtime.

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[1] The equity is interchangeable term with "equality" especially in the meaning on equality of opportunity (Psacharopoulos and Woodhall, 1985: 252).

1.4 Significance of the Study

Three points make this study significant. First, this study is the first attempt made by social science researchers to study factors that influence the probability to participate in university education and examine the inequality of opportunity to involve with university education in Thailand. Second, this thesis discusses the dominance of family attributes and income on participation opportunity to involve with university education. It is to confirm that socioeconomic characteristics are additional significant factors to family income. This discovery gives us the guideline to facilitate the non-participation issue of talented students, encourages less social intuition wastes, and reduces the inequality of educational opportunity among different households. Third, the thesis provides the understanding of the changes in the inequality of opportunity in university education among various family incomes over time, including the period of student loans policy. Such policy aims at raising the possibility for low income families to get involved with higher education. The implementation of policy might affect individual's probability and the equality of opportunity to university participation.

1.5 Scope and Limitations of the Study

The empirical study is carried out on higher education in Thailand. Here, higher education is defined as a university education at baccalaureate level for an average four years of study. Note that certain disciplines such as medicines, pharmacy, and dentistry requires 5 years or higher for degree completion. The secondary data, Labor Force Survey of various years are used in this thesis. The statistical and empirical results will present pictures and patterns of changes in that time.

1.6 Organization of the Study

The first Chapter introduces the study by outlining the rationale, research objectives, and limitations of the study. Chapter 2 reviews the literature related to the thesis issues. Chapter 3 deals with theoretical issues and presents the conceptual framework of the study. Chapters 4 details Thai education system. Chapter 5 describes datasets and methodology employed. Chapter 6 discusses the empirical results from both non-parametric and parametric methods. This chapter analyzes the effect of family income and socioeconomic factors on the probability to participate in university education. The inequality of opportunity to participate in higher education is illustrated by Lorenz curves of various years and expressed in many different measures, namely, Gini coefficient, Variance, Coefficient of the Variance, and Atkinson index. Also, an analysis on its changes over time would be carried out. The conclusion is organized in Chapter 7. It includes a summary and discussion of the main research results.

CHAPTER 2

LITERATURE REVIEW

This chapter comprises the reviews of two interrelated issues: 1) the effect of family income and socioeconomic background on educational opportunity and 2) the inequality of educational opportunity.

Many studies present the effect of family income and personal characteristics on students' educational opportunity (Li, 2007: 724-734; Canton and Blom, 2004: 1-46; Miller and Volker, 1989: 47-70). These researches have tried to investigate the issues of participation and access to education in different aspects such as parental education attainment, ethnic, father occupations, number of siblings and others. The study of Ermisch and Francesconi (2001: 137-156) is based on the first seven waves of the British Household Panel Study (BHPS). A wide range of explanatory variables is used, parents' education, income and family structure and using the measures of background factors and child's behavior throughout childhood in the National Child Development Study (NCDS). This dataset is analyzed by using the ordered logit model and analyzed in two models; with 25 and 39 variables.

The findings of this study are the significant relationship between family income and their children's educational attainment by showing that the young adults whose parents are in the bottom quartile of the family income distribution have lower educational attainments. This findings is similar to others studies (Gregg and Machin, 1998 quoted in Ermisch and Francesconi, 2001: 151; Blundell, Dearden, Goodman and Reed, 1997 quoted in Ermisch and Francesconi, 2001: 151; Haveman and Wolf, 1994 quoted in Ermisch and Francesconi, 2001: 151) showing the positive income effects on children's education. These findings are consistent in Huang (2005: 10) which present that the parent's educational attainments, occupations and family income have been reported as factors with strong and positive influences in students' deciding and eventually attending higher education.

Evidently, the low income family may face the problem of money shortage to invest and limit their educational opportunity, even when the rate of return is high positive and no constraint in ability and taste. Moreover, the effect of low-income family may reflect the poor capacity to absorb financial risk such that they may be unwilling to borrow even if they can (Barr, 2003: 327) or financial institutions do not provide the loans for students especially who are from low-income families due to higher risk. The findings in Ermisch and Francesconi (2001: 146) show the negative impact of being from a family that experienced financial difficulties in early or late childhood. Therefore, the financial aids program may alleviate this problem and contribute to more student enrollment, such as a 24 % increases in chance to enroll in tertiary level (Canton and Blom, 2004: 16) and perhaps offsets the adverse effect of short-term financial barriers to some degree (Li, 2007: 734).

Similarly, the analysis of the changes of student loans in Australia (HECS) by using the longitudinal panel of data in 1988, 1993, 1999 and both non-parametric and parametric approaches, shows the little impact on the changes of total university participation and its distribution and present the positive relationship between university participation and levels of income in all years but differ in gender (Chapman and Ryan, 2005: 491-512). The study does not express the relationship between education participation and other influencing factors that govern individual opportunity such as family background or socioeconomic status.

However, in Thailand, the analysis in Somkiat and Areeya (2008: 1-38) shows the insignificant influence of Thai's student loan fund on the decisions of high school students to continue their studies to a higher level, except for the poorest group.

In Thailand, The effect of family income on individuals' opportunity to involve in education may be reflected by the evident that "the average family incomes of university students usually greater than that of the general population by 5 to 7 times, and up to 10 to 20 times higher than farming and working-class families" (Sirilaksana Khoman, 1993: 333). This presents the greatly difference on family income between university participants and non-participants. However, the students from lowest income families may not reach university education and they leave school after completing compulsory education. It may be rooted from the shortage of money and their family needs their earnings (Direk Patamasiriwat, 2008). Besides, it reflects

that the family income can contribute to student's opportunity to participate in education through the pattern of their family educational expenditures. This implies that the family income is positive associated to educational expenditures and their children's chance to continue their education. Likewise, Taubman (1989: 58) also presents the positive relationship of family income and educational expenditure that increases until the marginal return on schooling falls below the return on financial assets.

The study of Chaiyuth Punyasavatsut, Dow Mongkolsmai, Plearnpit Satsanguan and Sirilaksana Khoman (2005: 3-14), presents the findings, based on Socio-economic Survey 2002, that higher-income households spend much greater amounts on educational expenditure, tuition and fees, than poorer households, whether in terms of the absolute amount of expenditure or the percentage of total expenditure. The poorest households have to spend more than 9 % of their total expenditure on books and still their spending of 41 baht is only 26 % of the richest group's spending of 156 baht per household per month. A similar pattern is seen in educational supplies.

Another study of the effect of educational expenditure on Thai youth (Virote Na-ranong, Anchana Na-ranong and Atthakit Lekvilize, 2006: 1-77) presents the relationship of educational probability to involve with lower secondary (M1) or upper secondary school (M4) and socioeconomic characteristics of individuals, e.g. fathers' age, father's education attainment, parental occupation, future expectation and place of residence. The study also utilizes the probit estimation to find out the level of this relationship. The factors that impact on the decision to continue student's education from lower to upper secondary school are family education expenses, number of children in household, students' age and parental education attainment. But, the family income per head is nearly statistical insignificant. However, the finding also presents that higher educational expenditure inversely affects student's probability to continue their education more for the poor than the rich. Also, the greater more number of children affects to the poor more than the rich.

The lower family income, the lesser the family spends on their children's educational expenditures. So, the family income may affect student's decision to continue their study further. However, as results of previous studies, the effects of

family financial status, including their ability to access the loans on individual opportunity to participate in education are still unclear for Thailand.

The influencing factors to university education are not just the family income but family characteristics or socioeconomic background, attitudes, lack of information, debt averse and limits on the size of loans as well (Taubman, 1989: 60; Barr, 2003: 132; Canton and Blom, 2004: 31). The family background can be expressed differently. The study of Ermisch and Francesconi (2001: 137) defines it as parents' education and income, gender, family structure, ethnic, parents' age, number of brother and sisters; while, parent's education, family size, place of residence, father occupation and ethnic are widely use in many studies.

Le and Miller (2004b: 39-65) examine the factors of socioeconomic, family, and institutional factors that influenced the decision to invest in education, using the data set from Australian Bureau of Statistics during 1960 to 1980. By applying the logit estimation on Year 12 completion in each age cohort, the study reports that the major factors affecting school-leaving decisions are students' ability, school-type and family background. The findings show that the parents' education can influence the children's school-leaving decisions by associating to social status, parental income and also indirect affect as a role model, provide more encouragement and parent's attitudes and tastes for children's education.

For the difference in gender, the analyses show that females have higher probabilities of completing Year 12 than males. It implies that the gender affects educational opportunity in Australia but not in Thailand. It may found small disparity of access to education between males and females (Sirilaksana Khoman, 1993: 326).

The study of Ermisch and Francesconi (2001: 146) also presents the significant gradient between each parent's educational attainment and their children's educational attainment. Moreover, they express that mother's education has a stronger association with her child's educational attainments than the education of the father and the higher level of education such as university level makes the effect much stronger. The findings of Li (2007: 730) express that parental education is an important long-run factor which strongly and positively correlated with higher education attendance of students. This study also presents that the enrollment level of students whose parents attained college education or above at high and medium

quality universities is higher than those students whose parents have a high school education or below. For example, at elite universities, there is a 50.4% gap in attendance probabilities between those students whose mother has a college education and those students whose mother only has a junior middle school education. These findings are in the same way as Miller and Volker (1989: 54) which exhibit that children whose parents possess a university degree apparently place a premium upon completing high school. It is noted that the net impact of the mother possessing a university degree is greater than that of the father having a similar level of qualification (27% and 19%). Note that both previous studies use the parental education variables in terms of dummy variables with 2-3 limited choices. It may be better and provide larger information if it is used in term of years of schooling. Another point is the previous studies, Ermisch and Francesconi (2001: 137-156); Miller and Volker (1989: 47-70), present that the mother's education has greater impact on children's education than that of father. It indicates that mother take a major role on promoting their children education through various activities and more education for females is more important than that for males.

Well-educated parents may better prepare their children and better know how to help their children identify the relationship between learning and future aspiration and help their children's work toward their future aspiration (Li, 2007: 731). That may facilitate their offsprings to get a better chance to involve with university education. The parental education variables may capture differences in attitudes and tastes toward their children education (Le and Miller, 2004b: 39).

For the characteristics on family size, having more members which mean the large family size reduces students' education attainment and opportunity (Ermisch and Francesconi, 2001: 144; Miller and Volker, 1989: 56). The larger family size, the more likely that individuals would decide to leave school (Le and Miller, 2004b: 52). This negative impact arises because of the dilution effect of educational expenditure per child. There is some evidence that scarcity of resources both money and time in larger families may lower educational attainments (Micklewright, 1989 quoted in Ermisch and Francesconi, 2001: 151; Blundell et al., 1997 quoted in Ermisch and Francesconi, 2001: 151).

For the place of residence, it reflects the supply of educational resources which may be distributed unequally among students in different regions. The study of Corcoran, Jencks and Olneck (1976: 430-435), finds that children's life chance in the U.S., including educational opportunity, is believed to improve if children live in the North rather than the South, living in an urban area rather than on a farm. Moreover, the places of residence also refer to the quality and quantity of school in various regions and areas as well. For Thailand, the education statistic in 1986 show that of the 2,923 private secondary schools, almost half (1,040) are located in Bangkok, and of the 894 municipal schools, 427, are in Bangkok (Sirilaksana Khoman, 1993: 327). In general, students who live in rural areas will go to cities or Bangkok for school may face higher cost of living than urban students who have their own house (Direk Patamasiriwat, 2008: 9). This implies that Bangkok students may get higher educational opportunity than other students.

For father's occupation status, Miller and Volker (1989: 144) find that father's occupation status is a key determination of education retention. The results present the likelihood of high school graduation of their children by about 7%. It is found that the 30% difference in predicted probability of high school completion for their children (males) whose fathers work as blue collar workers (in textile factories) and professionals (dentists). Another similar study also presents the prestigious occupation of parents enhance their children' chance, especially in education, (Corcoran et al., 1976: 430). However, this study also presents the effect of family marital status on children's chances. The findings expresses that the status of being separated or divorced have negative impact to their children's educational opportunity.

The study of Ermisch and Francesconi (2001: 137-156) also shows a strongly negative association between experience of a single-parent family and educational attainment. It found that the parent's education has a causal impact on child's education. However, in the study of Miller and Volker (1989: 47-70), there is not exactly a marital status variable. Instead, it is a variable, "Family structure at Age 14", and it takes 3 different values: live with both mother and father, live with mother only, and live with father only. The findings show the children's education opportunity is greater when they live with one parent, mother or father. This result is consistent with Virote, et al., (2006: 35).

Ethnicity and father birth place may relate to students educational opportunity. The findings in the study of Miller and Volker (1989: 47-70) describe that the socioeconomic background including father birth place, is found to be an important influence on furthering education decision, a result consistent with previous research. Compared to second - generation Australians, students whose fathers were born in Mediterranean countries appear much more likely to continue on school than other groups. This result is important in the wider context: a father of older age groups is that immigrants from the Mediterranean have average levels of educational attainment and hence average earnings considerably lower than other groups. Students whose fathers were born in Asia have a much higher probability of acquiring more education beyond high school. This evidence on migrant educational achievement is consistent with well-known study of Birrell and Seitz (1986 quoted in Miller and Volker, 1989: 54) on Monash University enrollment data. Children whose parents possess a university degree apparently place a premium upon completing high school. Moreover, ethnicity affects the education attainments for the young adults with Indian or Chinese parents and show the significantly higher educational attainments than others (Ermisch and Francesconi, 2001: 143).

The concept on equality of opportunity has been developed for many years in Western democracies. However, it is defined into two different ways: equity and equality. The equity is not only referred to the distribution or sharing of resources among individuals or groups, but it is also tied up with the notion of justice. Any determination of equity must therefore be based on facts about how resources are distributed and on normative judgments about how society should distribute resources. The equality may used interchangeable to equity, particularly in discussions about the distribution of educational opportunities (Psacharopoulos and Woodhall, 1985: 252).

The equality of opportunity is usually presented in the notion of fairness (Rawls, 1973: 11-14) which conceptually means the right of different groups of people to have a similar social position and receive the same treatment or everyone is treated fairly and equally. These are the equality in the assignment of basic rights and duties given that social and economic are inequalities (Rawls, 1973: 14-15). Similarly, the equality of opportunity is expressed as “level the playing field” among individuals

who compete for positions be admissible to pools of candidates competing for positions and “nondiscrimination” principle states that the decision are judged only with respect to those relevant attributes and not with other such as race, gender, social and income status, place of residence (Roemer, 1998: 4).

A frequency distribution of opportunity which is usually measured similarly to the distribution of income can also be described in terms of quartiles, quintiles, deciles or percentiles. These measures are used to compare the relative share going to specific groups, say, the top deciles or the bottom quintiles. The most commonly used measures of distribution are the representation index, the curve of concentration or Lorenz curve and Gini coefficient (Psacharopoulos and Woodhall, 1985: 255). Identically, Chapman and Ryan (2005: 503) also utilize Lorenz curves, Gini coefficient, Atkinson index (with aversion parameter: 0.5, 1.0 and 2.0) and the percentile ratio to examine the distribution of university participation proportion and its changes over time. The study describes the Higher Education Contribution Scheme (HECS), Australia’s income-contingent charge mechanism, and analyzes its impact on the social composition of university participation by using panel data on 1988 young Australians cohorts (prior to HECS), 1993 and 1999. The findings show that the higher parameter values, the greater value of Atkinson index and inequality. The index in 1999 is less than those in 1988 and 1993. It reflects that the inequality of university participation being calculated from individual probability value has improved. Gini coefficient and other measures also share the same direction.

The findings show that participation in the middle of the income distribution has increased relative to both the top and the bottom. Then, it is more unequally distributed in 1993 comparing to 1988 which is prior to HECS. However, the distribution in 1999 present equally distributed than it has been prior to the introduction of HECS. It is unclear to conclude the effect of HECS on enhancing the equality of education participation among different income levels.

However, Atkinson index in this study uses only three levels which may not be suitable for analyzing the level of inequality, especially when the society changes its preferences of inequality of opportunity. The lack of the outcomes when the parameter varies is another issue that should be considered. Based on an assumption that proportion of university participation reflects social welfare, it needs to show that

how sensitive Atkinson index is when the society weights more to the lowest income families.

The study of educational opportunity may use the other measure such as Selectivity Index. As presented in Sirilaksana Khoman (1993: 332), the index is used to present the ratio of university students from professional and commercial background to total student population. The study states that a value of one for the Selectivity Index would roughly indicate equality of access, i.e., that the proportion of the student population from a particular background corresponds to the proportion of that occupational category in the total population, an index value above one indicates over-representation and below one under-representation. The findings show that Selectivity Index in 1993, are 8.93, 5.05, 0.16, 0.12 for fathers who are professionals, businessmen, farmers and production workers, respectively.

The study also shows the weakness of this index that it ignores some factors, such as family sizes and age structures, but the magnitude of the index still indicate that differential access is a major consideration.

The study of Sirilaksana Khoman and Sakon Varanyuwatana (1990: 33) uses the ratios and measures to explain the inequality of educational opportunity in Thailand. The study presents that the educational inequality in university participation is rooted from the problem of inequality of education access at the lower level of education such as secondary and primary level. The findings show that the gross enrollment rate for lower secondary education are 67.2% in Bangkok and 34.5% in other regions while for upper secondary level are 22.9% in Bangkok and 8.5% in other regions. This research also presents the inequality apparently expressed in the number of schools and school quality. It is found that most institutions located in Bangkok by using the number of university, teacher-student ratio, and educational budget per student to identify the school quality and presents the inequality of education provision is presented among regions. The inequality of access to university education is evidently seen by the concentration of university students in Bangkok (85%) and 30% of students enrolled in regional universities are from Bangkok. Most students who pass the entrance examination and get into university are from secondary schools in Bangkok. This study, Sirilaksana Khoman and Sakon Varanyuwatana (1990: 11), also presents the disadvantages of rural children. The

inequality at the low level of education is a major factor in creating unequal university participation. Rural students are likely to leave school more than urban students.

Regarding quality of education, Sukanya Nitungkorn and Chitra Vutisart, 1980 quoted in Sirilakana Khoman and Sakon Varanyuwatana (1990: 11) notice that the high-educated parents are able to seek the education input for their children more than that low-educated parents. Chalongphop Susangkarn, (1987 quoted in Sirilaksana Khoman and Sakon Varanyuwatana, 1990: 12) states that the children in households with independent works in informal sector are unlikely to continue their study because their net expected future benefit is low.

Sewell (1971: 794-797) presents the outcome of his study on inequality of opportunity in higher education, in the U.S. society. The study uses a longitudinal data of approximately 9,000 randomly selected Wisconsin high school students who have been successfully followed since their high school years in 1957. The findings present enormous differences in educational opportunities among various socioeconomic groups and between gender. The research results show that a high socioeconomic (SES) student has almost a 2.5 times more chance relative to low SES student of continuing in some kind of post-high school education. In addition, the lower the SES group, the more limited the opportunities at each higher level of education. In addition, the educational chances of males are uniformly greater than those of females at every SES level. This study reveals still other inequalities suffered by students from low SES groups in their quest for higher education.

Huang (2005: 87-89) studies the inequality of university education participation in China by comparing the ratio of student from urban and rural areas, gender distribution and region of origin. The findings show that rural girls make only 22% of the female students in the sample while rural boys represent 44% of the male students. This implies that boys' access to higher education is less influenced by their geographic origins than that of girls. She also compares by father's and mother's education attainment and ethnicity in both urban and rural areas. The results show the great inequality among these groups.

From 2002 SES, the study of Chaiyuth, et al., (2005: 3-14) presents that high-income households spend much greater amounts on education than poorer households, whether the absolute term or percentage term (of total expenditure). Education

expenditures still are determined by the socioeconomic characteristics and high-income households will continue to spend more on education than lower-income households, so do more educated and professional household heads.

Even though the findings present a large inequality of access to education occurring in the country, it takes into account on the demographics of households. For example, large expenditure can merely reflect a large number of children or an age structure is concentrated in relatively higher expenditure levels of education. By using benefit incidence analysis, the inequality of educational opportunity is analyzed through the distribution of public expenditures on education across income groups. The estimation of education benefits incidence is carried out at each level and for each type of education. Furthermore, the study analyzes the role of household spending on public education in terms of incurred expenses to gain access to this education. The analysis is conducted by calculating the amount of subsidies received, number of children, aggregate government spending and total of students for each groups of households and education levels. The concentration curves (or Lorenz curves) for all education levels are constructed on the cumulative shares of education spending against the cumulative share of population ranked by the per-capita income. The findings show that the pre-primary and primary level subsidies are well distributed and targeted. It implies that the poorest gain almost equally to the better off, the secondary level subsidy not progressively distributed in both years and the tertiary level subsidy is not well targeted and slightly distributed. About 60% of education spending in this level go to the last decile group in both years and the overall public spending on education in 2000 and 2002 are not distributed proportionately across the population. The benefit incidence of public educational spending is being pro-rich to some extent. The total subsidy concentration curve lies above the Lorenz curve implies that the subsidy helps closing the relative gap between the rich and the poor.

However, this methodology needs many assumptions such as total government spending on education is taken as the benefit that individuals or households receive and unit subsidy could be valued differently by individuals according their differential accesses to services.

In Thailand, previous studies mostly emphasize on the access to education and the equality of resource distribution. The educational opportunity is presented through

the comparison of received educational resource among individuals. Only study directly associates to the educational opportunity and family background, but focuses at secondary school (Virote et al., 2006). In Thailand, at present, it lacks the study on educational opportunity at university level and founds a few studies applying the measures on income distribution to the educational opportunity distribution.

By using Chapman and Ryan's model in university participation, the study is conducted by adding the socioeconomic factors associated to university education in Thailand. In an analysis of the inequality of opportunity, the study utilizes a number measures in income distribution study. Moreover, the aversion parameter in Atkinson index is extended into five levels in order to verify the effect of social weighted level on inequality and lastly, analyzes the changes in social welfare over time.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1 The Concept on Access and Participation to Education

The meaning of access to education is obviously far different to participation of education. Concept of access to education is mainly on the provision for people accessibility to education by means of resource distribution to each relevant part such as rural areas. On the other hand, it illustrates that the conception of access to education mainly consider on the distributive educational resources such as schools, teachers, budget, books, etc (Psacharopoulos and Woodhall, 1985: 112) to facilitate for easier education accessibility.

In contrast, the conception of participation concerning demand side associated with individual demand and choices. The demand for education is presided over by many factors such as education fee, family income, earnings forgone and other direct costs. Also important constituents are gender, region, expected private benefit in the form of increased lifetime earnings, the level of personal disposal income, and unemployment rates (Psacharopoulos and Woodhall, 1985: 112, 252). Therefore, the demand for education measured in years of schooling depends on both external factors, e.g., school quality, social status and internal factors, e.g., individual abilities, tastes and other personal attributes.

Because the conception of access to education relates only on supply side, most policies target at people accessibility by expanding the education system and distribution of resources. Government policy in some countries may be concerned with reducing inequalities of access and thus may opt for building schools in remote areas or reducing fees to remove financial barriers for those who cannot afford to enroll (Psacharopoulos and Woodhall, 1985: 252). This policy achievement can be measured in term that related to target group of people who already pay for education such as student enrollment ratio, resource distribution rate or budget allocation ratio.

The policy for raising equality of opportunity among people regardless of their socioeconomic factors, will target on individuals who determine not to participate in some specific level of education, for example, university or upper secondary education. Therefore, this policy which is chosen to promote an equality of opportunity to participate in education will be wider than policy for accessibility of education that is simply concerned with removing barriers, because it seeks to increase participation by changing some factors that governs private demands. (Psacharopoulos and Woodhall, 1985: 252).

3.2 The Concept on Equality of Opportunity

The concept of equality of opportunity was widely accepted as a principle of justice which especially be referred as a notion of fairness. Rawls (1973: 14-15) proposed his conceptual idea on 'Justice as Fairness' by expressing two different doctrines: the first requires equality in the assignment of basic rights and duties which mean that each person is to have an equal right to most extensive basic liberty compatible with similar liberty for others, and the second holds that social and economic inequalities, for example, inequalities of income and authority, are to be arranged to ensure that they are both reasonably expected to be to everyone's advantage, and attached to positions and offices open to all.

Similarly, by Roemer (1998: 1), the equality of opportunity is expressed on economic concept with two core principles; "the level of playing field" and "nondiscrimination." The level of playing field states that the society should encourage equality among individuals who compete for positions. However, this principle accepts the variety of personal natural abilities. So that, all those with relevant potentials or abilities will be admissible to candidate pool competing for positions. The other, nondiscrimination principle, states that those individuals' possible occupancy of the position be judged only with respect to those relevant attributes regardless of race, religion, gender, social status, income status and education level.

Indeed, the conception of equality of opportunity is still elusive and complex in practice. The genuine equality of opportunity may be difficult to observe but the inequality of opportunity can be simply identified. Okun (1980: 2) expresses the

inequality of opportunity which does arise may cause concerns for two reasons. First, even if individuals start equally placed, there may be differences of outcome which is called 'casino[1]'. Second, individuals have differing initial advantages, arising from natural abilities, family background, or other factors.

Klapplotz (1972: 246) proposed two concepts of equality of opportunity. The first concept is based on the view of conveying the expression of an ethical judgment. It may treat and affirm that men are very similar in their natural endowments of character and intelligence. In this sense, the assertion of human equality is clearly impossible. The second concept is based on the state of fact. It asserts that while people differ profoundly in capacity and character, they are equally entitled as human. The well-being of a society is likely to increase if it is planned. Therefore, whether their powers are great or small, all its members may be equally enabled to make the best of such powers as they possess.

These two principles provide the framework for individual equality of opportunity. It implies that the equality of opportunity is not basically as the distributive justice or resources, but it is considered in context of personal accessibility such as to occupations and education. Therefore, equality of opportunity is rooted in the notion of fair race where people are even at the starting line; however, it's hard to find that line. Also, the dissimilarity in natural abilities is generally accepted as relevant characteristics that are being tested in the race rather than as unfair head starts and handicaps. (Okun, 1980: 22).

Additionally, the conception on human equality may be presented through the dissimilarity of personal income. Barr (2003: 135) presents that the individual's income depends on three sets of factors: his endowments such as human capital or inherited income, his tastes with respect to work and leisure, consumption, saving, risk and etc.; and his luck since outcomes have a stochastic element. Therefore, two persons with identical tastes and opportunity sets may experience very different outcomes, (Barr, 2003: 135), but it does not imply inequality of opportunity.

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[1] It means the situation that people try to maximize own benefit or to win money in games, but actually they may get greatly different outcomes.

Finally, another points of inequality is accepted that family factors may create the inequality of opportunity. Two major factors are inherence of natural ability and the advantage of a family position which are on each side of line of inequality (Okun, 1980: 22). However, family factors that be regarded as an origin of inequality of opportunity, should be considered and determined. Therefore, the boundary on this concept still has an indefinite boundary, even though in some specific areas are clearly evident. For example, sexual discrimination in jobs argues obvious cases of inequality of opportunity.

3.3 The Framework of Equality of Opportunity

Equality of opportunity can be defined in a number of ways. One, it is equality of full income – both of money income and income in kind; two, equality of public expenditure – the per capita of public expenditure; three, equality of access e.g. equal years of schooling; four, equality of cost - everyone faces the same cost of using the public service such as health service or education; five, equality of outcome such as everyone receive the same education subsidy from public service (Le Grand, 1982 quoted in Barr, 2003: 134).

According to the classic essay (Tawney, 1964 quoted in Atkinson, 1983b: 78), the equality of opportunity is defined as the circumstances that, in so far as, and only in so far as, each member of a community, whatever his birth, or occupation, or social position, possess in fact, and not merely in form, get equal chances of using to the full his natural endowments of physique, of character, and of intelligence. In addition, Tawney (1980: 12) also clearly expressed that 'the equality which all these thinkers emphasize as desirable is not equality of capacity or attainment, but of circumstances, institutions, and manner of life. The inequality which they deplore is not inequality of personal gifts, but of the social and economic environment. They are concerned, not with biological phenomenon but with a spiritual relation and the conduct to be based on it. They view, in short, is that, because men and men, social institutions – property rights, and the organization of industry, as far as is possible, to emphasize and strengthen, not the class differences which divide, but the common humanity which unites, them.'

Generally, inequality of opportunity is used in the meaning of situation that lack of certain opportunities or unfairness and should be remedied. Situation of unfairness require the re-distribution of resources. The equality of opportunity in this meaning reflects that all people have equal amount of opportunity. No man has a greater right to fuller opportunity than another man and no man. If all men have a right to full opportunity the scarcity must be abolished, but the demand is relevant only if opportunities are scarce and its fulfillment requires some rule of equality for the distribution these opportunity. (Klappholz, 1972: 247)

By using the concept of full income which consists of money income and non-money income such as housing, food, value of own production, etc. may be defined as a measure of an individuals' opportunity sets. For given prices, the opportunity set measures the individual's potential consumption, including leisure. (Barr, 2003: 122) The individuals are equal if they face identical opportunity sets or face the same full income. Thus, the equality of opportunity can be defined in terms of income or using money income as a proxy, which captures all aspects of the individual opportunity set. To define the equality of opportunity in term of money, three steps are needed as shown below (Barr, 2003: 135).

Firstly, equality of opportunity exists if

$$Y_f = K \text{ for all i} , \qquad \text{i=1, 2, 3, …, N} \qquad (3.1)$$

where Y_f is money income with time dimension. This equation states the money income should be the same for all N individuals, but opportunity usually be perceived as expected value instead of real term. Then, with taking into account the stochastic component, equality of opportunity implies equal chances of people who may differ in choices and should be calculated as an expected value, as

$$E[Y_f | C_i] = K_i \text{ for all i} , \qquad \text{i=1, 2, 3, …, N} \qquad (3.2)$$

Finally, with considering people choice, C_i

$$E[Y_f | C_i] = K_i \quad \text{for all } D_i \,, \tag{3.3}$$

where C_i is a choice characteristics and D_i is discrimination characteristics. Equation (3.3) shows that the variance of income due to different in personal choice, C_i , is not counted as inequality. However, two persons with identical choice should have the same expected value of income. This means that D_i characteristics may not influence the money income.

However, an individual's income depends on three sets of factors. (1) his endowments, e.g., human capital or inherited income; (2) his tastes with respect to work and leisure, consumption and saving, risk, etc., (3) random events. Since outcomes have a stochastic element and the two individuals with identical tastes and opportunity sets may experience very different outcomes (Atkinson and Stiglistz, 1980 quoted in Barr, 2003: 135), the individual's opportunity could be measured in term of expected or probability value. For example, the opportunity to participate which implies that people should have an equal chance to participate in the education system can be measured using the same approach, as follows. First, equality of opportunity to participation in education exists if

$$P_i = K \quad \text{for all i} \,, \qquad \text{i=1,2,3,…,N} \quad , \tag{3.4}$$

where P_i is a probability to participate in education. The equation (3.4) states that probability value should be the same for all N individuals in society. Similarly, the obvious problem is that it takes no account stochastic element.

Second, equal opportunity can be said to exist if

$$E[P_i | C_i] = K_i \quad \text{for all i} \,, \qquad \text{i=1, 2, 3, …, N} \quad , \tag{3.5}$$

Here equality of opportunity requires only that expected value of probability should be the same for all individuals. However, there are same measurement

problems of using money income to be a proxy of equality of opportunity. The one that is, it values both with the individuals opportunity sets, and with individual choice. Thus, differences in probability resulting from different choices need not imply inequality.

Third, equal opportunity exists if

$$E[P_i|C_i] = K_i \text{ for all } D_i \tag{3.6}$$

Previously, some characteristics may affect probability without causing inequality. These include age and any differences in individual choice that are the result of differences in tastes, and so are referred as characteristics C. But, if probability varies systematically with other characteristics (social class, gender, ethnic, background, parental money income) it is regard the society as being unequal. These are characteristics D. Equation (3.6) states that equality of opportunity exists if the expected value of probability is the same for all individuals with given characteristics C, but must be invariant to their characteristics D. Thus, two individuals with identical tastes and opportunity sets may experience very different outcomes.

3.4 The Relationship between Equality of Opportunity and Equality of Income

The equality of opportunity is highly related to individual's income. As shown in Figure 3.1, the three factors directly determine the individual's earnings are inborn abilities, schooling, and opportunity. While individual's opportunities relate to both employment and education. It is indirectly affects their earnings, as well.

One of the important opportunities is a chance to participate in education. The equality of opportunity to involve in education is defined not equal investment amount but equal opportunity to invest while the actual amount depending on personal ability and tastes and other characteristics (Becker and Chiswick, 1965: 362). Taubman (1978 quoted in Atkinson, 1983b: 78) describes the definition of equality of opportunity related to education as "For whom equality of opportunity eliminates: all the barriers that prevent individuals from obtaining the training necessary to convert the potential

talents implicit in their genetic endowments into capacities". Therefore, strong correlation exists between opportunity to invest in education and earnings.

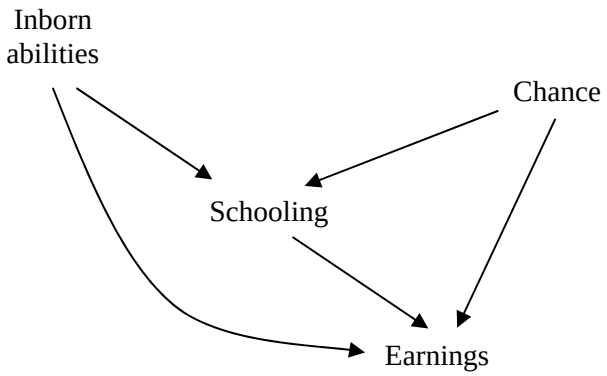

Figure 3.1 Model of Determination of Earnings
Source: Atkinson, 1983b: 78

For all definitions, there is a notion of inborn abilities[1] or fitness of individuals which are relevant to earning power. They may relate to intellectual capacities, to physical skills, to personality, or to other aspects. They may influence earnings directly via facilitating schooling and training. These relationships are shown in Figure 3.1, supplemented by a chance or stochastic factor at each stage (Atkinson, 1983b: 78). If the earnings relationship holds in identical form for everyone with the same distribution of the chance variable, then the conditions for equality of opportunity are satisfied in the sense that the ex ante distribution of earning is the same for all people with identical innate abilities. When do they generate inequality of opportunity? First, the earnings relationship may not be the same for everyone. There may, for example, be systematically higher earnings for people of one race or sex or religious group, and this may persist even in a perfectly competitive economy. This is referred to here as 'discrimination', although it may encompass a variety of phenomena, including possibly some factors which might otherwise have been related as part of the

[1] Innate abilities which is referred as family endowment include both genetic and cultural attributes that are transmitted from parents to children (Becker, 1993: 260-261)

stochastic term. Second, there may be a systematic link with family background: the privileges enjoyed by the children of higher income parents. (Atkinson, 1983b: 79)

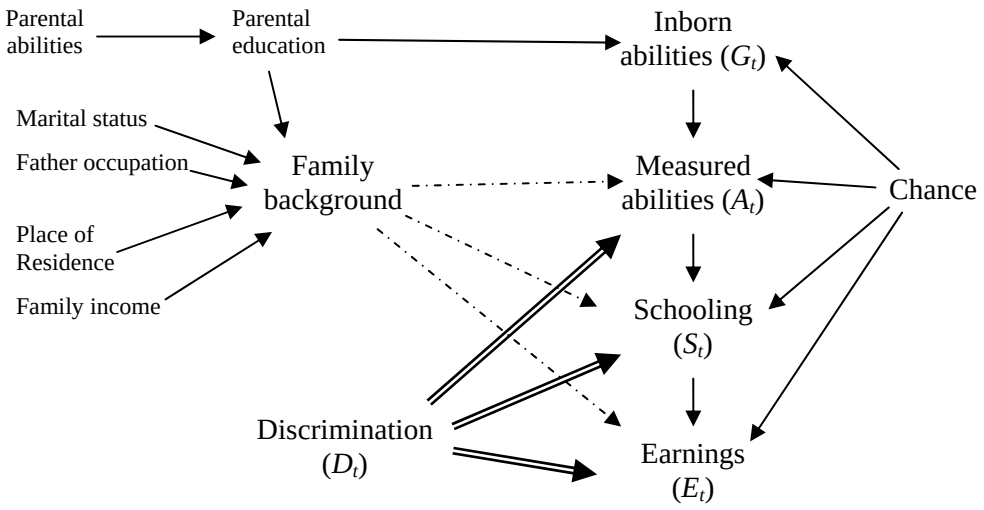

Figure 3.2 Sources of Inequality of Opportunity
Source: adapted from Atkinson, 1983b: 79

These sources of inequality of opportunity are introduced in Figure 3.2, where they are indicated by the dashed lines. The influence of family background may operate at three levels: measured ability, years of schooling and personal earnings. Family background is defined in five components: parental education, family marital status, father occupation, place of residence and family income.

In Figure 3.2, parental abilities are based on their education attainment and impact to their children's inborn abilities. Inborn abilities may be categorized into two kinds: genetic abilities and cultural abilities. Actually, inborn abilities may be observed thorough measured abilities which can be found by various types of testing.

However, measured abilities are mainly influenced from family background which comprises of parental education, marital status, father occupation, place of residence and family income. Moreover, family background also influences children's schooling in both quality and quantity which finally indirect effect to their children's future earnings. The advantages of family background may be revealed in terms of

participation to education or superior quality of education. Also, as shown by schooling, there are the direct link between family background and earnings. Well-off families may be able to secure good openings for their children; or the recruitment policies of firms may favor those from a superior social background. (Atkinson, 1983b: 79)

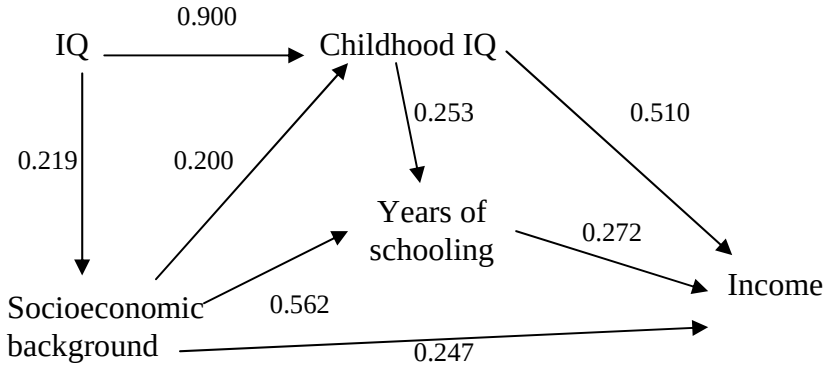

Figure 3.3 Recursive Model of Intergenerational Effects on Income
Source: Bowles, 1973: 348

Family background, especially family income strongly effect to personal schooling. The advantages families may be able to support their children on the high quality school and years of schooling, but within their budgetary. These links refer to the key role of family income on determination on years of schooling.

On the other hand, personal schooling usually be accounted as an important factor identifying individuals lifetime benefits. Generally, more years of schooling, higher personal wages received. Bowles (1973: 348) presents that personal income be affected from Childhood IQ (0.510), Years of schooling (0.272) and socioeconomic background (0.247). Furthermore, Years of schooling be affected from socioeconomic background (0.562) higher than Childhood IQ (0.253). Childhood IQ is referred to personal inborn ability or Genotype IQ (0.900) as shown in Figure 3.3.

Therefore, on this view, the government policy on inequality reduction will contribute to enhancing the equality of opportunity claiming that perfect equality of

opportunity will give rise to very strikingly the inequality of the results (Joseph and Sumption, 1979 quoted in Atkinson, 1983b: 83).

3.5 The Concept on Inequality of Opportunity to Participate in Higher Education

In Thailand, the opportunity to participate in university education is considered as the involvement of students and not be defined only the basis of entrance examination system or admission system. It also does not relates to the resource distribution of education system or the policy for expanding of academic campus of public universities to provincial area but it means the equal chance to invest in university education for all which the scope expands to include all types of university that grants degrees: limited-access public university, open university, private university, Rajabhat university, Rajamongkala university and other colleges.

Because different in concept between the access to education and education participation, the equality to access and equality to participate also have different in meaning. The opportunity to access to higher education are focus to observe (1) whether the differences in gender, social status, economic status, and ethnic groups have equal access to educational facilities, especially in remote areas; (2) how great urban and rural educational facilities differ, and (3) how the university education resources are distributed among regions, area and households.

These can be illustrated by the distribution on educational resources in which usually regarded as per capita and being an analysis on outcomes such as enrollment rate, public expenditure per enrolled students, student-teacher ratio and ,etc. While the opportunity to participate university education mainly focus on individual demand which varies among family backgrounds, at given personal ability and taste. Therefore, the equality of opportunity to participate means the equally distribution of individual probability to make a choice regardless irrelevant characteristics. This probability should be distributed equally and not depended on characteristics D, as equation (3.6). This is referred to the concept of vertical equality which implies the unequal treatment of unequal and which raises the question of how equality or inequality is to be judged (McMahon, 1982 quoted in Psacharopoulos and Woodhall, 1985: 249-250).

The opportunity to participate in university education can be measured in term of probability to participate in university education. Therefore, the inequality of educational opportunity means the differences in the level of educational probability to participate according to individual's social background (Boudon, 1973: 6). Given ability and tastes, the equality of opportunity means equal probability to participate in higher education.

By the difference of personal choice, the equality of opportunity to participate higher education does not mean that everyone involves in higher education or anyone who wishes to participate can do it freely. However, it would imply not equal investment but equal opportunity to invest, the actual amount depending on ability and other personal attributes. For instance, if there are two individuals, A and B with the same ability and tastes for university education, A should have opportunity to participate university education equally to B, regardless of his/her socioeconomic background such as family income, residential location, size of family, social status and others. In the other definition as in Barr (2003: 135) the equality of opportunity to participate university education would occur when the expectations of each individual are the same across individuals.

The equality of education participation mainly aim to people who are not decide to involve into education while the equality to access education focus on the currently participated persons. If level of education is correlated with equality of income distribution, it might expect the expansion of educational opportunities to encourage equality by reducing educational disparities (Psacharopoulos and Woodhall, 1985: 270). In this concept, based on the widely accepted concept on the different on natural personal attribute, individuals' opportunity depends on his/her choice. The policy should not aim to equalize an investment amount on education, but regarding on encourage and rising up personal opportunity as a whole.

In an ideal educational equality, all households should have the same level of opportunity to participate higher education because the information is provided perfectly and at no cost. There are completely no barriers such as money or other geographical barriers and having other facilities in order to make a rational choice.

3.6 Measurement of Inequality

The inequality probability can be defined the frequency distribution. This frequency may be expressed and categorized in term of quartiles, quintiles, deciles and percentiles which are explained by using mean, median, standard deviation, coefficient of variation and other variables. The analysis mostly carried out by comparison among the different groups e.g. comparing to top and bottom quintiles.

The Lorenz curve, Gini coefficient, Atkinson indicator and ratios which are usually used in income distribution study, are used to analyze the distribution of personal probability. Like former studies, Chapman and Ryan (2005: 491-512), Le and Miller (2005: 152-165), Miller and Volker (1989: 47-70), all are using the comparison the opportunity distribution in specific time period to the perfect equal distribution. Mostly, the studies use to compare among frequency distributions, denoted F(y), of and attribute y which is referred to as probability.

Generally, the Lorenz curve shows the dispersion of income by plotting cumulative income against cumulative share of population. The perfect equality occurs when the share of income equals to share of population in all levels, for example, the first 10% of population should have 10% of cumulative income.

Because the Lorenz curve is consistent to four principles of anonymity, scale independent, population independence and transfer principle, so that, it can demonstrates in visually by comparing with the line of equality. The wider gap between Lorenz curves and diagonal line mean higher inequality.

In this study, the Lorenz curves are plotted with the cumulative share of university attendance against the cumulative share of population ranked by family income. However, if the Lorenz curves intersect each other, it may not clearly decide which one is higher inequality on education opportunities than the other. However, it is needed other representation index such as Atikinson index, to compares these curves.

The Lorenz curve which is expressed as the distribution of participation share across individuals groups can give a good picture of the degree of equality. Two or more of curves drawn on the same diagram can be used to compare distributions. While the Gini coefficient is a measure of the degree of equality of opportunity and can be expressed as:

$$G = \frac{1}{2n^2 \bar{p}} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| p^i - p^j \right| \tag{3.7}$$

where p^i and p^j are the probability to university participation of i^{th} and j^{th} household, respectively. The Gini coefficient is based on the Lorenz curve and also calculated graphically by the ratio of the 45° line – curve area and triangle area of the 45° line. If opportunities are distributed completely equally, Gini coefficient will be zero; and if nobody but one has it all, it will be unity. Therefore, many researches use the Lorenz curves together with Gini coefficient and Atkinson index on analysis the distribution of probability.

The Atkinson index is another measure which shows distributional values explicitly. It bases on a social-welfare function and with constant relative inequality aversion denoted by ε being an explicit representation of distributional values. The Atkinson measure is given by

$$A = 1 - \left[\sum_{i=1}^{N} \left(\frac{p^i}{\bar{p}} \right)^{1-\varepsilon} f(p^i) \right]^{1/(1-\varepsilon)} \qquad (\varepsilon \neq 1), \tag{3.8}$$

where p^i is the probability of university participation of i^{th} household member, $f(p^i)$ is the proportion of the population with probability in the i^{th} range, $\bar{p}$ is the mean of probability. The index takes a value from 0 to 1 $(0 \leq A \leq 1)$. The index equals to zero, *A=0*, if the probabilities of all individual are the same ($p^i = \bar{p}$) which no deviation on probability distribution ($\varepsilon = 0$).

The great the deviation p^i from $\bar{p}$ and the high the value of ε and causes the great value of *A*. The inequality aversion parameter reflects society's preference for equality. If $\varepsilon = 0$, society is indifferent to inequality, and *A* become zero. If $\varepsilon = \infty$, society is concerned only with the position of the lowest income group.

The Atkinson indexes vary according to the inequality aversion parameter such as 0.5, 1.0 and 2.0 (Chapman and Ryan, 2005: 503). In this context, this means that larger values of the ‘inequality aversion’ parameter place larger values social weights on increased participation by individuals at the lowest end of the income distribution.

CHAPTER 4

EDUCATION SYSTEM IN THAILAND

4.1 Introduction

Education, like other forms of investment, can contribute to economic growth and directly interact with the raising of income and improving of health status. The raising of income for the poor will make the better dispersion of income and open up new opportunity for their children.

In Table 4.1, high income countries normally have an average education attainment of people higher than that of low income countries. On the other hand, the more educated people, the higher average income of country and the government can afford more expenditure and build up high quality on education.

Table 4.1 The Coefficient of Schooling Years, Mean Rate of Return

Per-capita income group	Mean per capita (US$)	Years of Schooling (years)	Coefficient (%)
High income countries ($9,266 or more)	23,463	9.4	7.4
Middle income countries (to $9,265)	3,025	8.2	10.7
Low income countries ($755 or less)	375	7.6	10.9
World	9,160	8.3	9.7

Source: Psacharopoulos and Patrinos, 2004: 115

4.2 Historical Development in Education

The development of education in Thailand has many achievements in the past, but still remain many tasks to be done. Based on the study of World Bank, comparing

to neighbor Asean countries, Thailand' educational performance is generally satisfactory. In 1992, government expenditures allocated to education 19.6% of National Budget while Indonesia 9.4%, Philippines 10.5%, China 12.2%, Japan 16.6% Malaysia 16.9% and Hong Kong 18.1%, United Nations Educational, Scientific and Cultural Organization (UNESCO) (1995 quoted in World Bank, 1998: 78-80). The primary enrollment in Thailand in the same year also at the rate of 50% while Philippines 12%, Indonesia 18%, Singapore 21% China 26%, Vietnam 28% and Malaysia 36%. Similarly, the secondary enrollment rate are also at high rate for Thailand 39%, Vietnam 32%, Indonesia 43%, China 54%, Malaysia 60%, Singapore 65% and Philippines 77% (UNESCO, 1995 quoted in World Bank, 1998: 69, 71).

After the first National Education Development Scheme (NEDS) was launched in 1960 and implemented until 1976, the education system was changed from the former time. The primary education taking 7 years was divided into 2 sub-levels: lower primary taking 4 years and upper primary taking 3 years. Secondary education was divided into general track and vocational track. General track had 2 sub-levels, the beginning level lasted 3 years and the end level lasted 2 years. Vocational track also had 2 sub-levels, the beginning and the end. Each level might be arranged for 1, 2 or 3 years, depending on their characteristics of the programs. This NEDS emphasized the importance of providing educational opportunity to the general and developing a better qualified labor to accommodate the policies on promotion of import-substitutions industries in order to reduce the deficit in the balance of trade.

A major change in education system structure occurred during the period of Second National Education Development (1977-1991) which emphasized non-formal and encouraged the role of private education. The fourth, fifth and sixth education development plans, taking for 5 year each, are functioned under this scheme and the structure of education system was changed from 4: 3: 3: 2 to 6: 3: 3 (World Bank, 1998: 4). The level of education is divided into 4 levels namely pre-school education, primary education taking 6 years, secondary education as divided into 2 levels: lower and upper secondary level with taking 3 years each, and higher education.

Moreover, during this period, the NEDS also emphasized on enhancing quality of education through management development, increasing education opportunity and addressing equity problems with strongly emphasized research on education.

The Third NEDS, starting from 1992, composed of 7th and 8th Education Plans. The education system provided equilibrium between development economics, social, and culture aspects and strongly emphasized that Thailand education system should facilitate the country's development process toward self-reliance, sustainability and enhances global competitiveness.

In this period, education policy aims to expand and accelerate the level of basic education while improving quality and equity, reform teaching and learning process, reform teacher training and development, improve quality and skills of labor force, reform education management, promote decentralization of authority and decision making, encourage participation of communities and family and finally, encourage life-long education in the forms of formal and non-formal school systems (World Bank, 1998: 5-7).

The formal education under this NEDS consists of four levels: pre-primary, primary, secondary and higher levels. Pre-primary level offers a two-year course in public school and a three-year course in private school. Pre-primary education aims to nurture and prepare physical, mental, intellectual and emotional skills to students for their further movement on to the primary education. Primary level undergoes at least six years of primary education as a compulsory education. Primary educations put emphasis on basic literacy numeracy skills and cultivate desirable behavior in students.

Secondary level is divided into two levels: lower and upper secondary levels. Lower secondary education offers a three-year course which is geared toward developing the students' ethics, knowledge and abilities. It allows the students to explore their needs, areas of interests and aptitudes and enables them to meet their appropriate careers. Upper secondary education is a three-year course as a fundamental stage for the students who will proceed to higher education. It also aims to prepare students to meet the labor market and to promote their entrepreneurship skills. There are two tasks; vocational task is provided in vocational and technical colleges for the students who are good at skills while academic task is offered in general education schools for the students who are academically-talented. At last, higher level is a post-secondary education which is divided into three levels: diploma, undergraduate and graduate levels, National Statistics Office (NSO) (2007: 52).

The provision of formal education is flexible, depending on the different ability groups, school location and the nation's needs. There is vocational training for the students who are interested in teaching. Special education is provided for the people who are disabled and difficult in learning. Welfare education is for the poor and remote rural students. Purposive education is offered based on the schools' potential and the nation's needs such as nursing, military and police cadet and transport and telecommunication as well (NSO, 2006: 102).

After that, in 1996, Thailand has launched the program of Education Reform in the objectives that to encourage change to education system and facilitate the country for competitiveness in rapidly change economy with 4 major improvements on physical state of schools, quality of teachers, learning and teaching methods and education management. (World Bank, 1998: 6)

In 1999 the educational system was based on the National Education Act of B.E. 2542 (1999). All individuals shall have equal rights to receive basic education provided by the State for the duration of at least 12 years, free of charge. Compulsory education shall be for nine years, (grade 1 – grade 9) formerly it was at least 6 years (NSO, 2006: 101). Therefore, at present, the formal education system of Thailand is classified in two parts: basic education and higher education. It can be shown in Figure 4.1 and expressed as

Basic education – the first step of the educational path for Thai people which consists of 12 years of education and classified in three sub-levels.

1. Pre-primary education: for age of 3-6 years old.
2. Primary education: for age of 7-12 years old.
3. Secondary education: for age of 13-18 years old.
    i. Lower secondary, 13-15 years old: Mathayom 1-3
    ii. Upper secondary, 16-18 years old: Academic track (Mathayom 4-6) and Vocational track (Vocational Certificate 1-3).
4. Higher education - classified in two sub-levels.
    i. Lower than degree level: high vocational certificate consists of 3 years.
    ii. Degree level: Certification, Bachelor, Master and Doctorate degree

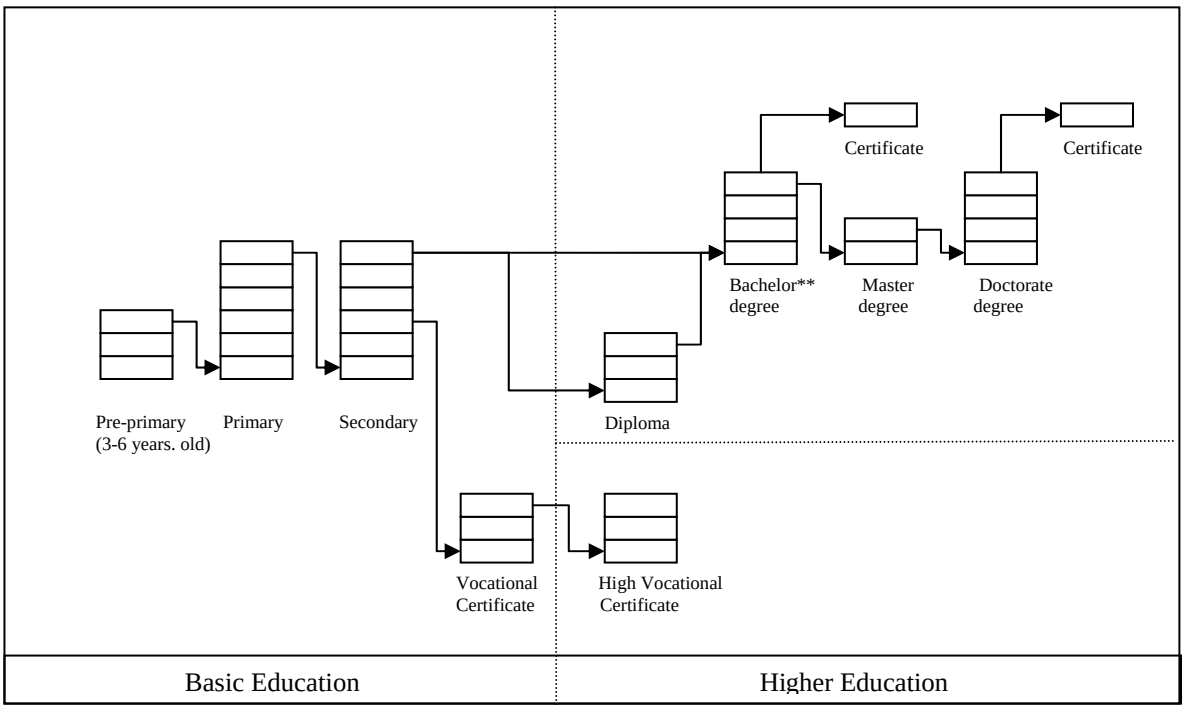

Figure 4.1 Thailand Education System

Source: World Bank, 1998: 68

Notes: 1. Each block stands for 1 year

2. Bachelor degree generally takes 4 years duration, except Medicine, Dentistry, Pharmacy, and Veterinary

4.2.1 The National Education Act (1999; amended in 2002)

The National Education Act was created in August 1999 to serve as the fundamental law for the administration and provision of education and training. The Act states a number of important features. First, it stipulated the Thai people's fundamental right to receive quality, free basic education for at least twelve years. Second, it sets the foundation for a more creative, questioning approach to studying, which is different from traditional Thai educational norms such as lecturing and role learning. Third, it sets out to decentralize finance and administration, giving individual teachers and institutions more freedom in curricula and resource mobilization, which in turn increases accountability, and ensuring that funds are targeted in the right areas, National Education Act (NEA) 2002 (NEC, 2002b: 24).

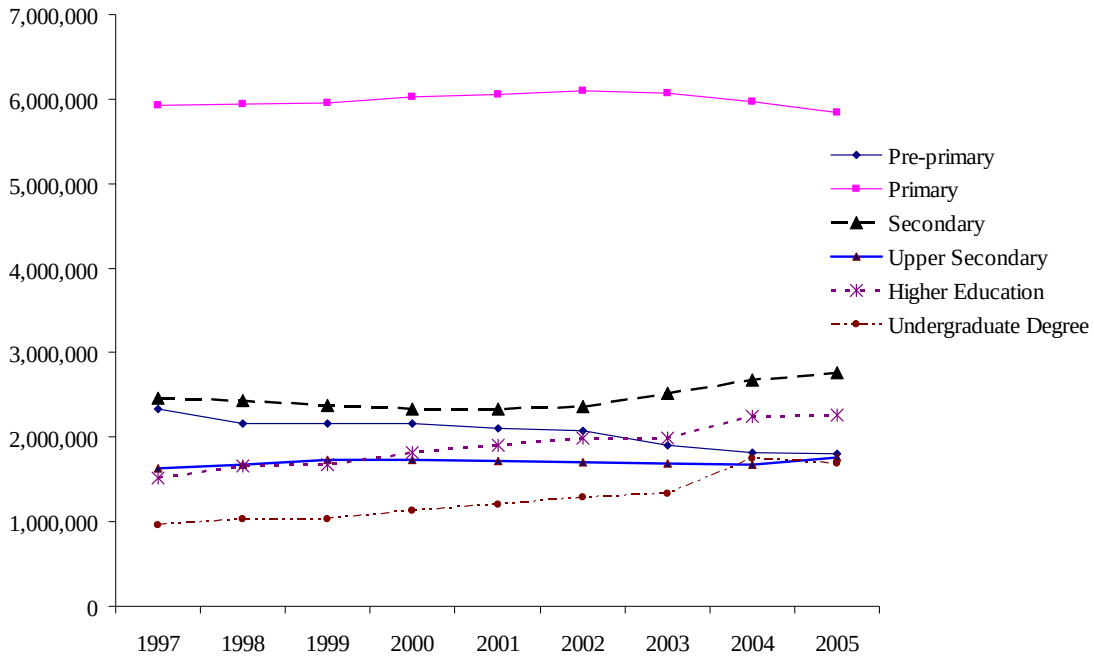

Figure 4.2 Number of Students by Education Level, 1997-2005
Sources: NSO, 1997b-2005b

The number of enrolled students in higher education level has increased since 1997, but the number of upper school graduates remains constant at the same level during 1997 to 2004 and slightly increase in 2005. If focusing on undergraduate and secondary education, the enrolled students have gone up since 2002 and greatly increasing happened in 2004 to 2005. This finding is consistent to the study of Somkiat Tangkitvanich and Areeya Manasboonphempool (2008: 2) which presented the changes in the gross enrollment ratio of higher education in Thailand 1992-2006.

In current situation, the fact that the children from poor rural families still have lower chance for progressing up the education ladder than their urban counterparts (Sirilaksana Khoman and Sakon Varanyuwatana, 1990: 11). Even tough the government policy for past four decades reflect the broad recognition of education's contribution to economic and social development and mainly focuses on education accessibility for less advantages group (World Bank, 1998: 5-6). Enrollment trends at different levels of education as shown in Figure 4.2 represent that despite the

impressive achievement recorded to date, major challenges lie ahead if more individuals have equal opportunity to participate in university education.

Table 4.2 Average Schooling Years and Annual Income by Region and Area

Regions	Area	Average Schooling Years	Average Monthly Income
Bangkok	Urban	8.72	14,717.59
Central	Urban	6.89	8,832.84
	Rural	5.73	6,283.23
North	Urban	6.56	7,398.28
	Rural	4.67	3,282.70
Northeast	Urban	6.66	7,932.08
	Rural	4.75	2,569.95
South	Urban	6.98	8,638.87
	Rural	5.24	4,372.27
TOTAL		6.23	7,277.70

Source: NSO, 2004a and own calculation – for all age groups

Table 4.2 obviously presents the difference of rural and urban resident's opportunity. The urban residents have greater probability to university participation than the rural residents for all regions of Thailand. The average schooling years for urban and rural are 7.16 and 5.10 for urban and rural. Average monthly incomes are 9,503.93 and 4,127.04 baht for urban and rural.

Furthermore, for regional difference, the gap on education attainment between Bangkok and others regions are in range of 1.74 to 4.05 years. It presented highly correlation between average years and average monthly income.

While the distribution of enrollment rate among various education level in Thailand still have some problems. Table 4.3 presents that percentage of baccalaureate is still greater in urban than rural, particularly in Bangkok. The inequality of education attainment is generally found between rural and urban area, including regional and Bangkok area, as well.

Table 4.3 Percentage of Population by Education Attainment and Region

Regions	Area	No Schooling*	Primary**	Lower Secondary	Upper Secondary	Higher Education
Bangkok	Urban	31.63%	16.35%	13.19%	21.53%	17.30%
Central	Urban	46.17%	16.64%	12.57%	15.97%	8.65%
	Rural	55.38%	18.94%	11.00%	10.89%	3.79%
North	Urban	51.99%	14.43%	10.66%	14.01%	8.90%
	Rural	66.50%	16.55%	7.64%	6.51%	2.80%
Northeast	Urban	49.40%	16.50%	11.06%	13.67%	9.36%
	Rural	63.61%	22.07%	7.83%	4.90%	1.58%
South	Urban	44.46%	16.70%	12.27%	17.19%	9.39%
	Rural	57.26%	20.36%	9.51%	10.04%	2.83%
TOTAL		51.82%	17.62%	10.64%	12.75%	7.18%

Source: NSO, 2004a and own calculation

Notes: * not graduate Primary education, but have been study in some years

** complete Primary but not graduate Secondary education; others level would be the same

As shown in Table 4.3, Thai education system has been achieved their educational development for many years since the first NEDS was launched in 1960. However, the number of 'no schooling' population still at high level, especially in rural area which is found more than half people illiteracy. The percentage of population hold the degree is 7.18% of total population. By comparing across the country, the number of population who graduates higher education level has 7.18% of total population. It seems to be low level compare with 12.75% of upper secondary and 10.64% of lower secondary.

However, Table 4.3 also presents the high distinction on education attainment among regions. Bangkok is a region which contained highest proportion of higher education graduates in 17.30% of population while other regions have the nearly proportion of 8.65%, 8.90%, 9.36% and 9.39% for Central, North, Northeast and

South. That is, it means the number of university graduates was found in Bangkok twice more than other regions. It may caused by employment opportunity generally abundant in Bangkok more than other regions. The graduates go in Bangkok to get a job. However, this measure also reflects the personal probability to participate higher education for Bangkok residents may have higher probability than other regions residents.

Another perspective on education attainment is the percentage proportion of university education attainment of who live in urban is higher than who live in rural more than 2 times. The greatest difference clearly appears in Northeast region. It may explain on the circumstance of employment for graduates which normally worked in urban area. However, this reflects the education inequality occurs among these two areas.

When exploring the individual reason for not attending school which was conducted by NSO in 1999. It is found that 'no financial support' is the major reason for people decision to discontinue schooling, in all levels of education. Those are 70.38%, 56.91% and 45.10% for lower secondary, upper secondary and higher education, respectively. These proportions imply the problem of education participation is highly severe on lower education schooling. It show that the problems on education inequality may begin at lower secondary level.

Another reason on education discontinuing is 'school far from home and had problem in communication." This reason may support the government policy on expanding the number of schools and other educational resource to up countries. However, it illustrates only small portion of population on theses reasons which are 3.64%, 1.62% and 1.51% for lower secondary, upper secondary and higher education, respectively.

The reason on 'had to earn livelihood for family and oneself' is an interesting one, especially at age of 18-24 years old which the age to participate university education. The number of people is 1,742,200 persons from total 5,982,800 persons or 29.12% of total population. It is found that at this age is highly involved into labor market more than other ages and the portion of males and females are nearly equal. It is clearly found that the financial support seem to affect to females more than males.

The lacking of financial support affects to females' discontinuing twice as much as that of males.

Table 4.4 Population not Attending School by Sex, Age and Reason, 1999 (thousand persons)

Reasons	Persons			Males			Females		
	13-14	15-17	18-24	13-14	15-17	18-24	13-14	15-17	18-24
1. No financial support	131.4	541.7	2,698.1	49.4	295.3	1,408.4	101.2	420.8	2,901.7
2. Had to earn livelihood for family	2.6	84.8	1,018.3	2.5	46.3	496.3	0.1	38.4	522.0
3. Had to earn livelihood for oneself	2.8	50.9	723.9	0.9	27.9	378.4	1.9	23.0	345.4
4. Not interested or useless	22.5	119.0	589.2	17.4	83.0	325.7	5.1	36.1	263.5
5. Unknown	6.4	50.0	331.0	3.3	25.1	160.1	3.1	24.9	170.8
6. Others	5.5	17.8	290.8	2.4	6.3	100.9	3.0	11.5	189.9
7. Sickness or had disability	7.2	40.4	104.2	5.3	18.5	57.8	1.9	21.9	46.4
8. School far from home and had problem in communication	6.8	15.4	90.4	3.7	5.4	54.9	3.1	10.0	35.5
9. Could not admitted	0.7	8.1	87.9	n.a.	4.5	58.6	0.7	3.6	29.4
10. Misconduct	0.8	23.9	49.0	0.6	18.9	39.9	0.3	5.0	9.1
Total	186.7	951.9	5982.8	85.5	531.2	3,081.1	101.2	420.8	2,901.7

Source: NSO, 1999b: 235

Moreover, the reason on 'not interested or useless' reflects to personal opportunity cost on attending school. It is expressed that these costs for males are higher than for females. It may reflect the higher wage on males becomes that males may get wages or foregone earnings more than females, for other things equally.

4.3 Higher Education Institutions

Higher education plays a central role in Thailand's development and can be the driving mechanism for more equal income distribution. Moreover, higher education also plays an important role in developing Thailand's competitiveness for dealing with globalization. Thai higher education has been developing since 1916 with the foundation year of its first university - Chulalongkorn University; and Thammasat University, Medical School, Kasetsart University and Silpakorn University a few years later. The main objectives were producing competent people for the civil service. However, later, the higher educated labor force became important for economic development and social projects. Therefore, since 1957, higher education's major role is the provision of skilled workers and a highly competent labor force for public sector, private sector, state-enterprises, and various other organizations.

In Thailand, public universities are the largest providers of higher education. Since 1991, Thai higher education has expanded even faster with enrollments doubling over the ten years from 1992-2001. In 2006, the number of institutions was 144 universities/colleges throughout the country with more than 1.77 million students enrolled. The gross enrollment ratio for Thai higher education rose from 20.74% to 24.03% and 27.10% in 2004, 2005, and 2006, respectively.

Besides growth of enrollment, the subsidization of higher education is another issue of concern. Similar to other countries, Thailand greatly subsidizes higher education with enrollments in the limited-access public universities dominated by students from higher income families. This is the equity aspect which deserves a closer look in order to understand how the characteristics of family income and family background influence opportunity to participate in university education. An empirical study of this is presented later in this monograph.

In Thailand, there are many various types of higher education institutions which are organized under many public departments and private organizations. Therefore, this makes the quality of education variable depending on attending groups, institutional management and budget. Moreover, the number of institutions and enrolled students increased greatly in the past decade, especially during 2003 with

the change the status of Rajabhat institutions. This was through a policy expanding educational accessibility to provincial areas and extending their range of educational provision to many others disciplines, instead of only teaching. Similarly, in 2004, Rajamongkala institutions, throughout country, were also elevated to university status and extended their education provisions. This reflects the increasing enrollment of students in 2004, which was 1,416,820, up from 951,515 in 2001 and 883,073 in 2000.

The Thai higher education system has been affected by socioeconomic change and globalization. This is reflected in the expanding trend of an increased number of institutions and enrolled students. The demand for university education has also been significantly growing for the last decade. This encourages the development of higher education institutions by giving them an incentive to increase their service provision by offering a greater variety of disciplines to serve the variety of students demand.

Furthermore, the relationship between public universities and the government has also been changing in order to increase the effectiveness and independence of universities. The universities look for effectiveness in their management and excellent educational provision under the constraints of funds (Charas Suwanvela, 1997 quoted in NEC, 2002a: 3).

Table 4.5 Number of Population, Student and Enrollment Ratios by Educational Level, 2004-2006

Education level	Age	2004			2005			2006		
		Population	Student	Enrollment	Population	Student	Enrollment	Population	Student	Enrollment
Pre-primary	3-5	2,402,776	2,466,693	102.66	2,355,564	2,460,545	104.45	2,376,730	2,499,702	105.17
Primary	6-11	5,601,419	5,967,857	106.54	5,497,003	5,839,581	106.23	5,317,302	5,704,782	107.28
Lower-secondary	12-14	2,889,489	2,633,995	91.15	2,874,148	2,633,901	91.64	2,885,150	2,672,888	92.64
Upper-secondary	15-17	2,768,090	1,650,639	59.63	2,839,151	1,706,382	60.10	2,896,799	1,817,587	62.74
Higher education										
-Under and Bachelor degree	18-21	3,761,987	1,291,534	34.33	3,685,565	1,474,443	40.00	3,635,635	1,633,695	44.93
- Bachelor degree and higher	18-24	6,830,823	1,416,820	20.74	6,679,819	1,605,398	24.03	6,558,909	1,777,519	27.10
Total	3-24	20,492,597	14,136,004	68.98	20,245,685	14,245,807	70.36	20,034,890	14,472,478	72.23

Sources: Office of National Education Commission (NEC), 2004, 2005 and 2006 and own calculation

Notes: 1. Exclude students in Open/Distance University

2. The enrollment ratios higher than 100% result from students aged lower than 3 years old and higher than 5 years old and some of Prathom 6 students aged more than 11 years old

Table 4.6 Number of Universities in Thailand by Types, 1997- 2002

Type of Universities	1997	1998	1999	2000	2001	2002
1. Limited-access public universities	20	21	22	22	22	22
2. Open access public universities	2	2	2	2	2	2
3. Private universities/colleges	29	33	46	48	55	56
4. Rajabhat Universities*	n.a.	n.a.	n.a.	n.a.	41	41
5. Rajamongkala Universities**	n.a.	n.a.	n.a.	n.a.	55	55

Sources: NSO, 1997b-2002b

Notes: * changed to university status in 2003

** changed to university status in 2004

Among the 5 groups of Thai universities shown in Table 4.6, the limited-access universities, which are under in the former Ministry of Universities, are the most developed. There are two open/distance universities; Ramkamhang University and Sukhothaithammatirat University, which are universities focused on increasing access university education by lowing tuition fees and offering unlimited access. In addition, Rajabhat Universities, former teacher colleges, extended their educational provisions to multi-disciplinary institutions due to the excess supply of teaching graduates. In the same way, Rajamongkala universities, former technical colleges, extended their educational provisions to a variety of disciplines, as well.

The universities in Bangkok, presently account for about 50% of the universities in the whole country. Most of them are private universities which have rapidly grown since 1997. In 2005, there were 59 private universities in Bangkok and that had increased to 62 universities by 2007. However, the overall number of enrolled students in private universities was 284,723 which is still significantly less than that of public universities. Furthermore, the increase in number of enrolled students was mainly in public universities which were 1,416,280; 1,605,398; and 1,777,519 for 2004, 2005 and 2006, respectively. The overall average growth is 10.71% annually, which is a significant rate of growth.

Table 4.7 Number of Higher Education Institutions by Region, 2007

Region	Limited-access university	Open university	Private university and college	Rajabhat University	Rajamongkala University	Total
Bangkok	9	2	28	9	2	50
Central	1	-	11	6	1	22
North	4	-	14	11	4	30
Northeast	4	-	9	12	2	27
South	3	-	6	5	2	16
Total	21	2	62	43	11	

Sources: Office of Commission of Higher Education, 2007a: 1-19 and own calculation

Note: Exclude community colleges which provide below bachelor degree level education and regional campuses

4.3.1 Entrance System

In 2006, as shown in Table 4.8, the total number of students who decided to continue their schooling to the higher education level was 106,103. It clearly shows that the number of applicants and enrolled students in public universities is much greater than private universities in all regions. In addition, it also shows the unequal of enrollment of students who are from different regions. The northeast region students were the least successfully involved in public and private universities while the most involved were the central region students. Moreover, in 2007, the average numbers of students applying per university were 2,727.5; 1,107.6; 839.3 and 1,004.0 for the limited-access, Rajabhat, Rajamongkala and private universities, respectively. And, the ratios of the number of accepted students per applicant were 82.10%, 16.04%, 47.22% and 3.81%.

The entrance system in Thai university education can be categorized into two main groups; direct examination which is performed by each university and central examination which is carried out by the examination unit under Commission on Higher Education.

Table 4.8 Number of University Applicants and Students who Passed the Examination by Region, 2006

Living region of students	No. of applicants	No. of students who passed examination			Ratio (Applicant :Passed)
		Public university	Private university	Total	
Bangkok	28,256	17,019	554	17,573	1.61
Central	25,692	15,203	547	15,750	1.63
North	16,310	10,359	396	10,755	1.52
Northeast	21,788	14,596	884	15,480	1.41
South	14,057	9,353	240	9,593	1.47
Total	106,103	66,530	2,621	69,151	1.53

Source: Office of Commission on Higher Education, 2007a: 4-6 and own calculation

The central entrance system of Thai universities has changed from the earlier entrance system which only focused on examination scores to the admission system in 2005. The new system which comprises of five components; GPAX, GPA, O-NET, A-NET and an interview, places more emphasis on the three years of study at upper secondary level (see Table 4.9). However, the examination score still plays a key role in assessing an individual's ability, because the most admired universities for secondary students to choose for their further study are limited access public universities. Two basic reasons are that individuals perceive that they are of higher academic quality which, subsequently, makes for greater opportunity to get a good job and good pay. Another reason is that most of limited access universities are substantially subsidized by the government, so their tuition costs are much lower than what private universities charge their students, at full cost for all programs.

In addition, each university also conducts their own examination to screen qualified applicants. Most of the examinations of private universities, Rajabhat University and Rajamongkala University have lower acceptance qualifications than

that of limited-access universities, while no examination is required in open universities.

Table 4.9 The Components of Central University Admission System (CUAS)

Components	Weighted (for 2006 to 2009)	Remarks
1. GPAX: Accumulated Grade point average	10%	
2. GPA: Grade point average of main courses (3-5 subjects).	20%	
3. ONET: Ordinary national educational testing.	35-70%	- Test on Thai, Social Sciences, English and Mathematics
4. ANET: Advanced national educational testing.	0-35%	

Source: Office of Commission of Higher Education, 2007c: 1-2 and own calculation

4.3.2 Cost of Enrollment

For public universities, students may absorb only 9% to 56% of the full cost of enrollment, as shown in Table 4.10. However, the limited access universities can be categorized by cost level in three groups: low cost, medium cost and high cost, as shown in Table 4.11. Even the students who were charged at the higher amount, still paid a lower percentage than that of open universities. The tuition cost of limited-access universities were subsidized by more than 59% of the full cost while there was no subsidy for private universities and a 44% to 84% subsidy for open universities.

In addition, Table 4.10 illustrates the average appropriate tuition fees by type of universities. Generally, the tuition fees of health science groups is the highest, followed by the tuition fees of technological sciences and social sciences. Social sciences are the cheapest programs in both public and private universities. However, concerning government subsidization, the tuition fees of private universities are perceived higher than that of public universities. For example, suppose the subsidization ratio is 32.5% at the medium range. The student pays at average tuition

fee of 49,138.47 baht. So, the average full cost is 72,797.73 baht annually (49,138.47 ÷ 67.5%) for a limited-access university comparing to 59,390.88 baht which is nearly the full cost of the private university. Assuming equal quality if education provision, the private university seems to be higher efficient than the limited-access university.

Table 4.10 Average Appropriate Tuition Fees by Subjects and Type of Universities (baht per year)

Programs of study	Tution Fees (Baht)			
	Public University	Private University	Difference	
			Baht	%
(1) Education and teacher training	30,353.00	n.a.	n.a.	n.a.
(2) Humanities Religion and Theology	n.a.	n.a.	n.a.	n.a.
(3) Fine and Applied Art	40,710.00	58,835.00	18,125.00	44.52%
(4) Law	37,287.00	37,010.00	-277.00	-0.74%
(5) Social science	47,972.25	40,973.75	-6,998.50	-14.59%
(6) Natural Science	53,745.00	63,891.50	10,146.50	18.88%
(7) Medical Science and Health related	128,097.00	78,219.00	-49,878.00	-38.94%
(8) Engineering and Architecture	40,752.50	77,416.00	36,663.50	89.97%
(9) Agriculture, Forestry and Fishery	44,544.00	n.a.	n.a.	n.a.
(10) Others	n.a.	n.a.	n.a.	n.a.
Average	49,138.47	59,390.88	1,296.92	17%

Source: Chamaiporn Kunakemakorn et al., 2004 quoted in Medhi Krongkeaw, 2005: 6 and own calculation

Moreover, the cost of university study entails not only tuition cost. There are other costs such as foregone earnings, consumption expenditures, etc. The estimated lifetime earnings of secondary school graduates, calculated by the data of Socioeconomic survey (SES) 2004 with an age-earning equation, is 230,000 baht. It was found that at a 5% interest rate, they would have to invest 90,000 baht annually for tuition fees and foregone earning. At this level of income, 69% of the Thai population could not reach higher education because of borrowing constraints. Therefore, if other sources of funding do not exist outside of family income, the individuals who are from low income families would not be able to participate in

higher education. According to the principle of human capital investment, individuals will invest where their marginal benefit is equal or higher than marginal cost. If they cannot ensure their return, they will not continue their schooling.

Table 4.11 Proportion of Education Full Cost by Type of Universities

Type of university	Program of study									
	[1] (%)	[2] (%)	[3] (%)	[4] (%)	[5] (%)	[6] (%)	[7] (%)	[8] (%)	[9] (%)	[10] (%)
Open / Distance										
- Subsidized	44	50	67	-	-	74	53	-	-	-
- Student	56	50	33	-	-	26	47	-	-	-
Low cost										
- Subsidized	83	82	79	77	88	84	72	90	59	59
- Student	17	18	21	23	12	16	28	10	41	41
Medium cost										
- Subsidized	73	74	76	68	91	73	87	70	78	78
- Student	27	26	24	32	9	27	13	30	22	22
High cost										
- Subsidized	72	68	79	66	78	91	68	84	64	64
- Student	28	32	21	34	22	9	32	16	36	36

Source: adapted from Medhi Krongkeaw, Suchittra Chamnivickorn and Prasopchoke Mongsawad, 2004: 17

Notes: 1. [1]. Law, Political science, Fine and Applied Art, [2]. Business, Management, Economics and Social Science, [3]. Education, Science and Technology, [4].Architecture and Engineering, [5]. Nursing and Pharmacy, [6].Agriculture, Forestry and Fishery, [7]. Medical technique and Public Health, [8]. Veterinary medicine, [9]. Dentistry, [10]. Medical Science

2. It can be grouped as Health science is [7], Technology sciences [6], [8] and [9] and Social sciences [1], [2], [3], [4] and [5]

4.3.3 The Growth of Higher Education

The number of students that a limited access public university can accept is growing at a rate much lower than that of the demand. According to Thai Educational Statistics, Ministry of Education: New students of limited-access universities (excluding Rajabhat/ Rajamongkala University) are 100,676 and 144,962; while the

numbers of students graduating from upper secondary school are 700,551 and 566,565, in 2005 and 2006, respectively. Therefore, most students who cannot get in will choose to go to other universities such as an open university, private university, Rajabhat University, Rajamongkala University and have to pay more to do so. In fact, the decision to participate in university education does not solely depend on their ability and preference.

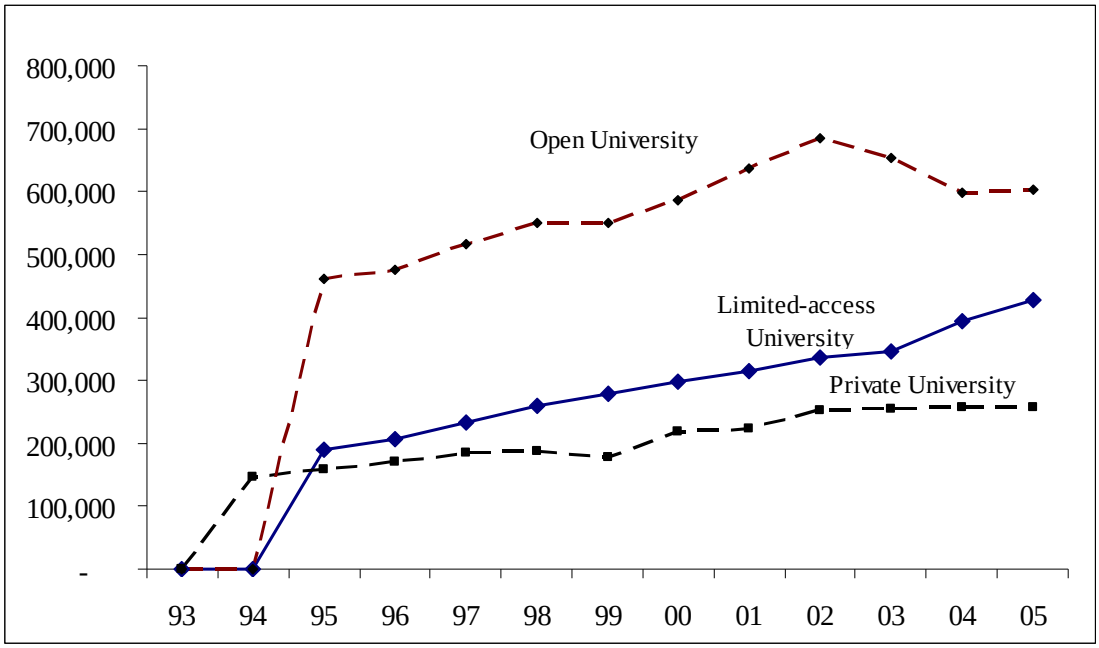

Figure 4.3 Number of Student Enrollment by Type of Universities, 1994-2005
Sources: NSO, 1994b-2005b

It illustrates that the family income and socioeconomic factors can be an influence on people's decision to participate in university education. At present, the supply of university education is still not sufficient for the demand of upper secondary graduates. This is illustrated by the ratio of new secondary graduates to new university enrolled students shown in Table 4.5. By assuming ability and preference are equally distributed among cohort and region, this ratio declines from 24.96% in 2001 to 20.77% in 2005. Moreover, until now, the public sector has been the greatest provider of higher education in Thailand. The limited access universities are the most frequently chosen and applied for at 88.66 % of full capacity while other universities

have the applicants at only 33% of full capacity. As shown in Figure 4.3, the growth rate of enrolled students of the limited-access universities is greater than that of private universities while the open universities show the largest number of enrolled students, with its rapid growth from 1994 to 2002.

4.4 The Inequality in Higher Education Institutions

Most higher education institutions are still mainly located in Bangkok and the Central region. By analyzing the information in Table 4.7, it can be seen that the percentage of institutions in Bangkok is 34.48%, 15.17% are in the Central region, 20.69% in the North, 18.62% in the Northeast and 11.03% in the South. This reveals an inequality of institution dispersion country wide. The inequality among institutions is not only the geographical distribution, but also their level of competency. Comparing the institutions and their ranking results by university type, the uneven distribution can be clearly seen in Table 4.12. The results reflect the different potential in each group of Thai universities. Within two major missions of universities; teaching and research, the results show that Rajabhat and Rajamongkala universities are less competent than limited-access universities in both areas. This clearly illustrates different levels of quality of educational provisions between the two types of universities and shows the inequality among higher education institutions in Thailand.

In addition, comparing the limited-access universities with Rajabhat University, the difference in budget may reflect the difference in quality level of education provided. The budgetary index, which is calculated from the expenditure per capita, shows the inequality among higher education institutions. The limited-access public universities are highly subsidized by government budget while others universities such as Rajabhat and Rajamongkala universities receive a low level of funding per student. Table 4.14 shows the increasing trend of the budgetary index for limited-access universities; while that of Rajabhat universities, which are local universities, have lower values. The range of the budget for Rajabhat universities is from 0.0127 to 0.0321 or an average of 0.0236.

Table 4.12 University Ranking, 2005 *

Indicator	Limited-access public university	Rajabhat University	Rajmongkala University	Colleges
Research Ranking Indicator				
Group 1. (5)	5	-	-	-
Group 2. (4)	4	-	-	-
Group 3. (5)	5	-	-	-
Group 4. (4)	7	5	-	-
Group 5. (5)	-	16	5	2
Teaching Ranking Indicator				
Group 1. (4)	4	-	-	-
Group 2. (4)	3	-	1	-
Group 3. (8)	7	-	1	-
Group 4. (13)	7	3	3	-
Group 5. (20)	-	18	-	2

Source: Office of Commission on Higher Education, 2006

Notes: * For all 50 universities excluding private and open universities

1. Categorized in groups by score level; Group 1 is the highest potential/score, while the lowest is Group 5
2. Research indicator consists of Funding, Personnel, Output and Graduates
3. Teaching indicator consists of Student ratio, Faculty resources, Financial resources, International standards, and Quality of Education

This implies an unchanging budget per student over the period of 1996-2002. Therefore, the budgetary gaps between these two types of universities have become wider. In addition, in terms of amounts, the difference in the received budget per student from 1999 to 2003 can be seen in Table 4.13. In 2003, the limited-access universities received 71,018.73 baht per student; while Rajabhat / Rajamongkala universities received 22,198.29 baht per student and the open university received 2,060.29 baht per student, while no subsidization for was received for students at private universities. This inequality can undoubtedly affect the quality of education and the development level of universities.

Table 4.13 Annual Budget per Student by Type of Universities, 1996–2003

University	Annual budget per student				
	1999	2000	2001	2002	2003
1. Limited-access	99,820.48	91,059.93	73,549.50	74,773.84	71,018.73
2. Open	2,177.09	2,073.65	1,620.74	1,760.98	2,060.05
3. Rajabhat / Rajamongkala	31,586.69	27,785.11	23,658.58	22,075.86	22,198.29
Difference (1-2)	97,642.91	88,986.28	71,928.76	73,012.86	68,958.68
Difference (1-3)	68,233.79	63,274.82	49,890.92	52,697.98	48,820.44

Source: Suprawadee Mongkolthamkul, 2005: 85-87 and own calculation

Note: Excludes Mae Fah Luang University and Walailak University

The budgetary index shown in Table 4.14 reflects significant underlying differences between limited-access universities and open universities, for example different teaching and administration systems. Normally, open universities, which are conducted as distance learning, have a lower cost than other systems. However, this lower budget affects the education quality level which may impact the quality of graduates, as well. Comparing limited-access and Rajabhat or Rajamongkala universities, the difference in the budgetary index became wider in 2003 and the increasing trend reflects the diverging level of development, as well.

Table 4.14 Inequality Index of Budget Allocation among Universities, 1999-2003

University	Equality of Budgetary Index				
	1999	2000	2001	2002	2003
1. Limited-access university	0.0268	0.0340	0.0304	0.0387	0.0428
2. Open university	0.0018	0.0002	0.0038	0.0004	0.0039
3. Rajabhat University	0.0127	0.0249	0.0273	0.0321	0.0209
Difference (1-2)	0.0250	0.0338	0.0266	0.0383	0.0389
Difference (1-3)	0.0141	0.0091	0.0031	0.0066	0.0219

Source: Suprawadee Mongkolthamkul, 2005: 95-96

Furthermore, because of being the most admired type of university, limited-access universities have a better chance to select high potential students than others universities. Initially, almost all students apply for the examination and admission system. Then, if they cannot get into their desired public university or discipline, they will look for other institutions e.g. private, Rajabhat, Rajamongkala universities or even, discontinue their studies. This system is effective and provides a second chance for under-achieving students to enter Rajabhat / Rajamongkala, private or open universities. On the other hand, students may not participate in university education if they find that their marginal benefits lower than marginal cost, which usually occurs in the "second-chance" universities.

4.5 Public Expenditures on Education

The government still to be a main provider and funds supplier for the whole education system of Thailand while the private role are mainly in some sector of education such as university and vocational levels. Total education trends are increasing since 1997 (see Figure 4.3).

Table 4.15 Allocation of the Educational Budget, 1997-2007 (percent)

Education Level	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Pre-primary and Primary education	46.3	44.2	43.6	43.6	44.4	44.0	41.8	71.3	70.2	69.0	68.8
Secondary education	26.0	24.9	23.9	23.5	23.7	24.2	27.6				
Higher education	17.4	16.8	17.1	15.6	14.8	14.3	14.2	13.7	15.3	16.3	16.5
Non-formal education	1.6	1.5	1.4	1.3	1.4	1.5	1.4	1.3	1.4	0.1	0.0
Education support	6.1	10.2	10.8	13.1	12.7	13.0	12.1	11.7	11.7	11.4	11.4
Other education	2.7	2.3	2.7	2.9	3.0	2.8	2.9	1.9	1.5	3.2	3.3

Sources: Bureau of Budget, 1997-2007 and own calculation

Note: For year 2004 to 2007, the proportion includes both Pre-Primary, Primary and Secondary education

The largest amount of education budget from government is allocated at pre-primary and primary education, but the ratio declined recently, 2005-2007. Secondary education received 27.57 % of the education budget in 2003 and it seems remain the same proportion for the later.

However, the budgetary for higher education slightly declined during 1997 to 2003 and increased during 2004 to 2007. The percentages of higher education budget per total budget or per gross domestic products are presents the same perspectives which reflects the heavy subsidization. It affirmed that the government still being a major supporter to higher education system.

In period of 2002 – 2006, the ratio of education budget per gross domestic product (GDP) is lower than that in period of 1997-2001 due to the high expanding of GDP after the economic crisis situation. However, this ratio increase in 2007 to 4.21% and government spending on education is in order of 357 billion baht which can be illustrated the higher concerning of government on education. The ratio of education budget per total budget is also roughly remains the same as of the previous and is 21.04%, 21.74 and 22.79% for 2005, 2006, and 2007, respectively.

Table 4.16 Public Expenditure on Education, 1997-2007 (million baht)

Year	GDP	National Budget (NB)	Education Budget (EB)			Higher Education Budget			
			Amount	% of NB	% of GDP	Amount	% of EB	% of NB	% of GDP
1997	4,732,610	925,000	202,864.0	21.9	4.3	35,202.0	17.3	3.8	0.74
1998	4,626,447	830,000	201,707.6	24.3	4.4	33,986.1	16.89	4.1	0.73
1999	4,637,079	825,000	207,316.5	25.1	4.5	35,542.7	17.1	4.3	0.77
2000	4,922,731	860,000	220,620.8	25.7	4.5	34,482.1	15.6	4.0	0.70
2001	5,133,502	910,000	221,591.5	24.4	4.3	32,761.5	14.8	3.6	0.64
2002	5,450,643	1,023,000	222,989.8	21.8	4.1	32,008.3	14.4	3.1	0.59
2003	5,928,975	999,900	235,092.1	23.5	4.0	33,423.5	14.2	3.3	0.56
2004	6,503,488	1,163,500	251,194.0	21.6	3.9	34,509.9	13.7	3.0	0.53
2005	7,104,200	1,250,000	262,938.3	21.0	3.7	40,308.3	15.3	3.2	0.57
2006	7,786,200	1,360,000	295,622.8	21.7	3.8	48,095.5	16.3	3.5	0.62
2007	8,471,400	1,566,200	356,946.3	22.8	4.2	58,827.5	16.5	3.8	0.69

Sources: Bureau of Budget, 1997-2007 and own calculation

The budgets for higher education are increasing over time since 2002 while previously nearly the same level. Percentages of higher education budget per total education budget declined in the period of 1997 to 2003 and increased in the period of 2004 to 2007. However, for overall perspectives, percentage of higher education budget to national budget remains the same level which confirms that government policy still remain the same level of subsidization for a long time.

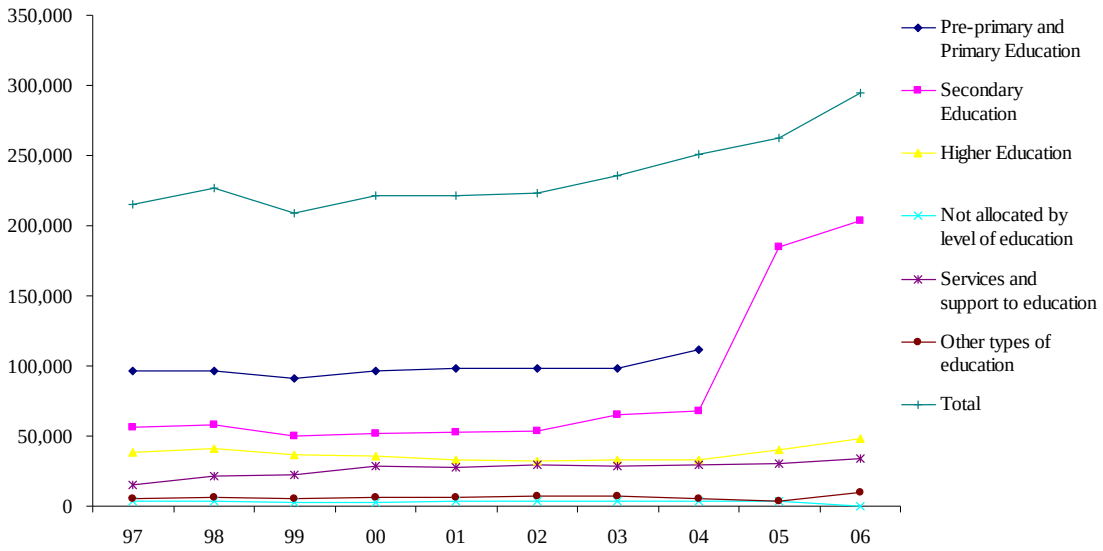

Figure 4.4 Thailand's Education Budget Allocation by Education Level, 1997-2006

Note: In 2005 and 2006, the budget for Pre-primary and Primary Education Budget are included in Secondary Education

4.6 Education Investment and Returns

The demand for education, including higher education, involves various factors which related to investment decision and personal taste and ability. However, the personal ability is believed as an innate quality or ability that individual was born with, not individual has learned and the examination score at pre-primary or primary education level might be reflected personal inborn ability. The high ability person

usually demands for more years of schooling than the low one. Therefore, the demand function of education can be expressed as, Belfield (2000: 54)

$$x_e = f(p_{xe}, p_n, Y, ses, w, B) \tag{4.1}$$

where p_{xe} is the price of education, p_n is the price of other commodities, Y is the household income, B is the individual's ability which usually positive correlates with years of schooling, w is forgone earning on education period, and ses is other socio-economics factors, e.g. family size, marital status, occupation of household head.

However, because higher education consumes large amount of time and money, it can be viewed as an investment project. Hence, individuals will continue to acquire education so long as their gross present value (GPV) of additional year of education is more than additional cost of education (C_E), or GPV>C_E, when considering the total lifetime earnings in present term, as follow.

$$GPV = \frac{B_1}{1+r} + \frac{B_2}{(1+r)^2} + ... + \frac{B_N}{(1+r)^N} \tag{4.2}$$[1]

That is, the net present value, NPV, can be computed as follow and will decrease along with increasing of schooling year of individual until equal to zero.

$$\text{NPV} = GPV - C_E = \sum_{t=0}^{N} \frac{B_t}{(1+r)^t} - C_0 - \sum_{t=0}^{N} \frac{C_t}{(1+r)^t} \tag{4.3}$$

,where B_t is the annual earnings, r is the discount rate and C_E is the cost of education which are direct cost such as tuition fee, expenditure for book and indirect cost such as forgone earnings.

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1 Equations (2) and (3) are modified from Barr (2003: 26).

Within the age group of 18-24 years, the 1996 Socioeconomic Survey (SES) expresses the proportion of working individuals to total population is 70.10% while the proportion of studying individuals to total population is 22.96%. But, later, after Student Loans Fund launching, the SES in 2004 shows these two proportions are 63.21% and 31.57%, respectively.

This implies that the most of individuals aged of 18-24 years old are involve in labor market. It also reflects the lacking financial support problems and the major sources in investing for their higher education come from parental income or some kinds of loan. Until nowadays, there is no market provided loan for education purpose due to high risk and market failure problems. The risk occurs from the possibility on student fails to complete their graduation and no collateral for the loans. While the market failure is caused by the circumstance of students are better informed than the lenders (Barr, 2003: 326).

4.6.1 Private and Social Rates of Return

The fact is that earnings are highly correlated with education at every age. The highly educated person earns more than people who are less educated. Of three different levels of education[1], higher education is directly involved with income of individuals due to the course contents relate to their jobs and occupation. For instance, as a medical doctor, individuals have to study an anatomy course which is provided only in university level at medical school. The other two are compulsory and their course contents in general knowledge such as writing, reading, mathematics and sciences which is basic knowledge for better understanding their society and environment. While the evidence shows that the university graduates have an average lifetime income 124.77% higher than that of upper secondary school graduates[2]. Table 4.17 presents the social and private rate of return to investment in higher education is in high level for all regions. For Asia countries, private rate of return is greater than social rate of return in all level of education. It is consistent with other

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1 Primary, Secondary and Higher education (Tertiary)

2 The SES data set in 2004 shows that the average earning of university graduates and upper secondary graduates are 17,003.41 and 7,565.00 baht per month, respectively.

countries overall the world, except Europe, Middle East and North Africa. Because of private rate of return, it would make the lifetime profile of expected return is higher far away from the actual costs (Todaro and Smith, 2006: 383-384).

This occurs as a result of the growth of private cost is slower than that of expected private return, for reasons of the widening gap between social and private rate of returns. Consequently, this wider gap makes a greater stimulus to the demand for higher education than it does for education at lower levels (Todaro and Smith, 2006: 383).

Table 4.17 Average Returns to Investment by Education Level and Region, 2004

Region	Social			Private		
	Primary	Secondary	Higher	Primary	Secondary	Higher
Asia (Non OECD)	16.2	11.1	11.0	20.0	15.8	18.2
Europe/Middle East/North Africa	15.6	9.7	9.9	13.8	13.6	18.8
Latin America/Caribbean	17.4	12.9	12.3	26.6	17.0	19.5
OECD	8.5	9.4	8.5	13.4	11.3	11.6
Sub-Saharan Africa	25.4	18.4	11.3	37.6	24.6	27.8
World	18.9	13.1	10.8	26.6	17.0	19.0

Source: Psacharopoulos and Patrinos, 2004: 114

Moreover, because the private rate of return for higher education is greater than that of secondary education. It would encourage students attempt to continue their education. It also obviously shows that developed countries have the rate of return for all education level lower than those of developing countries. Since, individuals try to maximize lifetime value which is the difference between their expected benefits and costs and the optimal strategy would be to secure as much schooling as possible.

In Table 4.18, the estimated private rate of return for bachelor degree education for all programs, except teacher training is higher than social rate of return. The difference on rate of return between academic track upper secondary and higher education is 5.8%. This encourages a great motivation for people to involve higher

education, if knowing information and no barriers on both budgetary and ability. However, undergraduate study in Thailand in teacher training programs mostly in Rajabhat University which is provincial university and were established up to 46 campuses throughout country. Their mainly purposes are servicing education students nearby and not so much rigorous entrance examination than the limited access university.

Table 4.18 Thailand's Estimated Social and Private Rates of Return by Education Level, 1994

Types of Return	Primary	Lower Secondary	Upper Secondary		High Vocational	Bachelor degree	
			Academic	Vocational		(1)	(2)
Social rate of return (%)	5.7	12.6	2.4	7.2	6.0	14.2	8.0
Private rate of return (%)	21.4	15.3	3.2	9.4	9.0	18.8	11.4

Source: World Bank, 1998: 87

Notes: (1) = Technical and (2) = Teacher training

In this case, private rate of return for teacher training bachelor degree is a small higher than the high vocational education (+2.4%) or vocational education (+2.0%) may not affect the students to extent their education. Moreover, comparing to secondary education which having the greater private rate of return than teacher training degree, it would be negative impact on students' aspiration on continuing their study to higher education.

4.6.2 Student Loans Scheme

Table 4.19 illustrate the reasons for abandon of studying in youth age (15-17) and the financial reasons is the major reasons for all income level. But the financial issues is the most concerning for 91.2% of low income family. Low-income families with borrowing constraints are limited their opportunity to involve in high level

education and households' income[1] is significantly effect to the opportunity to access higher education of their members. Moreover, the financial problem is not only tuition fee and other educational expense, but also the student foregone earnings that the family needs because, of this age, students can participate in labor market legally.

Table 4.19 Reasons for Discontinuing Studies (Drop-out), Non-Student Youth Aged 15-17

Reasons for drop-out	Total family annual income (baht)		
	Up to 50,000 (%)	50,001-100,000 (%)	Total (%)
Financial reasons	91.2	57.1	77.5
Academic reasons	4.4	17.9	11.3
Other	4.4	25.0	11.2
Total	100.0	100.0	100.0
Number in sample	48	32	80

Source: Ziderman, 2003: 62

Therefore, such financial barriers would block the ability people who are from low income family to enter the university education. The overall society will not maximize the benefits and the great variation of household income might imply the high variation of opportunity to access in university education for their members, as well.

Thailand's Student Loans Scheme was established on 1996 with the main objectives of making the greater educational opportunities, higher living standard and greater degree of equality in the population. The Scheme provides funding for individuals with annual family income not more than 150,000 baht and intends to study at higher education or vocational or upper secondary education. Because the low-income families may not access to others loan, due to their qualification in terms of income amount and their occupation and poor ability regarded the amount of

[1] Besides the household income, we may use the wealth level which is reflected by cumulative assets.

money and regularity of their earning, to absorb the risk and interest. This scheme would raise the opportunity of low income individual to involve in high level education. Therefore, the efficiency of this scheme can be seen by loan reaching to the target group and its efficacy that lead to continuation of study (Ziderman, 2003: 90).

CHAPTER 5

DATA AND METHODS

This study uses the Labor Force Survey of various years as main datasets. The Labor Force Survey (LFS) has been undertaken by the National Statistical Office (NSO) since 1963. It had been conducted in two, three and four rounds per year in 1971-1983, 1984-1997 and 1998-now, respectively. Currently, the first round is February, the second is May, the third and the fourth rounds are in August and November, respectively. Since 2001[1], the survey has been conducted monthly; period of data collection is the 1^{st} -12^{th} of the current reference month.

The survey assimilates information on labor force characteristics and the data derived from this survey include: 1) the number of population by age, sex, educational attainment, occupation, marital status, etc., 2) the number of employed persons by occupation, industry, work status, work hours, income and others and 3) the number of unemployed persons. Provinces were constituted strata. Each stratum is divided into two parts according to the type of local administration, namely municipal areas and non-municipal areas. A stratified two-stage sampling method has been adopted with the primary sampling unit being blocks for municipal areas and villages for non-municipal areas. The secondary sampling units are private households or persons.

5.1 Data for Analysis

The study is carried out by selecting students aged 18-24 years old to analyze the empirical pattern of the relationship between opportunity in university participation and family income, including socioeconomics factors. This may lead the

[1] In Labor Force Survey since 2001, the workforce is defined as individual aged 13 years and over.

selection bias problem because the selected groups are not randomly related to the whole LFS observations.

The possibility of selection bias limits the use of secondary data for identifying the parental relationship to offspring's university participation. The study cannot use the whole sample which includes all ages because some observations are not in scope of university students. Besides, individuals aged less than 18 years may remain in primary or secondary school; while, those aged over 24 years are unable to identify their parental characteristics and parents and children may not live together in the same household. Therefore, it should aware that this selected group may causes the over significant outcomes.

In many cases, the selection bias may be occurred when use the secondary data and difficult to solve. Because the analyst lack control over data could be collected even if they have abundant resources. For example, Dubin and Rivers (1989: 360) presents that the analyzing the relationship between schooling and earnings which only have earnings data for those who are employed. However, Labor-force participation is voluntary and some people may choose not to work or are unable to find work. The employed people are not to be a random subset of the entire population and there is no reliable way to impute earnings to those who are unemployed.

In addition, Heckman (1979: 153) presents that the sample selection bias may arise in practice for two reasons. First, there may be self selection by the individuals or data units being investigated. Second, sample selection decisions by analysts or data processors operate in much the same fashion as self selection. Standard econometric techniques may not powerful enough to identify selection effects (Casari, Harn and Kagel, 2005: 2).

This study uses non-weighted data of individuals aged 18-24 years old in 1996 to 2003. In 2003, the data present that the number of university participant totals 7,196 and non-participant totals 3,812. If the study includes all ages, it would be unable to compare and analyze the findings related to parental characteristics. In order to merge into annual basis and reduce seasonal effect, four rounds (two or three rounds in some years) of data are pooled together for analysis.

5.2 Research Methods and Variables

This research deals with this issue through both non-parametric and parametric approaches. First, for a non-parametric method, kernel regression technique will be used for estimating the shape of function, f_t being as a form of relationship between university participation of households' members, y_t and households' incomes, x_t. This relationship can be expressed as

$$y_t = f_t(x_t) \tag{5.1}$$

This can be plotted the relative function of university participation and household income level to view the relationship.

Next, probit estimation technique will serve the parametric method. This approach also identifies the changes in the relationship between university participation and household income and SES variables.

It can be conducted in two models. One is an analysis between the probability in gaining an access into university education and household income only, two is an analysis between the probability to gain an access into university education and household's socioeconomic variables including its income. The probability to access university education for individual *i* at time *t* can be described as

$$y_{it}^{*} = \beta_t^{'} X_{it} + \varepsilon_{it} \qquad , \varepsilon_{it} \sim N(0,1) \tag{5.2}$$

and

$$y_{it} = 1 \quad \text{if} \quad y_{it}^{*} > 0 \qquad \text{and} \qquad y_{it} = 0 \ \text{if} \ y_{it}^{*} \leq 0 \tag{5.3}$$

where y_{it}^{*} is an unobserved variable which is implied to individuals' tastes and ability on making a choice to involve higher education at particular time, t , and y_{it} is

the actual of that process. The X_{it} are a set of explanatory variables and $\beta_t^{'}$ is a parameter vector. In this case, the threshold is set to zero, but the choice of threshold value is irrelevant due to a constant term is included in. Therefore, the probit models can be expressed as

Model I $$\Pr(y_i = 1) = E(y_i = 1|x_i) = F(x_i) = \beta_1 + \beta_2 x_i \quad (5.4)$$

Model II $$\Pr(y_i = 1) = E(y_i = 1|x_i, SES_{ji})$$

$$\Pr(y_i = 1) = F(x_i, SES_{ji}) = \beta_1 + \beta_2 x_i + \beta_j SES_{ji} \quad (5.5)$$

Where $F(.)$ is the cumulative distribution function of normal distribution , x_i is the family income and SES_{ji} is the vector of socioeconomics factors such as gender, social status, household head occupation, etc.

The third approach is using of previous findings to analyze the pattern of equality across households income by quintiles and deciles. The attendance opportunity is clearly illustrated by Lorenz curve and various measures such as Gini coefficient, Coefficient of variation and Atkinson index and its changes overtime. Furthermore, this approach will show the effect of student loans scheme on attendance opportunity and implicates a policy on the equality of opportunity to participate in higher education and how to adjust the student loan scheme. If this policy is conducted efficiently, the opportunity to access higher education for the low-income families will be greatly improved.

The variables for the study which are expressed in Model I and II can be shown as follows.

5.2.1 Dependent Variable

This study uses individual's participation (or non-participation) in university education as a dependent variable. It is defined university education as a higher education with four years (or 5-6 years) of study at a bachelorate level.

5.2.2 Independent Variables

This study categorizes variables being expected to have an impact to individual decision to participate in university education into four groups:

5.2.2.1 Family Characteristics

1) Family Income

This variable is expected to be positive associate to student's opportunity to participate in university education and is defined in logarithm value.

2) Father's and Mother's Years of Schooling

These variables are the numbers of years in formal school system of father or mother. It reflects the social status of households and can be expected that these two variables positively affect student's educational opportunity.

3) Family size

This variable is the number of family members such as father, mother and children who live in the same households excluding house keeper or maid.

5.2.2.2 Place of Residence

These variables reflect the education provision which differ in quantity and quality among regions and areas nationwide. These may affect students' decision to involve with higher education. However, due to the limitation of the LFS data and other sources of information, dummy variables are used to define in the models as follows.

AREA equals to "1" if student lives in municipal or urban area and "0" for living in non-municipal or rural area. Normally, the number of school and education resources are more available in urban than in rural area. It may influence more urban students to participate in university than rural students. In contrast, the number of students in urban is greater than in rural and this may affect the resources per student. Therefore, it is still unclear that urban students get higher opportunity to university participation than rural students.

CENTRAL equals to "1" if student lives in central region and "0" otherwise. NORTH equals to "1" if student lives in northern region and "0" otherwise.

NORTH_E equals to "1" if student lives in northeastern region and "0" otherwise. SOUTH equals to "1" if student live in southern region and "0" otherwise, where Bangkok served as a base for these four variables. All variables equal to "0", if

student lives in Bangkok. It can be predicted that other regions having education resources less than Bangkok and would make their students have less opportunity to involve with university education. In the same way, if the number of students is considered, it is difficult to predict the direction of the impact.

5.2.2.3 Father's Occupation

Father's occupation is expressed as a dummy variable as follow. PRIVATE equals to "1" for father works in private company and "0" otherwise. ST_ENTERP equals to "1" for father works in state enterprise and "0" otherwise. GOV equals to "1" for father works in government agency and "0" otherwise. FAMILY equals to "1" for father works in family business and "0" otherwise. OWNER equals to "1" for father works as business owner without employee and "0" otherwise.

Father who works as an employer served as a base. It is expected that other occupations may provide fewer resources for their children than 'employer' status. It reflects the higher opportunity of students whose father works as an employer. However, regarding the effect of information and attitudes, the direction of impact may unclear to expect.

5.2.2.4 Marital Status

Family marital status of family is expressed as a dummy variable as follow. SEPARATED equals to "1" for parent (father or mother) who is 'separated' and "0" otherwise. DIVORCED equals to "1" for parent (father or mother) who is 'divorced' and "0" otherwise. WIDOWED equals to "1" for parent (father or mother) is 'widowed' and "0" otherwise. 'Married' parent is used as a base. It is expected that 'married' parent gives largest support to student's aspiration to continue his/her education to university level.

Statistical data for these variables from 1996 to 2003 are shown in Appendix A.

CHAPTER 6

EMPIRICAL FINDINGS

6.1 Research Design

The main question of this research is “What is the effect of household income on the opportunity to participate in higher education in Thailand? ,and how is the opportunity distributed among households of different socioeconomic status? The hypothesis for the research is:

H_0: The opportunity to participate in higher education in Thailand relates to income level and socioeconomic characteristics of households.

In addition, this research will examine the opportunity to participate in university education of the poor who are members in families at the lowest 20% group. The question of interest is “What is the change of the opportunity of the poor over time and how does the opportunity change after the implementation of student loan policy?” The analysis is conducted by utilizing various secondary data sets of Labor Force Survey from National Statistical Office as well as the dataset from Commissions of Higher Education and Student Loans Office.

6.1.1 Socioeconomic Status and Disparities in Higher Education

Many economic research projects have attempted to analyze the issue of education participation based on factors of individual characteristics and social status such as parental education attainment, occupation and family income. It has been found that these factors are strong and positive influences on a student’s decision to start and complete their degree in university. Socioeconomic characteristics have been examined as influencing factors on higher education participation in many studies (Miller and Volker, 1989: 47-70; Ermisch and Francesconi, 2001: 137-156; Le and

Miller, 2004b: 39-65; Le and Miller, 2005: 152-165). There are many factors other than the ability and preference of the students which influence their eventual educational participation and attainment. These include differences in the level and quality of education available in the country, region and area in where they live.

Sociological researchers have found that the family background of the students is the key to identifying the dimensions of inequality of access to higher education. As the key dimension to identifying a person's social position, the concept of socioeconomic status differs in theoretical approach in different social structures and cultures. However, education, occupation and income are the predominant variables used to measure socio-economic status (Huang, 2005: 11). There are at least two types of characteristics, which form a person's position in a given society, one is biological such as age, sex, race and ethnic origin, and another is acquired such as power, wealth and social prestige (Haug 1977 quoted in Huang, 2005: 11).

Furthermore, Husén (1975 quoted in Huang, 2005: 10) states that the main dimension of inequality in educational opportunity is parental socioeconomic status, which accounts for a large portion of the variance in access in the industrial countries. These influencing factors can be described as parental education attainment, parental occupation, parental birth origin, family size and other social status. However, assuming the ability and preference are equally distributed among the people within a country, the reason for making a decision not to participate in university education may be rooted in insufficient information about higher education because of low background social status. Students from poorer backgrounds might not be well informed or they may be not be correctly informed about the nature of higher education (Barr, 2001: 182) if they come from a family with no graduates, especially their parents. Moreover, these students may not choose to be involved in the labor market because of a shortage of money and perceived high risk of failing to obtain the degree, even the average private return on a degree is positive. For the poor whose annual income is below the poverty line, investing in higher education seems too far to reach and the students may have to work menial jobs rather than study in university because their families need his/her earnings . Hence, they may face greater risks than others. Because the efficiency problems of the loans impact most on people from poorer background, women and ethnic minorities (Barr, 2001: 182).

Another factor is school type and quality of education. People may think that it is unsuitable for him/her or lack inspiration that they did not get from their secondary school or because of their poor quality of education (Barr, 2003: 327; Canton and Blom, 2004: 4). Family size is one of the influencing factors which have a negative impact on university participation. The larger the family size, the lesser the probability of participating in university education. The reason is that the educational expenditure per capita will be insufficient for all to be university graduates.

Location and family background play a key role in influencing motivation, values and attitude toward higher education. The previous section shows the distribution of enrolled students by region and number of schools. The differences in region and area may reflect the differences in school quality which could be shown by school assessment, and average education attainment within the region. The location may be viewed in two parts, geographic region and community. Thailand is often broken down into five regions: Bangkok, the Central region, the North, Northeast and South and community areas are set as municipal and non-municipal areas. Both of them are influencing factors on university education participation. In Thailand, the majority of universities are located in Bangkok and the Central region while the smallest number is located in Northeast. This is reflected in the student numbers as well.

In sociological terms, the social status or background can be taken from the father's work place. Generally, fathers who work in state enterprises and government agencies are considered to be of higher social status than people in family businesses or private companies. However, a better reference may be the parental occupation. In 1997, the parent's occupations were only 11% farmers and almost 50% were merchants or businessmen. Addition, 12.8% of people whose occupation was in category of "Professional, Civil servant, Business and Trading" represented 73% of students in limited-access universities and 77% in private universities while "Agriculture" which represented 66% of people attended only 1.4% and 0.7% respectively (World Bank, 1998: 30).

6.1.2 Socioeconomic Factors and Equality of Opportunity

Based on the concept of equality, participation in university education should be based on a person's ability and preference, not on family income, socioeconomic status, gender or ethnicity. Because the improvement in increased opportunity of university participation contributes to equity and efficiency, in that it minimizes the waste of talent (Barr, 2003: 322). Nevertheless, the selectivity of higher education could hardly satisfy the goal of social equity (Duke, 1998 quoted in Huang, 2005: 8). It is widely known that the equity of any educational system could hardly reach the point of having the same proportion represented in schools by each social group as their original proportion in the society at large, even when talent is equally distributed among the population.

Even though it can be theoretically open to every person in a society, entry into higher education depends on personal will and choice, besides individual learning ability. First, there are many political, social, economic and cultural factors, which influence the decision of a person to enter a school and stay for a number of years. Second, learning ability differs from person to person, but it is an important criterion in terms of selection for higher education. Assuming the same personal ability and preference, the investment in higher education of different people may not be equal. The circumstance of the equality of opportunity means that individual has a chance to invest for his/her higher education equally without any others restrictions such as gender, social status. In fact, the actual amount varies depending on ability and other influencing factors.

In Thailand, there is an emphasis on equalizing educational opportunity, but mainly on Primary and Secondary education levels as stated in the National Education Act B.E.2542 (1999) (and Amendments – Second National Education Act B.E.2545 (2002)) in Section 10 "In the provision of education, all individuals shall have equal rights and opportunities to receive basic education provided by the State for the duration of at least 12 years. Such education, provided on a nationwide basis, shall be of quality and free of charge." But there are no clear directions to promote the equality of opportunity to participate in higher education. Section 11 states that the major role for individuals' higher education is their parent's responsibility and according to the families capabilities.

This is different from United Nations' policies, which are shown on Article 13, the 1966 International Covenant on Economic, Social and Cultural Rights, "Higher education shall be made equally accessible to all, on the basis of capacity, by every appropriate means, and in particular by the progressive introduction of free education." (Huang, 2005: 8). Therefore, it implies that the family socioeconomic and income factors are still the dominant factors in individual demand for university education.

Figure 6.1 shows the conceptual equality of influencing factors and shows particularly how the socioeconomic background and family income affect each others. Socioeconomic background promotes the increase of family income through intergenerational effects which is consistent in Taubman's study in 1989. In contrast, family income acts as a facilitating factor to improve socioeconomic status by being directly involved in the children's education. Family income was believed as a strong influencing factor on the personal decision to participate in university education. That is, the different family income levels will make a variable scale of probability for their children.

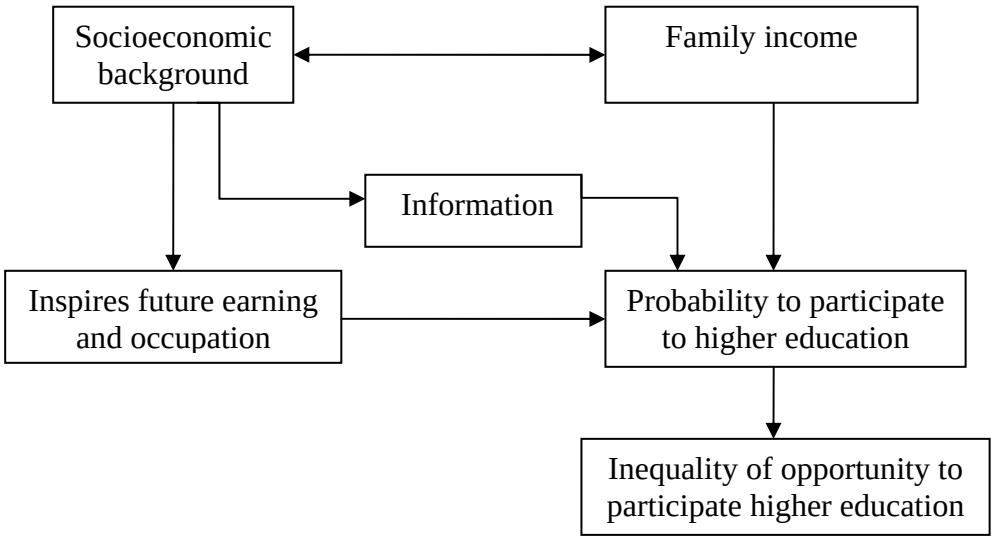

Figure 6.1 The Conceptual Framework for Inequality of Opportunity to Participate in Higher Education

The other two ways which socioeconomic factors can affect the probability to participate in higher education are through information provided by the family and through raising children's inspiration to keep studying. As stated in Le and Miller (2005: 156); Miller and Volker (1989: 54), socioeconomic background is found to be an important influence on school continuation decisions. Therefore, the socioeconomic factors which may affect individual probability and which should be concentrated on are the parent's education attainment, father's occupation, family size, geographical region, administration area and marital status. There are considerable differences in the predicted probability of undertaking university education, with the most marked variations being associated with the socioeconomic status of the family, parent's educational attainment, school type and ethnic origin Miller and Volker (1989: 54). This linkage should be proven. Also, the impact of individual probability with different income levels on inequality of opportunity to participate in higher education should be further studied and clarified.

6.2 Empirical Findings on Individual Opportunity to Participate in Higher Education

6.2.1 Non-Parametric Method

The kernel density estimation, one of non-parametric methods, is used to estimate density distribution without any applied assumptions such as normal distribution and lets the data express the outcomes by itself (DiNardo and Tobias, 2001: 12). The analysis of density distribution of family income for members aged 18-24 can be categorized into two groups: university participants and university non-participants. The purposes of this study are (1) to establish and compare the density distribution of income between families with members attending university and families with non-participating members; (2) to examine the association of personal decision making with university involvement and family income.

The kernel density distribution diagrams from 1996 to 2003 are plotted to examine the changes of income dispersion for both participating and non-participating families. Next, the kernel regression is conducted to identify the kernel function form, f_t. This is a weighted function to determine the transformation of the relationship

between university participation probability, y_t, and family income, x_t. This relationship can be demonstrated as the equations (6.1) and (6.2), which are used to estimate the kernel function of each particular family income, x_t.

$$y_t = f_t(x_t) \tag{6.1}$$

$$m(x_t) = \sum_{i=1}^{N} (y_t - \beta_0 - \beta_1(x_t - X_t) + - ... - \beta_k(x_t - X_t)^k)^2 K(\frac{x_t - X_t}{h}) \tag{6.2}$$

Equation (6.2) is the local polynomial kernel regression fit, y_t ,at each value x_t, by choosing the parameters β to minimize the weighted sum-of-square residual. So that, for some particular bandwidths and weighted observations, the linear kernel regression fit, y_t, can be carried out by using the parameters to make the lowest weighted sum of square residuals. It can be exhibited by the association of two variables.

6.2.2 Kernel Density Distribution

$$f(x) = \frac{1}{Nh} \sum_{i=1}^{N} K(\frac{x - X_i}{h}) \tag{6.3}$$

Kernel Density Distribution is conducted through equation (6.3) where N is the member of observations, h is a bandwidth or smoothing parameter, and K is a weighted kernel function which is aggregated for unity. The bandwidth can be computed by $h = 0.15 (x_U - x_L)$, where $(x_U - x_L)$ is the latitude of family income. It means that the higher the value of bandwidth, the smoother the line of distribution.

The density distribution of family income for participating and non-participating families from 1996 to 2003 is shown in Figures 6.2 to 6.7. These diagrams are employed to examine what the differences in density distribution of family incomes are between participating and non-participating members and how they change over time. The kernel density of family income for participating members

has longer tails to the right than that of non-participating members. This represents those university students who come from relatively affluent families. On the other hand, the members of high income families tend to decide to participate in university education more than those from low income families.

From 2001 to 2003, the kernel density distributions unambiguously show that the density of university participating members from high income families decreases while members from low income families participates more in university education. It can be shown by another peak of the density distribution on the left hand side (LHS). However, from 1996 to 2000, the density distribution of family income shows only one peak in the participation diagram.

In 2001, the kernel density diagram for participating family members clearly shows the increasing density of low income families, which reaches another peak. The first peak, which is on the left hand side (LHS), shows the family income at approximately 5,000 baht per month while it shows at about 15,000 baht per month on the right hand side (RHS). This differs from the kernel density diagram for participating family members in 1999, which has only one peak.

Remarkably, in 2002, the density of high income families is revealed to be greater in the participation diagram than in non-participation diagram, while the density of low income families is shown in the non-participation diagrams higher than the participation diagrams.

No two-peak distributions are observed in the period from 1996 to 1999. Furthermore, in 2003, the distributions clearly display a greater concentration of high income families represented in participation curves than non-participation curves. The distributions, however, show that the proportion of low income families is quite similar in both participation curves and non-participation curves. These reflect the greater participation of low income family members during the period of 1996 to 2003.

In addition, explicit evidence which reveals the increasing involvement of members from low income families is the gap between the average family income of participants and non-participants which decreases over time. As shown in Table 6.1, the average family incomes for participants are declining over time while those for non-participants remain approximately the same. These consequences illustrate the

weak linkage between university education and family income. It can be stated that the influence of family income on personal decisions of family members to extend their studies to university education declines over time.

To clarify the distribution outcomes, an equality test on average and variance of family income is conducted. It is hypothesized that participating and non-participating members have same mean and variance in family income. By using the LFS data, the analysis result rejects the hypothesis for all years of the study (1996 to 2003). For example, F-statistics for the equality of means, which is the mean square divided by the mean square within, is equal to 30.58 in 2003. This strongly affirms the difference in family income between university participants and non-participants.

However, after the hypothesis is rejected, the next step is to investigate and determine the reason why the distribution of family income for participants and non-participants is so significantly different. The test results for 2003 show the difference of density distribution between the two groups with 95% confidence (p-value=0.0000). These results imply the personal decision to enter university education is affected by their family income. In addition, the variance between these two groups' density distributions occurs at the beginning. University participants have an average family income and variance larger than non-participants. It reveals a wider range of family income for participants.

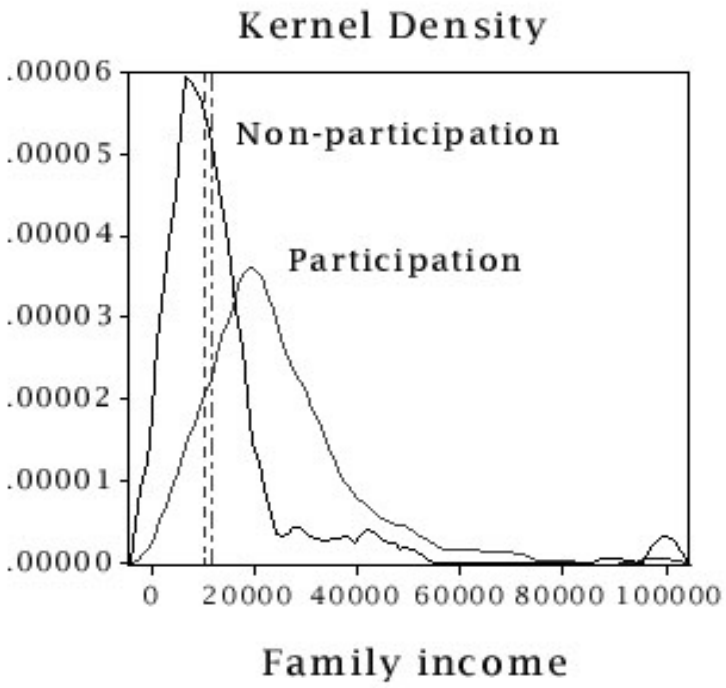

Figure 6.2 Kernel Density Distribution of Family Income for Participants and Non-Participants in Higher Education, 1996

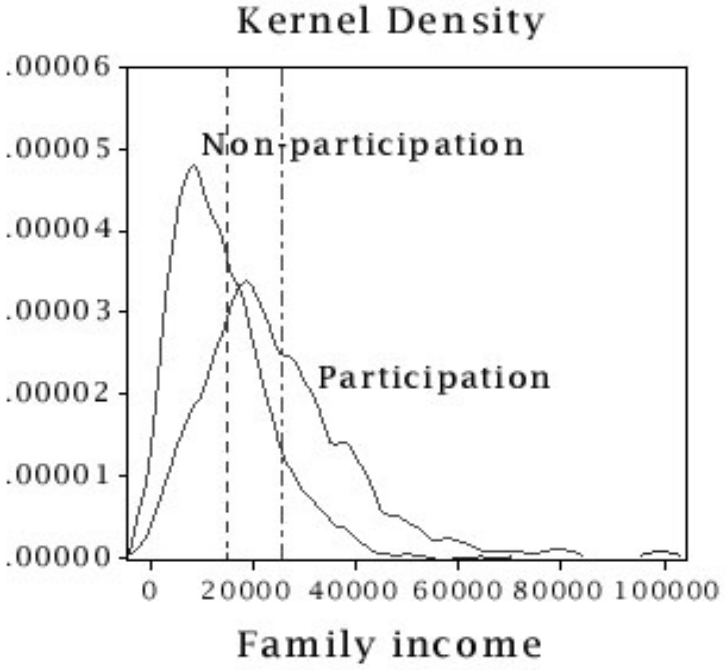

Figure 6.3 Kernel Density Distribution of Family Income for Participants and Non-Participants in Higher Education, 1999

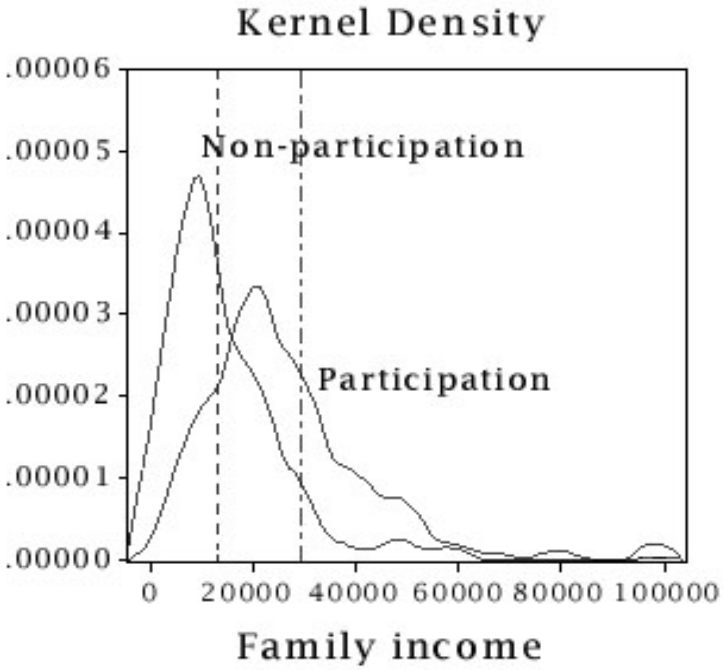

Figure 6.4 Kernel Density Distribution of Family Income for Participants and Non-Participants in Higher Education, 2000

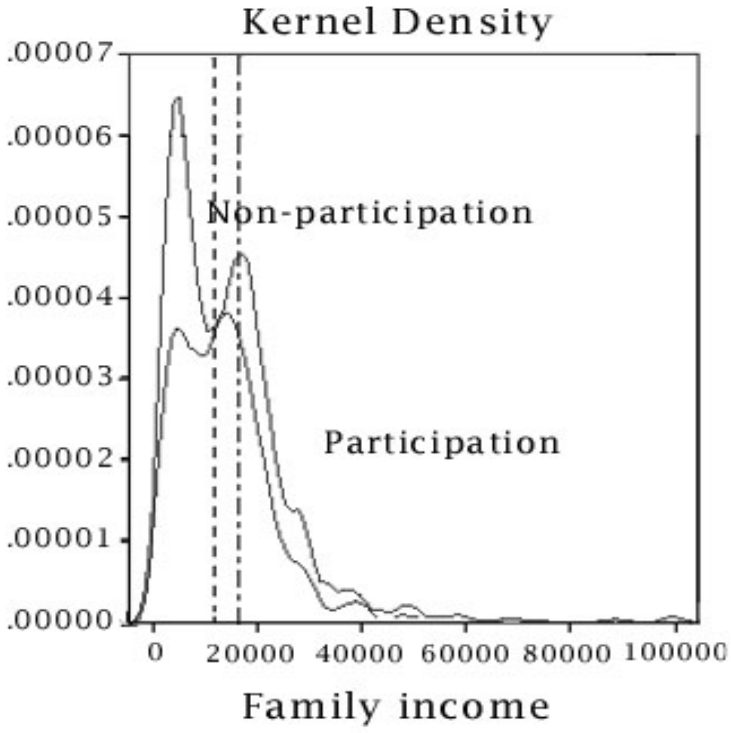

Figure 6.5 Kernel Density Distribution of Family Income for Participants and Non-Participants in Higher Education, 2001

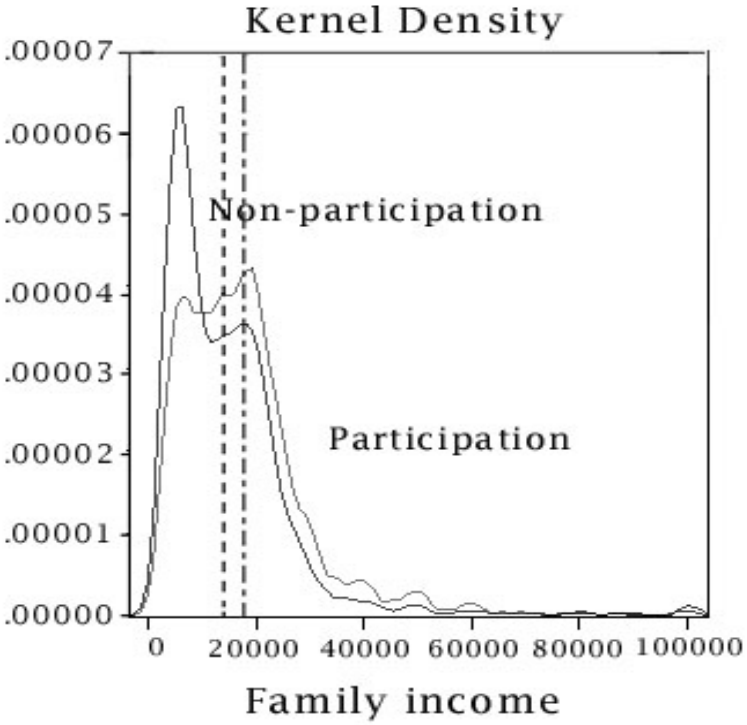

Figure 6.6 Kernel Density Distribution of Family Income for Participants and Non-Participants in Higher Education, 2002

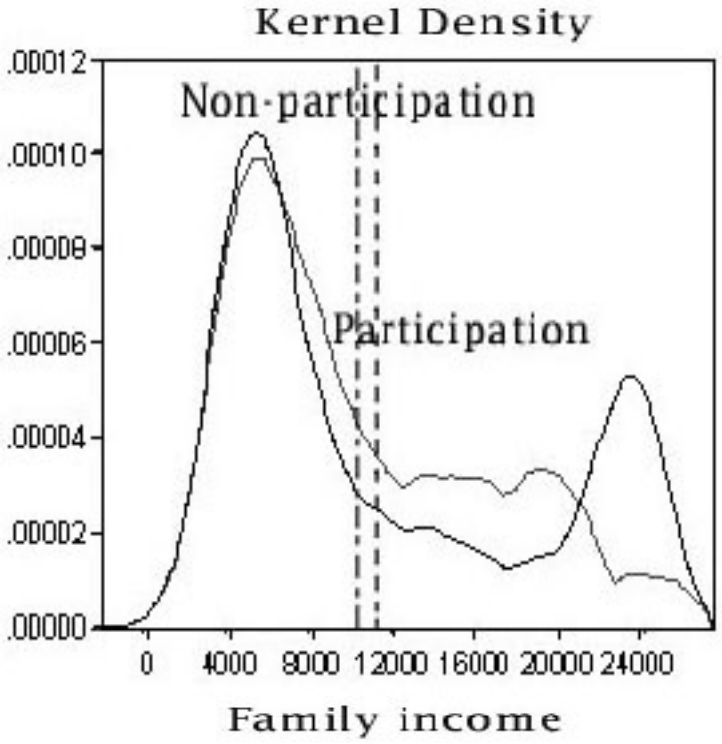

Figure 6.7 Kernel Density Distribution of Family Income for Participants and Non-Participants in Higher Education, 2003

Table 6.1 Average Family Income, 1996 - 2003 (baht per month)

Year	Average family income the 18–24 age cohorts			Average family income for all ages of members
	Participating	Non-participating	Difference	
1996	23,378.03	13,807.41	9,570.62	16,062.48
1997	26,414.60	16,471.73	9,942.87	21,130.42
1998	25,708.52	14,116.16	11,592.36	21,110.95
1999	25,102.28	12,998.79	12,103.49	21,520.23
2000	27,291.13	13,986.52	13,304.61	21,834.95
2001	17,981.89	13,464.15	4,517.74	12,649.42
2002	18,163.10	14,297.11	3,865.99	14,469.42
2003	11,332.77	10,388.17	944.60	14,980.86

Sources: NSO, 1996a to 2003a and own calculation

6.2.3 Kernel Regression

This method is used for estimating the probability that a person will decide to further their study into university for all ranges of family income. The kernel regression applies the Epanechnikov estimator for all years, uses the logarithm of terms of income and categorizes the results in quintile groups, as shown in Figures 6.8 to 6.15. The dotted line represents the linear estimation of the relationship of two variables.

In 1996, it is found that family income is positively associated with individual probability to participate in university education. That is, the higher the family income, the higher the probability to participate in higher education. Compared to other years, the change in probability per different family income level is the largest among the quintiles. It reveals that individuals may have some probability to participate in university education because its can be nil only if his/her family income is less than 31.62 baht per month (log w = 1.5). However, if family income is as high as 30,000 baht per month (log w = 4.48), the probability of its members participating in university education would be higher than 95%.

The kernel regression lines are similar for 1997 through 1999. The individual probability of low income families increases slightly from 1997 to 1998. At the low level, individual probability is equal to 0.05 in 1997 and 0.15 in 1999 with family income of 63.10 baht per month (log w = 1.8); while at the high level, individual probability equals 1.00 in 1997 and 1999 with family income of 63,095.73 (log w = 4.8) and 79,432.82 (log w = 4.9) baht per month, respectively.

In 2001, the individual probability to participate in university education equals 0.98 at the high level with family income of 79,432.82 (log w = 4.9) baht per month and equals 0.00 for family income of 125.89 (log w = 2.2) baht per month at the low level. While in 2002, the high level of individual probability of university participation equals 0.83 with family income of 100,000 (log w = 5.0) baht per month and 0.15 with family income of 158.49 (log w = 2.2) at the low level. It can be seen that the probability of participating in university education for low income families increases in 2003. If families have monthly income as low as 317 baht (log w = 2.5), the individual probability for their members would be 0.26, 0.34, 0.22 and 0.62 in 1996, 1999, 2002 and 2003, respectively.

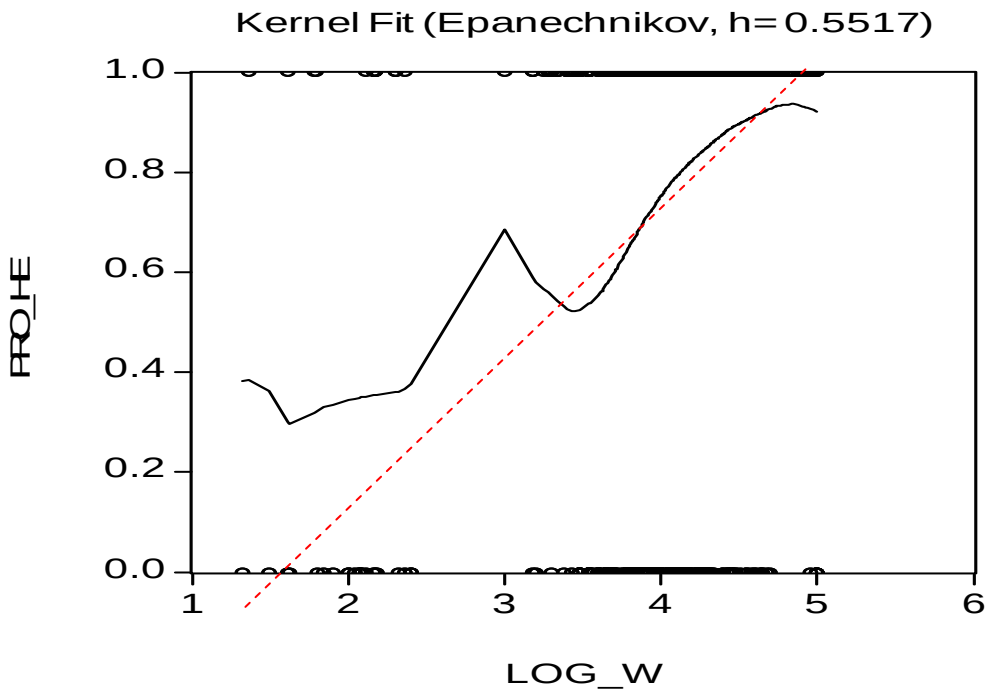

Figure 6.8 Kernel Regression of Probability to Participate in Higher Education with Logarithm of Family Income, 1996

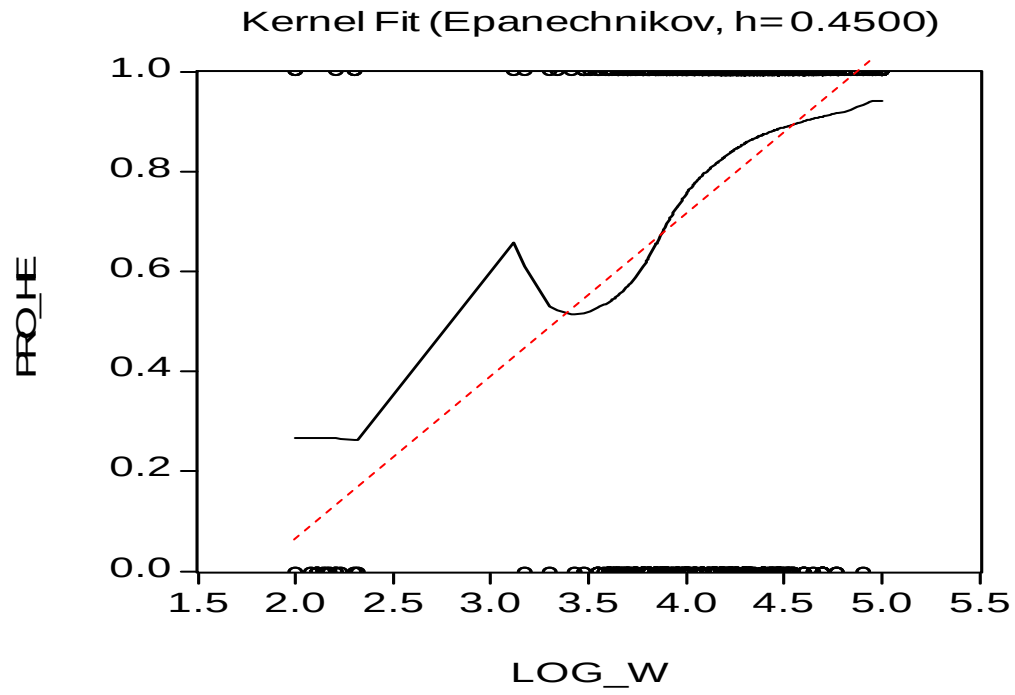

Figure 6.9 Kernel Regression of Probability to Participate in Higher Education with Logarithm of Family Income, 1997

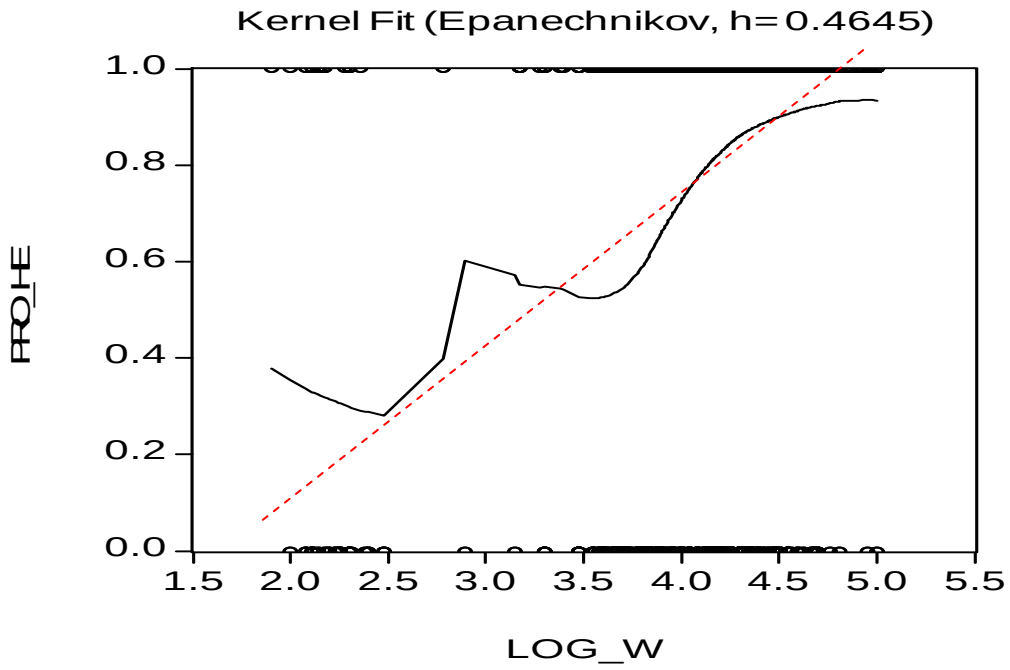

Figure 6.10 Kernel Regression of Probability to Participate in Higher Education with Logarithm of Family Income, 1998

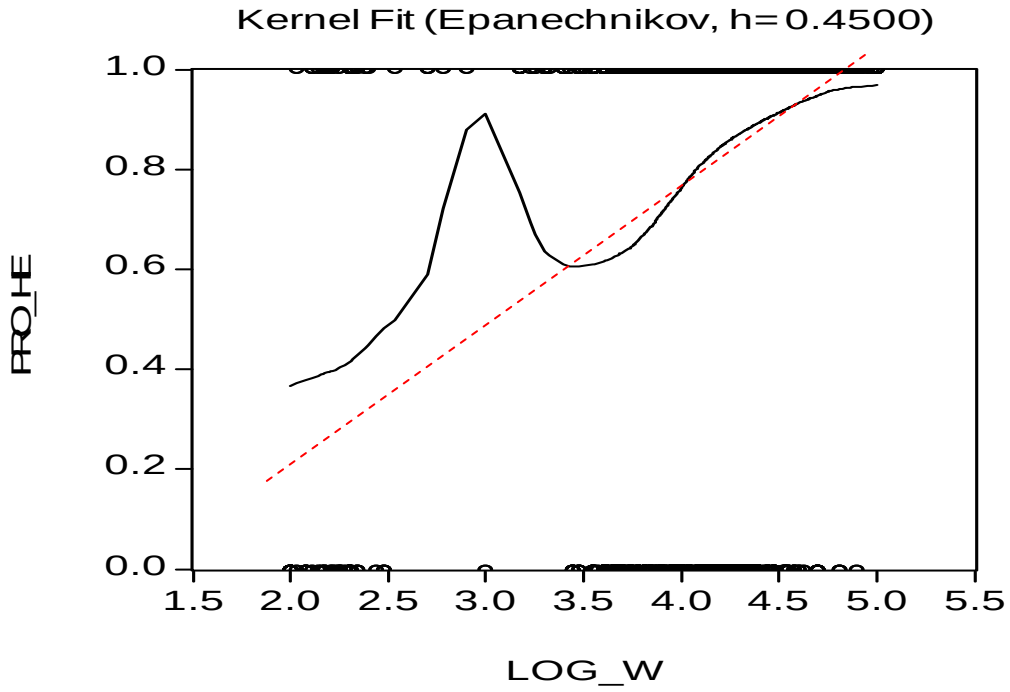

Figure 6.11 Kernel Regression of Probability to Participate in Higher Education with Logarithm of Family Income, 1999

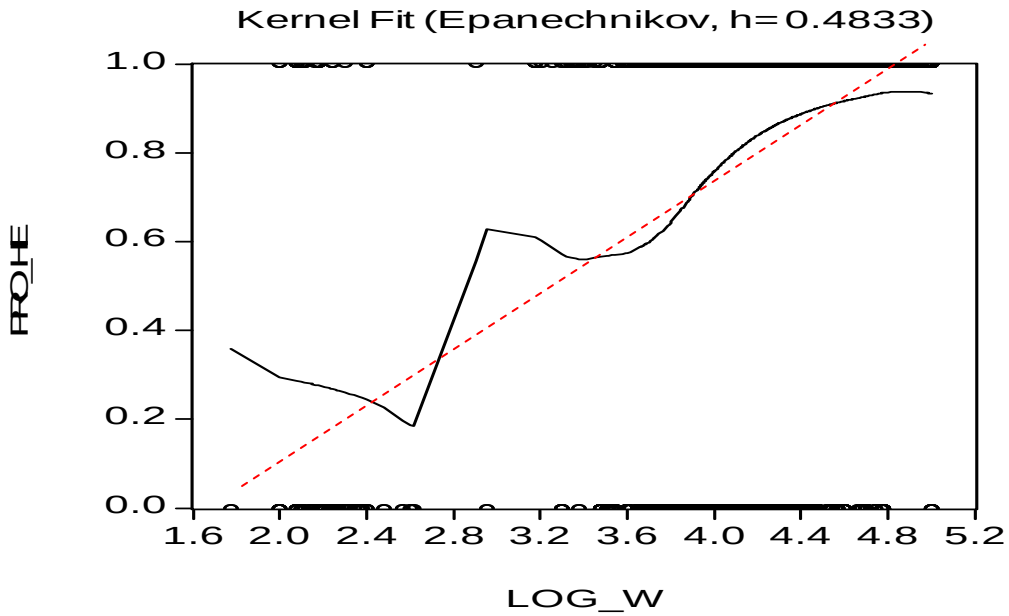

Figure 6.12 Kernel Regression of Probability to Participate in Higher Education with Logarithm of Family Income, 2000

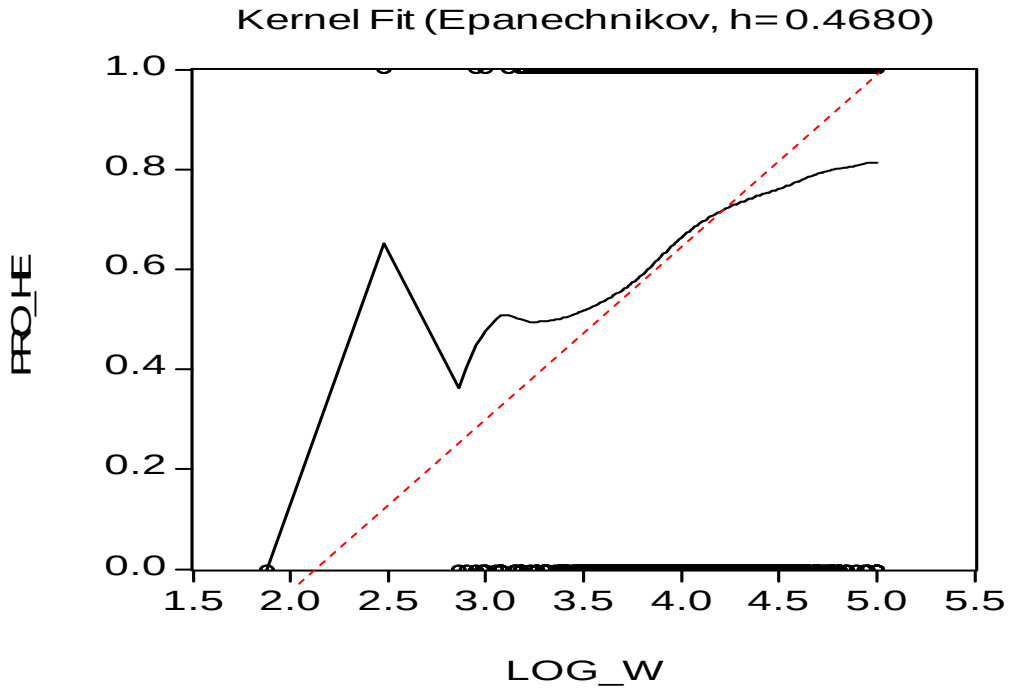

Figure 6.13 Kernel Regression of Probability to Participate in Higher Education with Logarithm of Family Income, 2001

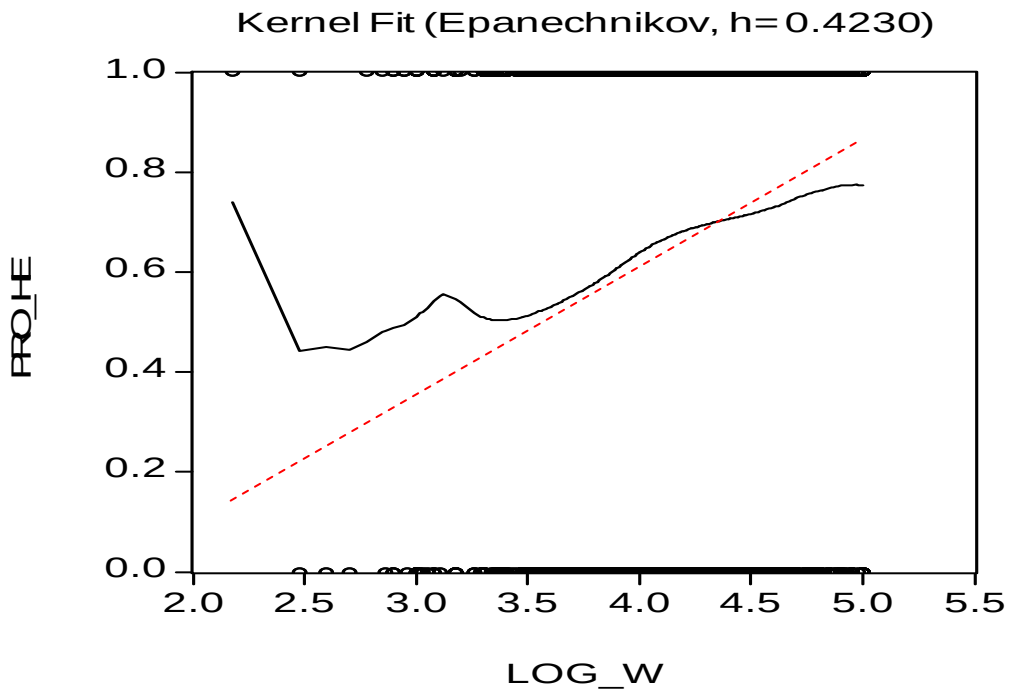

Figure 6.14 Kernel Regression of Probability to Participate in Higher Education with Logarithm of Family Income, 2002

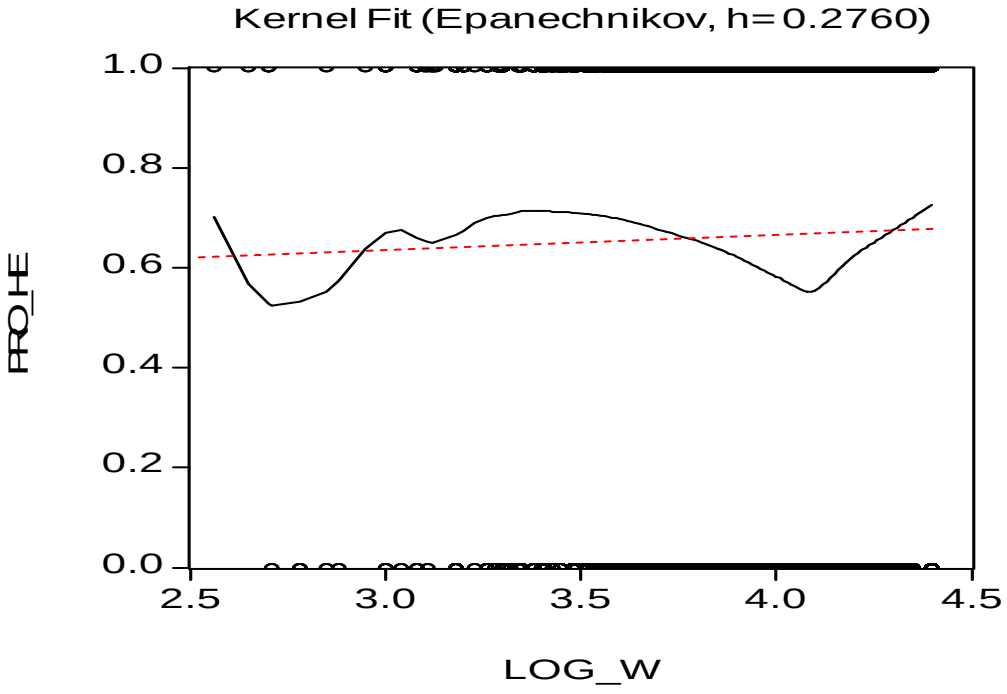

Figure 6.15 Kernel Regression of Probability to Participate in Higher Education with Logarithm of Family Income, 2003

However, the previous study (Miller and Volker, 1998: 47-70; Sewell, 1971: 793-809) implies that the problems in higher education mainly stem from the demand side, which influences the personal choice, instead of the supply side which provides accessibility by resource allocation. In 2003, the regression line relative to other years becomes much smoother. This shows that the changes in family income would have less influence on a member's decision to participate in university education.

Table 6.2 The Distribution of Individual Probability to University Participation, 1996 to 2003

Quintile No.	1996	1997	1998	1999	2000	2001	2002	2003
Q1	0.35-0.50	0.45-0.57	0.46-0.52	0.55-0.65	0.44-0.60	0.49-0.49	0.50-0.50	0.70-0.67
Q2	0.50-0.62	0.57-0.78	0.52-0.79	0.65-0.80	0.60-0.80	0.49-0.55	0.50-0.60	0.67-0.59
Q3	0.62-0.82	0.78-0.90	0.79-0.90	0.80-0.90	0.80-0.90	0.55-0.66	0.60-.65	0.59-0.53
Q4	0.82-0.94	0.90-0.90	0.90-0.93	0.90-0.97	0.90-0.95	0.66-0.75	0.65-0.70	0.53-0.78
Q5	0.94-0.92	0.90-0.94	0.93-0.94	0.97-0.98	0.95-0.94	0.75-0.80	0.70-0.75	0.78-0.85

Sources: NSO, 1996a to 2003a and own calculation

Figures 6.16 to 6.23 and Table 6.2 demonstrate the probability of participating in higher education by percentile of family income. In the period of 1996 to 1997, there is a significant difference in individual probability between low income families and high income families. In 1996, students from the first and second income quintile have a probability of participating in higher education ranging from 0.35 to 0.50 and 0.50 to 0.60, respectively. While the members of the top income quintile had a probability of participating in higher education in the range of 0.93 – 0.95 which is almost the full value of probability. Similarly, in 1997, the difference between top and bottom probability is approximately 0.50 (0.93 minus with 0.43), which reflects the existence of high inequality of individual probability. The obvious change during the period is that the individual probability of the second quintile family income increases in 1997, in contrast to that of 1996.

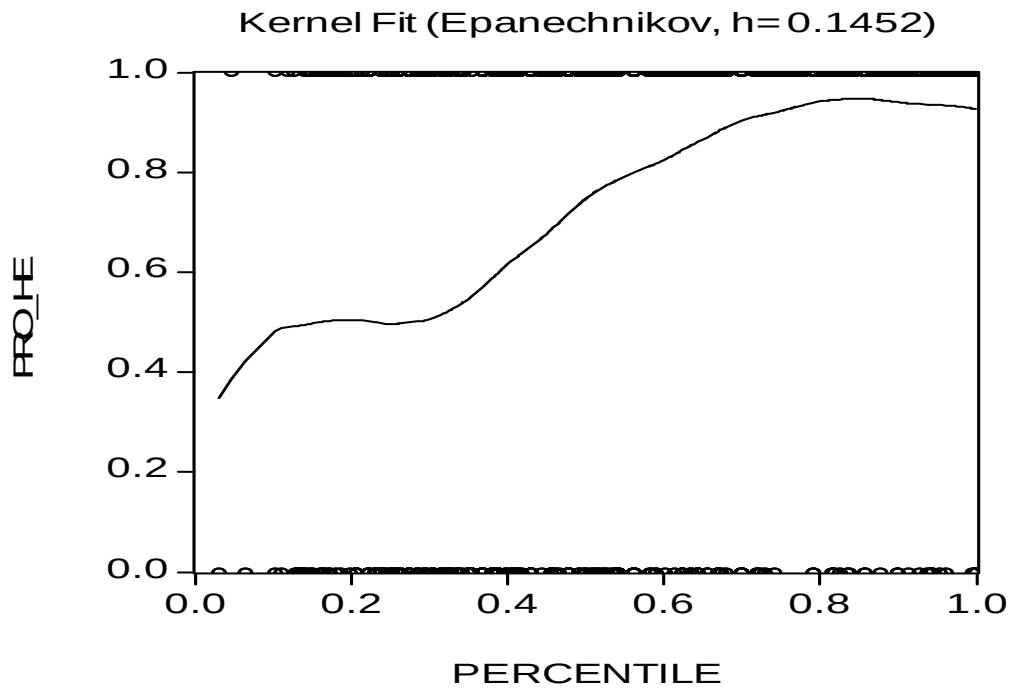

Figure 6.16 Kernel Regression of Probability to Participate in Higher Education on the Percentile of Family Income, 1996

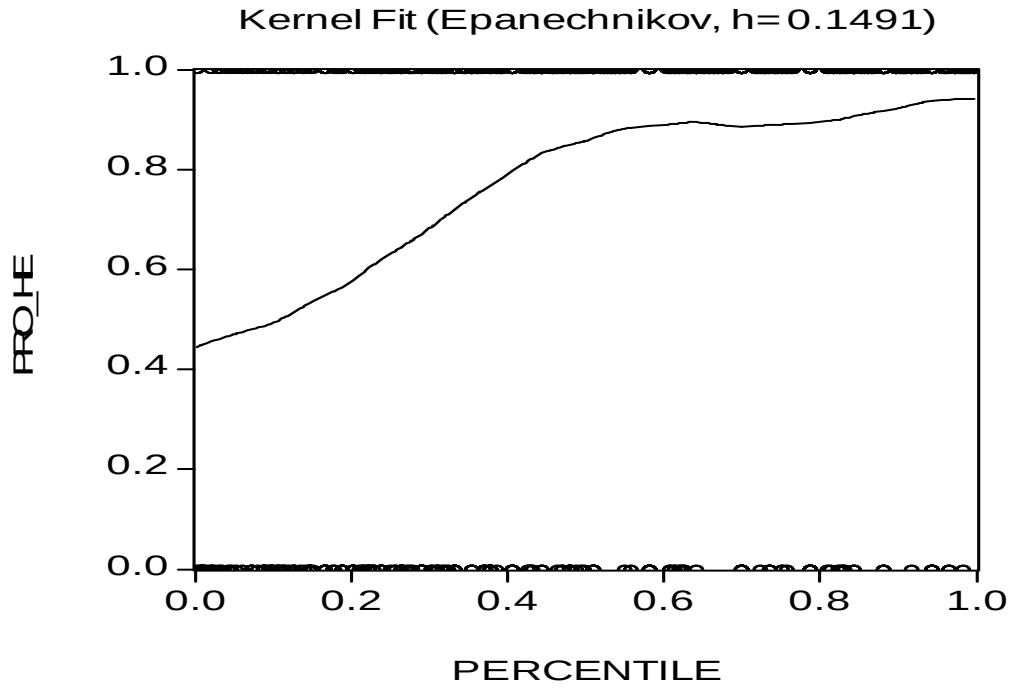

Figure 6.17 Kernel Regression of Probability to Participate in Higher Education on the Percentile of Family income, 1997

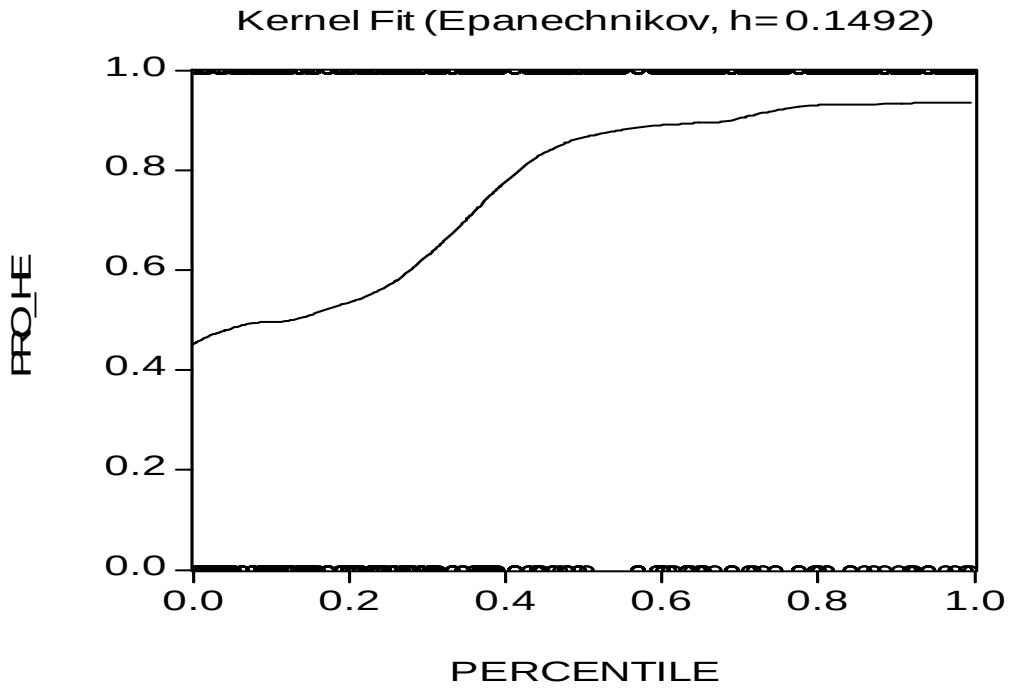

Figure 6.18 Kernel Regression of Probability to Participate in Higher Education on the Percentile of Family Income, 1998

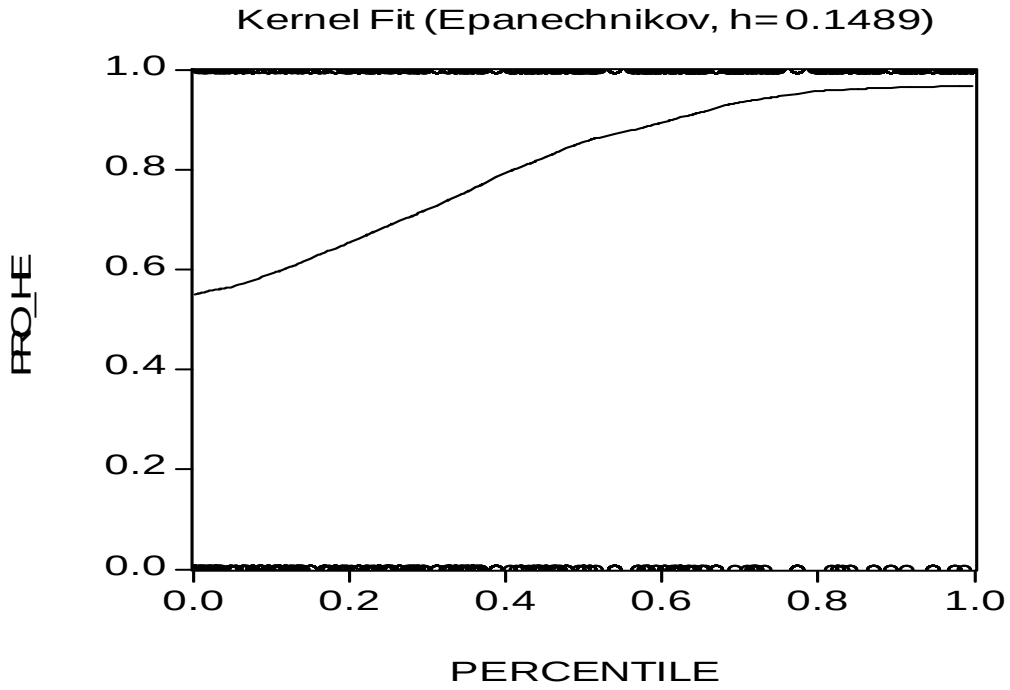

Figure 6.19 Kernel Regression of Probability to Participate in Higher Education on the Percentile of Family Income, 1999

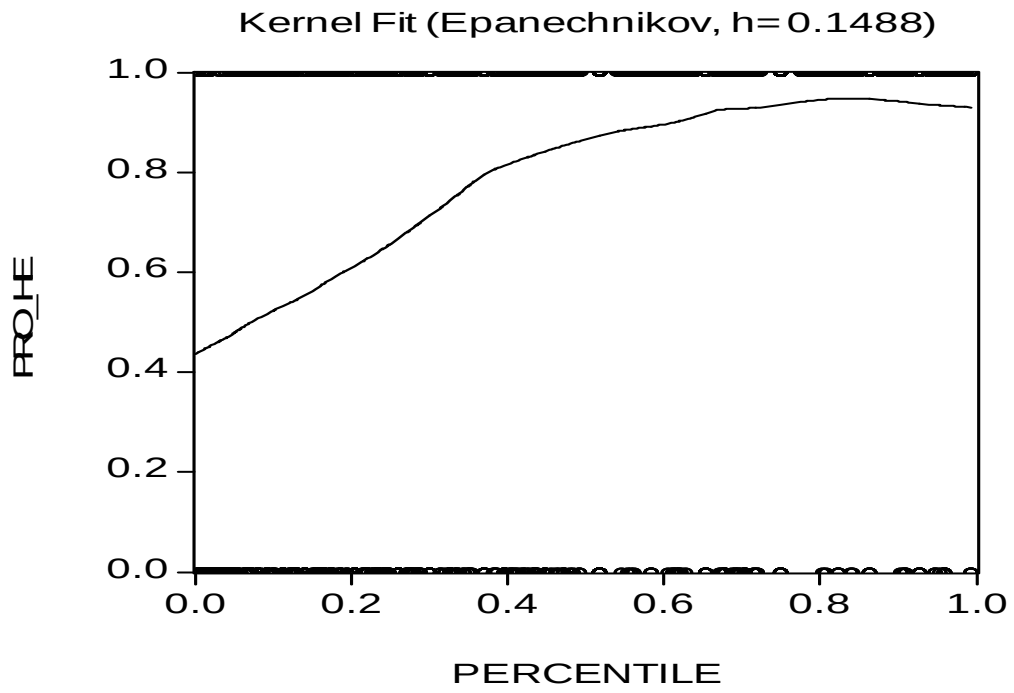

Figure 6.20 Kernel Regression of Probability to Participate in Higher Education on the Percentile of Family income, 2000

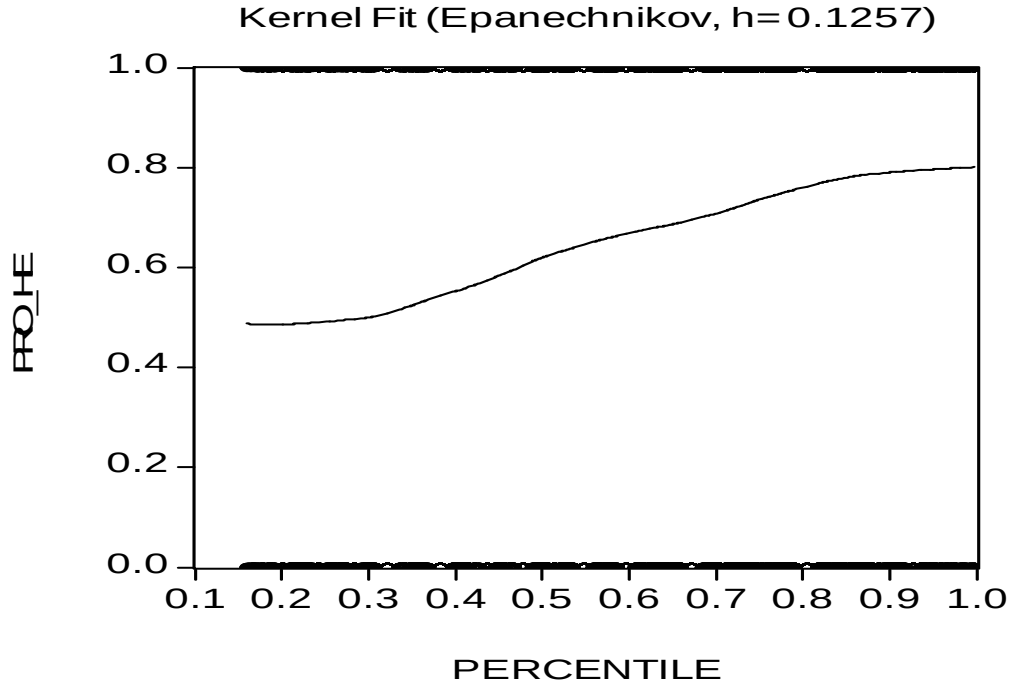

Figure 6.21 Kernel Regression of Probability to Participate in Higher Education on the Percentile of Family income, 2001

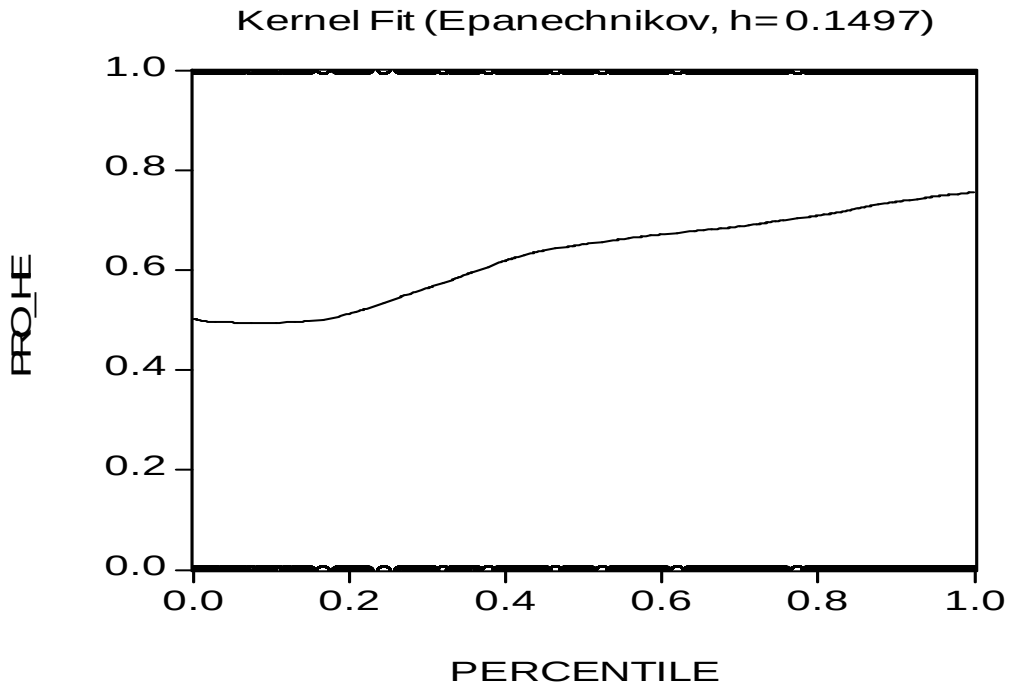

Figure 6.22 Kernel Regression of Probability to Participate in Higher Education on the Percentile of Family income, 2002

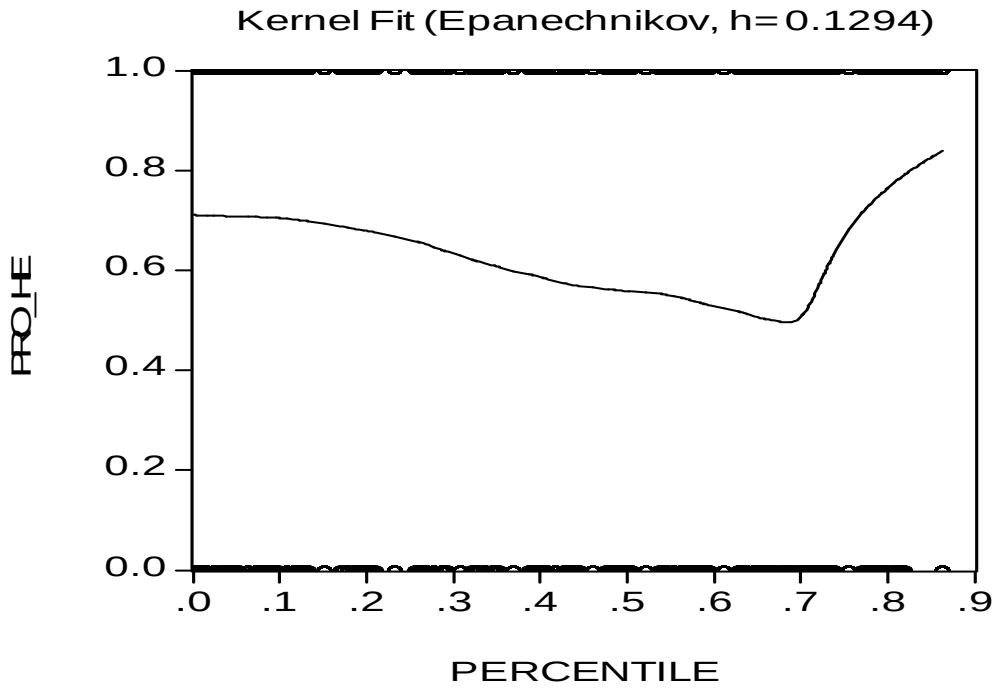

Figure 6.23 Kernel Regression of Probability to Participate in Higher Education on the Percentile of Family income, 2003

However, in 1998, the overall individual probability for all family income levels remains close to that of 1997, except for the second quintile in which individual probability decreases. From 1999 to 2000, the relationship between individual probability and income level roughly remains the same. In 1996-1999, the change in family income would greatly affect individual probability of participating in higher education, especially for the first and second quintiles, while in 2000-2003, the impact on participation in higher education is lesser.

In 2002 and 2003, individual probability to participate in university education declines for all income quintile levels. The biggest decrease in value is in the first 40% of low income families, which declined from 0.90-0.95 in 2000 to 0.66-0.78 in 2001 and to 0.66-0.75 in 2002. However, in 2001 and 2002, the probability for individuals of the first income quintile increased and those of the second remains at the same level as in 2000.

It can be seen that the probability of participating in higher education is higher than 0.50 for all family incomes in 2002 and 2003. A possible reason is the great improvement in educational opportunity from the expansion of universities in Bangkok into regional campuses and more students admitted into universities. A case in point: Ramkamhaeng University has expanded to 13 regional areas nationwide since 1995.

During 1996 - 2003, individual probability of university participation varies by family income level. The individual probabilities for the first and second quintiles increases while those for the third, fourth and fifth quintiles decline. Therefore, changes in probability in this manner reflect the reduction of inequality in probability among various levels of family income.

6.2.3 Summary

First, the average family income for university participants is usually higher than that for non-participants. The difference clearly starts early from the beginning of the period but it become closer over time due to the great increase in participation of low income students.

Second, the study reveals the strong relationship between individual probability, which is normally referred to as opportunity, and family income. From

1996 to 1999, the changes in family income level greatly affect individual probability, but this impact weakens from 2000 to 2003. During 1996 to 2003, the probability of participating in higher education for low income families increases, especially in the first and second quintiles. It might have been caused two policies, student loan[1] and access to education. Meanwhile, the probabilities of the third, fourth and fifth quintiles decline and this improves the inequality of probability to participate in higher education.

6.2.4 Parametric Method

The parametric approach, probit regression, identifies the pattern in the relationship between participation in tertiary education and family-related variables. Two models are tested: one, an analysis between the probability of participating in university education and family income; two, an analysis between the probability of participating in university education and family income together with other socioeconomic variables. The probability to participate in university education for an individual *i* at time *t* can be described as:

$$y_{it}^{*} = \beta_t^{'} X_{it} + \varepsilon_{it} \qquad , \varepsilon_{it} \sim N(0,1) \tag{6.4}$$

and

$$y_{it} = 1 \quad \text{if} \quad y_{it}^{*} > 0 \qquad \text{and} \qquad y_{it} = 0 \ \text{if} \ y_{it}^{*} \leq 0 \tag{6.5}$$

where y_{it}^{*} is an unobserved variable which applies to individuals' tastes and abilities in making a choice to participate in higher education at a particular time, t, and y_{it} is the actualization of that process.

---

[1] Student loans fund (SLF) was introduced on January 16, 1996 to provide funding to needy students who enroll in higher education. In 2006, SLF provided loans for 2,181,116 students for a total of 185,162.90 million baht.

The X_{it} are a set of explanatory variables and $\beta_t^{'}$ is a parameter vector. In this case, the threshold is set to zero, but the choice of threshold value is irrelevant due to a constant term included. Therefore, the probit models can be expressed as:

Model I $$\Pr(y_i = 1) = E(y_i = 1 | x_i) = F(x_i) = \beta_1 + \beta_2 x_i \quad (6.6)$$

Model II $$\Pr(y_i = 1) = E(y_i = 1 | x_i, SES_{ji})$$

$$\Pr(y_i = 1) = F(x_i, SES_{ji}) = \beta_1 + \beta_2 x_i + \beta_j SES_{ji} \quad (6.7)$$

Table 6.3 The Independent Variables of Probit Model II

No.	Variables	Base unit
(i)	**Family Income**	-
	Parental income (Log_w)	
(ii)	**Family Background**	-
	Father's schooling year	-
	Mother's schooling year	-
	Family size	
(iii)	**Family Residence**	
	Live in Central	Bangkok
	Live in North	Bangkok
	Live in Northeast	Bangkok
	Live in South	Bangkok
	Live in Municipal Area	Non-municipal Area
(iv)	**Father Occupation Status**	
	Work in Private company	Employer
	Work in State enterprise	Employer
	Work in Government	Employer
	Work in Family business	Employer
	Work in Owner	Employer
(v)	**Family Marital Status**	
	Separated	Married
	Divorced	Married
	Widowed	Married

$F(.)$ is the cumulative distribution function of normal distribution, x_i is the family income and SES_{ji} is the vector of socioeconomics factors. The first restricted specification includes only parental income in logarithm value and excludes all socio-economic related regressors. The second estimation includes socioeconomic factors,

e.g., the education attainment of the parents (in schooling years), family size, Place of residence, father's work status, marital status, and occupation, as shown in Table 6.3.

6.2.5 Probit Estimation: Model I

The estimation results can be expressed in three parts. First, the results of probit estimation indicate that family income, which is represented by family income, captures the relationship between income and university participation satisfactorily for all periods except for 1998 and 2001. These results show that family income is positively related to the probability to participate in higher education for all years. The results suggest that family income best serves to explain why the student may or may not have chosen to participate in university education.

Second, it seems that the impact of income on the opportunity to participate in higher education declines over time. For example, for every 10,000 baht of monthly family income, the probability to participate in university education will be 0.6622 for 1996 but will drop to 0.4277 in 2003, respectively. In addition, if family income is 20,000 baht per month or above, family members have certainly opportunity to enter higher education, except in 2002 and 2003, in which the probability was 0.5480 and 0.4414. This shows that in the period of 1996-2001, family income highly influences students' decisions on higher education, while this influence declines in 2002 and 2003.

Third, the effects of changing in family income were nearly in the same level from 1996 to 2002. The interpretation of the coefficient values is complicated by the fact that estimated coefficients from the probit model cannot be interpreted as the marginal effect on the dependent variables, like those of any nonlinear regression model. The marginal effect of x on the conditional probability is given by:

$$\frac{\partial E(Y_i|x_i,\beta)}{\partial x_{ij}} = f(-x_i'\beta)\beta_j \quad , \tag{6.8}$$

Where $f(x) = \frac{dF(x)}{dx}$ is the density function that corresponds to the cumulative distribution *F(.)*. The direction of the effect of a change in x_j depends

only on the sign of the β_j coefficient. A positive value of β_j implies that increasing x_j will increase the probability of the response and a negative value implies the opposite.

As shown in Tables 6.5 and 6.6, the results illustrate that family income positively affects a student's decision to continue their schooling to the university level. When each additional unit of log family income increases in the probability of participating in university education 25.28% in 1996, 28.71% in 1997, 22.26% in 1999, 23.87% in 2000 and 21.22% in 2002. This model reveals the strong relationship between probability to participate in university education and family income. Marginal effects also argue the influence of family income is less over time. For example, if family income rises from 10,000 baht (log w = 4.0) to 20,000 baht (log w = 4.3010) per month, which is approximately a growth rate of 7.5% the individual probability to participate in university education increases 1.8960% in 1996, 2.1532% in 1997, 1.6695% in 1999, 1.7903% in 2000 and 1.5915% in 2002. This result reflects the weakening influence of family income over time, but to a relatively small degree.

To get an overall view of the model, the likelihood ratio (LR) statistic, which is equivalent to the F-test, is used to test the null hypothesis of $\beta = 0$ and follows the Chi-square distribution with a degree of freedom that is equal to the number of independent variables. As shown in Tables 6.5 and 6.6, the LR statistics for all years are significant except in 2003 with p-value of 0.4243 and McFadden R^2 of 0.0003.

In addition, another approach for interpretation of the coefficient results is a measure of the relative change in the probability expressed as follows:

$$\frac{\beta_j}{\beta_k} = \frac{\partial E(Y_i | x_i, \beta) / \partial x_{ij}}{\partial E(Y_i | x_i, \beta) / \partial x_{ik}} \tag{6.9}$$

Where β_j and β_k are the comparison parameters. For example, the ratios of coefficients between 1997 and 1996 can be expressed as follows:

$$\frac{\beta_{1996}}{\beta_{1997}} = \frac{\partial E(Y_i | x_i, \beta) / \partial x_{i1996}}{\partial E(Y_i | x_i, \beta) / \partial x_{i1997}} \tag{6.10}$$

Therefore, the ratios of coefficients for all years can be computed and presented as in Table 6.4.

Table 6.4 The Ratio of Coefficients $(\beta_k \setminus \beta_j)$, 1996-2003

Year	1996	1997	1999	2000	2002	2003
1996	1.0000	1.0402	0.9085	0.9522	0.6115	0.0400
1997	0.9614	1.0000	0.8734	0.9154	0.5879	0.0385
1999	1.1007	1.1449	1.0000	1.0481	0.6731	0.0440
2000	1.0502	1.0924	0.9541	1.0000	0.6422	0.0420
2002	1.6352	1.7009	1.4856	1.5571	1.0000	0.0654
2003	24.9934	25.9978	22.7068	23.7987	15.2845	1.0000

The relative change in the probability for each year has decreased since 1996, as shown in Table 6.4. If the value in 1996 is equal to 1.0, the ratios would slightly increase in 1997 and 2000 and stay at that level during 1996 to 2000. But, the probability falls below 1 in 2001 and 2003. This may indicate that the family income has exerted a somewhat weak influence on probability to participate in university education than previously believed.

Table 6.5 The Estimation Results for Probit Model I in 1996, 1997 and 1999

Dependent variable: Participation in university education (1=Participants, 0=Non-participants)

Independent variables	1996			1997			1999		
	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect
Constant	-3.9066	(-9.4629)		-4.0891	(-8.7034)		-3.2957	(-11.6378)	
Log_w	1.1422	(11.4647)	0.2528*	1.1881	(10.6148)	0.2871*	1.0377	(15.4012)	0.2226*
L2	1.9367	(3.9196)	0.3495*	---	---	---	-0.0270	(-0.3106)	-0.0068
L3	0.0262	(0.3152)	0.0069*	-0.0333	(-0.3890)	-0.0096	-0.1087	(-1.2543)	-0.0277
L4	---	---	---	---	---	---	-0.0485	(-0.5546)	-0.0122
No. of observations	1309			1273			2660		
Log-likelihood function	-593.0722			-551.9411			-1061.267		
Restricted log likelihood	-671.5883			-617.6984			-1193.113		
Prob. Chi-squared (8)	0.0000			0.0123			0.0000		
Prob. Chi-squared (10)	0.0000			0.0019			0.0000		
LR statistic (df)	157.0321 (3)			131.5147 (2)			263.6927 (4)		
Hosmer-Lemeshow	53.8058			19.527			52.3745		
Probability (LR stat)	0.0000			0.0000			0.0000		
McFaddens R^2	0.1169			0.1065			0.1105		
Prediction (cutoff=0.5)									
% not participate correct	30.73			27.94			25.56		
% participate correct	82.05			83.46			85.57		
% correct	71.31			72.95			75.64		

Notes: z-statistics are in parentheses.

L2, L3 and L4 are the dummy variables for the 2nd, 3rd and 4th round of labor force survey.

* denotes statistical significance at the 1% level

** denotes statistical significance at the 5% level

*** denotes statistical significance at the 10% level

Table 6.6 The Estimation Results for Probit Model I in 2000, 2002 and 2003

Dependent variable: Participation in university education (1=Participants, 0=Non-participants)

Independent variables	2000			2002			2003		
	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect
Constant	-3.5244	(-12.7386)		-2.4562	(-15.7449)		0.2449	(1.3727)	
Log_w	1.0876	(16.6368)	0.2387*	0.6985	(18.5746)	0.2122*	0.0457	(1.0211)	0.0137
L2	-0.1901	(-2.2136)	-0.0528**	0.0395	(1.2252)	0.0148	-0.0158	(-0.4622)	-0.0058
L3	-0.1581	(-1.8328)	-0.0436***	-0.0903	(-2.9466)	-0.0343*	0.0329	(0.7331)	0.0120
L4	-0.0667	(-0.7622)	-0.0180	-0.0557	(-1.7126)	-0.0211***	-0.0361	(-1.0465)	-0.0132
No. of observations	2638			12730			9719		
Log-likelihood function	-1086.712			-8039.962			-6223.996		
Restricted log likelihood	-1251.326			-8223.584			-6225.929		
Prob. Chi-squared (8)	0.0000			0.1945			0.0000		
Prob. Chi-squared (10)	0.0000			0.0390			0.0000		
LR statistic (df)	329.2282 (4)			367.2439 (4)			3.8672 (4)		
Hosmer-Lemeshow	44.9397			11.1296			133.6515		
Probability (LR stat)	0.0000			0.0000			0.4243		
McFaddens R^2	0.1315			0.0223			0.0003		
Prediction (cutoff=0.5)									
% not participate correct	29.68			36.65			33.96		
% participate correct	84.68			66.24			66.08		
% correct	74.68			55.95			55.18		

Notes: z-statistics are in parentheses.

L2, L3 and L4 are the dummy variables for the 2nd, 3rd and 4th round of labor force survey.

* denotes statistical significance at the 1% level

** denotes statistical significance at the 5% level

*** denotes statistical significance at the 10% level

6.2.6 Probit Estimation: Model II

From the estimation results, Tables 6.7 and 6.8, socioeconomic background is found to be a significant factor influencing the decision to participate in university education. The results are consistent with many previous researches. A number of findings of the results are summarized as follows. First, even including other socioeconomic factors, family income is still an important factor influencing the individual decision to participate in higher education over time. The results clearly express the linear relationship between log family income and probability to participate in university education. The results show that the independent variable (Log_w) is 99% statistically significant in all years.

Family income has a strong impact on family members aged 18-24 years old on their decision to continue their studying to university education. For each additional 1 unit of log_w, the probability to participate in university education increased 6.07% in 1996, 6.15% in 1997, 8.56% in 1999, 8.48% in 2000 and 10.59% in 2002. Compared to the first model, family income actually is an influencing factor, but potentially less so.

However, in 2003, the relationship between family income and probability to participate in higher education is negative. The increase of 1 unit of log_w decreases the probability of university participation by 6.76%. This contradicts previous years, but is consistent with the result of the kernel regression in the previous section. These results identify family income as having less potential to influence the individual decision to participate in higher education. This can be concluded because the rate of economic expansion equals 7.1% in 2003, compared to 5.3% in 2002, and 2.2% in 2001 and the growth in the period of 1997 to 2001 is lower than 5.0%, (Office of the National Economic and Social Development 2007). This implies the greater effect of opportunity cost in terms of foregone earnings in the studying period.

Next, for parental education attainment, the results show that the father's schooling years are statistically significant in only two years: 1997 and 2003 with a 95% and 90% level of statistical significance, respectively. The students' probability to participate in university education increases 0.21% in 1997 and 0.15% in 2003 for each additional year of the father's schooling. It reflects the minimal impact of this variable on individual probability to participate in university education. Moreover, it

seems to have had no effect in 1996 and little effect in 1999, 2000 and 2002 for both the father's and mother's education attainment. However, because this variable is statistically insignificant, drawing conclusions about this effect should be conducted carefully.

For the mother's schooling years, it is found to be statistical insignificant for all years. It implies that the mother's schooling does not affect a student's decision regarding university participation. However, most of the results are statistical insignificant, it may not identify, in general, whether this factor affects the individual decision to participate in higher education or not. The results of this study differ from an earlier study, (Miller and Volker, 1989: 57; Le and Miller, 2004b: 44), which shows both the father and mother possessing university education affect the children's probability to graduate from a higher educational institution, but the mother's education is of greater impact than father's. In another study, Virote, et. al., (2006: 46), expressed that "the education attainment of the household head increasing by one year positively impacts their offspring's probability to continue study to the 10^{th} grade (M.4) or vocational certification level in 2.1% and 1.7% in 2002 and 1997, respectively."

Another factor, family size positively relates to the individual decision of university participation but to a lesser degree (0.06% to 0.16%). The results in all years are statistical significant. For example, in 2002, the probability that student may decide to participate in higher education increases 0.16% for each additional family member.

This can be explained by the information effect which has been put forth by Barr (2003: 327) as students do not participate in education due to a lack of information such as the future benefits after graduation, expenditure and risk of not knowing about higher education which causes their attitude to be risk averse and to think that it is not good enough for them. It is further expressed that the greater the family size means the larger the information channels. Also, Miller and Volker (1989: 63) state that the differences in participation in university education among various socioeconomic groups appear to reflect differences in attitudes which refer to information received rather than purely financial factors.

To determine how large this effect is, the difference in probability between two sizes of family are computed such as with a 4-member and 8-member family. It can be seen that the differences in probability are from 0.0024 to 0.0072. The results show that family size has a weak positive influence on participation in university education. These results are consistent with earlier studies and present a small positive influence on family size which had a marginal effect range from 0.00% in 1996 to 0.16% in 2003.

Comparing average family size among regions in Thailand[1], in 2003, this factor influenced individual probability in a range of 0.54% for Bangkok to 0.65% for the South. This shows that family size has a statistically significant impact on individual educational decisions. Moreover, the influence of this factor increases during the period from 1996 to 2003. It can be concluded that information which directly depends on family size becomes more important over time and can build up a student's aspiration. It is found that family size has a positive effect on individual decision to participate in higher education. This implies that the information available and encouragement are greater in a large family than a small one.

In contrast, the member may be an additional burden to the parents if it is a child. It also minimizes the allocation of financial resources per child and causes a diluting effect. In this situation, the marginal effect for this case would be negative. But, if the additional member is an adult, it may increase their family income, which positively relates to individual probability. But, in order to draw definitive conclusions, further information and clear definitions are needed.

Next, for analyzing the effect of dummy variables in Model II, the marginal effects are calculated using the following equation:

$$\frac{\partial E(Y|x)}{\partial x}(Dummy) = \Pr[Y=1|\bar{x}_{(d)}, d=1] - \Pr[Y=1|\bar{x}_{(d)}, d=0], \qquad (6.11)$$

[1] In 2004 Socioeconomic Survey , the average family size is 3.02, 3.31, 3.14, 3.52 and 3.60 for Bangkok, Central, North, Northeast and South, respectively (NSO, 2004a).

Where $\bar{x}_{(d)}$, denotes the mean of all the other variables. The marginal effects are first calculated in each observation, then, they are summed and the average value is computed in order to explain the relationship of independent variables to individual probability to participate in university education. This calculation is carried out by comparing the findings for each year.

Place of residence, namely, regions and areas reflect the supply of education which is shown by the number of schools, teachers and other resources. A place of residence is an important socioeconomic factor which influences individual probability to participate in higher education. There are four regional variables: CENTRAL, NORTH, NORTH_E, SOUTH, with "Bangkok" as a base. The area variables are denoted as AREA, (municipal or urban = 1, non-municipal or rural=0) and set the "rural" as a base. Since 2000, Bangkok students have had a greater probability to continue on to higher education than in other regions. In 2002, assuming other factors are equal, students who live in Bangkok have a greater probability to participate in university education significantly than those in Central, North, Northeast and Southern regions by 10.36%, 7.76%, 15.68% and 13.73%, respectively.

In 2003, the degree of influence of regional factors is lower than in 2002. Bangkok residents have a greater probability of university participation than residents outside Bangkok. Compared to the other regions, Bangkok dwellers significantly have a 7.79% to 10.89% greater probability than those who live in all other regions, except for the North. The findings may explain the accessibility to university education. In 2007, 36.11% of higher education institutions are located in Bangkok; while, 18.75% are in Central, 15.30% in the North, 18.06% in the Northeast and 11.81% in the South. The policy of expanding education institutes/campuses appears to have promoted university participation in each region.

In addition, students who live in an urban area have significantly higher probability to participate than those who live in rural areas. Assuming other factors are equal, the probability for urban students is greater than rural students by the margins of 6.87%, 6.27%, 9.80% and 13.15% in 1999, 2000, 2002 and 2003, respectively.

The dummy variable associated with father's work place is expressed as: PRIVATE, ST_ENTERP, GOV, FAMILY, and OWNER by using EMPLOYER as a base. In 1999, if the father works as an employee for a private company or government agency, the probability of participating in university for his offspring increases 6.40% or 5.22%. However, his children's probability would increase 9.21% or 8.69%, if the father's job is family business or he is a business owner. Both are greater than when a father works as an employee in private company, state enterprise government agency and as an employer.

In 2000, the marginal effects have changed. If the father works as an employee in a private company, his child's probability would increase 7.64%. But, his children's probability would nearly be the same; when the father works as an employee in state enterprises (6.03%), government agencies (5.60%), and family businesses (6.24%) and as a business owner (5.03%).

During 1999 to 2000, there is no change in probability of students whose father works as an employer. However, this finding reflects the important of socioeconomic factors on students' probability, because as a father who is an employer usually entails higher earnings which would enable better facilities for his offspring. But, these imply other factors beside family income that affect individual decision to involve university education. It might be information and others socioeconomic factors.

Another dummy variable that impacts a students' probability to participate in university education is marital status, which is categorized as: SEPARATED, DIVORCED and WIDOWED, using the MARRIED as a base. In 1996 and 2000, only SEPARATED has strong positive correlation, that is, it increases student's probability 21.21% and 5.86%, respectively. In 1997, SEPARATED shows a slightly negative correlation to the student's probability of 0.34%.

WIDOWED is another dummy variable which shows a positive impact on individual probability to participate in university education. In 1996, this impact is 15.39%, an increase from switching married to widowed and 2.62% in 2000. These findings indicate that students from single parent families need to put more effort into being entirely self-reliant than those who are from married families. So, the divorced

family is expected to have the same effect on probability as other single family statuses, but DIVORCED is statistically insignificant for all years.

6.2.7 Summary

The results from Model I clearly show that family income significantly affects the individual decision to participate in higher education. However, its influence declines over time. For example, in 1996, the effect of family income on individual probability of university participation is twice as much as in 2001. For Model II, the study's outcomes show that family income is still a major influencing factor on the individual decision to participate in higher education but to a lesser degree over time. Also, place of residence significantly affect individual probability. It is found that Bangkok residents have a higher probability than other residents. Students from urban areas have a higher probability than those from rural areas. Family size exerts a positive influence on individual probability, though slightly. It is found that adding one member to a family would increase probability very small (0.06% to 0.16%). For father's occupation, it is clearly shown that when a father works as an employee, individual probability is higher than a father working as an employer in 1999 and 2000. It reflects that indirectly provides the information and encourages students' inspiration. Parental education attainment, for both the father's and mother's are statistical insignificant for most years. This may be interpreted that neither the father's and mother's schooling affect their offspring's probability to participate in university education. Last, single parent families are found to better encourage their offspring to participate in university education. In brief, the family income and socioeconomic factors play a significant role on influencing individual's decision to involve with university education. But the effects become weaker over time.

Table 6.7 The Estimation Results for Probit Model II in 1996, 1997 and 1999

Dependent variable: Participation in university education (1=Participants, 0=Non-participants)

Independent variables	1996			1997			1999		
	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect
Constant	-2.3911	(-3.3983)	---	-2.6566	(-3.2611)	---	-2.8232	(-5.1910)	---
Log_w	0.4652	(3.0310)	0.0607*	0.4150	(2.4791)	0.0615*	0.6187	(5.5292)	0.0856*
FA_SYEAR	0.0003	(0.0119)	0.0000	0.0143	(0.4126)	0.0021**	-0.0015	(-0.0630)	-0.0001
MO_SYEAR	-0.0027	(-0.0998)	0.0000	0.0160	(0.5761)	0.0024	0.0060	(0.3065)	0.0008
GROUPSIZE	0.0031	(6.5632)	0.0000*	0.0050	(7.7580)	0.0007*	0.0044	(9.3543)	0.0006*
CENTRAL	-0.0054	(-0.0251)	-0.0019	0.0179	(0.0650)	0.0043	-0.3984	(-2.9806)	-0.0875*
NORTH	-0.0288	(-0.1344)	-0.0104	-0.0580	(-0.2335)	-0.0144	0.0443	(0.2595)	0.0082
NORTH_E	-0.4181	(-1.9067)	-0.1576***	-0.6402	(-2.5196)	-0.1853**	-0.1206	(-0.7424)	-0.0239
SOUTH	0.3202	(1.4531)	0.1124	0.2123	(0.8521)	0.0497	-0.2528	(-1.8560)	-0.0530***
AREA	0.1465	(0.9165)	0.0537	0.2819	(0.8808)	0.0737	0.3256	(2.4721)	0.0687**
PRIVATE	0.4030	(1.3017)	0.1406	0.2610	(2.0261)	0.0621	0.3493	(2.1122)	0.0640**
ST_ENTERP	0.3100	(0.9549)	0.1048	0.6362	(1.2760)	0.1241**	0.2267	(1.2860)	0.0392
GOV	0.0902	(0.3044)	0.0322	0.3616	(2.3010)	0.0821	0.2963	(1.9580)	0.0522***
FAMILY	0.2625	(0.6672)	0.0885	0.9206	(1.5063)	0.1365**	0.7895	(3.0821)	0.0921*
OWNER	0.3018	(0.6635)	0.1005	0.9399	(-0.0833)	0.1351	0.7282	(2.2039)	0.0869**
SEPARATED	0.5999	(3.4854)	0.2121*	-0.0141	(1.3037)	-0.0034**	0.0730	(0.6411)	0.0138
DIVORCED	0.2602	(1.3169)	0.0888	0.2701	(-0.5269)	0.0587	0.2306	(1.6030)	0.0389
WIDOWED	0.4549	(2.8924)	0.1539*	-0.0826	(1.5337)	-0.0205	0.0530	(0.5021)	0.0098
L2	-0.7050	(-1.0265)	-0.2641	---	---	---	0.0914	(0.8394)	0.0168
L3	0.0137	(0.1329)	0.0049	-0.0129	(-0.1195)	-0.0031	-0.1089	(-1.0121)	-0.0213
L4	---	---	---	---	---	---	0.0452	(0.4159)	0.0084
No. of observations	1164			1168			2400		
Log-likelihood function	-393.25			-357.36			-708.5926		
Restricted log likelihood	-529.25			-508.73			-980.9457		
Prob. Chi-squared (8)	0.2632			0.1245			0.7721		
Prob. Chi-squared (10)	0.0000			0.0000			0.0000		

Table 6.7 (Continued)

Independent variables	1996			1997			1999		
	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect
LR statistic (df)	272.00 (19)			302.73 (18)			544.71(20)		
Hosmer-Lemeshow	10.0265			12.6486			4.8630		
Probability (LR stat)	0.0000			0.0000			0.0000		
McFaddens R^2	0.2570			0.2975			0.2776		
Prediction (cutoff=0.5)									
% not participate correct	36.08			37.11			33.06		
% participate correct	86.99			88.19			89.00		
% correct	78.38			80.15			81.05		

Notes: z-statistics are in parentheses.
L2, L3 and L4 are the dummy variables for the 2nd, 3rd and 4th round of labor force survey.
* denotes statistical significance at the 1% level
** denotes statistical significance at the 5% level
*** denotes statistical significance at the 10% level

Table 6.8 The Estimation Results for Probit Model II in 2000, 2002 and 2003

Dependent variable: Participation in university education (1=Participants, 0=Non-participants)

Independent variables	2000			2002			2003		
	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect
Constant	-2.5920	(-4.7891)	---	-1.4563	(-5.0315)	---	-1.1826	(-3.4601)	---
Log_w	0.5992	(5.8153)	0.0848*	0.4394	(8.2936)	0.1059*	-0.3234	(-4.7558)	-0.0676*
FA_SYEAR	-0.0142	(-0.5729)	-0.0012	0.0002	(0.0506)	0.0000	0.0073	(1.7456)	0.0015***
MO_SYEAR	-0.0005	(-0.0243)	-0.0001	0.0050	(1.4008)	0.0012	-0.0020	(-0.5022)	-0.0004
GROUPSIZE	0.0053	(8.7747)	0.0007*	0.0067	(8.0860)	0.0016*	0.0074	(7.0459)	0.0016*
CENTRAL	-0.6346	(-4.7094)	-0.1342*	-0.2686	(-3.6261)	-0.1036*	-0.1997	(-2.5892)	-0.0779*
NORTH	-0.4052	(-2.2415)	-0.0790**	-0.2018	(-2.7960)	-0.0776*	-0.1210	(-1.5660)	-0.0471
NORTH_E	-0.1987	(-1.2290)	-0.0355	-0.4036	(-5.4659)	-0.1568*	-0.3950	(-5.0629)	-0.1554*
SOUTH	-0.2405	(-1.6210)	-0.0438	-0.3533	(-5.0052)	-0.1373*	-0.2775	(-3.6757)	-0.1089*
AREA	0.3381	(2.3106)	0.0627**	0.2554	(8.2864)	0.0980*	0.3360	(9.0096)	0.1315*
PRIVATE	0.4897	(2.8517)	0.0764*	-0.1969	(-0.9498)	-0.0730	-0.0647	(-0.3890)	-0.0248
ST_ENTERP	0.4466	(2.3695)	0.0603**	0.0572	(0.2551)	0.0214	0.1361	(0.6110)	0.0513
GOV	0.3784	(2.4094)	0.0560**	-0.1131	(-0.5351)	-0.0432	0.2110	(1.2008)	0.0789
FAMILY	0.5402	(2.5125)	0.0624**	-0.1542	(-0.6340)	-0.0594	0.0348	(0.1708)	0.0133
OWNER	0.4041	(1.5327)	0.0503	-0.0369	(-0.1700)	-0.0140	0.3238	(1.8353)	0.1196***
SEPARATED	0.3549	(3.0588)	0.0586*	-0.0239	(-0.4898)	-0.0090	0.0618	(1.0269)	0.0237
DIVORCED	0.1661	(1.2245)	0.0248	-0.0289	(-0.5520)	-0.0109	-0.0187	(-0.2921)	-0.0072
WIDOWED	0.1719	(1.7241)	0.0262***	-0.0345	(-0.7611)	-0.0130	0.0422	(0.7724)	0.0162
L2	-0.2379	(-2.1887)	-0.0421	0.0686	(2.0309)	0.0257**	0.0854	(2.2680)	0.0327**
L3	-0.1848	(-1.7015)	-0.0321	-0.0919	(-2.6593)	-0.0349*	0.0633	(1.0812)	0.0242
L4	-0.0445	(-0.4046)	0.0074	-0.0502	(-1.4683)	-0.0190	-0.0457	(-1.1888)	-0.0176
No. of observations	2407			11694			7774		
Log-likelihood function	-705.93			-7317.29			-4987.95		
RestrIcted log likelihood	-1043.03			-7563.22			-5150.97		
Prob. Chi-squared (8)	0.4294			0.0054			0.5740		
Prob. Chi-squared (10)	0.0000			0.0014			0.3468		

Table 6.8 (Continued)

Independent variables	2000			2002			2003		
	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect	Coefficient	z-statistics	Marginal effect
LR statistic (df)	674.21 (20)			491.86 (20)			326.04 (20)		
Hosmer-Lemeshow	8.0416			21.75			6.6574		
Probability (LR stat)	0.0000			0.0000			0.0000		
McFaddens R^2	0.3232			0.0325			0.0316		
Prediction (cutoff=0.5)									
% not participate correct	38.76			37.59			40.28		
% participate correct	88.67			66.58			63.87		
% correct	80.87			56.47			54.98		

Notes: z-statistics are in parentheses.
L2, L3 and L4 are the dummy variables for the 2nd, 3rd and 4th round of labor force survey.
* denotes statistical significance at the 1% level
** denotes statistical significance at the 5% level
*** denotes statistical significance at the 10% level

6.3 Empirical Findings on Inequality of Opportunity to Participate in Higher Education

Based on the university attendance, the likelihood and its shape are estimated through income quintiles. The attendance opportunity is clearly shown by the inequality among various household income levels by Lorenz curve and various measurements such as Gini coefficient, Coefficient of variation and Atkinson index and its changes over time. Furthermore, these measures might implicate the effect of the student loans scheme on attendance opportunity.

6.3.1 Beginning Period of Student Loans Policy (1996 to 1997)

Figure 6.24 shows the Lorenz curves on probability of participating in university education in 1996. The probability to participate in university education is computed by the proportion of university students per total population. These Lorenz curves show the cumulative share of university attendance and the proportion of the population ranked by family income from lowest to highest. Therefore, it shows graphically the degree of dispersion of probabilities. More unequal distributions of probability lie further away from the complete equality 45° line, which means a high difference in probability. Therefore, if probabilities of university participation are equal, every 10% of the population receives 10% of the cumulative probabilities. In 1996, the bottom 10% of population received about 5.92% of the cumulative probabilities and the bottom 20% of the population received 11.84% of the cumulative probabilities. The analysis shows the higher the family income, the greater the probability of university education. It unambiguously illustrates the unequal probability of participating in university education among different income level families.

As with the other inequality measures, the use of Lorenz curves has to include four properties[1] together with three criteria: Lorenz-dominance, Lorenz-coincidence

[1] These properties are anonymity, scale independence, population homogeneity and transfer principle. (Fields, 2001: 15-18)

and Lorenz-crossing, which are used for analysis and to make an inequality comparison.

Moreover, the Lorenz curve of 1996 also shows that the probability distributions of the rich, 4th and 5th quintiles, have greater equality than that of the poor, 1st and 2nd quintiles. This implies that the difference in probability relative to others groups for the low-income deciles are greater than high-income deciles.

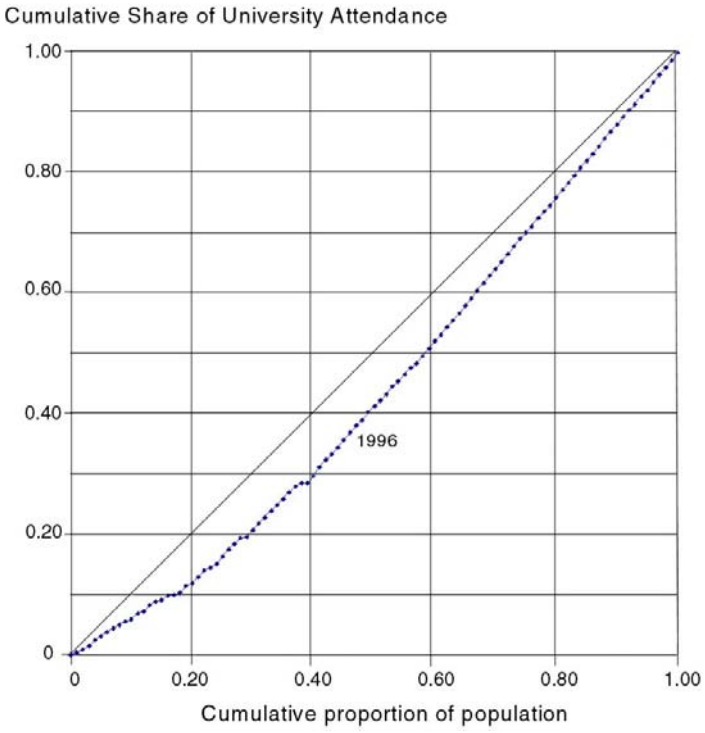

Figure 6.24 Lorenz Curve of Probability in University Participation, 1996

Comparing the distributions in 1996 and 1997, the Lorenz curve of 1997 is closer to the line of equality than the Lorenz curve of 1996. This shows that the inequality of opportunity to participate in university education has improved since the beginning of the Student Loan Scheme. Unfortunately, these two Lorenz curves intersect and nearly overlie each other at the first income quintile. Therefore, the determination of inequality should not use the Lorenz curves alone.

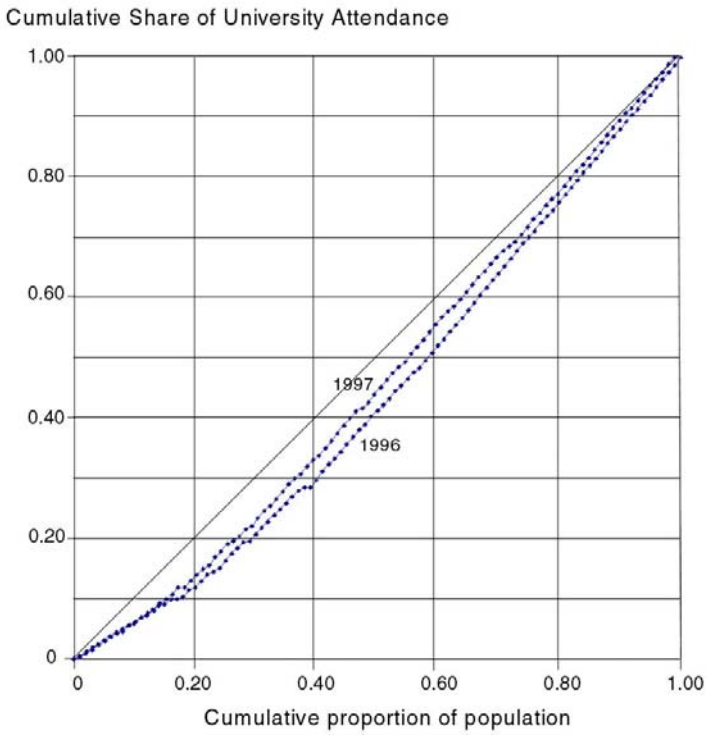

Figure 6.25 Lorenz Curves of Probability in University Participation, 1996 and 1997

The recent implementation of the Student Loans Fund (SLF) in January 1996 might partially explain why the poor, especially the 10% bottom, who still face barriers on accessibility to the funds, have no gain in their probabilities of university participation (from 0.0592 in 1996 to 0.0591 in 1997). But it is now a smaller fraction, so the other part of Lorenz curve illustrates that probabilities improved for all income deciles except the poorest.. Therefore, the lowest deciles do not gain from the Student Loans Fund at the beginning and the dispersion of probability among the first quintile is explicitly uneven. However, individuals from middle and higher income groups receive greater cumulative probability, as presented in Table 6.11, and the share received by the middle and the richest income groups are greater, so the 1997 Lorenz curve lies above the Lorenz of 1996 at the middle to higher end of the probability distribution scale.

Table 6.9 The Cumulative Probability of University Participation, 1996 and 1997

Cumulative percentage of population	Cumulative probability of university participation, 1996	Cumulative probability of university participation, 1997
0	0.0000	0.0000
20 %	0.1184	0.1376
40 %	0.2981	0.3372
60 %	0.5214	0.5678
80 %	0.7592	0.7859
100 %	1.0000	1.0000

In fact, Lorenz comparisons should not be used alone to judge the inequality. There is a need for other measures to provide more information. The Gini coefficient, the coefficient of variation and the Atkinson index, which are strong Lorenz-consistent measures; and the variance, Lorenz-inconsistent measure, are computed for comparison of 1996 and 1997, as shown in Table 6.12. All measures are strongly consistent for 1997 though less than in 1996. They illustrate the unequal improvement during this period. Furthermore, the variance declines from 0.3042 in 1996 to 0.2626 in 1997, which reflects the reduction in the deviation range of individual probability to participate in university education. It clearly shows that the inequality of opportunity of university participation improve during 1996-1997.

Table 6.10 The Inequality Measures of Probability to University Participation, 1996-2003

Inequality measures	1996	1997	1998	1999	2000	2001	2002	2003
Gini coefficient	0.1157	0.0910	0.1129	0.0902	0.0984	0.0892	0.0728	0.0806
Variance	0.3042	0.2626	0.3073	0.2263	0.2464	0.5066	0.5720	0.5655
Coefficient of Variance	0.6957	0.6293	0.7006	0.5702	0.6032	1.0102	1.1117	1.1016

Table 6.11 Average Probability to University Participation by Income Quintiles, 1996-2003

Quintile No.	1996	1997	1998	1999	2000	2001	2002	2003
Q1	0.4674	0.5441	0.5019	0.6112	0.5333	0.5041	0.5024	0.4989
Q2	0.7115	0.7923	0.7404	0.7701	0.8019	0.6403	0.6330	0.6017
Q3	0.8846	0.9154	0.9195	0.8804	0.8857	0.6872	0.6785	0.6852
Q4	0.9423	0.8654	0.9514	0.9458	0.9221	0.7678	0.6976	0.7193
Q5	0.9539	0.8500	0.9673	0.9674	0.9424	0.8005	0.7495	0.7240

The inequality of probability to participate in higher education is less in 1996 than in 1997. This effect might have been caused by the Student Loans Fund (SLF), which increases involvement from low income students. SLF requires that the annual family income of the student borrower must not exceed 150,000 baht, or 12,500 baht per month. As a result, students eligible for the loans borrow from the 1st to 5th decile groups and the inequality of probability improvement is observed from higher involvement of these decile groups. However, as shown in findings, the poorest are exclude from the loans and it reflects an inefficiency in the screening process for loans at the beginning as well. Apparently, many students who are from the high-income decile groups may have secured loans from SLF due to an inefficient screening process, which mainly uses personal guarantees.

From the Table 6.12, it appears that the 2nd, 3rd and 4th decile groups receive most benefit from the student loans policy during 1996 – 1997, while the 1st decile group has no gain. This is reflected by the probability of the 1st decile group.

6.3.2 Expansion Period of Student Loans Policy (1997 to 2000)

The Lorenz curves explicit shows that the inequality of probability does not improve during this period. There is no change in the 1st quintile but small declines in the 2nd, 3rd and 4th quintiles (see Appendix F). The probabilities of the 1st and 2nd quintiles improve during 1998 to 1999 but decline in 2000. However, by other inequality measures, there is no distinct improvement on the inequality of university

participation. Also, the variance and coefficient of variance both follow the same trend as the Gini coefficient.

Table 6.12 The Cumulative Probability to University Participation, 1996 and 1997

Cumulative percentage of population	Cumulative probability to university participation, 1996	Cumulative probability to university participation, 1997
0	0.0000	0.0000
10 %	0.0592	0.0591
20 %	0.1184	0.1376
30 %	0.2068	0.2316
40 %	0.2981	0.3372
50 %	0.4126	0.4506
60 %	0.5214	0.5678
70 %	0.6408	0.6783
80 %	0.7592	0.7859
90 %	0.8806	0.9079
100 %	1.0000	1.0000

Table 6.13 Average Family Income by Deciles, 1996-2003 (baht per month)

Deciles No.	1996	1997	1998	1999	2000	2001	2002	2003
D1	24.94	2,042.04	1489.93	2,267.07	1829.77	0.000	3,303.55	3507.94
D2	782.52	5,641.11	5426.04	6,003.98	6,280.87	1757.00	4,814.91	4965.81
D3	4,358.06	8,575.09	8436.81	9,473.70	9,773.87	3930.99	6,042.68	6161.08
D4	7,454.66	12,869.35	12617.53	13,599.89	14,084.10	5448.89	7,531.69	7653.85
D5	10,861.40	16,235.74	16300.84	17,058.97	18,196.44	7327.82	9,672.82	9794.54
D6	14,702.16	19,359.32	19558.03	20,328.60	20,945.47	10344.06	12,807.12	12894.54
D7	18,277.16	22,777.42	22939.55	24,141.77	25,015.80	14184.43	15,954.63	16224.47
D8	22,668.58	28,088.64	28382.33	29,144.38	30,209.38	17746.61	19,316.93	19891.93
D9	29,953.81	36,251.67	36166.48	36,135.88	35,543.55	22221.57	23,378.00	24426.48
D10	51,541.52	59,463.78	59791.96	57,048.06	56,470.28	43532.84	41,871.85	44287.99

Sources: NSO, 1996b to 2003b and own calculation

In 1998, the SLF requirement on the family income had changed from 150,000 to 300,000 baht per year. This has caused a rapid increase in borrowers of 405,958 students. During 1997 and 1998, there is no change in the 1st quintile but slightly decline in the 2nd, 3rd and 4th quintiles. Probabilities of the 1st and 2nd quintile improve in the next periods but decline in 2000. So, the net improvement becomes zero, or there has been no improvement in individual probabilities from 1998 to 2000. The probabilities of the poorest have improve but not sustainable during the SLF expansion period. It may reflect that SLF may not contribute to the improvement in the inequality of university participation, as it should be.

Regarding the difference of family income during 1997 to 2000, it illustrates greater in family income for all decile groups except the 1st , 9th and 10th deciles. It cannot be expressed that higher income affects individual probability in this case since it is calculated from the proportion of university students and it is in relative term to other groups. Therefore, comparing 1997 with 2000, there are small increases in the 1st, 4th, 6th, 8th, 9th and 10th deciles, as a whole, it is not clear that the inequality of opportunity has improved during this period.

Table 6.14 Average Probability to University Participation by Income Deciles, 1996-2003

Deciles No.	1996	1997	1998	1999	2000	2001	2002	2003
D1	0.4656	0.4657	0.5267	0.5299	0.4715	0.4857	0.4520	0.4833
D2	0.4692	0.6231	0.5016	0.6112	0.5354	0.5224	0.5224	0.5144
D3	0.7000	0.7461	0.6687	0.6413	0.7300	0.6071	0.6237	0.5928
D4	0.7231	0.8385	0.8120	0.6907	0.8740	0.6735	0.6423	0.6459
D5	0.9077	0.9000	0.9713	0.7250	0.8213	0.6806	0.6195	0.6604
D6	0.8615	0.9308	0.8678	0.8804	0.9504	0.6939	0.7374	0.7054
D7	0.9462	0.8769	0.9394	0.7800	0.8631	0.7327	0.6536	0.7036
D8	0.9385	0.8539	0.9633	0.9458	0.9810	0.8031	0.7416	0.7306
D9	0.9615	0.9692	0.9633	0.8202	0.9696	0.7684	0.7329	0.7414
D10	0.9462	0.7308	0.9713	0.8343	0.9164	0.8344	0.7660	0.7135

Table 6.15 Number of Borrowers and Amount of Student Loans, 1996 – 2003

Years	Current borrowers		New borrowers	
	No.of Contracts	Amount (Million baht)	No.of Contracts	Amount (Million baht)
1996	-	-	148,444	3652.59
1997	113,798	3,925.23	321,628	8,225.96
1998	341,052	11,499.30	405,958	7,943.72
1999	592,482	17,928.78	289,386	5,817.61
2000	658,572	20,551.90	242,418	3,897.73
2001	665,595	22,001.52	322,060	6,479.55
2002	738,153	25,544.35	265,064	4,166.44
2003	731,717	25,663.30	187,249	2,973.88

Source: Student Loans Office, 2007: 15

Table 6.16 The Difference in Probability to University Participation, 1997 and 1999

Deciles No.	1997	1999	Difference	
			Amount	%
D1	0.4657	0.5299	0.0642	13.79%
D2	0.6231	0.6112	-0.0119	-1.91%
D3	0.7461	0.6413	-0.1048	-14.05%
D4	0.8385	0.6907	-0.1478	-17.63%
D5	0.9000	0.7250	-0.175	-19.44%
D6	0.9308	0.8804	-0.0504	-5.41%
D7	0.8769	0.7800	-0.0969	-11.05%
D8	0.8539	0.9458	0.0919	10.76%
D9	0.9692	0.8202	-0.149	-15.37%
D10	0.7308	0.8343	0.1035	14.16%

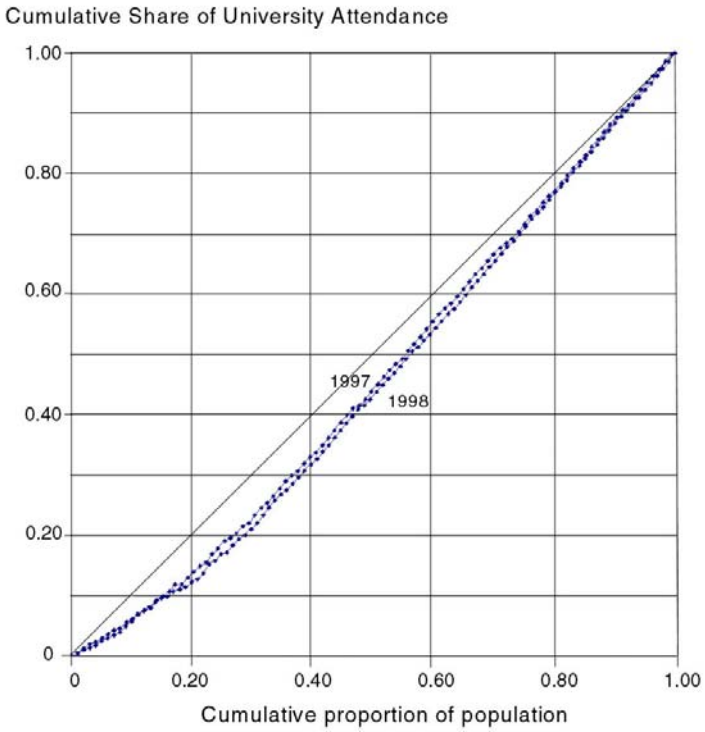

Figure 6.26 Lorenz Curves of Probability in University Participation, 1997 and 1998

6.3.3 Full Operation of Student Loans Policy (2000 to 2003)

A great improvement in equality of opportunity for participating in university education is quite evident from 2000 to 2003. It can be seen that the probability redistribution improves significantly due to, perhaps, the high increase in new borrowers of SLF from 322,060 students (for 6,479.55 million baht) in 2001 to 265,064 students (for 4,166.44 million baht) in 2002.

During 2000 to 2001, the improvement on the inequality of probability to university participation is in the 60% poorest. The improvement expands to the 4th quintile during 2001 to 2002 but declines in 2003.

However, by comparing the Gini coefficient in 2000 with 2003, the net improvement is positive. Unfortunately, the variation in probability during this period becomes higher. It reflects that even the inequality is better but the chance to enter university may deviate with unobservable factors. However, the inequality improvement does not come from higher participation from the poorest but from lower participation from the middle class and the rich.

This also shows no change on the probability to participate in university education for the poorest. Since the probability reflects the proportion of university students in each decile group, it reflects no change in proportion for the 1st decile, slightly increases in the 6th decile and declines in the rest during 2001 to 2003.

In summary, for the period of 1996 to 2003, it can be determined that the greater opportunity to participate in higher education has been transferred from the upper to the low-income decile. The Lorenz curves for each and every year from 1996 to 2003 rise closer to the equality line and Gini coefficient has decreased over time. This demonstrates a reduction in the unequal distribution of probability to participate in university education which might have particularly been brought on by SLF in terms of the number of borrowers and the size of loans. If compare 1996 with 2003, the probability improvement is in the 1st and 2nd decile but declines in the rest.

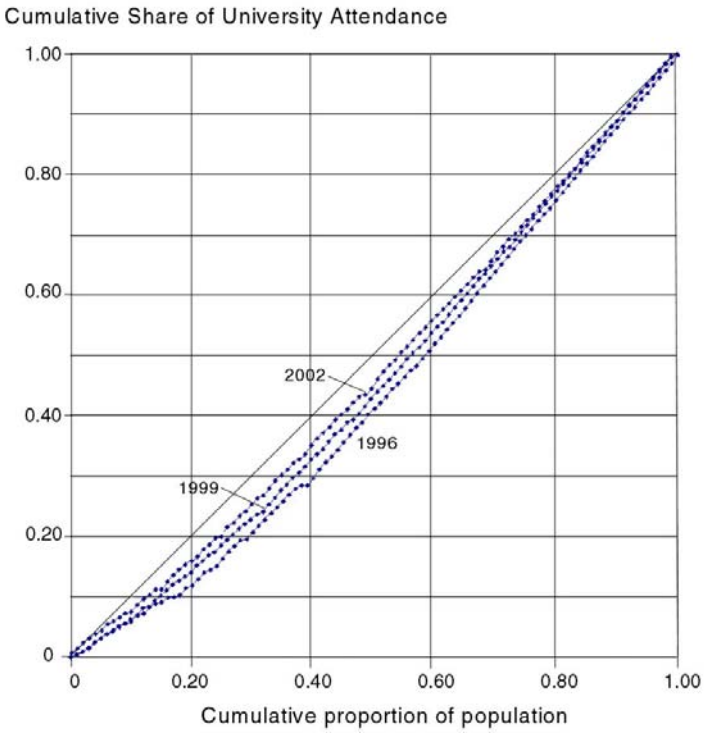

Figure 6.27 Lorenz Curves of Probability in University Participation, 1996, 1999 and 2002

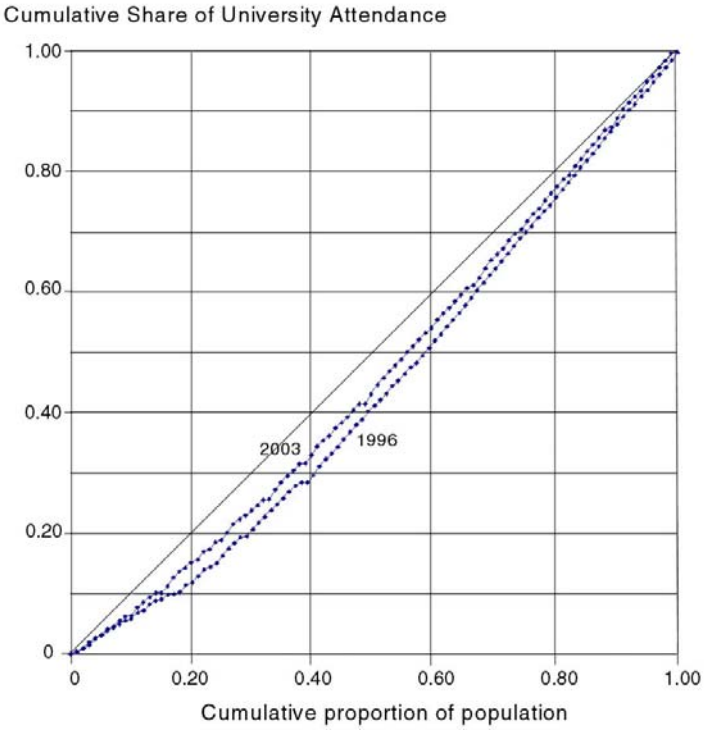

Figure 6.28 Lorenz Curves of Probability in University Participation, 1996 and 2003

6.3.4 Percentile Ratios

The inequality of opportunity of university participation among different levels of income can be analyzed through the changes in the period of 1996 to 2000 and in the percentile ratios. The individual probabilities are better distributed over time and the difference in probability between the high and low percentiles has decreased. This is also reflected in the percentage of the 10^{th} decile, which has risen over time while the other decile groups have declined. The implication is that the proportion of university students from the poor increases.

Table 6.17 The Ratio of Percentile of Probability to University Participation, 1996-2003

Ratio	1996	1997	1998	1999	2000	2001	2002	2003
90-75	1.2062	1.0000	1.1776	1.0000	0.9280	0.5280	0.8211	1.1667
90-50	1.2062	1.0000	1.0000	1.0000	1.0000	0.4648	0.9712	1.0000
90-25	0.9286	1.0000	1.8529	3.2308	1.0450	0.4925	3.0606	1.3162
90-10	3.0000	2.6250	1.8529	1.4483	1.1959	0.9296	3.4828	1.1241
75-50	1.0000	1.0000	0.8492	1.0000	1.0776	0.8803	1.1827	0.8571
75-25	0.7698	1.0000	1.5735	3.2308	1.1261	0.9328	3.7273	1.1282
75-10	2.4872	2.6250	1.5735	1.4483	1.2887	1.7606	4.2414	0.9635
50-25	0.7698	1.0000	1.8529	3.2308	1.0450	1.0597	3.1515	1.3162
50-10	2.4872	2.6250	1.8529	1.4483	1.1959	2.0000	3.5862	1.1241
25-10	3.2308	2.6250	1.0000	0.4483	1.1443	1.8873	1.1379	0.8540

6.3.5 Atkinson Index

The Atkinson index can be used both as an inequality measure and as an index of the potential welfare gains from redistribution (Barr, 2003: 145). The Atkinson index is usually used in these circumstances and varies with the aversion in inequality parameters. This study categorizes it into five sets: 0.1, 0.5, 1.0, 2.0 and 5.0. The parameters are the relative sensitivity to transfers at different income levels. When the parameter rises, more weight is transferred to the lower end and less weight is transferred to the top of the distribution (Atkinson, 1980: 34). It can be stated that the greater the values of the inequality parameters are, the greater the social weights on increased participation at the lower income distribution. In this case, the Atkinson index means the measurement of the redistribution of the transfer of probability of university participation from the high-income families to the low-income families in which these probabilities are scarce and the redistribution is a function of government policy.

For the beginning period of SLF (1996 to 1997), Atkinson index become lower for ε=0.1 and 0.5. It means that the inequality of individual probability of university participation improves during this period. It also might reflect the effect of student loans policy which was launched in early 1996 with 148,444 new borrowers

and became fully operational in 1997 with 321,628 new borrowers. However, when the society places more concern on inequality (ε=1.0, 2.0 and 5.0), the index takes a higher value. It reflects that no mechanism has facilitated inequality improvement during that time. The same trend is observed in 1998 to 2000. If the society concerns low on inequality distribution, the improvement is observed. In contrast, if society concerns high on inequality distribution, there is no improvement to be found.

This is due to the fact that as ε rises, the greater weight is attached to lower income family decile groups. For ε =1.0, the redistribution of probability from the rich may leak and would stop at the proportion of ½. In the other words, as stated by Atkinson (1983a: 58), the redistribution by continual getting 1 unit of probability from the rich and redistributing it to the poor until x, the targeting proportion falls to ½ then the redistribution will stop.

Table 6.18 The Atkinson Index of Probability to University Participation, 1996-2003

Inequality measures	1996	1997	1998	1999	2000	2001	2002	2003
Gini coefficient	0.1157	0.0910	0.1129	0.0902	0.0984	0.0892	0.0728	0.0806
Variance	0.3042	0.2626	0.3073	0.2263	0.2464	0.5066	0.5720	0.5655
Coefficient of Variance	0.6957	0.6293	0.7006	0.5702	0.6032	1.0102	1.1117	1.1016
Atkinson index								
ε = 0.1	0.0255	0.0226	0.0257	0.0199	0.0214	0.0382	0.0419	0.0415
ε = 0.5	0.2072	0.1857	0.2087	0.1658	0.1770	0.2954	0.3197	0.3173
ε = 1.0	0.8159	0.8327	0.8148	0.8488	0.8397	0.7533	0.7380	0.7394
ε = 2.0	0.9988	0.9988	0.9989	0.9995	0.9995	0.9998	0.9999	0.9998
ε = 5.0	0.7789	0.7848	0.7809	0.8269	0.8238	0.8498	0.8527	0.8479

Instead of current income, it assumed that the individual probability of participating in university education is an important basis of social welfare in terms of future earnings and benefits with accounting probabilities as scarce resources. If the probabilities were equally distributed in 1996, the Atkinson index of 0.8159 would mean that the country could reach the same level of social welfare with only (1.0000 –

0.8159) = 18.41% share of university students to total population. While it would require 13.40%, 12.98%, 16.03%, 26.20% and 26.06% of total probabilities in 1997, 1999, 2000, 2002 and 2003. Alternatively, the gains from redistribution to bring about the equality of opportunity of participating in university education would be equivalent to raising total probability by 83.27%, 84.88%, 83.97%, 73.80% and 73.94%, respectively.

During 2001 to 2003, the Atkinson index for ε =0.1 and 0.5 becomes higher. This reflects no improvement of inequality of university participation in this period. However, when the society places more concern, ε =1.0, 2.0 and 5.0, it shows a light improvement and perhaps might implicate inefficient SLF when looking at greater borrowers.

Suppose ε =1.0 and assume that the distribution would be the same for all years. It would mean that the redistribution occurs until the proportion is equal to ½. Regarding this point, it can be seen that the Atkinson index has declined over time and in 2002 has the lowest values.

6.3.6 Summary

The inequality measures presented in the study confirm a number of points made earlier. First, the distribution of university participation by income appears to have been more unequal in 1996 than 2003. Many measures have shown reduced inequality in 2003 from 1996. For example, assume ε equals to 1.0, the Atkinson index declines from 0.8159 to 0.7394 in 2003. This illustrates the reduction of inequality of probability of university participation. Second, the growth in university participation between 1996 and 2003 is concentrated in the poorest – the 90/10, 90/50 and 50/10 percentile ratios decline. That is, the probability of university participation at the bottom of the income distribution increases relative to the top of the income distribution.

CHAPTER 7

CONCLUSION

Results of the kernel density approach clearly illustrate the effect family income has on university participation. This confirms the widely held belief that studying in university is an activity for members from middle to high family backgrounds. Such a belief is supported by findings from 1996 to 2003. However, the outcomes show that the participation of low background individuals has increased over time. In 2003, the density of low income students who participate in university education was nearly equal to those not participating. This reflects the decrease in the impact of family income on the individual decision to participate in higher education.

The kernel regression results also show that the difference in individual probability for all family income levels has declined over time. The sharply estimated lines in 1996 and 1997 illustrate that changes in family income greatly affect individual probability to participate in higher education. But, this influence potential decreases in later years. The variation of family income has a diminishing effect on individual probability from 1999 – 2003. For instance, in 2003, the change in family income from 316.23 baht per month (log w = 2.5) to 31,623.78 baht per month (log w = 4.5) alters the change in individual probability no more than 10%. In addition, by comparing results within the percentile diagram, the individual probability of participating in higher education for individuals from the 40% richest families remains at a high level and consistent during the years before 2001. But, the probability for individuals from the other groups, which is 60% low income families, highly fluctuates, especially in the first quintile. For example, in 1996, members of the 10% lowest income families have a great uncertainty of probability to participate in higher education. The lowest probability for this group is about 0.30, which gradually increases to 0.50 in 1997 and 1998 until it reaches more than 0.50 in 1999. However, the probability for high income families declines in 2001 – 2003. This adjustment in

individual probability is nearly the same as previous years, because of the increasing participation of individuals from low income families.

Probit estimation, a parametric approach, is used to analyze the relationship of variables which are categorized into two models with family income and SES variables as independent variables. The results in Model I show that family income significantly affects the individual decision to participate in higher education. However, its influence has declined over time. For example, in 1996, the effect of family income on individual probability of university participation is twice as much as in 2001.

For Model II, the socioeconomics factors are added to analyze the effect on individual probability. The outcomes show that family income is still a major influencing factor on the individual decision to participate in higher education but to a lesser degree over time. Moreover, regional and area factors also affect individual probability significantly. It is found that Bangkok residents have a higher probability than other residents from 7.76% to 15.68% in 2002 and students from urban areas have a higher probability than students from rural areas at 6.87%, 6.27%, 9.80% and 13.15% in 1999, 2000, 2002 and 2003, respectively. Family size is another factor that affects individual probability, but only slightly. It is found that adding one member to a family would increase probability 0.06% to 0.16%. However, in general, family size does not matter across regions. It can be concluded that this factor would only slightly impact individual probability of university education.

As for the father's occupation, it is shown that when a father works as an employee, the individual probability is higher than a father working as an employer. Parental education attainment, for both father's and mother's, are statistical insignificant for most years. This may mean that neither father's nor mother's schooling may impact their offspring's probability to participate in university education. However, if there is any correlation, father's schooling is shown to be significant in 1997 and 2003, with only a slight effect at 0.21% and 0.15% in 1997 and 2003.

Family marital status is examined to determine its influence on individual probability. Only two significant variables are found, SEPARATED and WIDOWED. Separated status has a positive effect in 1996 and 2000 and a negative one in 1997; while, widowed is significant with a positive correlation only in 1996 and 2000. It can

be concluded that separated and widowed families encouraged their offspring more to participate in university education. This effect shows the greatest impact in 1996 (21.2% and 15.39%) and in 2000 (5.86% and 2.62%) when compared to married families.

The study of inequality of probability of participating higher education is carried out by using various inequality measures. The highest inequality is found in 1996 and a drop is observed from 1996 to 1997. The results could have implied the effect of Student Loan Funds. The opportunities to university participation mostly occur in the middle and highest income groups. During the expansion period (1998-2000), there is no improvement of university attendance among various family income deciles. The net improvement of inequality is zero during this period.

The large improvement occurs during 2001 to 2003 and may not cause from the higher participation of the poorest but lower participation of the rest. The 40% poorest got higher opportunity to participate in university education and the rest declines. This occurrence might caused by a large increase in the numbers of new borrowers. The declining of percentile ratios relative to the poorest demonstrates that the probability of the 10^{th} percentile has been improved relative to the other percentile ranks. Therefore, the increasing probability to go to university occurs in the low-income groups more than in the middle and high-income groups.

All inequality measures such as the Gini coefficient, variance, coefficient of variance, and Atkinson index follow a similar trend as inequality reduction over time. The Atkinson index represents the rapid reduction in inequality of probability of university participation for all values of ε. If social welfare is of a great concern, the policies for enhancing equality of probability should be initiated for the low background individuals. Instead of present income, it assumes that the individual probability of participating in university education is an important basis of social welfare in terms of future earnings and benefits with accounting probabilities as scarce resources. For the beginning period of student loans policy (1996 to 1997), Atkinson index become lower for ε=0.1 and 0.2. It means that the inequality of individual probability of university participation improved during this period. However, when social higher concern on inequality (ε=1.0, 2.0 and 5.0), the index are increasing. It reflects the exactly no mechanism to facilitate for inequality improvement during that

time. The same trend occurs in the next period of 1998 to 2000. If the society concerns low on inequality distribution, the improvement is observed. In contrast, if society concerns high on inequality distribution, there is no improvement to be found. During 2001 to 2003, the Atkinson index for ε =0.1 and 0.5 becomes higher. For social welfare, if the probabilities are equally distributed in 1996, the country could reach the same level of social welfare with only 18.41% share of university students and the share become greater to 26.06% in 2003. Alternatively, the gains are equivalent to raising total probability by 81.59% in 1996 and 73.94% in 2003. It shows the social gains from improving the inequality become lesser over time, rising from 81.59% of university attendance in 1996 to 73.94% in 2003.

In the end, this study presents us a number of academic advancement in educational opportunity in Thailand. The empirical findings show that students come from relatively high-income family decides to involve with university education more than those from low-income family. Also, the findings present the strong relationship between university participation and family income. The changes of family income greatly affect individual probability in 1996-1999 but lesser in 2000-2003. For probit estimation, the results reveal that family income has a strong positive influence on individuals' opportunity to participate in university education while place of residence had the most impact on the opportunity. Also, family size exerts a positive factor, but weak influence on. Parental schooling has no impact on their children's probability. Father's occupation as an employer has the least marginal effect on their children's probability to university education. Students from single parent homes are more likely to participate in university education than whom from married families. Furthermore, the findings show that the inequality of opportunity to participate in university education is improved over time but not in the beginning of the student loans policy (1996-1997). During 1998 to 2000, there is no improvement of university attendance among various family income deciles but slightly increasing in probability for some groups. The great improvement occurred during 2001 to 2003. The 40% poorest got higher opportunity to participate in university and the rest declined. However, the social gains from improving the inequality of opportunity to participate in university education become lesser over time.

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APPENDICES

Appendix A

List of Variables

Table A.1 Descriptive Statistics of Variables, 1996

Description	PRO_HE	FAMILY_INCOME	FA_SYEAR	MO_SYEAR	GROUPSIZE	CENTRAL	NORTH	NORTH_E	SOUTH	AREA
Mean	0.7928	15984.44	11.1248	11.7319	174.3741	0.1625	0.1592	0.1777	0.3483	0.7761
Medium	1	12700	16	16	35	0	0	0	0	1
Maximum	1	99998	18	18	907	1	1	1	1	1
Minimum	0	11	0	0	1	0	0	0	0	0
Standard Deviation	0.4054	15813.74	7.2320	6.6050	231.4975	0.36890	0.3660	0.3823	0.4765	0.4169
Skewness	-1.4450	1.8416	-0.8465	-1.0930	1.2039	1.8297	1.8627	1.6867	0.6366	-1.3246
Kurtosis	3.0880	8.1154	1.7698	2.3749	3.0057	4.3477	4.4696	3.8451	1.4053	2.7547
Jarque-Bera	465.72	3215.09	445.829	526.17	590.16	1547.95	1632.54	1231.11	423.89	720.57
Probability	0	0	0	0	0	0	0	0	0	0
Sum	1060	31041784	27178	28661	425996	397	389	434	851	1896
Sum Sq. Dev.	219.61	4.85E+11	127720.90	106533.40	1.31E+08	332.49	327.06	356.90	554.56	424.52
Observations	1337	1942	2443	2443	2443	2443	2443	2443	2443	2443

Source: NSO, 1996a.

Table A.1 (Continued.)

Description	PRIVATE	ST_ENTERP	GOV	FAMILY	OWNER	SEPARATED	DIVORCED	WIDOWED
Mean	0.3602	0.1150	0.2712	0.0236	0.0157	0.4729	0.1032	0.2523
Medium	0	0	0	0	0	0	0	0
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Standard Deviation	0.4802	0.3191	0.4447	0.1519	0.1245	0.4994	0.3043	0.4345
Skewness	0.5826	2.4134	1.0294	6.2756	7.7817	0.1086	2.6081	1.1403
Kurtosis	1.3394	6.8247	2.0596	40.3832	61.5545	1.0118	7.8020	2.3003
Jarque-Bera	283.26	2610.65	352.62	107038.10	252676.30	319.68	4017.17	454.79
Probability	0	0	0	0	0	0	0	0
Sum	595	190	448	39	26	907	198	484
Sum Sq. Dev.	380.70	168.15	326.51	38.08	25.59	478.09	177.56	361.86
Observations	1652	1652	1652	1652	1652	1918	1918	1918

Source: NSO, 1996a.

Table A.2 Descriptive Statistics of Variables, 1997

Description	PRO_HE	FAMILY_INCOME	FA_SYEAR	MO_SYEAR	GROUPSIZE	CENTRAL	NORTH	NORTH_E	SOUTH	AREA
Mean	0.8143	20990.4100	12.1844	12.0747	204.9282	0.1692	0.1587	0.1803	0.3366	0.7789
Medium	1	17930	16	16	38	0	0	0	0	1
Maximum	1	99998	18	18	870	1	1	1	1	1
Minimum	0	70	0	0	1	0	0	0	0	0
Standard Deviation	0.3890	17138.1700	6.6601	6.6437	249.0037	0.3750	0.3655	0.3845	0.4727	0.4151
Skewness	-1.6163	1.8363	-1.2078	-1.1729	0.9154	1.7647	1.8682	1.6634	0.6914	-1.3440
Kurtosis	3.6124	7.9609	2.5561	2.5004	2.3027	4.1140	4.4901	3.7669	1.4780	2.8063
Jarque-Bera	587.68	2589.12	430.78	410.80	274.10	978.19	1155.58	832.40	301.99	518.69
Probability	0	0	0	0	0	0	0	0	0	0
Sum	1061	34235360	20884	20696	351247	290	272	309	577	1335
Sum Sq. Dev.	197.05	4.79E+11	75983.74	75610.44	1.06E+08	240.93	228.84	253.29	382.76	295.20
Observations	1303	1631	1714	1714	1714	1714	1714	1714	1714	1714

Source: NSO, 1997a.

Table A.2 (Continued.)

Description	PRIVATE	ST_ENTERP	GOV	FAMILY	OWNER	SEPARATED	DIVORCED	WIDOWED
Mean	0.4250	0.1784	0.3208	0.0292	0.0135	0.5355	0.1099	0.2139
Medium	0	0	0	0	0	1	0	0
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Standard Deviation	0.4945	0.3830	0.4670	0.1685	0.1154	0.4989	0.3129	0.4102
Skewness	0.3033	1.6799	0.7676	5.5889	8.4336	-0.1425	2.4937	1.3953
Kurtosis	1.0920	3.8222	1.5892	32.2352	72.1248	1.0203	7.2188	2.9469
Jarque-Bera	222.80	665.04	241.63	54451.68	281403.70	222.86	2377.25	434.00
Probability	0	0	0	0	0	0	0	0
Sum	567	238	428	39	18	716	147	286
Sum Sq. Dev.	326.00	195.54	290.68	37.86	17.76	332.56	130.84	224.82
Observations	1334	1334	1334	1334	1334	1337	1337	1337

Source: NSO, 1997a.

Table A.3 Descriptive Statistics of Variables, 1998

Description	PRO_HE	FAMILY_INCOME	FA_SYEAR	MO_SYEAR	GROUPSIZE	CENTRAL	NORTH	NORTH_E	SOUTH	AREA
Mean	0.7913	21099.8600	11.1145	11.9378	179.6074	0.1854	0.1648	0.1684	0.1627	1.6776
Medium	1	18000	16	16	39	0	0	0	0	1
Maximum	1	99998	18	18	928	1	1	1	1	3
Minimum	0	80	0	0	1	0	0	0	0	1
Standard Deviation	0.4065	17336.2100	7.2888	6.5425	225.7300	0.3887	0.3710	0.3742	0.3691	0.8488
Skewness	-1.4335	1.7418	-0.8418	-1.1735	1.1311	1.6190	1.8073	1.7726	1.8279	0.6670
Kurtosis	3.0549	7.4570	1.7472	2.5401	2.8745	3.6212	4.2662	4.1421	4.3413	1.7156
Jarque-Bera	479.30	2200.05	613.61	796.94	715.23	1514.62	2043.79	1932.90	2112.93	477.78
Probability	0	0	0	0	0	0	0	0	0	0
Sum	1107	34814763	37167	39920	600607	620	551	563	544	5610
Sum Sq. Dev.	231.05	4.96E+11	177603.10	143095.10	1.70E+08	505.05	460.21	468.21	455.50	2408.49
Observations	1399	1650	3344	3344	3344	3344	3344	3344	3344	3344

Source: NSO, 1998a.

Table A.3 (Continued.)

Description	PRIVATE	ST_ENTERP	GOV	FAMILY	OWNER	SEPARATED	DIVORCED	WIDOWED
Mean	0.2732	0.0793	0.1885	0.0224	0.0125	0.5011	0.1255	0.2250
Medium	0	0	0	0	0	1	0	0
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Standard Deviation	0.4457	0.2702	0.3912	0.1480	0.1113	0.5001	0.3313	0.4177
Skewness	1.0181	3.1148	1.5926	6.4562	8.7614	-0.0045	2.2613	1.3170
Kurtosis	2.0365	10.7019	3.5364	42.6829	77.7627	1.0000	6.1135	2.7344
Jarque-Bera	472.12	9129.90	970.72	162028.80	548621.30	443.67	3343.94	777.33
Probability	0	0	0	0	0	0	0	0
Sum	610	177	421	50	28	1334	334	599
Sum Sq. Dev.	443.36	162.97	341.63	48.88	27.65	665.50	292.09	464.21
Observations	2233	2233	2233	2233	2233	2662	2662	2662

Source: NSO, 1998a.

Table A.4 Descriptive Statistics of Variables, 1999

Description	PRO_HE	FAMILY_INCOME	FA_SYEAR	MO_SYEAR	GROUPSIZE	CENTRAL	NORTH	NORTH_E	SOUTH	AREA
Mean	0.8342	21443.0400	12.2913	12.1720	201.2686	0.1793	0.1575	0.1685	0.1586	0.7846
Medium	1	19000	16	16	37	0	0	0	0	1
Maximum	1	99998	18	18	889	1	1	1	1	1
Minimum	0	70	0	0	1	0	0	0	0	0
Standard Deviation	0.3720	16279.9300	6.6276	6.6481	249.0385	0.3836	0.3643	0.3744	0.3654	0.4111
Skewness	-1.7971	1.5998	-1.2530	-1.2040	0.9334	1.6722	1.8810	1.7712	1.8690	-1.3848
Kurtosis	4.2294	7.0495	2.6645	2.5650	2.3079	3.7964	4.5381	4.1370	4.4931	2.9177
Jarque-Bera	1656.95	3572.55	915.26	857.18	567.52	1692.18	2364.82	1981.56	2319.55	1099.19
Probability	0	0	0	0	0	0	0	0	0	0
Sum	2299	69025159	42233	41823	691559	616	541	579	545	2696
Sum Sq. Dev.	381.22	8.53E+11	150883.40	151815.30	2.13E+08	505.56	455.82	481.43	458.56	580.63
Observations	2756	3219	3436	3436	3436	3436	3436	3436	3436	3436

Source: NSO, 1999a.

Table A.4 (Continued.)

Description	PRIVATE	ST_ENTERP	GOV	FAMILY	OWNER	SEPARATED	DIVORCED	WIDOWED
Mean	0.4221	0.1805	0.3043	0.0309	0.0164	0.5362	0.0999	0.2062
Medium	0	0	0	0	0	1	0	0
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Standard Deviation	0.4940	0.3846	0.4602	0.1732	0.1271	0.4988	0.3000	0.4046
Skewness	0.3156	1.6618	0.8509	5.4171	7.6139	-0.1450	2.6680	1.4525
Kurtosis	1.0996	3.7615	1.7241	30.3452	58.9712	1.0210	8.1185	3.1097
Jarque-Bera	448.11	1299.21	505.59	96679.40	376001.10	447.05	6109.68	944.36
Probability	0	0	0	0	0	0	0	0
Sum	1132	484	816	83	44	1438	268	553
Sum Sq. Dev.	654.21	396.66	567.73	80.43	43.28	666.99	241.22	438.98
Observations	2682	2682	2682	2682	2682	2682	2682	2682

Source: NSO, 1999a.

Table A.5 Descriptive Statistics of Variables, 2000

Description	PRO_HE	FAMILY_INCOME	FA_SYEAR	MO_SYEAR	GROUPSIZE	CENTRAL	NORTH	NORTH_E	SOUTH	AREA
Mean	0.8230	22816.9300	12.4951	12.4247	200.1584	0.1749	0.1604	0.1592	0.1554	0.7877
Medium	1	20000	16	16	36	0	0	0	0	1
Maximum	1	99998	18	18	884	1	1	1	1	1
Minimum	0	50	0	0	1	0	0	0	0	0
Standard Deviation	0.3818	18270.1000	6.5059	6.5042	246.1637	0.3799	0.3671	0.3660	0.3624	0.4090
Skewness	-1.6923	1.7155	-1.3322	-1.3040	0.9225	1.7118	1.8506	1.8625	1.9022	-1.4069
Kurtosis	3.8640	7.1496	2.8800	2.8187	2.3072	3.9303	4.4245	4.4690	4.6185	2.9793
Jarque-Bera	1398.70	3821.93	1005.00	965.61	548.76	1778.41	2222.16	2265.50	2415.22	1118.69
Probability	0	0	0	0	0	0	0	0	0	0
Sum	2264	72192754	42371	42132	678737	593	544	540	527	2671
Sum Sq. Dev.	400.79	1.06E+12	143485.70	143412.50	2.05E+08	489.30	456.73	454.01	445.10	567.12
Observations	2751	3164	3391	3391	3391	3391	3391	3391	3391	3391

Source: NSO, 2000a.

Table A.5 (Continued.)

Description	PRIVATE	ST_ENTERP	GOV	FAMILY	OWNER	SEPARATED	DIVORCED	WIDOWED
Mean	0.4175	0.1824	0.2987	0.0379	0.0175	0.5167	0.1061	0.2081
Medium	0	0	0	0	0	1	0	0
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Standard Deviation	0.4932	0.3862	0.4578	0.1910	0.1310	0.4998	0.3080	0.4060
Skewness	0.3344	1.6449	0.8798	4.8406	7.3685	-0.0668	2.5584	1.4382
Kurtosis	1.1119	3.7058	1.7741	24.4315	55.2944	1.0045	7.5452	3.0685
Jarque-Bera	450.07	1269.86	515.88	62032.32	331102.30	449.34	5261.72	929.96
Probability	0	0	0	0	0	0	0	0
Sum	1124	491	804	102	47	1393	286	561
Sum Sq. Dev.	654.69	401.45	563.88	98.14	46.18	673.25	255.66	444.26
Observations	2692	2692	2692	2692	2692	2696	2696	2696

Source: NSO, 2000a.

Table A.6 Descriptive Statistics of Variables, 2001

Description	PRO_HE	FAMILY_INCOME	FA_SYEAR	MO_SYEAR	GROUPSIZE	CENTRAL	NORTH	NORTH_E	SOUTH	AREA
Mean	0.7046	12565.6600	8.6059	8.5426	24.4230	0.1501	0.1579	0.1687	0.1479	1.2281
Medium	1	8500	9	9	10	0	0	0	0	1
Maximum	1	99998	18	18	110	1	1	1	1	2
Minimum	0	0	0	0	1	0	0	0	0	1
Standard Deviation	0.4563	13936.5900	6.6396	6.6108	24.3195	0.3571	0.3647	0.3745	0.3550	0.4196
Skewness	-0.8968	2.8002	-0.1996	-0.1728	0.6716	1.9597	1.8759	1.7692	1.9839	1.2963
Kurtosis	1.8042	14.9771	1.4754	1.4524	2.1252	4.8404	4.5188	4.1300	4.9360	2.6803
Jarque-Bera	2188.20	210832.60	3688.74	3734.35	3816.02	27845.92	24330.97	20490.96	28949.95	10134.41
Probability	0	0	0	0	0	0	0	0	0	0
Sum	7963	3.64E+08	3.07E+05	3.05E+05	8.71E+05	5349	5630	6014	5271	43774
Sum Sq. Dev.	2352.54	5.62E+12	1.57E+06	1.56E+06	2.11E+07	4546.31	4740.76	4999.32	4491.55	6275.15
Observations	11302	28945	35645	35645	35645	35645	35645	35645	35645	35645

Source: NSO, 2001a.

Table A.6 (Continued.)

Description	PRIVATE	ST_ENTERP	GOV	FAMILY	OWNER	SEPARATED	DIVORCED	WIDOWED
Mean	0.7259	0.0297	0.0873	0.0138	0.1410	0.1492	0.1028	0.3481
Medium	1	0	0	0	0	0	0	0
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Standard Deviation	0.4460	0.1696	0.2822	0.1167	0.3480	0.3563	0.3037	0.4764
Skewness	-1.0131	5.5456	2.9251	8.3326	2.0634	1.9691	2.6161	0.6378
Kurtosis	2.0263	31.7534	9.5559	70.4322	5.2576	4.8774	7.8442	1.4068
Jarque-Bera	5687.53	1068968.00	86893.04	5430352.00	24904.09	24546.34	65566.33	5371.79
Probability	0	0	0	0	0	0	0	0
Sum	19609	801	2357	373	3808	4618	3181	10773
Sum Sq. Dev.	5374.11	777.25	2151.33	367.85	3271.17	3928.96	2854.06	7023.16
Observations	27012	27012	27012	27012	27012	30950	30950	30950

Source: NSO, 2001a.

Table A.7 Descriptive Statistics of Variables, 2002

Description	PRO_HE	FAMILY_INCOME	FA_SYEAR	MO_SYEAR	GROUPSIZE	CENTRAL	NORTH	NORTH_E	SOUTH	AREA
Mean	0.6803	14464.0500	8.9719	8.8737	24.0434	0.1735	0.1372	0.1597	0.1356	0.7657
Medium	1	11120	12	9	10	0	0	0	0	1
Maximum	1	99998	18	18	120	1	1	1	1	1
Minimum	0	40	0	0	1	0	0	0	0	0
Standard Deviation	0.4664	12391.7300	6.5176	6.5054	24.5477	0.3787	0.3441	0.3663	0.3424	0.4236
Skewness	-0.7734	2.8321	-0.2923	-0.2596	0.8127	1.7245	2.1085	1.8584	2.1283	-1.2548
Kurtosis	1.5982	15.7712	1.5653	1.5254	2.4613	3.9739	5.4460	4.4535	5.5298	2.5744
Jarque-Bera	2643.00	239218.60	3563.48	3628.80	4353.66	19069.72	35286.58	23646.23	36403.28	9619.05
Probability	0	0	0	0	0	0	0	0	0	0
Sum	9903	425000000	319694	316197	856738	6182	4890	5689	4833	27285
Sum Sq. Dev.	3165.61	4.52E+12	1.51E+06	1.51E+06	2.15E+07	5109.48	4218.93	4780.72	4177.49	6392.25
Observations	14556	29414	35633	35633	35633	35633	35633	35633	35633	35633

Source: NSO, 2002a.

Table A.7 (Continued.)

Description	PRIVATE	ST_ENTERP	GOV	FAMILY	OWNER	SEPARATED	DIVORCED	WIDOWED
Mean	0.7294	0.0259	0.0871	0.0177	0.1374	0.1566	0.0986	0.3351
Medium	1	0	0	0	0	0	0	0
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Standard Deviation	0.4443	0.1589	0.2820	0.1319	0.3443	0.3634	0.2981	0.4720
Skewness	-1.0326	5.9656	2.9282	7.3119	2.1065	1.8901	2.6933	0.6986
Kurtosis	2.0662	36.5882	9.5746	54.4632	5.4372	4.5726	8.2537	1.4880
Jarque-Bera	5835.19	1443254.00	88063.48	3251466.00	26909.28	21788.42	73587.74	5508.50
Probability	0	0	0	0	0	0	0	0
Sum	19885	707	2375	483	3746	4884	3075	10454
Sum Sq. Dev.	5381.34	688.67	2168.10	474.44	3231.29	4119.32	2771.88	6950.57
Observations	27263	27263	27263	27263	27263	31194	31194	31194

Source: NSO, 2002a.

Table A.8 Descriptive Statistics of Variables, 2003

Description	PRO_HE	FAMILY_INCOME	FA_SYEAR	MO_SYEAR	GROUPSIZE	CENTRAL	NORTH	NORTH_E	SOUTH	AREA
Mean	0.6827	14991.4500	8.7795	8.7154	21.5242	0.1916	0.1150	0.1338	0.1133	0.7849
Medium	1	11190	9	9	7	0	0	0	0	1
Maximum	1	99998	18	18	122	1	1	1	1	1
Minimum	0	120	0	0	1	0	0	0	0	0
Standard Deviation	0.4655	13099.3000	6.5584	6.5500	23.2292	0.3936	0.3191	0.3405	0.3170	0.4109
Skewness	-0.7849	2.8155	-0.2427	-0.2216	0.9500	1.5669	2.4130	2.1508	2.4395	-1.3869
Kurtosis	1.6161	15.0429	1.5298	1.4963	2.7153	3.4550	6.8228	5.6259	6.9511	2.9234
Jarque-Bera	2299.66	191276.40	3171.01	3250.92	4882.31	13263.45	50138.27	33596.84	52136.34	10184.49
Probability	0	0	0	0	0	0	0	0	0	0
Sum	8603	3.89E+08	2.79E+05	2.77E+05	6.83E+05	6084	3652	4249	3598	24918
Sum Sq. Dev.	2730.00	4.46E+12	1.37E+06	1.36E+06	1.71E+07	4918.03	3231.88	3680.30	3190.21	5359.42
Observations	12602	25974	31746	31746	31746	31746	31746	31746	31746	31746

Source: NSO, 2003a.

Table A.8 (Continued.)

Description	PRIVATE	ST_ENTERP	GOV	FAMILY	OWNER	SEPARATED	DIVORCED	WIDOWED
Mean	0.7309	0.0247	0.0799	0.0169	0.1422	0.1471	0.0963	0.3203
Medium	1	0	0	0	0	0	0	0
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Standard Deviation	0.4435	0.1552	0.2711	0.1291	0.3493	0.3542	0.2950	0.4666
Skewness	-1.0410	6.1259	3.0994	7.4865	2.0487	1.9927	2.7369	0.7704
Kurtosis	2.0838	38.5262	10.6064	57.0472	5.1974	4.9710	8.4904	1.5935
Jarque-Bera	5090.87	1389383.00	94726.85	3094443.00	21268.35	22819.70	69382.03	5023.90
Probability	0	0	0	0	0	0	0	0
Sum	17257	583	1886	400	3358	4075	2668	8873
Sum Sq. Dev.	4644.60	568.61	1735.36	393.22	2880.44	3475.61	2411.06	6031.17
Observations	23612	23612	23612	23612	23612	27704	27704	27704

Source: NSO, 2003a.

Appendix B

Definition of Inequality Measures

Table B.1 The Inequality Measures of Probability

Measure	Definition
Probability share of the richest R%	$S_R = \frac{\sum_{i=n^{(1-R)+1}}^{n^{100}} p_i}{n\bar{p}}$
Probability share of the poorest P%	$S_P = \frac{\sum_{i=1}^{n^P} p_i}{n\bar{p}}$
90-10 ratio	$R_{90-10} = \frac{p_{n^{90}}}{p_{n^{10}}}$
R%-P% ratio	$R_{R-P} = \frac{p_{n^R}}{p_{n^P}}$
Gini coefficient	$G = \frac{-(n+1)}{n} + \frac{2}{n^2\bar{p}}\sum_{i=1}^{n} ip_i$
Atkinson	$A_\varepsilon = \begin{cases} 1 - \left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{p_i}{\bar{p}}\right)^{\varepsilon}\right]^{1/\varepsilon} & \text{for } \varepsilon \leq 1 \text{ and } \varepsilon \neq 0 \\ 1 - \left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{p_i}{\bar{p}}\right)^{1-\varepsilon}\right]^{1/1-\varepsilon} & \text{for } \varepsilon > 1 \\ 1 - \prod_{i=1}^{n}\left(\frac{p_i}{\bar{p}}\right)^{1/n} & \text{for } \varepsilon = 0 \end{cases}$
Variation	$V = \frac{1}{n}\sum_{i=1}^{n}(p_i - \bar{p})^2$
Coefficient of variation	$C = \frac{V^{0.5}}{\bar{p}}$

Sources: Atkinson, 1983a: 30; Barr, 2003: 140-144; Fields, 2001: 30 and Cowell, 1995: 21, 24

Appendix C

Non-Parametric Estimation Diagrams

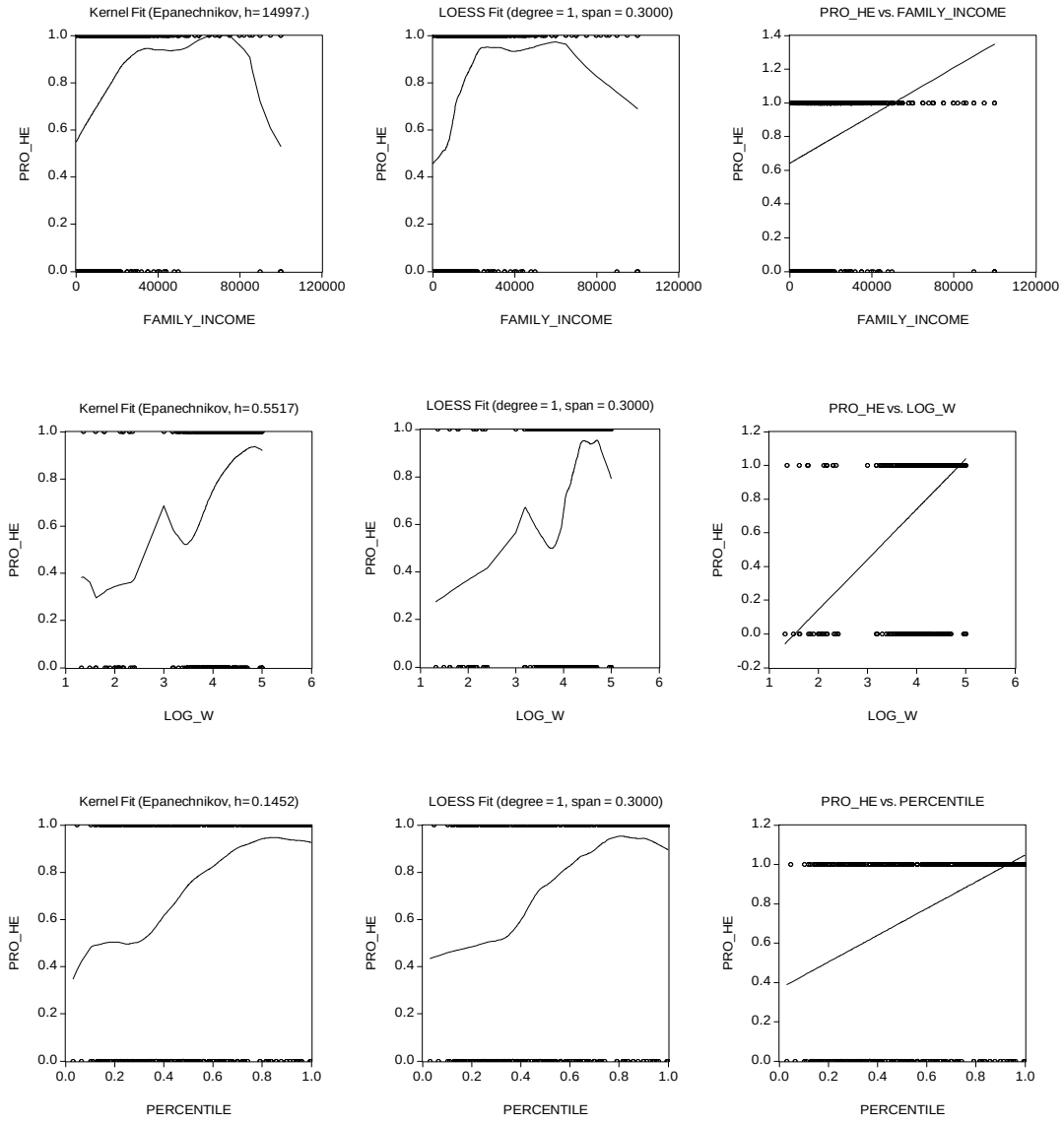

Figure C.1 Kernel Fit, LOESS FIT (Scatter with Nearest Neighbor fit) and Scatter with regression, 1996

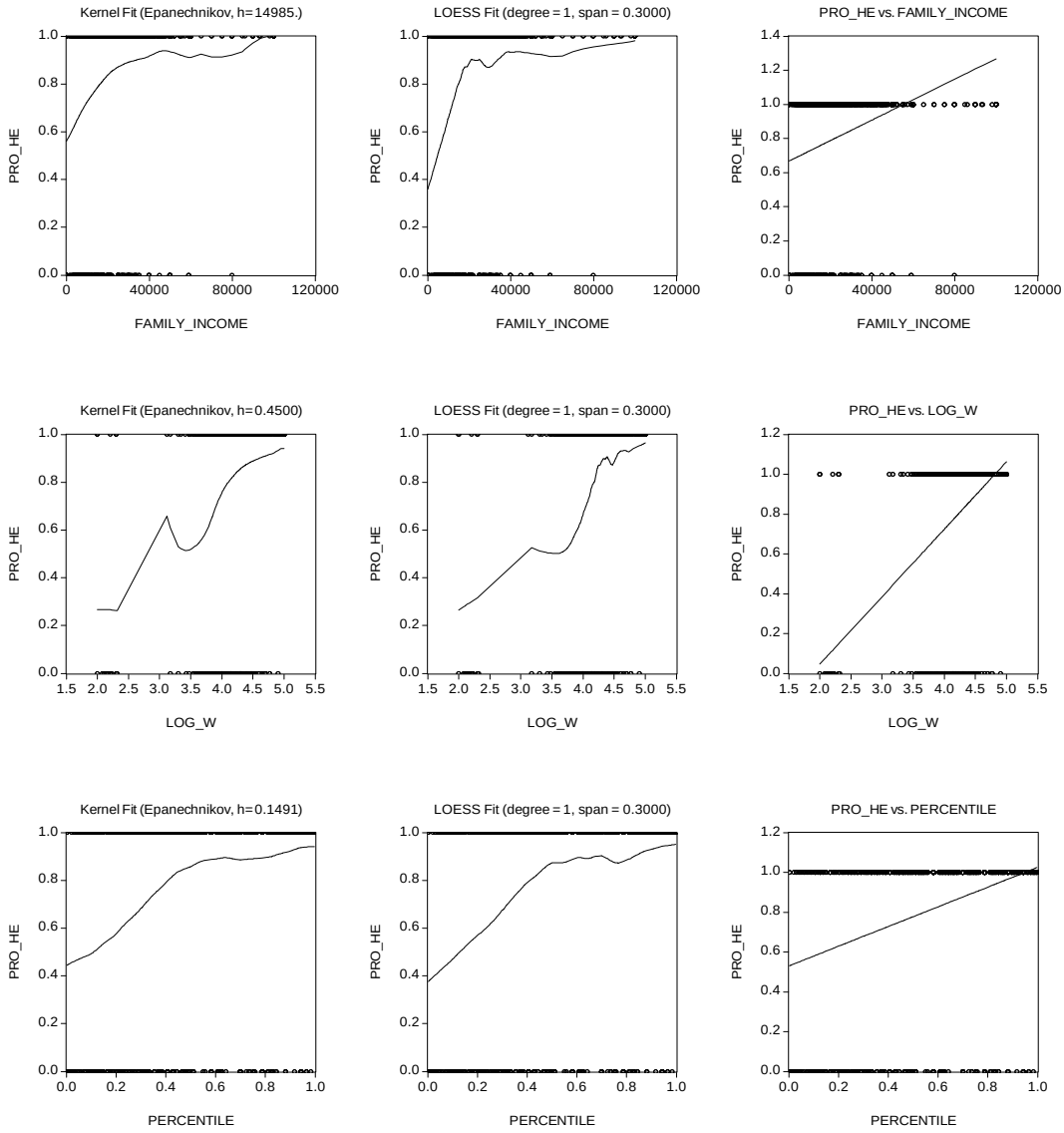

Figure C.2 Kernel Fit, LOESS FIT (Scatter with Nearest Neighbor fit) and Scatter with regression, 1997

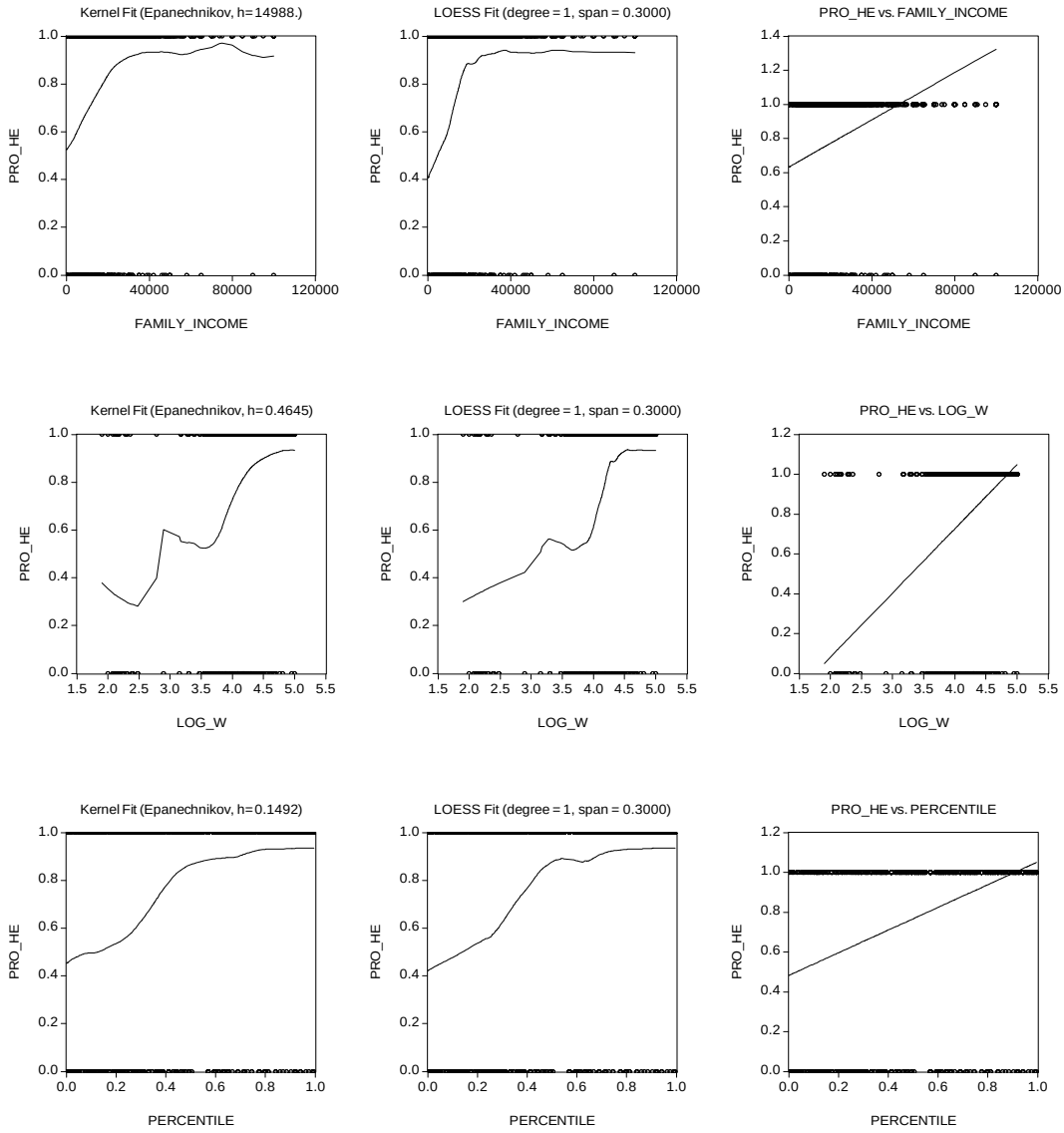

Figure C.3 Kernel Fit, LOESS FIT (Scatter with Nearest Neighbor fit) and Scatter with regression, 1998

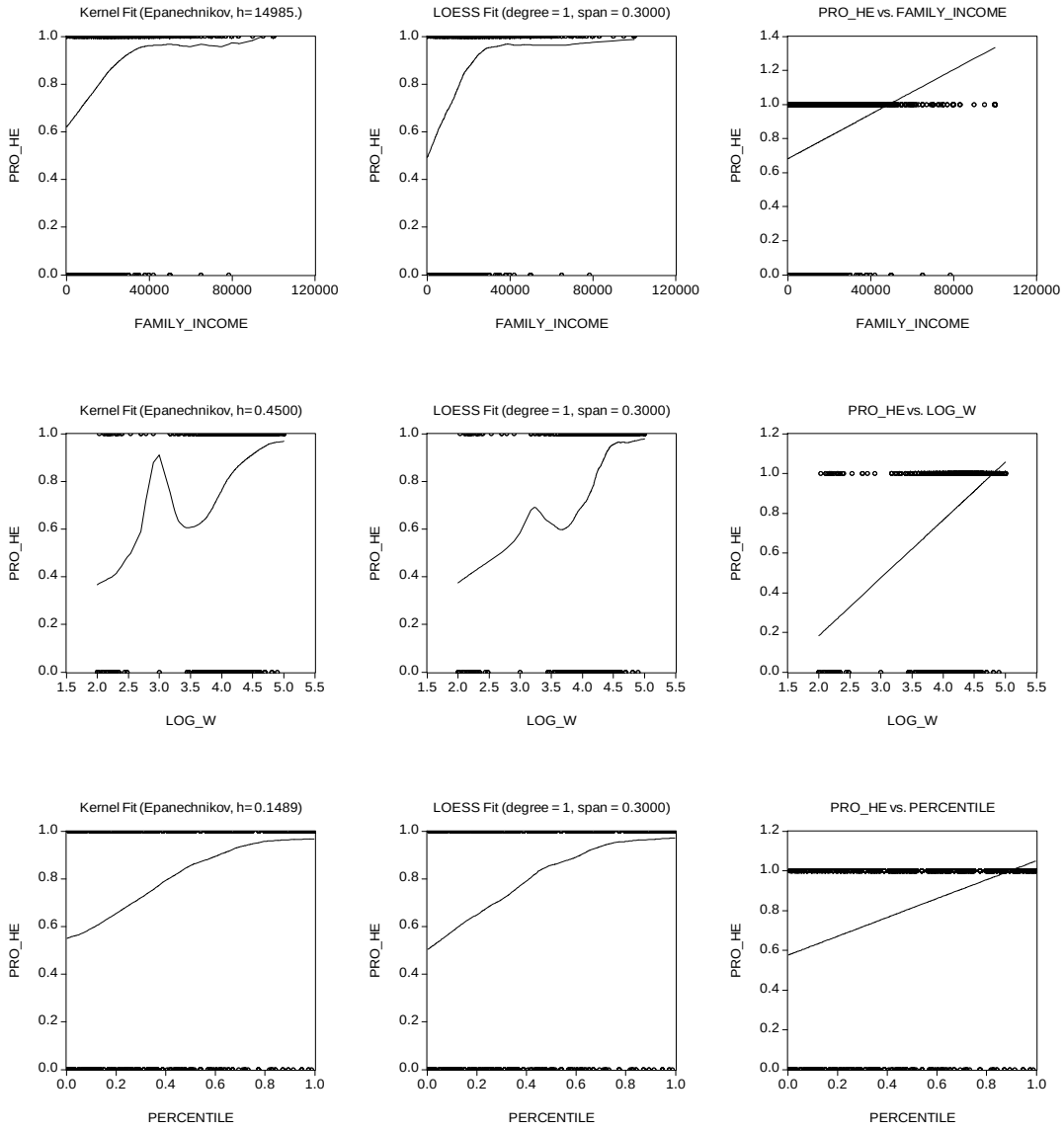

Figure C.4 Kernel Fit, LOESS FIT (Scatter with Nearest Neighbor fit) and Scatter with regression, 1999

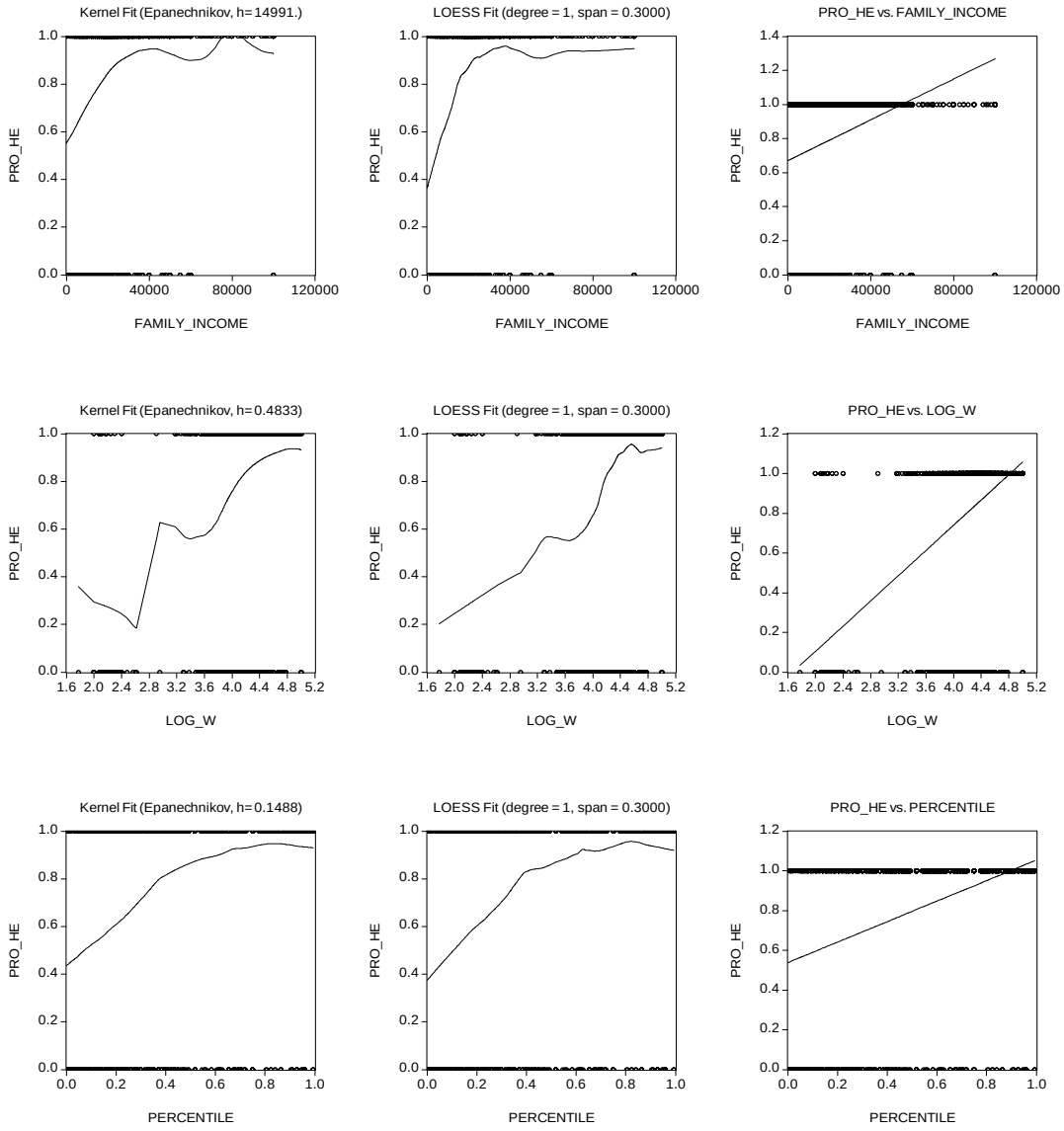

Figure C.5 Kernel Fit, LOESS FIT (Scatter with Nearest Neighbor fit) and Scatter with regression, 2000

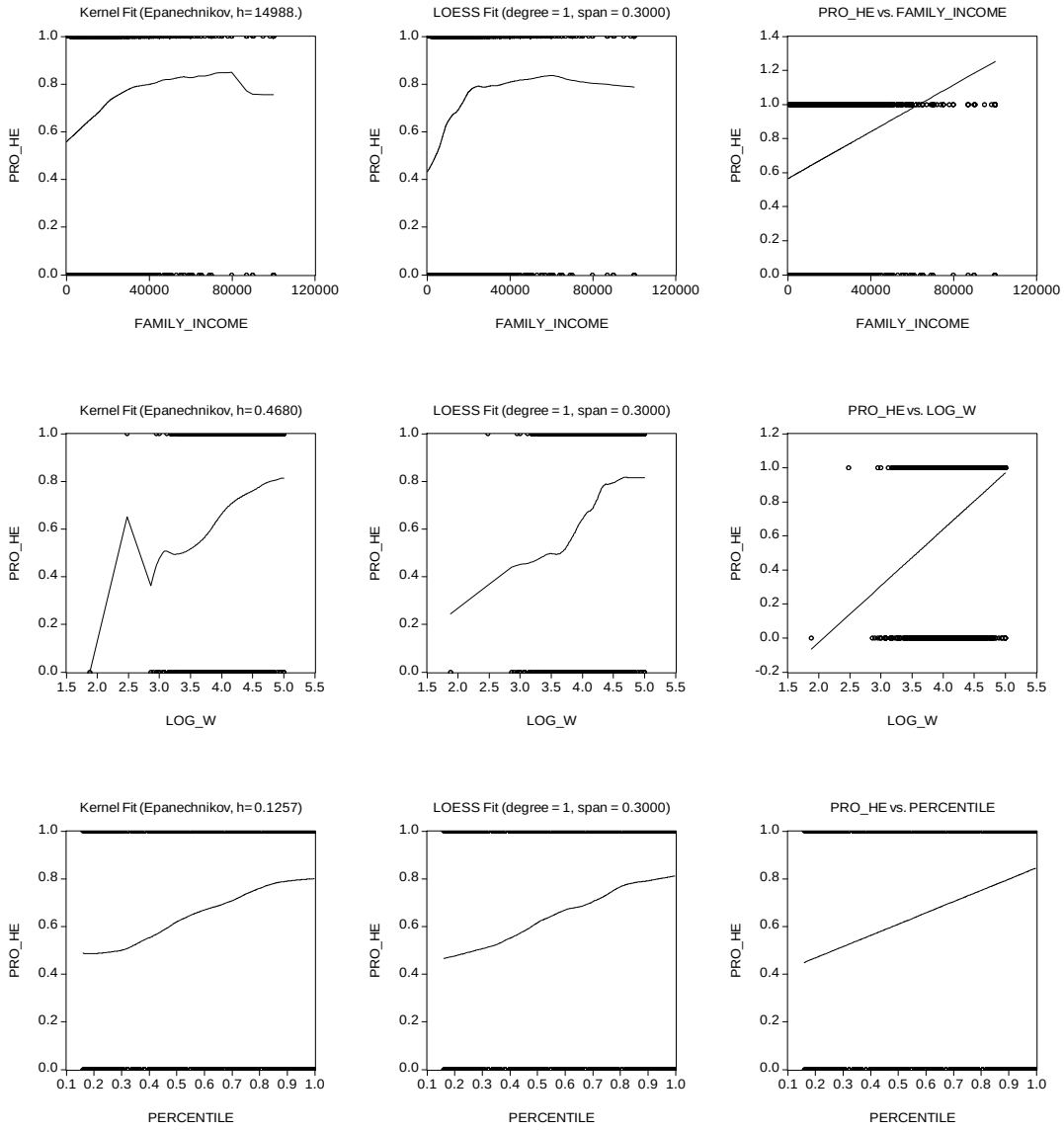

Figure C.6 Kernel Fit, LOESS FIT (Scatter with Nearest Neighbor fit) and Scatter with regression, 2001

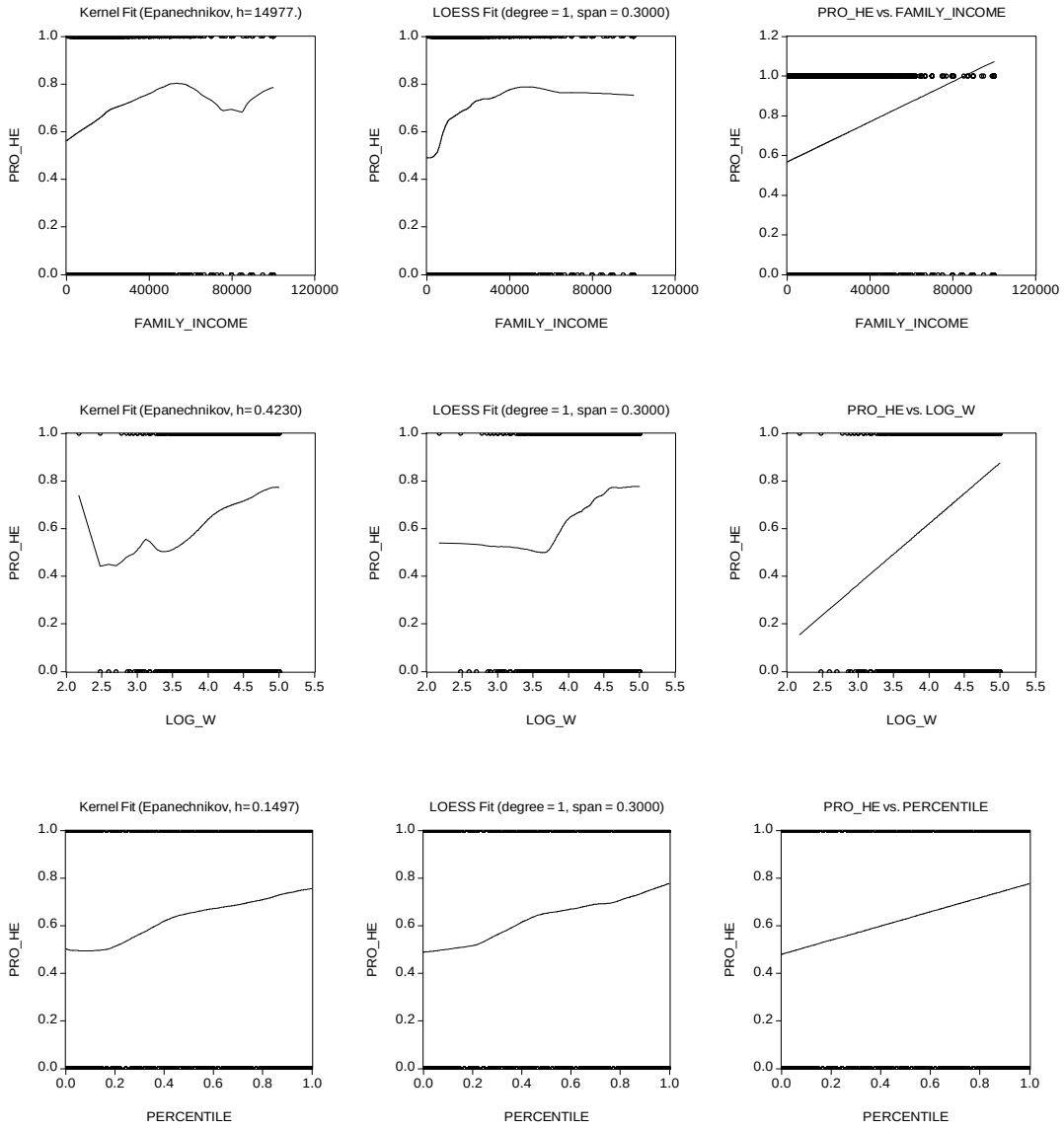

Figure C.7 Kernel Fit, LOESS FIT (Scatter with Nearest Neighbor fit) and Scatter with regression, 2002

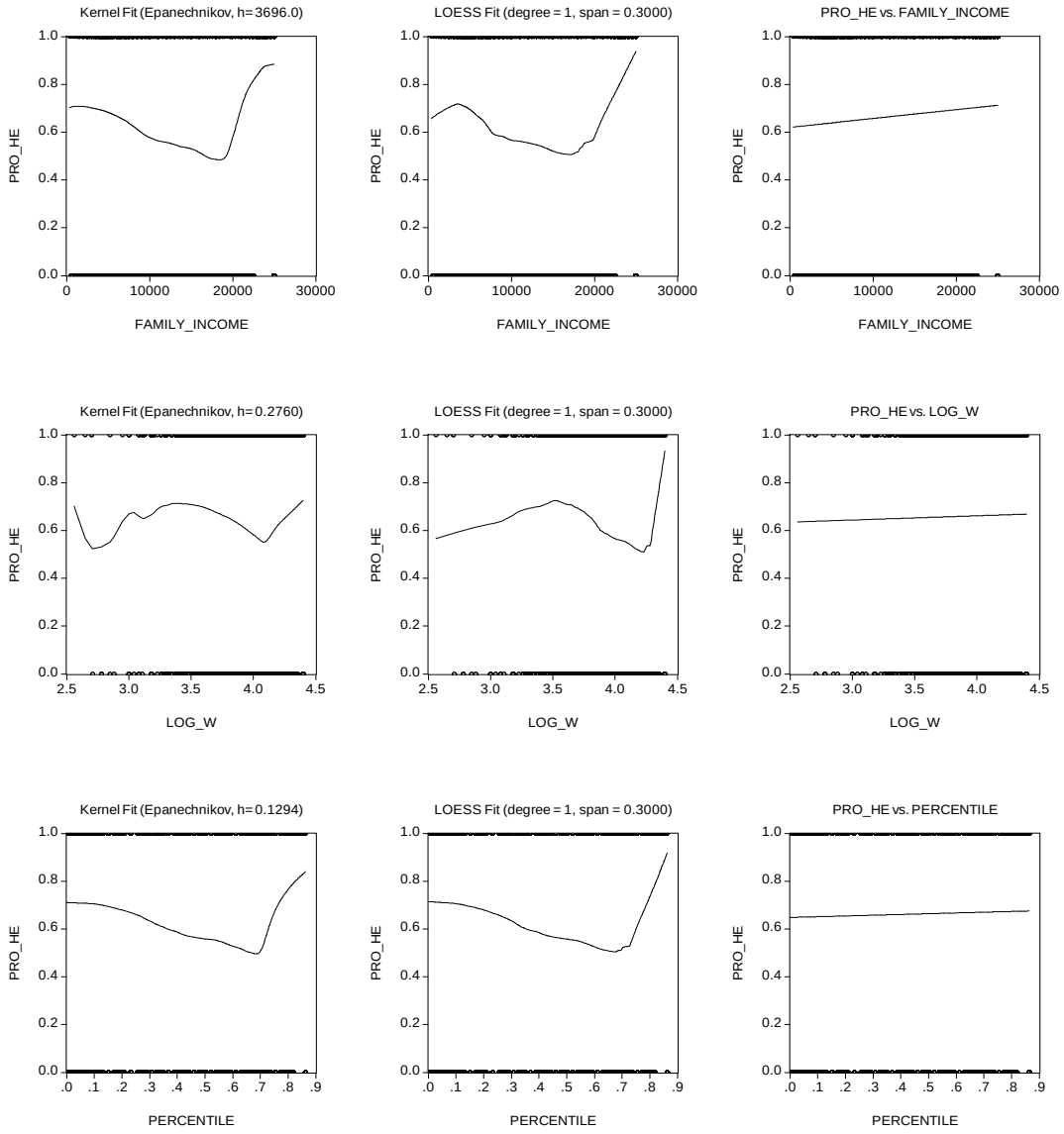

Figure C.8 Kernel Fit, LOESS FIT (Scatter with Nearest Neighbor fit) and Scatter with regression, 2003

Appendix D

Probit Estimation Outputs

Table D.1 Estimation Output - Probit Model I, 1996

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 08/07/08 Time: 00:12
Sample(adjusted): 594 2443
Included observations: 1309
Excluded observations: 541 after adjusting endpoints
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.906605	0.412834	-9.462897	0.0000
LOG_W	1.142245	0.099631	11.46472	0.0000
L2	1.936685	0.494099	3.919626	0.0001
L3	0.026205	0.083140	0.315188	0.7526

Mean dependent var	0.790680	S.D. dependent var	0.406979
S.E. of regression	0.380329	Akaike info criterion	0.912257
Sum squared resid	188.7688	Schwarz criterion	0.928077
Log likelihood	-593.0722	Hannan-Quinn criter.	0.918191
Restr. log likelihood	-671.5883	Avg. log likelihood	-0.453073
LR statistic (3 df)	157.0321	McFadden R-squared	0.116911
Probability(LR stat)	0.000000		

Obs with Dep=0	274	Total obs	1309
Obs with Dep=1	1035		

Table D.2 Estimation Output - Probit Model I, 1997

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 13:15
Sample(adjusted): 88 1713
Included observations: 1273
Excluded observations: 353 after adjusting endpoints
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.089125	0.469831	-8.703401	0.0000
LOG_W	1.188110	0.111930	10.61477	0.0000
L3	-0.033253	0.085487	-0.388977	0.6973

Mean dependent var	0.810683	S.D. dependent var	0.391914
S.E. of regression	0.368706	Akaike info criterion	0.871863
Sum squared resid	172.6486	Schwarz criterion	0.883998
Log likelihood	-551.9411	Hannan-Quinn criter.	0.876421
Restr. log likelihood	-617.6984	Avg. log likelihood	-0.433575
LR statistic (2 df)	131.5147	McFadden R-squared	0.106455
Probability(LR stat)	0.000000		

Obs with Dep=0	241	Total obs	1273
Obs with Dep=1	1032		

Table D.3 Estimation Output - Probit Model I, 1999

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 12:42
Sample(adjusted): 1 3214
Included observations: 2660
Excluded observations: 554 after adjusting endpoints
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.295703	0.283188	-11.63785	0.0000
LOG_W	1.037680	0.067377	15.40121	0.0000
L2	-0.027023	0.086991	-0.310644	0.7561
L3	-0.108687	0.086654	-1.254266	0.2097
L4	-0.048498	0.087455	-0.554554	0.5792

Mean dependent var	0.834586	S.D. dependent var	0.371623
S.E. of regression	0.352700	Akaike info criterion	0.801704
Sum squared resid	330.2740	Schwarz criterion	0.812768
Log likelihood	-1061.267	Hannan-Quinn criter.	0.805708
Restr. log likelihood	-1193.113	Avg. log likelihood	-0.398972
LR statistic (4 df)	263.6927	McFadden R-squared	0.110506
Probability(LR stat)	0.000000		

Obs with Dep=0	440	Total obs	2660
Obs with Dep=1	2220		

Table D.4 Estimation Output - Probit Model I, 2000

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 12:20
Sample(adjusted): 2 3161
Included observations: 2638
Excluded observations: 522 after adjusting endpoints
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.524413	0.276673	-12.73857	0.0000
LOG_W	1.087621	0.065374	16.63678	0.0000
L2	-0.190107	0.085883	-2.213569	0.0269
L3	-0.158120	0.086272	-1.832799	0.0668
L4	-0.066711	0.087519	-0.762240	0.4459

Mean dependent var	0.818044	S.D. dependent var	0.385881
S.E. of regression	0.357637	Akaike info criterion	0.827682
Sum squared resid	336.7727	Schwarz criterion	0.838822
Log likelihood	-1086.712	Hannan-Quinn criter.	0.831715
Restr. log likelihood	-1251.326	Avg. log likelihood	-0.411945
LR statistic (4 df)	329.2282	McFadden R-squared	0.131552
Probability(LR stat)	0.000000		

Obs with Dep=0	480	Total obs	2638
Obs with Dep=1	2158		

Table D.5 Estimation Output - Probit Model I, 2002

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 09:57
Sample(adjusted): 533 29944
Included observations: 12730
Excluded observations: 16682 after adjusting endpoints
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.456159	0.155997	-15.74493	0.0000
LOG_W	0.698535	0.037607	18.57463	0.0000
L2	0.039503	0.032243	1.225181	0.2205
L3	-0.090348	0.032889	-2.747105	0.0060
L4	-0.055701	0.032524	-1.712605	0.0868

Mean dependent var	0.652317	S.D. dependent var	0.476253
S.E. of regression	0.469335	Akaike info criterion	1.263937
Sum squared resid	2803.006	Schwarz criterion	1.266864
Log likelihood	-8039.962	Hannan-Quinn criter.	1.264916
Restr. log likelihood	-8223.584	Avg. log likelihood	-0.631576
LR statistic (4 df)	367.2439	McFadden R-squared	0.022329
Probability(LR stat)	0.000000		

Obs with Dep=0	4426	Total obs	12730
Obs with Dep=1	8304		

Table D.6 Estimation Output - Probit Model I, 2003

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/20/08 Time: 21:52
Sample(adjusted): 3924 26521
Included observations: 9719
Excluded observations: 12879 after adjusting endpoints
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.244925	0.178553	1.371723	0.1701
LOG_W	0.045732	0.044787	1.021105	0.3072
L2	-0.015783	0.034151	-0.462157	0.6440
L3	0.032888	0.044859	0.733142	0.4635
L4	-0.036073	0.034470	-1.046494	0.2953

Mean dependent var	0.660665	S.D. dependent var	0.473508
S.E. of regression	0.473515	Akaike info criterion	1.281818
Sum squared resid	2178.035	Schwarz criterion	1.285513
Log likelihood	-6223.996	Hannan-Quinn criter.	1.283071
Restr. log likelihood	-6225.929	Avg. log likelihood	-0.640395
LR statistic (4 df)	3.867238	McFadden R-squared	0.000311
Probability(LR stat)	0.424271		

Obs with Dep=0	3298	Total obs	9719
Obs with Dep=1	6421		

Table D.7 Estimation Output - Probit Model II, 1996

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 13:31
Sample(adjusted): 982 2443
Included observations: 1164
Excluded observations: 298 after adjusting endpoints
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.391131	0.703628	-3.398289	0.0007
LOG_W	0.465222	0.153486	3.031038	0.0024
FA_SYEAR	0.000341	0.028779	0.011865	0.9905
MO_SYEAR	-0.002673	0.026777	-0.099824	0.9205
GROUPSIZE	0.003118	0.000475	6.563242	0.0000
CENTRAL	-0.005448	0.217001	-0.025105	0.9800
NORTH	-0.028756	0.213906	-0.134431	0.8931
NORTH_E	-0.418135	0.219303	-1.906655	0.0566
SOUTH	0.320193	0.220345	1.453139	0.1462
AREA	0.146514	0.159868	0.916464	0.3594
PRIVATE	0.403023	0.309623	1.301657	0.1930
ST_ENTERP	0.309964	0.324603	0.954902	0.3396
GOV	0.090151	0.296182	0.304378	0.7608
FAMILY	0.262522	0.393487	0.667169	0.5047
OWNER	0.301818	0.454896	0.663488	0.5070
SEPARATED	0.599908	0.172118	3.485445	0.0005
DIVORCED	0.260195	0.197578	1.316924	0.1879
WIDOWED	0.454864	0.157260	2.892436	0.0038
L2	-0.705026	0.686825	-1.026501	0.3047
L3	0.013659	0.102793	0.132877	0.8943

Mean dependent var	0.830756	S.D. dependent var	0.375128
S.E. of regression	0.331425	Akaike info criterion	0.710055
Sum squared resid	125.6600	Schwarz criterion	0.796990
Log likelihood	-393.2522	Hannan-Quinn criter.	0.742852
Restr. log likelihood	-529.2538	Avg. log likelihood	-0.337846
LR statistic (19 df)	272.0033	McFadden R-squared	0.256969
Probability(LR stat)	0.000000		

Obs with Dep=0	197	Total obs	1164
Obs with Dep=1	967		

Table D.8 Estimation Output - Probit Model II, 1997

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 13:17
Sample(adjusted): 389 1713
Included observations: 1168
Excluded observations: 157 after adjusting endpoints
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.656582	0.814619	-3.261132	0.0011
LOG_W	0.414974	0.167387	2.479135	0.0132
FA_SYEAR	0.014325	0.034716	0.412626	0.6799
MO_SYEAR	0.016038	0.027837	0.576131	0.5645
GROUPSIZE	0.004989	0.000643	7.758010	0.0000
CENTRAL	0.017925	0.275644	0.065028	0.9482
NORTH	-0.058049	0.248574	-0.233529	0.8154
NORTH_E	-0.640261	0.254117	-2.519556	0.0118
SOUTH	0.212289	0.249138	0.852094	0.3942
PRIVATE	0.261034	0.296343	0.880850	0.3784
ST_ENTERP	0.636237	0.314021	2.026098	0.0428
GOV	0.361591	0.283373	1.276027	0.2019
FAMILY	0.920564	0.400063	2.301049	0.0214
OWNER	0.939904	0.623985	1.506292	0.1320
SEPARATED	-0.014054	0.168676	-0.083320	0.9336
DIVORCED	0.270103	0.207181	1.303709	0.1923
WIDOWED	-0.082636	0.156822	-0.526941	0.5982
AREA	0.281931	0.183820	1.533735	0.1251
L3	-0.012870	0.107737	-0.119462	0.9049

Mean dependent var	0.842466	S.D. dependent var	0.364460
S.E. of regression	0.316099	Akaike info criterion	0.644464
Sum squared resid	114.8064	Schwarz criterion	0.726825
Log likelihood	-357.3671	Hannan-Quinn criter.	0.675530
Restr. log likelihood	-508.7322	Avg. log likelihood	-0.305965
LR statistic (18 df)	302.7301	McFadden R-squared	0.297534
Probability(LR stat)	0.000000		

Obs with Dep=0	184	Total obs	1168
Obs with Dep=1	984		

Table D.9 Estimation Output - Probit Model II, 1999

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 12:42
Sample(adjusted): 1 3214
Included observations: 2400
Excluded observations: 814 after adjusting endpoints
Convergence achieved after 6 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.823158	0.543859	-5.190974	0.0000
LOG_W	0.618672	0.111892	5.529184	0.0000
FA_SYEAR	-0.001470	0.023320	-0.063019	0.9498
MO_SYEAR	0.005991	0.019543	0.306541	0.7592
GROUPSIZE	0.004432	0.000474	9.354343	0.0000
CENTRAL	-0.398391	0.133660	-2.980630	0.0029
NORTH	0.044324	0.170794	0.259516	0.7952
NORTH_E	-0.120593	0.162438	-0.742393	0.4578
SOUTH	-0.252801	0.136205	-1.856034	0.0634
AREA	0.325560	0.131693	2.472117	0.0134
PRIVATE	0.349254	0.165351	2.112198	0.0347
ST_ENTERP	0.226691	0.176280	1.285968	0.1985
GOV	0.296255	0.151308	1.957963	0.0502
FAMILY	0.789470	0.256150	3.082060	0.0021
OWNER	0.728163	0.330401	2.203874	0.0275
SEPARATED	0.072974	0.113820	0.641135	0.5214
DIVORCED	0.230641	0.143882	1.602985	0.1089
WIDOWED	0.053039	0.105645	0.502050	0.6156
L2	0.091430	0.108925	0.839384	0.4013
L3	-0.108885	0.107586	-1.012073	0.3115
L4	0.045172	0.108606	0.415927	0.6775

Mean dependent var	0.857917	S.D. dependent var	0.349208
S.E. of regression	0.309409	Akaike info criterion	0.607994
Sum squared resid	227.7510	Schwarz criterion	0.658597
Log likelihood	-708.5926	Hannan-Quinn criter.	0.626403
Restr. log likelihood	-980.9457	Avg. log likelihood	-0.295247
LR statistic (20 df)	544.7063	McFadden R-squared	0.277643
Probability(LR stat)	0.000000		

Obs with Dep=0	341	Total obs	2400
Obs with Dep=1	2059		

Table D.10 Estimation Output - Probit Model II, 2000

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 12:20
Sample(adjusted): 2 3155
Included observations: 2407
Excluded observations: 747 after adjusting endpoints
Convergence achieved after 6 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.591995	0.541231	-4.789072	0.0000
LOG_W	0.599158	0.103032	5.815290	0.0000
FA_SYEAR	-0.014168	0.024728	-0.572932	0.5667
MO_SYEAR	-0.000515	0.021152	-0.024353	0.9806
GROUPSIZE	0.005246	0.000598	8.774654	0.0000
CENTRAL	-0.634629	0.134757	-4.709433	0.0000
NORTH	-0.405232	0.180783	-2.241538	0.0250
NORTH_E	-0.198710	0.161685	-1.228998	0.2191
SOUTH	-0.240457	0.148338	-1.621007	0.1050
AREA	0.338139	0.146345	2.310552	0.0209
PRIVATE	0.489751	0.171738	2.851733	0.0043
ST_ENTERP	0.446637	0.188492	2.369528	0.0178
GOV	0.378392	0.157048	2.409394	0.0160
FAMILY	0.540253	0.215023	2.512538	0.0120
OWNER	0.404144	0.263680	1.532706	0.1253
SEPARATED	0.354870	0.116017	3.058771	0.0022
DIVORCED	0.166129	0.135669	1.224517	0.2208
WIDOWED	0.171868	0.099689	1.724051	0.0847
L2	-0.237903	0.108697	-2.188682	0.0286
L3	-0.184794	0.108610	-1.701449	0.0889
L4	-0.044547	0.110090	-0.404638	0.6857

Mean dependent var	0.843789	S.D. dependent var	0.363131
S.E. of regression	0.309428	Akaike info criterion	0.604011
Sum squared resid	228.4490	Schwarz criterion	0.654492
Log likelihood	-705.9267	Hannan-Quinn criter.	0.622373
Restr. log likelihood	-1043.033	Avg. log likelihood	-0.293281
LR statistic (20 df)	674.2126	McFadden R-squared	0.323198
Probability(LR stat)	0.000000		

Obs with Dep=0	376	Total obs	2407
Obs with Dep=1	2031		

Table D.11 Estimation Output - Probit Model II, 2002

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 09:57
Sample(adjusted): 533 29944
Included observations: 11694
Excluded observations: 17718 after adjusting endpoints
Convergence achieved after 6 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.456339	0.289442	-5.031543	0.0000
LOG_W	0.439383	0.052979	8.293578	0.0000
FA_SYEAR	0.000193	0.003816	0.050641	0.9596
MO_SYEAR	0.005042	0.003599	1.400791	0.1613
GROUPSIZE	0.006665	0.000824	8.086027	0.0000
CENTRAL	-0.268628	0.074083	-3.626062	0.0003
NORTH	-0.201780	0.072167	-2.796007	0.0052
NORTH_E	-0.403581	0.073836	-5.465869	0.0000
SOUTH	-0.353319	0.070590	-5.005198	0.0000
AREA	0.255394	0.030821	8.286364	0.0000
PRIVATE	-0.196948	0.207362	-0.949778	0.3422
ST_ENTERP	0.057176	0.224153	0.255074	0.7987
GOV	-0.113077	0.211330	-0.535072	0.5926
FAMILY	-0.154224	0.243243	-0.634031	0.5261
OWNER	-0.036871	0.216926	-0.169970	0.8650
SEPARATED	-0.023914	0.048825	-0.489778	0.6243
DIVORCED	-0.028926	0.052399	-0.552033	0.5809
WIDOWED	-0.034458	0.045276	-0.761065	0.4466
L2	0.068567	0.033762	2.030907	0.0423
L3	-0.091915	0.034563	-2.659329	0.0078
L4	-0.050151	0.034156	-1.468302	0.1420

Mean dependent var	0.651103	S.D. dependent var	0.476642
S.E. of regression	0.467042	Akaike info criterion	1.255053
Sum squared resid	2546.211	Schwarz criterion	1.268282
Log likelihood	-7317.294	Hannan-Quinn criter.	1.259496
Restr. log likelihood	-7563.224	Avg. log likelihood	-0.625731
LR statistic (20 df)	491.8602	McFadden R-squared	0.032517
Probability(LR stat)	0.000000		

Obs with Dep=0	4080	Total obs	11694
Obs with Dep=1	7614		

Table D.12 Estimation Output - Probit Model II, 2003

Dependent Variable: PRO_HE
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 06/21/08 Time: 10:26
Sample(adjusted): 3924 26521
Included observations: 7774
Excluded observations: 14824 after adjusting endpoints
Convergence achieved after 6 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	1.182591	0.341778	3.460110	0.0005
LOG_W	-0.323393	0.067999	-4.755829	0.0000
FA_SYEAR	0.007325	0.004196	1.745604	0.0809
MO_SYEAR	-0.002044	0.004069	-0.502158	0.6156
GROUPSIZE	0.007434	0.001055	7.045934	0.0000
CENTRAL	-0.199670	0.077117	-2.589169	0.0096
NORTH	-0.121009	0.077275	-1.565954	0.1174
NORTH_E	-0.395014	0.078022	-5.062852	0.0000
SOUTH	-0.277456	0.075484	-3.675684	0.0002
AREA	0.335961	0.037289	9.009641	0.0000
PRIVATE	-0.064686	0.166285	-0.389008	0.6973
ST_ENTERP	0.136080	0.222705	0.611033	0.5412
GOV	0.210960	0.175687	1.200775	0.2298
FAMILY	0.034798	0.203796	0.170750	0.8644
OWNER	0.323753	0.176404	1.835294	0.0665
SEPARATED	0.061836	0.060217	1.026880	0.3045
DIVORCED	-0.018743	0.064156	-0.292151	0.7702
WIDOWED	0.042206	0.054642	0.772410	0.4399
L2	0.085439	0.037671	2.268015	0.0233
L3	0.063317	0.058561	1.081202	0.2796
L4	-0.045734	0.038472	-1.188775	0.2345

Mean dependent var	0.622974	S.D. dependent var	0.484673
S.E. of regression	0.475093	Akaike info criterion	1.288641
Sum squared resid	1749.953	Schwarz criterion	1.307438
Log likelihood	-4987.948	Hannan-Quinn criter.	1.295084
Restr. log likelihood	-5150.970	Avg. log likelihood	-0.641619
LR statistic (20 df)	326.0449	McFadden R-squared	0.031649
Probability(LR stat)	0.000000		

Obs with Dep=0	2931	Total obs	7774
Obs with Dep=1	4843		

Appendix E

Education Statistics

Table E.1 New Enrolled Higher Education Students and the Ratio, 1997 - 2005

Description	1997	1998	1999	2000	2001	2002	2003	2004	2005
New enrolled students									
Limited-access university	73,302	81,791	83,109	88,888	96,688	118,782	111,383	134,898	140,093
Private university	59,533	60,731	54,570	71,218	86,372	92,634	89,526	86,147	80,690
Open university	185,637	206,398	213,941	233,154	244,723	198,891	142,617	153,463	146,415
Total	318,472	348,920	351,620	393,260	427,783	410,307	343,526	374,508	367,198
Ratio									
Higher education students per upper secondary students	93.11%	98.68%	97.26%	105.76%	110.85%	116.87%	117.53%	134.12%	128.16%
Undergraduate students per upper secondary students	106.30%	106.43%	97.89%	102.08%	106.00%	116.92%	122.58%	166.53%	158.58%
New enrolled students per upper secondary students (Academic track)	35.41%	35.80%	33.55%	35.39%	37.87%	37.25%	31.78%	35.80%	34.50%
New enrolled students per upper secondary students (Academic+Vocational track)	19.48%	20.77%	20.35%	22.79%	24.96%	24.14%	20.34%	22.40%	20.77%

Sources: NSO, 1997b-2005b and author's calculation.

Table E.2 Numbers of Students by Education Level, 1997-2005

Level	1997	1998	1999	2000	2001	2002	2003	2004	2005
Pre-primary	2,334,247	2,158,929	2,162,776	2,167,651	2,108,175	2,070,760	1,899,297	1,824,650	1,806,282
Primary	5,927,902	5,936,400	5,959,757	6,021,371	6,056,423	6,097,425	6,067,555	5,966,215	5,843,512
Secondary	2,462,556	2,426,931	2,375,218	2,339,817	2,338,674	2,368,920	2,523,786	2,672,082	2,761,216
Academic track	2,459,138	2,423,229	2,371,299	2,335,983	233,868	2,364,872	2,519,622	2,671,981	2,757,091
Vocational Track	3,418	3,702	3,919	3,834	3,806	4,048	4,164	101	4,125
Upper Secondary	1,634,775	1,679,878	1,727,484	1,725,558	1,713,973	1,699,734	1,688,809	1,672,072	1,767,546
Academic track	899,332	974,715	1,048,031	1,111,341	1,129,480	1,101,401	1,080,889	1,046,248	1,064,216
Vocational Track	733,487	703,346	678,002	612,800	583,081	597,014	606,749	622,975	701,499
Others	1,956	1,817	1,451	1,417	1,412	1,319	1,171	2,849	1,831
Higher Education	1,522,142	1,657,634	1,680,068	1,824,919	1,899,930	1,986,439	1,984,921	2,242,560	2,265,220
Vocational Education type	379,939	417,547	451,950	476,850	479,790	465,280	443,709	338,219	392,876
Teacher Training	65,661	65,913	60,971	59,655	51,000	44,198	42,648	3,657	543
Undergraduate Degree	956,022	1,037,430	1,025,926	1,134,412	1,197,296	1,287,790	1,324,943	1,742,268	1,687,666
Graduate Degree	62,653	76,477	82,734	95,623	115,449	137,578	127,571	140,562	179,191
Others	57,867	60,267	58,487	58,379	56,395	51,593	46,050	17,854	4,944
Total	13,881,622	13,859,772	13,905,303	14,079,316	14,117,175	14,223,278	14,164,368	14,377,579	14,443,776

Sources: NSO, 1997b-2005b and author's calculation.

Table E.3 Numbers of Students, Instructors and the Ratio by Type of Universities, 1997-2005

Descriptions	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of students									
Limited access university (Public)	232,040	258,389	278,673	296,728	315,888	336,795	347,000	393,682	428,272
Private university	185,767	188,087	178,564	219,060	224,325	251,153	253,605	256,008	256,148
Open university (Public)	517,482	549,711	549,362	586,345	635,627	684,138	652,917	597,428	602,582
Total	935,289	996,187	1,006,599	1,102,133	1,175,840	1,272,086	1,253,522	1,247,118	1,287,002
Number of instructors									
Limited access university (Public)	18,958	10,952	20,863	20,053	20,053	20,895	26,672	22,512	23,610
Private university	6,324	7,009	7,282	8,734	9,395	9,574	10,264	11,006	11,344
Open university (Public)	1,174	325	1,224	1,173	1,173	1,161	1,192	1,217	1,117
Total	18,958	10,952	20,863	20,053	20,053	20,895	26,672	22,512	23,610
Student-Teacher Ratio									
Limited access university (Public)	12.24	23.59	13.36	14.80	15.75	16.12	13.01	17.49	18.14
Private university	29.37	26.84	24.52	25.08	23.88	26.23	24.71	23.26	22.58
Open university (Public)	440.79	1,691.42	448.83	499.87	541.88	589.27	547.75	490.90	539.46
Total	35.35	54.48	34.27	36.79	38.40	40.22	32.88	35.90	35.68

Sources: NSO, 1997b-2005b and author's calculation.

Table E.4 Numbers of University Applicants, Passed the Examination Students and Average Family Income by Region, 2006

Region	No. of applicants	No. of passed examination students			Ratio (Applicant :Passed)	Average family income (baht per month)
		Public university	Private university	Total		
Bangkok	28,256	17,019	554	17,573	1.61	33,088
Central	25,692	15,203	547	15,750	1.63	26,523
North	16,310	10,359	396	10,755	1.52	13,146
Northeast	21,788	14,596	884	15,480	1.41	11,815
South	14,057	9,353	240	9,593	1.47	18,668
Total	106,103	66,530	2,621	69,151	1.53	

Sources: Office of Commission on Higher Education (CHE), 2007b: 4-6; NSO, 2006: 118 and author's calculation.

Appendix F

Lorenz Curves of Probability in University Participation

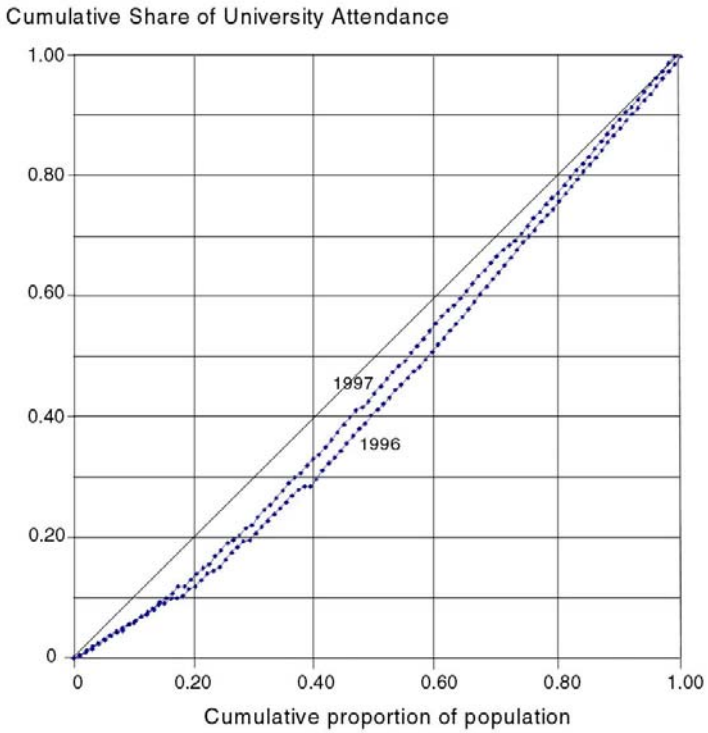

Figure F.1 Lorenz Curves of Probability in University Participation, 1996 and 1997

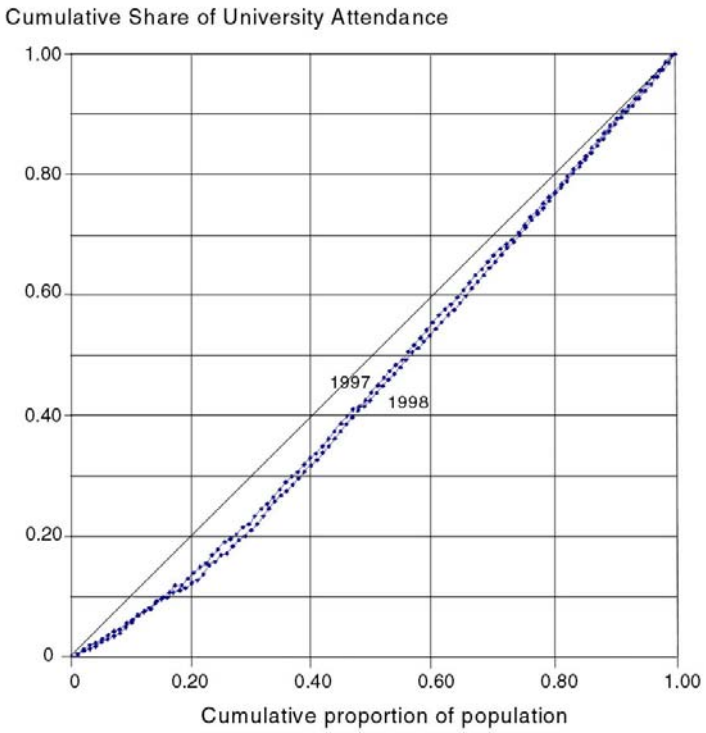

Figure F.2 Lorenz Curves of Probability in University Participation, 1997 and 1998

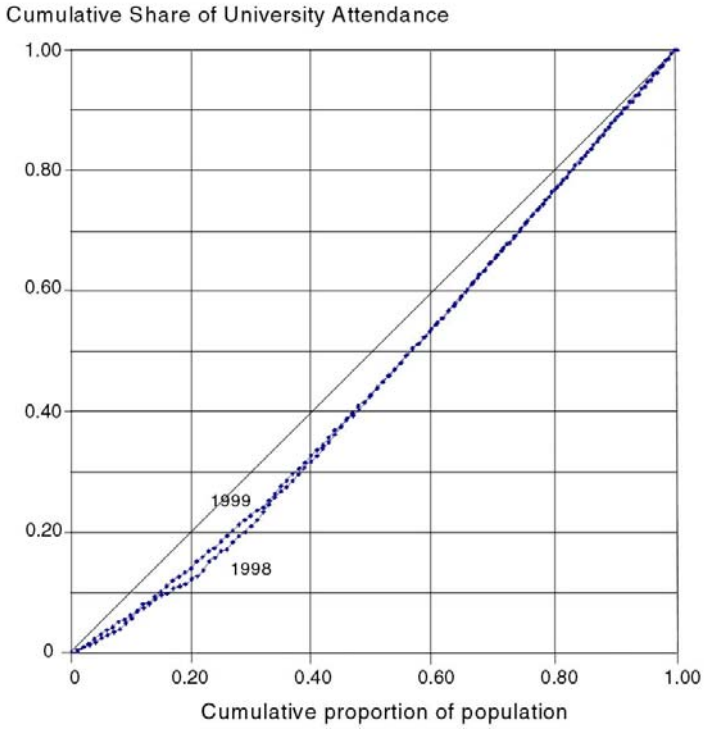

Figure F.3 Lorenz Curves of Probability in University Participation, 1998 and 1999

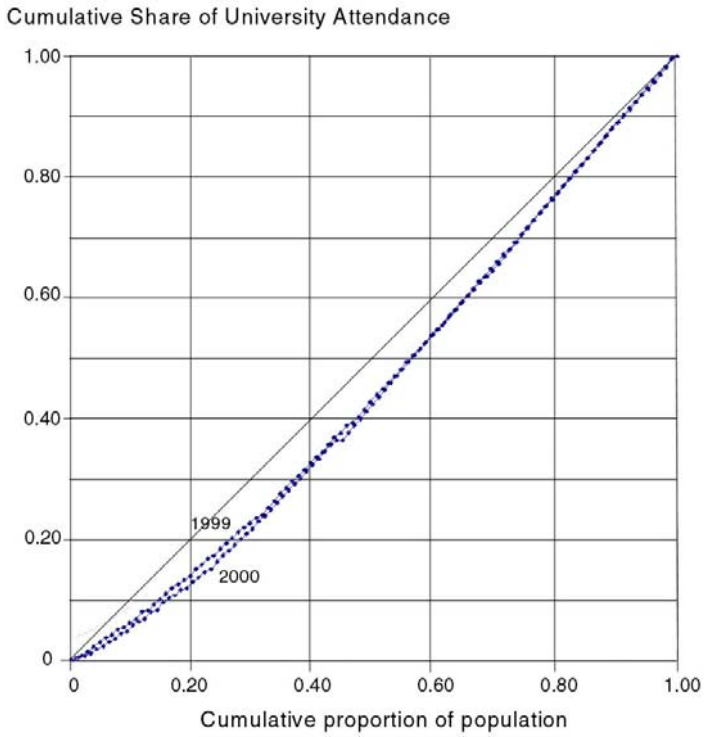

Figure F.4 Lorenz Curves of Probability in University Participation, 1999 and 2000

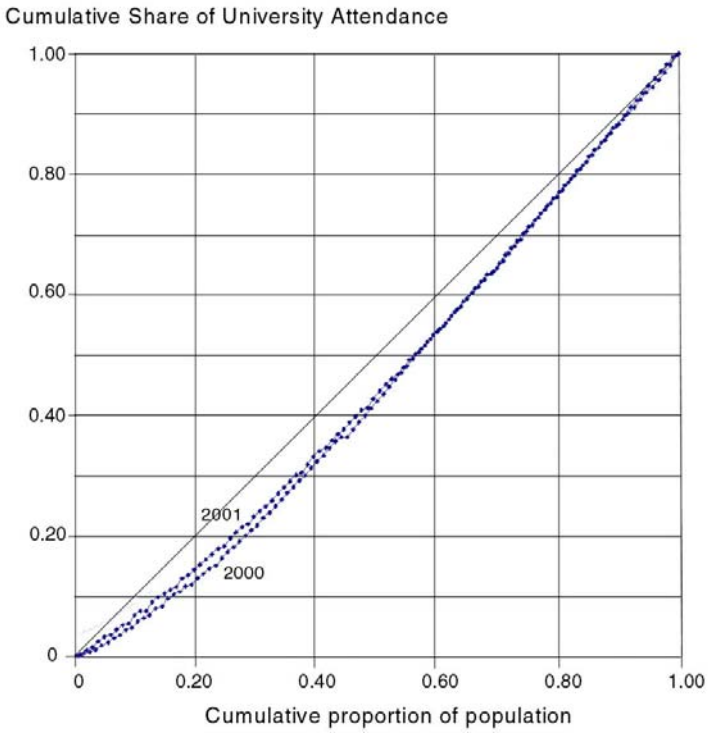

Figure F.5 Lorenz Curves of Probability in University Participation, 2000 and 2001

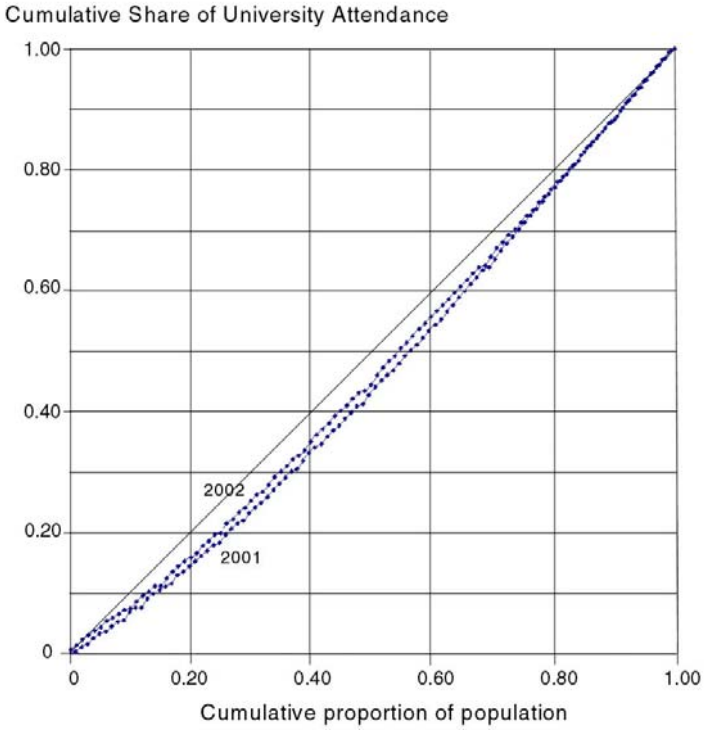

Figure F.6 Lorenz Curves of Probability in University Participation, 2001 and 2002

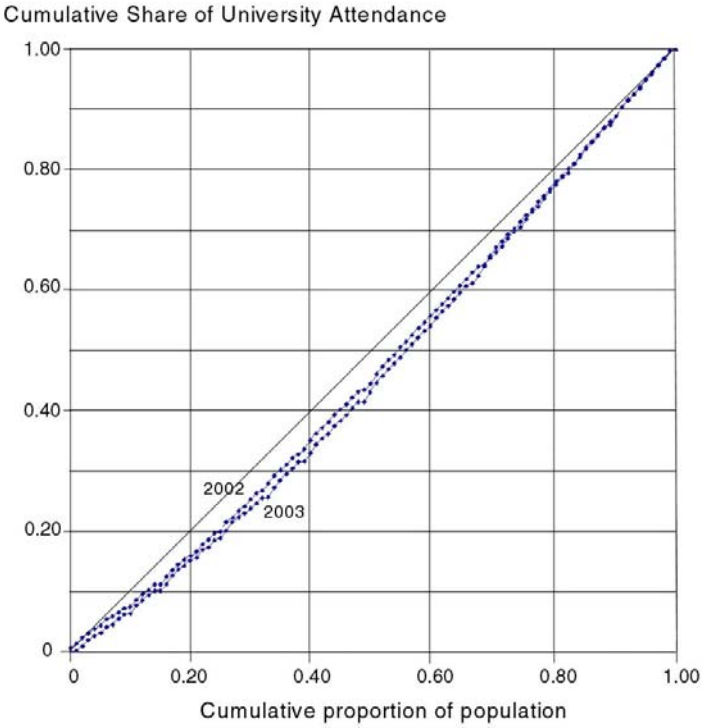

Figure F.7 Lorenz Curves of Probability in University Participation, 2002 and 2003

BIOGRAPHY

NAME	Mr. Montchai Pinitjitsamut
ACADEMIC BACKGROUND	1990. B.Eng. (Electrical Engineering) Chiang Mai University 2000 M.B.A.(Management) National Institute of Development Administration
PRESENT POSTION	Senior Consultant Business Management Co.,Ltd. Rama 9 Rd. Bangkok Quality Management Committee The Engineering Institute of Thailand Ramkanhaeng 39 Rd. Bangkok
EXPERIENCES	1992-1997 Electrical Engineer / Manager Saeng Pradit Engineering Co.,Ltd./ Sirikorn Co.,Ltd. 1998 The Engineering of Thailand under H.M.King patronage – Engineering and Management System Auditor 1998-2000 Arthur Andersen Business Advisory Limited – Business Consultant 2001-2002 Thomas Group Inc.(USA) – Resultant Manager - Total Cycle Time 2002-Present Business Consultant.