

**THE IMPACT OF FERTILITY ON CHILD EDUCATIONAL
ATTAINMENT: A LONGITUDINAL STUDY
OF A RURAL AREA IN THAILAND**

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Thesis
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THE IMPACT OF FERTILITY ON CHILD EDUCATIONAL ATTAINMENT:
A LONGITUDINAL STUDY OF A RURAL AREA IN THAILAND.

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ABSTRACT

The objective of this study was to investigate the influence of fertility on child educational attainment. Fertility was measured by the number of children born to the child's mother. Child educational attainment was measured by the number of years of schooling which the child had completed by 1994. The hypothesis of this study was that fertility has an inverse association with child educational attainment. Multiple regression and longitudinal data of Nang Rong 1984 and 1994 were employed for the data analysis. The unit of analysis was children who were 7 – 13 years old in 1984. There were 5,438 cases in this study.

Child education attainment was the dependent variable, while independent variable was children ever born. They were 11 control variables in 4 domains: 1) child characteristics (age and gender), 2) family context (family production resources, sizes of production activities, family activities to earn extra income, child dependency ratio, mother's education, and family type, 3) accessibility to school (distance from village to secondary school), and 4) community factor (living location and ethnicity).

The results revealed that in rural areas of the northeast, fertility had an inverse association with child educational attainment. However, fertility could explain child educational attainment very little. The socioeconomic context variables of the children played a more important role on child education than fertility did.

Regarding the control variables, boys and children who were younger had higher educational attainment than girls and children who were older. In addition, the children who resided in a family that possessed more production resources, had a lower child dependency ratio, and where the mother had completed grade 4 or higher had higher educational attainment than those who possessed less production resources, had a higher child dependency ratio, and where the mother had completed less than grade 4. Interestingly, the children who resided in villages where the major dialect was Lao had lower education than those who were in Thai Korat villages. The results of the study support the government policy in family planning.

KEY WORDS : FERTILITY / CHILD / CHILDREN / EDUCATION /
ATTAINMENT / IMPACT / NANG RONG

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ผลของภาวะเจริญพันธุ์ต่อการศึกษารองของเด็ก: การศึกษาข้อมูลต่อเนื่องระยะยาวในชนบทแห่งหนึ่ง
ในประเทศไทย (THE IMPACT OF FERTILITY ON CHILD EDUCATIONAL
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บทคัดย่อ

การศึกษานี้เป็นการศึกษาข้อมูลต่อเนื่องระยะยาวของโครงการนางรอง พ.ศ. 2527-2537 วัตถุประสงค์ในการวิจัยคือ เพื่อศึกษาผลของภาวะเจริญพันธุ์ต่อการศึกษารองของเด็ก โดยภาวะเจริญพันธุ์วัดจากจำนวนบุตรเกิดรอดของแม่ และการศึกษารองของเด็กวัดจากระดับชั้นที่เด็กจบการศึกษา โดยมีหน่วยวัดเป็นปี หน่วยในการวิเคราะห์ได้แก่เด็กอายุ 7 – 13 ปี ใน พ.ศ. 2527 มีจำนวนทั้งสิ้น 5,438 คน วิเคราะห์ข้อมูลโดยใช้สถิติการวิเคราะห์ถดถอยพหุ สมมุติฐานในการวิจัยคือ ภาวะเจริญพันธุ์มีผลทางลบต่อการศึกษารองของเด็ก

ตัวแปรอิสระและตัวแปรควบคุมที่ศึกษามีจำนวน 12 ตัวแปร จำแนกเป็น 4 กลุ่ม คือ 1) คุณลักษณะส่วนตัวทางประชากรของเด็ก 2) บริบทของครอบครัว 3) การเข้าถึงโรงเรียน และ 4) ปัจจัยด้านชุมชน

ผลการวิจัยพบว่าภาวะเจริญพันธุ์มีผลทางลบต่อการศึกษารองของเด็ก เด็กที่มีมารดามีบุตรมากได้รับการศึกษาน้อยกว่าเด็กที่มีมารดามีบุตรน้อยกว่า อย่างไรก็ตาม ภาวะเจริญพันธุ์มีอิทธิพลต่อการศึกษารองเด็กน้อยกว่าปัจจัยทางด้านเศรษฐกิจและสังคมของครอบครัว นอกจากนี้เมื่อพิจารณาถึงตัวแปรควบคุม เด็กผู้ชายและเด็กที่มีอายุน้อยได้รับการศึกษาสูงกว่าเด็กผู้หญิงและเด็กที่มีอายุมาก เด็กที่อยู่ในครอบครัวที่มีปัจจัยการผลิตมาก อยู่ในครอบครัวที่มีอัตราส่วนพึ่งพิงวัยเด็กต่ำ มีแม่ได้รับการศึกษาสูงกว่า ป. 4 จะได้รับการศึกษาสูงกว่าเด็กที่อยู่ในครอบครัวที่มีปัจจัยการผลิตน้อยกว่า อยู่ในครอบครัวที่มีอัตราส่วนพึ่งพิงวัยเด็กสูงกว่า มีแม่ได้รับการศึกษาน้อยกว่า ป. 4 นอกจากนี้เป็นที่น่าสังเกตว่าเด็กที่อยู่ในหมู่บ้านที่พูดภาษาลาว (ไทยอีสาน) ได้รับการศึกษาน้อยกว่าเด็กในหมู่บ้านที่พูดภาษาไทยโคราช ผลการศึกษานี้สนับสนุนโครงการวางแผนครอบครัวของรัฐ

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CHAPTER I

INTRODUCTION

1. Rationale and Statement of the Problems

The family is an important institution in society. The family consists of people who live together. Family members, as the United Nations (1969) mentions, have some relationship at a specific degree through blood, adoption or marriage.

Family has several important obligations; they are reproduction, sexual gratification, maintenance of immature children, and socialization etc. (Suparp, 1991; Samakkarn, 1976). The family has two obligations that relate to children. They are 1) reproduction and 2) maintenance of immature children (including rearing and educating). The numbers of children that families produce are the numbers that the families have to maintain. The family will have a large number of children to look after if they produce a large number of children.

As Notestein (1953) mentioned in Demographic Transition Theory, in ancient times the world's populations had high fertility and mortality rates. In the past, many children died when they were at a young age. However, after World War II, the improvement of health sciences, medical sciences and sanitation etc. improved the population's quality of life. Consequently, the mortality rate declined, while the fertility remained high. Each family had larger numbers of children and some of the

children were unwanted children. This theory explains why the population in many countries has increased rapidly. In this situation, developed countries especially USA and in that country the Rockefeller Foundation (King, 1974) became aware of the problems of having a large population. For this reason, they donated a large budget as well as academic support to help developing countries to implement some population control. The strategy was to control the growth rate of population between the 1960s and 1970s. The donors convinced developing countries' governments that the high population growth rate would cause poverty and would diminish the countries' economic development. Some developing countries such as Pakistan, Zimbabwe, Tunisia, Algeria, Thailand etc. had a population policy which is mainly aimed at reducing the population growth rate. A few years later, the fertility rates of some countries declined due to the initiation of population policies and family planning programs (Lee, et.al. 1995; Knodel, Chamrasritthirong, & Debvalya, 1987).

In Thailand, where the majority of the population is in the agricultural sector, the census of 1970 shows that 79 per cent of the population aged 11 years old and above work in agriculture, including farming, animal husbandry, forestry work and the fishery industry. Thirty years later, in 2000, the percentage of the population who worked in the agricultural sector had declined to 57 per cent (National Statistics Office, 1970; 2000A). Even though the trend has declined sharply, the majority of the Thai population still remain in the agricultural sector.

Thai farmers usually have problems in producing and selling their products. Some production problems are insufficiency of water for cultivation, lack of land, and

low yield etc. The selling problems are mostly due to lack of markets, low and unstable prices, and lack of purchasing negotiation power etc. The National Statistics Office (1981; 1990B; 2000B) has reported that the average monthly income per head of the population in the Bangkok Metropolitan area is much higher than other regions. For example, the average monthly income per head of population in the northeast was about 493 Baht, 784 Baht and 2,014 Baht in 1980, 1990, and 2000 respectively. The average monthly income per head of population of Bangkok was higher than the income of the population in the northeastern region by about 2.9, 4.2 and 3.8 times in 1980, 1990 and 2000, respectively.

The Thai government announced a population policy that supported voluntary family planning in 1970. The policy had an effect on the fertility rate of the Thai population. Total fertility rate (TFR) declined as six children per family in 1960 reduced to two children in 2000. However, it does not mean that all families have to limit the number of children at the same time. Some families may strongly follow the fertility guideline such as, limiting the number of children to one or two children, while some families may not pay so much attention to the fertility guideline. They may decide to have three, four or more children. Table 1 below, presents total fertility rates (TFR) between 1964 and 1996 by region.

Table 1 Total Fertility Rate (TFR.) by Region, Thailand 1964 – 1995

Region	1964 – 1965	1974 – 1976	1985 – 1986	1991	1995 – 1996
Country	6.3	4.9	2.7	2.2	2.0
Bangkok	n.a.	3.5	1.7	1.1	1.3
Central (not including Bangkok)	5.9*	4.1	2.5	2.0	1.7
North	6.5	3.7	2.2	2.0	1.9
Northeast	6.6	6.2	3.1	2.7	2.4
South	6.0	6.1	4.0	3.0	2.8

Note n.a. data not available.

* includes Bangkok

Sources: National Statistics Office 1978: 19; 1997: 15

Nowadays, many Thai families want their children to study in schools. They wish their children to have better opportunities not only for getting good jobs, but also for having a successful future. Education is the means to improve quality of life of children. Children who have a good education can have better opportunities for good occupations, good income, and can promote themselves to a higher social class. The family, whose parents allow their children to have higher education may get more benefits from their children who have good opportunities, than the family whose children have a low level education. For society, a better educated labor force means higher production. They can pay taxes and can help other people. Possibly some of them can lead innovation.

Child education is not only important for the children, but also for the country. The labor force of the country can be trained more easily when people have good education. A well educated labor force will benefit the country's economic development. However, the Thai population in general has a rather low level of

education. Information in Table 2 shows that there are relatively few children who have finished beyond the compulsory level of education. About 30 per cent of children 12 – 14 years of age studied in lower secondary education in 1990. About 20 per cent of children 15 – 17 years of age enrolled in upper secondary education. Therefore, child education in Thailand needs to be promoted for the sake of a higher population's quality that could lead to social and economic development.

Table 2 Percentage of students by total population in the exact age groups, 1980 - 2000

Education level	Age group	Proportion of students by total population in the age (times 100)		
		1980	1990	2000
Kindergarten	3-5	8.6	36.0	95.8
Elementary	6-11	98.0	93.8	105.6 ^{1/}
Lower secondary	12-14	29.4	37.2	107.3 ^{1/}
Upper secondary	15-17	18.4	22.5	78.7
College	18-22	n.a.	8.6	47.7

Note n.a. data not available.

^{1/} Percentage exceeds 100 due to some 5 years old children enrolled elementary education, and some 11 years old children enrolled lower secondary education.

Sources: Ministry of Education (1980; 1990; 2000)

Education is essential to human beings. It is the means to develop and the means to maintain human civilization. The benefits of education are not only rewards for the children who study but also rewards for their families and society.

As mentioned above, the benefit of education is enormous and its rewards are widely spread to children, family and society. Therefore, investment in child education should be the responsibility of the parents of every child and all social units so that it will earn benefits, for families and communities. The investment of families

in their children are investment in the child's daily expenses, education fees, and some opportunity costs such as the opportunity loss to gain benefits from the child labor force etc. Furthermore, the investment of society in children is investment in schools, teachers, and infrastructures etc.

As above mentioned, the investment in child education is both the responsibility of the government and the family. However, for those families that have many children, it could be a heavy burden for the parents to allow all their children to have a high level of education, because there is only an elementary education level that it is free of charge. The parents have to pay only for the child's daily expenses such as meals, school uniforms, transportation, and educational stationary etc. The parents have to pay both daily expenses and education fees when the children study beyond the elementary level. Therefore, parents who have low incomes will have problems supporting their children's higher education.

A survey conducted by the Office of the National Education Committee in 1999 reported that 24 per cent of families who have children enrolled in the pre-elementary level, elementary level, secondary level and vocational education had to borrow money at the beginning of the educational calendar year (Office of the National Education Committee, 2002). Therefore, this study has a research question, focused on families in rural areas, whether fertility impacts on child educational attainment. The answers to the research question will reveal understanding of whether education impacts child educational attainment or not. In addition, it will generate

some ideas to assist the Ministry of Education to prepare some measures to help high fertility families in rural areas.

This study required longitudinal data to analyze because of the need for family backgrounds to be control variables for the data analysis. Family backgrounds are family contexts both before and after the family decides to let their children study. Normally, longitudinal data collects the background of the samples it studies. The other benefits of longitudinal data are 1) the respondents answer the questions while the event occurs, so they still remember their information. Therefore, there is no bias on recall, 2) longitudinal data could provide information about both the cause (at the beginning) and information of the consequence (at the end) if we support the cause and consequence model (Blalock, 1971). For these reasons, longitudinal data is considered appropriate for this study.

The population of rural areas of Thailand are the majority of the Thai population. They normally have low education and low income especially when compared to the population who live in urban areas. Therefore, it is interesting to study the population of rural areas of Thailand.

This study aims to study the influence of fertility on child educational attainment. However, at the very beginning of the population policy which was proclaimed in Thailand in 1970, most families had high numbers of children. But the average number of children born per family is low nowadays. There is little variation in number of children born both at the beginning of the family planning program and

nowadays. It seems there is some variation in numbers of children born in the transition period, between 1970 and 2000. Therefore, this study chooses the period of transition to be the period of studying. It should thus be in 1980s.

From Table 1 presented earlier, the fertility of the Thai population continually declined. However, the fertility rate of the northeastern region seems to decline more slowly. This refers to the fact that numbers of children born of each family varies long times. Accordingly, the northeastern region has highest number of population. Most of them live in rural areas and work in the agricultural sector. Therefore, the northeastern region is the location which this study selected as the site of study.

There is a project of the Institute for Population and Social Research (IPSR), Mahidol University in the northeastern region. The project has longitudinal data sets of Nang Rong district, Buriram province (Nang Rong Project). Especially the data sets of 1984 and 1994, they have comprehensive information of individuals, households and communities. Accordingly, in 1984, the fertility of the northeastern region was in a transitional period. Total fertility rate was about 3.1 and declined to 2.4 in 1994. Thus, there will be some variations in fertility of peasant families of the northeastern region from these two data sets. In addition, the duration between the two data rounds is 10 years. It is long enough to investigate the impact of fertility on child education.

Regarding the two data sets, the first data set (1984) is a database that IPSR was collected for evaluation of a rural development project in Nang Rong. The second data set (1994) was collected by the collaboration of IPSR and the University of North Carolina at Chapel Hill under the project of “Social Change and Migration in Thailand: A Case Study of Nang Rong District, Buriram Province (1984-1994)”. Both of the data sets are a census of all individuals, households and communities from 51 selected villages. Details about these two data sets will be described in Chapter III.

2. Objective

Objective of this study is to investigate the influence of fertility on child educational attainment.

CHAPTER II

LITTERATURE REVIEW

There will be eight topics in this chapter. They are 1) fertility, economy and education 2) family's motivation on demand for children, 3) peasant economy, 4) Nang Rong district, 5) factors affecting child educational attainment, 6) conceptual framework, and 7) hypothesis of the study.

1. Fertility, economy and education

"Fertility" is "number of children born to women" (Weeks 1996). It is the responsibility of the parents to rear and provide their children some education after the children were born. Child rearing and child education are costly. The child's parents have to pay for food, clothes, educational stationary, tuition fee etc. Some of the cost may pay by the society. They are vaccination, school building, infrastructures, teachers' salary etc. The costs may high as some amount of budgets because the children consume for education for long time.

Fertility, economy and child education are closely related. As mentioned, child education needs budget. The amount of budget the family and the society pay for child education are partly depending on the family and the society's economy. In the case that the family and the society have good economy, they can pay large amount of budget for child education. Likewise, they may have to pay lesser amount

of budget when the society does not have good economy. The paragraphs below will present some debating about the arguments on the association between fertility and economy as well as the arguments about some association between fertility and child education.

1. The association of fertility and economics and the association of fertility and child education in macro level

The arguments that mention the association of fertility and economics in the macro level can be divided into three categories: 1) fertility has an inverse association with economics, 2) fertility and economics cursively affect each other, and 3) no association between fertility and economics.

1.1 Fertility has an inverse association with economics

French economists, Tracey and others (1857 in United Nations, 1973), mentioned that "Fertility has an inverse association with economy." They argued that the distribution of income was a factor affecting population growth. The size of a country's population varies inversely with per capita consumption, which in turn varies with the degree of inequality of income. This argument is similar to Garnier (1857 in United Nations, 1973), who proposed that prudence, capital formation, and regulation of fertility etc. could prevent poverty. Petersen, (1979) argued that population growth will contribute to economic development deficiency. He concluded from the writings of Malthus that 1) food production could not keep up with

population growth, 2) moral restraint was the only acceptable preventive check, and 3) poverty was an inevitable result of population growth.

There are some studies that confirm the inverse relationship between economic development and fertility. Entwisle, Hermalin & Mason (1982) found that the gross national product (G.N.P.) had inverse relation with population growth rate when observed in 15 countries. Their finding is similar to Kim (1985) in South Korea, and Israbhakdi (1983) in Thailand. That is, socioeconomic development at the provincial level had an inverse relationship with fertility rate.

1.2. Fertility and economics cursively affect each other

Smiths (Keyfitz, 1972) mentioned that there is a natural harmony between economic growth and population growth. Population growth always depends on economic growth. Population size was determined by the demand for labour and will be related to the productivity of lands. His idea can be concluded that ‘fertility and economic development cursively affect each other.’”

1.3. There is no association between fertility and economics

Weeks (1996) concluded from an interesting idea of Karl Marx that the economics was not related to population, but mostly depended upon the management of society. In a capitalist society, the country would face an over population problem, while in a socialist society, the population growth rate was readily absorbed by the

economy with no side effects. Furthermore, in some religions, economic development and population growth do not have any association. For example, Islamic society believes that population and the economy are absolutely unrelated. According to the Qur'an, man is the cause and the object of creation. God creates every thing only to facilitate man's life on earth. Man was created only to serve and worship God. And for economic aspects, no one should store properties that exceed his needs. The poor should have a share in the wealth of the rich (Nomani & Rahnema, 1994).

From the studies and arguments presented, it can not clearly be concluded whether fertility and economics have any association, because there are number of arguments under debate. However, the economy seems to be an intermediate variable when looking at the relationship between fertility and child educational attainment. For example, whether children will have high education or not may depend on their family's finances.

2. Fertility, economics and child education in the micro level

At the micro level, fertility may have different affects on family economics. This may occur in a different stage of the family lifecycle. For example, children are dependent in the early stage of family formation. Parents have to feed and provide them with education. Parents have to spend a lot of time looking after children. The time that parents use for child rearing, especially when the child is young, is apportioned from the time of work. The parents may lose some opportunities to work and to earn income. A family that has a lot of children will have a lot of consumers.

Even though the parents work harder to earn more income, the income that they earn may not be enough for consumption. Consequently, the funds left over for child education may not be sufficient. One may say that families who have lower numbers of children may have better financial status than those who have a higher number of children. Therefore, they can let their children study in higher grades. Likewise, there will be some older children who have become adolescent and can earn money for the family. The remittances that the family gets from these young men/women can be financial support for the younger children in the same family. Therefore, the children who are of younger age in families may be able to have a higher education than the older ones.

When considering the studies which looked at the association between fertility and child educational attainment, they are largely concerned with these three main topics: 1) child intelligence, 2) child educational achievement, and 3) child educational attainment.

The studies about the relationship between fertility and child intelligence are mostly concentrated on some associations between fertility and the child's mental ability. The child's mental ability is measured from the intelligent quotient points (IQ). Heer (1985) argued that: 1) the association between fertility and child's intelligence always appears to depend upon the social class. For example, the lower the social class of the child's father, the higher the association between fertility and intelligence, 2) the higher the fertility, the lower the intelligence when child birth order is controlled.

There are a number of studies which concentrated on the relationship between fertility and child educational achievement. Some of them focused on academic ability. For example, Blake (1989) found that the relationship between the number of the child's siblings and the test scores on measuring verbal ability had a strong inverse relationship in the USA. In addition, Leibowitz (1974) found that educational achievement depended upon the parent's education and the number of children in the family.

Considering the relationship between fertility and child educational attainment, most of the studies looked at some associations between fertility, which was measured by the number of the child's siblings and the number of years enrolled. There are some studies which focused on child educational aspiration. And most of the results found that these two parameters have an inverse association. Nevertheless, there are some studies which found a positive relationship between fertility and child educational attainment.

There are some studies which found an inverse association between fertility and child educational attainment. They are studies, investigated by Anh, Knodel, Lam and Friedman (1998) in Vietnam, Blake (1985; 1986; 1989) in the U.S.A., Teachman (1987), Knodel, Havanon and Sittitrai (1990) in Thailand etc.

The study of Anh, Knodel, Lam and Friedman (1998) which was conducted in Vietnam used the national representative data from the "1994 Inter-Censal

Demographic Survey". The data provided information on several educational measures for all children over age 10, including children who did not reside in households. They found a clear inverse bivariate association between fertility and child educational attainment. However, this association was attributable to other factors that were related to fertility when using the multivariate approach. Only a modest association between fertility and child schooling remains when applying multivariate analysis.

Blake (1985) investigated the interaction between fertility and child educational attainment. She used three major data sets. They are Occupational Change in a Generation 1962 and 1973 (OCG), and Generation Social Surveys 1972-1983 (GSS). She found that there was only a small proportion of men from large families who graduated from high school, whereas there was a large proportion of men from small families who did so.

About 1986, Blake looked at the relationship between fertility and school attainment. She found that males who were from a large family, when compared to ones who were from a small family, lost about 1 year of schooling. Likewise, her study in 1989 found that child education among those with many siblings (large families) showed a disproportionate drop out rate before high school graduation when compared to normal sized families.

Teachman (1987), used the National Longitudinal Study (NLS) of the 1992 High School Class to investigate the same relationship. He found that household

educational resources had some statistical significance in determining the level of child education for both men and women. For example, he found that fertility had a direct effect on child educational attainment. The study in Thailand by Knodel, Havanon and Sittitrai (1990) also received the same results. They used data from the household survey of 612 couples. The sample size was equally divided between large and small families. And the educational attainment was measured from the level of education when the child graduated. They found that fertility and child educational attainment had some inverse association.

Considering the association between fertility and child educational attainment, there are some studies which found that these two factors have positive relationships. The study of Gomes (1984) in Kenya found that there is a positive association between fertility and child education. He used two data sets when investigating this issue. The first data set is the 1979 cross sectional sample of the employees who were working in the formal wage sector. The sample size was about 1,448 employees that was stratified by the size of the enterprise and by location in three towns. The second data set is a part of an investigation on the effects of individual background on the samples' education and earnings. This sample covered both rural school children and parents' information. The total sample was 1,802 cases. He found that the number of siblings had some statistical significant influence on child educational attainment. The relationship direction was positive.

From the literature review as mentioned above, it seems most of these studies in various parts of the world found an inverse association between fertility and

educational attainment. There are only some studies that found some positive associations between these two factors. That is to say, the relationships between the two variables are still being debated.

2. Family's motivation on demand for children

According to family planning programs, a couple can control the number of children when they want to control it. However, it is interesting to consider what motivates some families to have a low number of children while others have many children. The motivation that could motivate a family to have a few or more children is not only economic reasons, but also other rationality. The rationale can be roughly classified into three categories; 1) The benefit perspective, 2) The demand – supply perspective and 3) The innovation-diffusion perspective.

1. The Benefit perspective

The benefit perspective is partly related to the benefit provided by children to the family. For example, there were some critiques of Coale (1973), Caldwell (1982), etc. Coale (1973) which mentioned that there were three preconditions for substantial fertility decline: 1) the acceptance of calculated choice as a valid element in marital fertility, 2) the perception of advantages from reduced fertility, and 3) knowledge and mastery of effective techniques of control.

Caldwell (1982) proposed a “Wealth Flow Theory.” The main issue of this theory was the effect of wealth that flowed between children and their parents. Net wealth flows from children to their parents when parents get more benefit from children than cost. In this case, the family will have many children. On the contrary, the family will have fewer children when the wealth flows is in a different direction.

2. The demand – supply perspective

The “demand–supply perspective” used microeconomic principles to explain demand and supply of children. Becker (1960) introduced the idea that children might be thought of as “commodities.” He proposed that the family had to produce three types of goods: 1) child numbers, 2) child quality, and 3) general commodities. The family has to trade between child numbers, child quality and general commodities under one budget line. The families who increase child quality have to reduce child numbers when the general commodities are constant.

3. The innovation-diffusion perspective

As Weeks (1996) mentioned, social pressure plays a major role on individual fertility, regardless of the underlying economic circumstances. A study by Hayfa, (1983) in Bangladesh supports the view that acceptance of social and cultural norms may act as a strong motivation for having many children. Religion, marriage customs, son preference, social prestige, and status of women show a pronatal pattern. Leibenstein (1973) mentions that neither education, food, clothing, mother’s time, nor

child earnings can account for reduced fertility. The different of taste and changing desire for number of children can explain a smaller family. And these are usually found among those families whose incomes are rising. The other example is the influence of government policy on family planning approach in developing countries. Consequently, most families had fewer children after practicing contraception under the support of a family planning program (Lee, et. al., 1995; Knodel, Chamratitthirong and Debvalya, 1987).

With regard to the idea of the benefit perspective, the demand–supply perspective, and the innovation-diffusion perspective, it seems all three approaches are appropriate for the family to decide to have a small or large number of children. All of them seem believable, but depend upon the society, the situations of the family and the individual's perspective. That is, different societies might have different perspectives. A family may make a decision on number of children according to individual rationality even if they are in the same society. Some families do not necessarily follow the same fertility behaviors as their neighbors practice. Some families may think about the benefit of additional children, while others may be concerned about social norms and quality of children. For example, the fertility rate in Thailand sharply declined after the government proclaimed their population policy. The policy had strong support for voluntary family planning that aimed to reduce the annual population growth rate from 3.00 per cent at the end of the Third Plan period (1976), to 1.2 per cent at the end of the Seventh Plan period (1996) (Wongboonsin, 1995). Also Knodel, Havanon and Pramualratana (1983) suggested that there are two very important components that interacted and resulted in rapid fertility decline. The

first component was fundamental social and economic changes. These changes induced latent demands for fertility control among the older generation as well as current desires for smaller family size among the younger. The second component was the effect of family planning programs.

3. Peasant economy and child education

“Peasant” in this study refers to rural inhabitants. It included farmers, employees of the agricultural sector, gatherers etc. In general, a peasant economy is a self sufficient economy (Kitahara, 1996). They plant, gather, do animal husbandry themselves and generally feed their family members with non-market products. A self sufficient economy of peasant families seems to be a trait of all peasants. According to Natsupa, et.al (1997) the Russian peasants of the 19th century, before the country was governed by the communists, worked in their fields for the benefit of members. The work suited household resources. In addition, they produced for their own family’s consumption. It is not so much different from the peasants of northeastern, Thailand. Kesinee, (1997) and Deesuankhok, Teerasasawat, & Kaenmanee (1986) found that the northeastern peasants cultivate rice fields and keep all of the production for consumption in their families.

Peasant families in Thailand have very few factors of productions. A lot of them have a small amount of land for cultivation, insufficient water for agriculture, and lack of appropriate technology etc. A survey of the National Statistics Office (1993) revealed that in 1993, the majority of peasant households cultivated on small

areas of lands. One third of peasant households cultivated on land that was less than 10 rai (4 acres). For approximately half of them, the amount of cultivated land was 10-39 rai (4-15.6 acres). Comparing the surveys of 1978 to 1993, the trend of households who cultivated on small pieces of land increased gradually, while the households who cultivated on larger pieces of land decreased, as shown in Table 3.

Table 3 Percentage distribution of peasant households by amount of land cultivated, Thailand 1978 – 1993

Amount of Land Cultivated (Rai)*	1978	1983	1988	1993
Less than 6	15.9	14.8	14.4	19.7
6 - 9	12.1	12.4	12.3	13.2
10 - 39	55.8	57.7	59.7	54.3
More than 40	16.2	15.1	13.6	12.8
Total	100.0	100.0	100.0	100.0

Source: National Statistics Office. 1993: 10

Note: * 1 rai equals 1,600 square meters

Concerning lands proprietary rights in Thailand, the agricultural census between 1978 – 1993 revealed that the percentage of households who tenanted some land for cultivation increased, while the percentage of households who owned land gradually decreased. For example, there were about 10 per cent of peasant households who tenanted some parts of their land for cultivation in 1993. In addition, about 7 per cent of them totally tenanted the land. Table 4 presents this information.

Table 4 Percentage distribution of peasant households by lands proprietary rights, Thailand 1978 – 1993

Proprietary right	1978	1983	1988	1993
Owner	86.3	72.4	87.1	77.4
Tenant	5.8	5.5	3.6	7.3
Others (national forest reservation area, national park area, waste land etc.)	0.9	3.2	0.9	5.8
Owner and/or tenant and/or others	7.0	18.9	8.4	9.5
Total	100.0	100.0	100.0	100.0

Source: National Statistics Office. 1993: 11

As mentioned before some peasant families did not have enough land for cultivation. Besides, they also lacked agricultural irrigation, technology and productivity knowledge. Thus their product may not be enough for their own consumption and for sale. They had to work outside the agricultural sector. The survey of the National Statistics Office (1993) in 1993 found that more than half of the peasant families in Thailand earned income from outside the agricultural sectors. And there were about 40.2 per cent of peasant families who had debts.

Podhisita (1985) remarked that one strategy the family could perform for escaping from poverty is to limit the number of children. The strategy was congruent with the arguments of Knodel, Chamratritthirong and Debavalya (1987). They argued that the rapidly fertility decline in Thailand was due to the concealed needs to reduce fertility among Thai people. Family planning programs were distributed all over the country rapidly after the government declared its population policy. Pills, condoms, IUD, etc. were all accepted. Some other household decided to use migration as a

strategy to fight family economic constraints. The migrants can remit their wages back to the family members who are left behind (Pongsapich, 1988).

In conclusion, a peasant economy mainly depends on the production of agricultural sectors. However, there are some peasant family members working outside agricultural activities. For example, they work as wage labours in a local community as well as migrate to a city or foreign country. That is to say, some of these household strategies are important for family economic improvement. That is, the peasant householders' economy depends largely on agriculture and wage employment. As a result, most of the peasant families have low economic status and lack finance for child education because they do not have enough land for cultivation. Furthermore, peasant families in Thailand do not have much opportunity to let their children study higher than six years compulsory education. Some of them do not want to let the children study higher than compulsory education, because they want their children to be employed or help in their family work.

4. Nang Rong district

Nang Rong is a district of Buriram province. It is located in the northeastern region of the Korat plateau. The landscape includes both hilly and flat lowland areas, with plenty of paddy, vegetables, cassava, sugar cane, kenaf, and corn. Cows and water buffaloes are the major products in animal husbandry. Nang Rong is 330 kilometers from Bangkok. It is about 55 kilometers from the town hall of Nang Rong to Buriram provincial center. The area of Nang Rong in 1984 is about 1,300 square

kilometers. In 1992, Nang Rong was split into three districts for administration purposes. The split districts are Chamni, Nonsuwan, and Chalermprakiet. The population of Nang Rong in 2000 was 83,283 persons. This number comprised 41,052 males and 42,231 females (Ministry of Interior, 2001). Most of them live in rural areas and work in rice farming. According to the census of Thailand 2000, the population in the agricultural sector of Buri Ram province is 84 per cent (National Statistics Office, 2000C). Normally the farm production of families in Nang Rong is quite low because their paddy fields depend largely on rainwater. The district has few irrigation projects. Therefore, they do not have enough water for cultivation. For this reason, some young adults from rural villages normally seek outside work during the dry season between January and June. The main streams of migrants are to Bangkok, Nakhorn Ratchasima, Chonburi, Rayong and Khonkaen (Sawangdee, 1997). In this study, Nang Rong refers to the area of Nang Rong in 1984, which includes the area before it was divided.

Among villagers who live in Nang Rong, the central Thai dialect is rarely used in daily life. It is used only when the villagers contact government offices such as the district office, hospital, police station, school etc. The dialects used in the daily life of the population in Nang Rong are: 1) Thai Korat, 2) Lao, 3) Khmer, and 4) Suai. The names of the dialects are also the names of minority groups in the northeastern region.

The Thai Korat is a Thai sub-group. They are scattered over seven provinces in the Korat plateau of the northeast region, especially in Nakhornratchasima

province. Thai Korat is a branch of the central Thai dialect. Most of the vocabulary of the Thai Korat dialect is the same as the central Thai dialect. However, there are some words that are similar to the Lao and Khmer languages. The main difference between Thai Korat and the central Thai dialect is only the accent.

It is believed that the Thai Korat's ancestors were Thai soldiers who married with native Mon and Khmer in the northeast of Thailand. Some scholars argue that the Thai Korat is a group of people who originated from the blending of the central Thai group and Thai-Lao group of the northeast (Premsrirat, 1999; Suwannapat, 2001).

The Lao in the northeast of Thailand migrated from the eastern side of the Khong river, where the country of the Lao People's Democratic Republic (Laos PDR) is now located. The large volume migrations of Lao across the Khong River were between the 16th and 18th centuries (Meekusol, 1990).

The presence of significant numbers of Khmers results from when the kings of Khmer from the 11th to 13th centuries expanded their boundary to the west into what is now the south of the northeast region of Thailand. The Khmer constructed a number of cities and stone forts in the kingdom. They also constructed roads from Nakhornthom, the ancient capital, to the new cities. The construction required much labour, and this was provided through the migration of Khmer workers. After construction most of the migrants remained in what is now the northeast region of Thailand (Meekusol, 1990).

The last ethnic group that will be mentioned is the Suai. There are several names that other groups call them, such as Kooy, Kuay, Kha, Khamu etc. The Suai previously had a city-state in the south of Champasak, Laos PDR. However, the Khmer defeated them and the Suai migrated into the northeast of Thailand together with Khmer to construct new cities, fortifications and roads. In addition, some of them migrated to the northeast of Thailand escaping from the disturbance of Lao from Champasak in the 17th century (Meekusol, 1990).

5. Determinants of child educational attainment

Fertility is potentially only one among a number of factors that may impact on child educational attainment. Determinants of child educational attainment can be grouped into four categories: 1) child factors, 2) family factors, 3) accessibility to schools, and 4) social and environment factors.

1. Child factors

Important child factors include gender, age, intelligence, seriousness, and aspiration. The factors that are measured in this analysis are gender and age.

For **gender**, even though the educational ability of males and females is equal, however, where gender biases exist, the probability of enrolling at a higher educational level may be higher for the preferred gender than for the non-preferred

gender. For example Anh, Knodel, Lam. and Friedman (1998) in Vietnam found that the probability of a boy enrolling in secondary school was 20 percent higher than for a girl.

Thailand has been influenced by cultures such as Indian and Chinese culture. There are son preferences in both Indian and Chinese culture. Consequently, it is possible that son preference could be found in some segments of Thai society. Furthermore, the social and economic development of the country is promoting rapid change. Children who are of younger **age** may receive more educational opportunities than those who are older. Thus, one alternative hypothesis of this study is that the younger children may be more likely to have higher educational attainment than those who are older.

2. Family factors

The family forms the primary social context related to child behavior. Important family factors that may impact on child educational attainment are fertility, production resources, family type, child dependency ratio, parent's aspirations, mother's education, family activities to earn extra income, and attention of parents to child education. However, parent's aspirations and attention of parents to child education are discarded from this study due to lack of information.

Fertility in this study measured from the number of children ever born to the mother of each child in the sample. Normally, family members are both consumers

and producers. However, children are primarily consumers but sometimes they also could produce for the family. The children could contribute to the family when they become adolescents or adults. For this reason, a large family also has a large number of consumers when children are young. In this situation, the family may have insufficient resource to support their children's education. The children from a larger family may have lower educational attainment.

Production resources can impact child educational attainment because the production resources can determine family income. The more the production resources, the greater the income available to the family. The income could help parents to pay for their children's education. In this study, production resources was measured from the amount of land that a family owns.

"Family activities to earn extra income" is also one of the factors that is related to the family economy. Most farming families in Thailand can produce only one crop per year. This is because of the factor of insufficient water for cultivation. Therefore, they typically obtain all their income at one time in a year. Thus, some families that engage in activities that can earn extra income can have more opportunities to support their children to continuing their education.

Another factor that may impact on child educational attainment is the **child dependency ratio**. Families that have high child dependency ratio will have a large number of consumers and may have a small number of producers at the same time. Consequently, it may impact adversely on the educational attainment of the children.

Family type in this study refers to the structure of the family. There are two types of family type in this study. They are nuclear families and non-nuclear families. Nuclear family is a family whose members are only father, mother and children. However, non-nuclear families will have not only father, mother and children but also grand parents or relatives living together in one household. The children may live in a nuclear or non-nuclear family. The children not only obtain educational support from their parents, but also may receive support from grandparents when they live in a non-nuclear family. Therefore, they could have more educational opportunities when compared to those who are living in a nuclear family.

The last family factor included in the study is the mother's educational variable. Many studies agreed that **mother's education** had a positive effect on child education. This is because the mother is the person who takes care of the child. Mothers who have a higher education may ascribe to more modern techniques of child rearing and may be more supportive of education. In the U.S.A., Murnane, Maynard and Ohls (1981) investigated this point in Gary, Indiana in 1981. They found that there was a positive association between the mother's education and the child's academic achievement.

3. School's Accessibility

School factors that may impact on child education could be classified into two groups. They are characteristics and accessibility. This study concentrated only

on the school accessibility factor. The variable here was measured by the distance from home to school.

In Thailand, approximately two villages shared one elementary school. Furthermore, one district had at least one secondary school (Ministry of Education, 1980). Children who live in a village that is located far from school would have higher expense to get to school than those who live nearby. Thus, **distance from village to school** should have an inverse association with child educational attainment.

4. Social and environment factors

There are two social and environment factors included in this study. They are ethnic group and village location.

Different **ethnic groups** may have unequal opportunities to access education. In Thailand, there are some groups such as hill tribes that live in some remote areas and some minority groups who live along with the border, whose houses are quite far from secondary schools. Therefore, their children have problems with accessibility to school. Consequently, they may have low educational attainment.

Concentrating on ethnicity and child education inequality, there also found some differences in child educational attainment. Even in some urban areas, this can be seen from studies in the USA and Israel. In the USA, it has been found the percent

studying in the university is lower for black Americans and Hispanics than for white Americans (Richardson and Skinner, 1990). In Israel, it was found that the educational attainment of Arabs was lower than the educational attainment of Jews (Shavit, 1990).

In Nang Rong, there are four major ethnic groups. They are Thai Korat, Lao, Khmer, and Suai. In this study, ethnicity is classified into three categories. They are Thai Korat, Lao and Khmer and Suai. Khmer and Suai are grouped together because they lived in the same location. Suai who live near Khmers typically assimilate into Khmer culture.

Village location can be defined in several ways. However, in this study it is defined as location in relation to canals or streams. Children who reside in a village that has a canal or a stream are in an environment where family production is likely to be higher, because the village has access to water resources. Hence the family economy should be better than those where the village is not located next to a canal or stream. Therefore, the former parents should have more finance available for child education. Consequently, a family who lives in a village that has a canal or stream may be more likely to support their children to receive higher education than those who reside in villages that do not have a canal or stream.

6. Conceptual framework

This study desired to test the direct effect of fertility on child educational attainment. Therefore, the main variable of this analysis is fertility. The other 4 sets of variables are defined as control variables. They are the individual, family, school accessibility and community characteristics. Fertility and all the control variables are measured in 1984 data, and child educational attainment is obtained from 1994 data. The diagram below presents the conceptual framework to test whether fertility has any effects on child educational attainment or not when controlling for the individual, family, school accessibility and community characteristics.

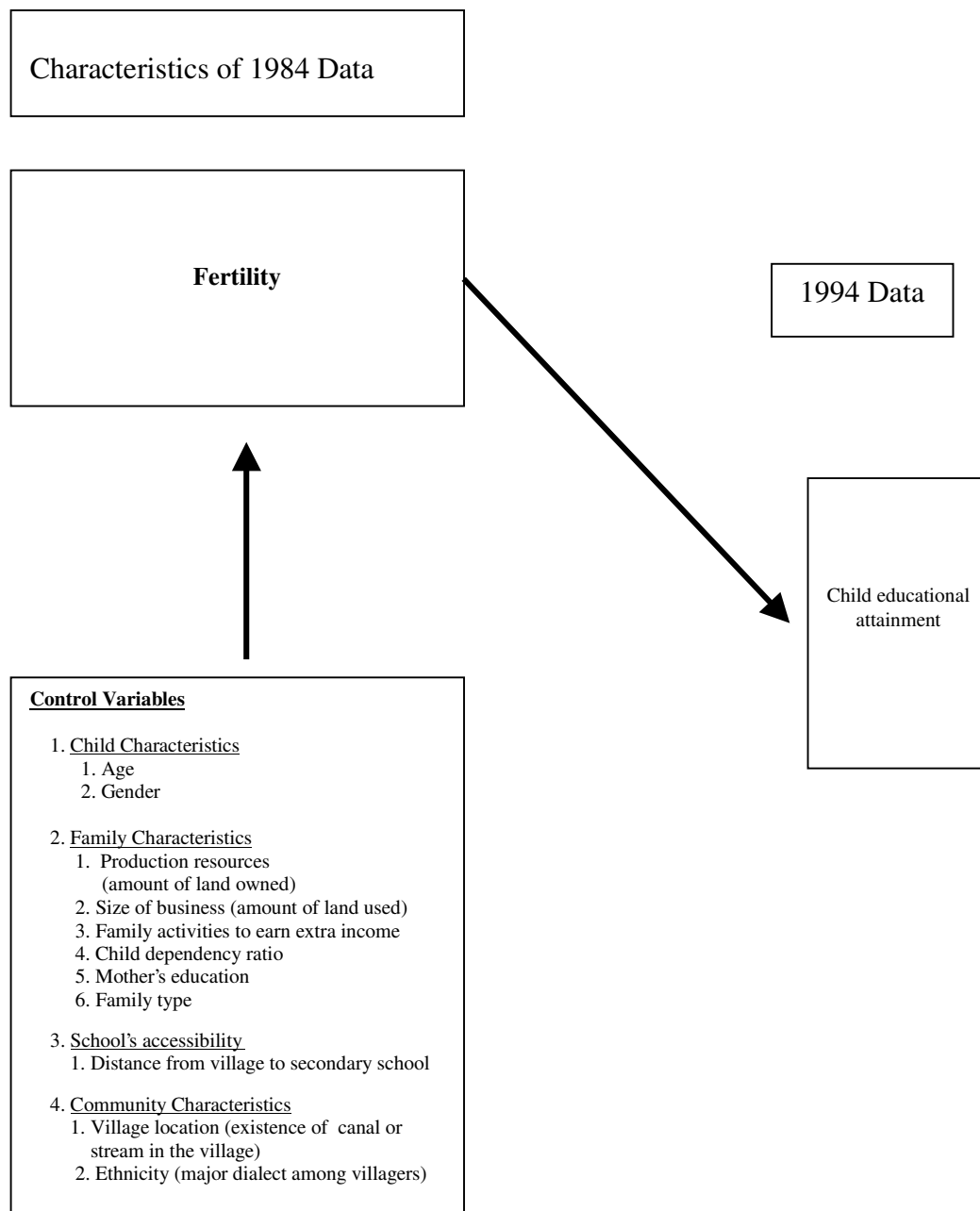


Figure 1 Conceptual framework, "The impact of fertility on child educational attainment."

In Figure 1, the dependent variable is child educational attainment. It is measured by the number of years that children spent in school, counting only elementary education or higher (excluding kindergarten). The independent variable is fertility. It is measured by number of children ever born to the child's mother.

7. Hypothesis

The hypothesis of this study is fertility has an inverse association with child educational attainment.

CHAPTER III

RESEARCH METHODOLOGY

This chapter covers 4 topics. They are: 1) source of data, 2) variable construction, 3) statistical methods, and 4) sample selection bias analysis.

1. Source of data

This study used longitudinal data of 1984 and 1994 of the Nang Rong project. This project was conducted by the Institute for Population and Social Research (IPSR) and the Carolina Population Center, the University of North Carolina at Chapel Hill (CPC).

The unit of analysis of this study is children who were 7 and 13 years old in 1984. The age groups are selected because the children who were 7 and 13 years old may graduate at least from high school (grade 12) in 1994 if they continuously enrolled. The children's age should not exceed 13 years old in 1984 because children who were older than 13 years old in 1994 seldom studied higher than six years of compulsory education. Thus, most of them had a constant educational attainment at about six years of elementary education.

According to the Nang Rong 1984 data set, there were 6,842 children who were 7 and 13 years old. In 1994, there were 62 children (0.91 per cent) who had died.

Likewise, there were 659 children (9.63 per cent) lost to follow up. The remaining subject were 6,121 children. Some of them were adolescents. And some of them were young adults in 1994. All of the remaining cases are the actual number of the sample size of this study. Nevertheless, there are 57 cases which will be dropped from the analysis. This is because there was: 1) incomplete educational information (7 cases), 2) extremely high child dependency ratio in the families (38 cases), and 3) outliers which have extremely high fertility (12 cases). Besides, an other 626 cases were automatically dropped from the analysis due to missing data of some independent variables. That is to say, the remaining cases for the analysis are 5,438 children.

2. Variables

The dependent variable is child educational attainment. It is measured by the number of years in which the child had completed schooling in 1994. The independent variable is fertility. Likewise, the control variables consisted of 4 domains. They are: 1) child characteristics, 2) family contexts, 3) school accessibility factors and 4) community factors. And they are 12 variables altogether. The independent variable and all of the control variables are measured in 1984. The research design for this analysis is the cause and consequence approach using a longitudinal data set. The empirical assumption for this study is that family resources about 10 years ago would have some effect on the child's current educational attainment. That is, family production resources within the peasant families rarely change even if the times had changed. Consequently, the study employs them as

control variables. The definitions, scale, measurement, and explanation of all variables for this analysis are shown in Table 5.

Table 5 Variables’ name, definition & explanation of all variables in the analysis of The impact of fertility on child educational attainment.

Variable	Definition	Explanation
<u>1. Dependent Variable</u>		
1. Child educational attainment	School grade or number of years of completed education in 1994 of children who are 7 – 13 years old in 1984 (Only school grades commencing from elementary school are counted in the analysis.)	Children who are aged between 7 and 13 years old in 1984 will be 17 and 23 years old ten years later. At the ages of 17 and 23, children can complete at least high school if they study. It is to measure complete education of the children.
<u>2. Independent Variables</u>		
1. Fertility	Number of children ever born of the children’s mother	It is only living children that can consume or produce for families. However, some living children may migrate outside and the families forgot to report them. In addition, Nang Rong project 1984 did not record migrants who migrated for longer than 2 months on the day that the survey was conducted. Therefore, the number of children ever born of the mother is employed for fertility.
<u>3. Control Variables</u>		
<u>I. Child Characteristics</u>		
1. Age	Age of children in 1984, in years	During school ages, children who have higher ages normally study in a higher grade. “Age” is used as control variable because there are 7 cohorts of children included in the analysis. During the 7 years there may be some special events that affect child educational attainment.
2. Gender	Dummy variable, 1 = male, 0 = female	Though males and females are not different in learning ability, for poor families, parents have to trade off between sons and daughters’ education due to lack of educational budget. In such a case, parents may let their sons study in a higher grade rather than their daughters.
<u>II. Family Characteristics</u>		
1. Amount of land owned	Amount of land a family owned in 1984, in number of rai (1 rai = 1,600 m ² or 0.4 acre)	Amount of land owned represents family production resource at the starting point of the follow up of this study.

Table 5 Variables' name, definition & explanation of all variables in the analysis of, The impact of fertility on child educational attainment (Continued).

Variable	Definition	Explanation
2. Amount of cultivated land	Amount of land that a family cultivated in 1984, in number of rai	Amount of cultivated land represents the size of the family business or family farm. It is also the variable concerned with family finance.
3. Number of family activities to earn extra income apart from the main occupation	Number of activities those families practice to earn extra income. Activities to be counted are <u>pig raising</u> , <u>fish pond</u> , <u>chicken farm</u> , <u>cloth weaving</u> , <u>bamboo and basket weaving</u> , and <u>vegetable garden</u> . One activity that a family performs will get 1 point. Therefore, the highest points is 6 and the lowest point is 0.	This variable also concerns family economy. It represents extra income apart from the main occupation. Normally, peasant families get agricultural production only one or two times in a year. Therefore, their income is not continuous. The activities to earn extra income will help their child's education because children need cash for daily expenses. The income beside the main occupation will allow the family to have extra money for their children. The families who have more working activities should have more extra income.
4. Child dependency ratio	$\frac{\text{number of family members aged 0-14 in 84}}{\text{number of family members aged 15-59 in 84}}$	Families who have a high dependency ratio will have many consumers while few producers.
5. Mother's education	Dummy variable 1 = do not have education beyond grade 3, 0 = completed grade 4 or higher,	Mothers are the people who look after the children. They plays a major role of child rearing. Mothers who have high education may know how to encourage the children to work harder to accomplish their education. Mother's education should have a positive association with child education.
6. Family type	Dummy variable 1 = the children live in a nuclear family, 0 = the children live in a non-nuclear family,	Children who live in non-nuclear families may receive some benefit from grand parents or other adults that assist them in studying. Therefore, children who live in non-nuclear families should have more opportunities to study in higher grade than children who live in nuclear families.

Table 5 Variables' name, definition & explanation of all variables in the analysis of, The impact of fertility on child educational attainment (Continued).

Variable	Definition	Explanation
<u>III. School's accessibility</u>		
1. School accessibility	Distance from village to secondary school, in kilometers (kms.).	In Nang Rong 1984, there is one secondary school, located not far from the town hall of Nang Rong. Children who reside in the village not far from school will spend less on transportation price fewer than those who reside in village far from school. They also save commuting times between home and school. Therefore, distance from village to secondary school should have an inverse association with child educational attainment.
<u>IV. Community characteristics</u>		
1. Village location	Dummy variable 1 = there is at least 1 canal or stream near the village, 0 = no canal near the village	A canal or stream is a natural resource in the village. It is a variable that concerns family economy. Water in the canal can be used for plantation. The villagers can get some benefit such as water for agriculture, do fishery in the canal etc. If there is a canal or stream near the village, villagers can have a good yield of production and good income from selling their products. They can have some finance for child education. Therefore, children from a village that has a canal or stream are more likely to have higher education than those who are from villages that do not have any canal or stream.
2. Ethnicity	Dummy variable Major dialect among villagers 1 = Thai Korat, 0 = otherwise	This variable is included as one of the control variables. It concerns the ethnicity of the study population.
• D_Thai	1 = Thai Korat, 0 = otherwise	There are three groups of major dialect in Nang Rong: Thai Korat, Khmer & Suai, and Lao. (The central Thai dialect is the official language in Nang Rong. It is rarely used in daily life communication.)
• D_Kh_sui	1 = Khmer and Suai 0 = otherwise (reference group)	
• D_Lao	1 = Lao, 0 = otherwise	

To construct the variables that are consensual with the definition and explanation in Table 5, there are 3 variables that should have some additional details. They are: 1) the family activities to earn extra income variable, 2) the mother's educational variable, and 3) the family type variable.

1) Family activities to earn extra income besides the main occupation's variable

At the very beginning when constructing this variable, the activities that will be counted for "number of family activities to earn extra income beside the main occupation's variable," are: 1) pig raising, 2) fish pond, 3) chicken farm, 4) cloth weaving, 5) handicraft making, and 6) vegetable garden. A family that has at least one pig will have 1 point. A family that has at least 20 chickens and answered the interviewer that the chickens were raised for sale, or for sale & consumption will get another point. As for the other activities, when a family did some activities and answered the interviewer that their activities were for sale, or for sale & consumption, they will receive another point for each activity. After that, the number of activities will be summed up to be "Number of family activities to earn extra income beside the main occupation." However, after checking the frequencies, it was found that most of the families did not do many activities. There was no variation in to this variable. Therefore, the variable was re-coded into a dummy variable. For example, the family that has at least 1 activity to earn extra income beside main occupation will receive code 1. The family that did not do any activity to earn extra income will receive code 0.

2) Mother's education

Most of the mothers in this study finished 4 years of education. Therefore, mother's education in this analysis is classified into two categories: code 1 is did not have education beyond grade 3, and code 0 is graduated grade 4 or higher.

3) Family type

Family type is classified into 2 categories: 1) nuclear family and 2) non-nuclear family. The nuclear family is the family that has only the mother, father and children living together. On the other hand, the families that have at least one member who is not the mother, the father or children, will be classified as a non-nuclear family.

3. Statistical Methods

This study employed Multiple Regression Analysis (MRA). In addition, there were some descriptive statistics such as mean and standard deviation (S.D.) used when explaining the sample's characteristics etc. Furthermore, Pearson product moment correlation coefficient was also applied when considering collinearity and multi-collinearity diagnosis.

The sampling of Nang Rong data, was undertaken by first selecting 51 villages to be the representatives of Nang Rong district. The project then collected data from every person and every household in the sampled villages. The sample design, was based on cluster sampling, and this may contribute to some statistical effects when analysing the data. For this reason, it is necessary to correct some standard errors of this cluster variable when using regression model (Guilkey and Murphy, 1993). There is software that has an option of standard error correction. This software is STATA. STATA provides some robust standard errors correction for Multiple Regression Analysis. Therefore, this study employed STATA when investigating the effects of fertility and child educational attainment.

4. Sample Selection Bias Analysis

For longitudinal data analysis, there are always some cases lost in follow up. Thus, it is necessary to pay attention to the cases that are lost to follow up and whether they have some effect on the analysis or not. The results from sample selection bias diagnosis could provide some data to support when interpreting the main results of this analysis. The means to find out whether the cases which were lost to follow up have an effect on the predicting model or not, is the log likelihood ratio test (LR).

The number of cases for sample selection bias analysis was 6,842 children who were between 7 and 13 years old in 1984. The sample selection bias analysis had

to drop 62 children (0.91 per cent) because they died. The remaining cases for the analysis were 6,780 children. Most of them, 6,126 children, were found in 1994 but there were about 659 children lost to follow up.

Table 6 and Table 7 show descriptive statistics and Pearson product moment correlation coefficient when testing for sample selection bias analysis. Logistic regression analysis was employed.

Table 6 Descriptive Statistics of individuals, families, school accessibility, and community characteristics of children aged 7 to 13 years old in Nang Rong, 1984 when testing for sample selection bias regarding those lost to follow up in 1994

Characteristics	N	Min	Max	Mean	Std. Deviation
1. Lost to follow up in 1994	6780	0	1	0.10	0.30
2. Age	6780	7	13	9.98	1.98
3. Male	6780	0	1	0.51	0.50
4. Amount of land owned, in rai	6729	0	90	21.18	20.10
5. Amount of land used, in rai	6698	0	90	22.62	17.88
6. Nuclear family	6780	0	1	0.68	0.46
7. Family had activities to earn extra income beside the main occupation	6780	0	1	0.06	0.23
8. Child dependency ratio	6758	0.11	3.50	1.24	0.73
9. Accessibility to school (distance from village to secondary school, kms.)	6780	2	37	15.74	7.18
10. Village location (a canal or stream is near the village)	6780	0	1	0.27	0.44
11. Major dialect is Khmer & Suai	6780	0	1	0.06	0.23
12. Major dialect is Lao	6780	0	1	0.22	0.41

Note: Reference groups: female, families do not have activities to earn extra income beside the main occupation, non-nuclear family, no canal or stream near the village, major dialect is Thai Korat.

Table 7 Pearson product moment correlation coefficient when testing for sample selection bias regarding some children lost to follow up in 1994.

	AGE	MALE	LANDOW	LANDUS	INCOMSRE	CHILDDPE	NUCLEARF	CANALSTR	D_KH_SUI	D_LAO
MALE	0.005									
N	a									
LANDOW	.094(**)	-0.023								
N	b	b								
LANDUS	.081(**)	-0.02	.832(**)							
N	c	c	d							
INCOMSRE	0.015	-0.002	0.016	0.014						
N	a	a	b	c						
CHILDDPE	-.146(**)	0.022	-.212(**)	-.200(**)	-.024(*)					
N	e	e	f	g	e					
NUCLEARF	-0.024	-0.02	-.167(**)	-.140(**)	-0.005	.162(**)				
N	a	a	b	c	a	e				
CANALSTR	0.004	-0.014	-.054(**)	-.039(**)	-0.006	-0.019	-0.007			
N	a	a	b	c	a	e	a			
D_KH_SUI	-0.004	0.009	0.019	.040(**)	0.005	.052(**)	0.017	.106(**)		
N	a	a	b	c	a	e	a	a		
D_LAO	-0.005	0.009	0.023	.037(**)	-.041(**)	.071(**)	0.005	-.085(**)	-.126(**)	
N	a	a	b	c	a	e	a	a	a	
VILL_NR	-0.017	0.003	.054(**)	.064(**)	-.079(**)	.040(**)	.035(**)	.037(**)	.146(**)	.454(**)
N	a	a	b	c	a	e	a	a	a	a

Note: * = $p < .05$, ** = $p < .01$ (2-tailed test)

Meaning of the abbreviations; LANDOW = Amount of land owned in 1984 (in rai), LANDUS = Amount of land used in 1984 (in rai), INCOMSRE = Family has some activities to earn extra income beside the main occupation (=1), CHILDDPE = Child dependency Ratio, NUCLEARH = Nuclear family (=1), CANALSTR = A canal or stream is near the village (=1), D_KH_SUI = Major dialect is Khmer & Suai (=1), D_LAO = Major dialect is Lao (=1), VILL_NR = Accessibility to school (Distance from village to secondary school, in kilometers)

Number of cases: a = 6,780, b = 6,729, c = 6,698, d = 6,690, e = 6,758, f = 6,708, g = 6,677

Table 6, shows about 10 per cent of the children were lost to follow up in 1994. The mean age of the children was 10 years old. The number of males and females were closely equal, 51 and 49 per cent respectively. The amount of land owned and amount of land used had almost no difference. They were 21 and 23 rai (8.5 and 9 acres) respectively. There was about 6 per cent of the families who had some activities to earn extra income beside their main occupation. The average child dependency ratio was about 1.2. Most of the children, 68 per cent, lived in a nuclear family. One fourth of them lived in a village that has one canal or stream near the village. Almost three fourths of the children lived in a village where the major dialect was Thai Korat. One fifth of the children lived in a village where the major dialect was Lao. Only 6 per cent lived in a village where the major dialect was Khmer & Suai.

Table 7 shows the result of Pearson product moment correlation coefficient. It found a high correlation (0.832) between the amount of land those families used for cultivation (LANDUS) and the amount of land owned (LANDOW). Thus, it was necessary to drop one of the variables. Considering these two variables, the amount of land owned is a better representative for family economy. Therefore, the amount of land used for cultivation (LANDUS) was dropped from this sample selection bias diagnosis employing logistic regression analysis. In addition, the “mother’s education” variable was also dropped because for all the children who were lost to follow up, the mothers’ educational information was not available.

Table 8 shows logistic regression coefficients and robust standard errors from the sample selection bias analysis. The dependent variable was assigned code 1 when the children were lost to follow up. Similarly, the reference group was assigned code 0 when the children were found in 1994.

Table 8 Logistic regression coefficients and robust standard errors when investigating the characteristics of the children who lost to follow up in 1994.

Variables ¹	Coefficient	Robust Std. Error
1. Age	-0.038*	0.016
2. Male	0.098	0.084
3. Amount of land owned, in rai	-0.026***	0.006
4. Nuclear family	-0.040	0.150
5. Family had some activities to earn extra income beside the main occupation	-0.470	0.411
6. Child dependency ratio	0.315***	0.099
7. Distance from village to secondary school, in kilometers	-0.009	0.012
8. A canal or stream is near the village	-0.091	0.120
9. Major dialect is Khmer & Suai	0.008	0.304
10. Major dialect is Lao	0.378 [†]	0.229
Constant	-1.748***	0.340

N = 6,708

Model Chi-square = 44.99***

Pseudo R² = 0.044**Note:** [†] = p < .10, * = p < .05, ** = p < .01, *** = p < .001

Reference groups for independent variables are female, families who do not have activities to earn extra income beside the main occupation, non-nuclear families, no canal or stream near the village, major dialect is Thai Korat.

Table 8 shows the children who were lost to follow up in 1994 were a systematic loss when considering the child's age, amount of land owned, child dependency ratio, and the major dialect of Lao. That is to say, the children who had older age and whose families had more land owned were less likely to be lost to

follow up in 1994. Furthermore, the children who lived in a family that had a high child dependency ratio and those who lived in a village where the major dialect was Lao were more likely to be lost to follow up.

According to the child's age, the higher the age, the lower the probability to be lost to follow up. It can be explained that the children of older age would become adolescents or adults between 1984 and 1994. Consequently, they could migrate for work by leaving one of their parents or both to live at their houses. On the other hand, the parents may migrate by allowing some of their children to live at the house with the younger brothers or sisters, because the children were old enough to look after their younger one. Therefore, the interviewers were able to find them and record their information.

The second variable that will be mentioned here is amount of land owned in 1984. The amount of land owned had an inverse association with "lost to follow up." It can be explained that families who possessed a large amount of land owned in 1984 had enough land for cultivation. Though some of the family members had migrated, they needed some family members to look after the land. Furthermore, in the case where the family had a large amount of land, the family could cultivate the land without paying any rent. The more land they had, the greater the products they should cultivate. Moreover, they could let some one tenant some of their lands to receive rental fee. For this reason, a family that had much land did not have any reason to allow all their family members to migrate outside the village.

The third variable, the child dependency ratio variable, had a positive association with lost to follow up. This might be because children in the families who had a higher child dependency ratio faced some tensions on some economic problems, because they had a lot of consumers. Then all members needed to migrate outside to seek better job and income opportunities. As a result, no one in the family was available for the interviewer to interview because nobody lived there.

The last variable that will be mentioned here is the ethnicity variable. It is interesting that children who lived in a village where the major dialect is Lao were more likely to be lost to follow up when compared to those who lived in a village where the major dialect is Thai Korat.

In conclusion, the majority of children that will be used to investigate the impact of fertility on child educational attainment are a little biased towards those who have older age, more amount of land owned, lower child dependency ratio, and live in non-Lao village.

CHAPTER IV

THE IMPACT OF FERTILITY

ON CHILD EDUCATIONAL ATTAINMENT

Chapter 4 presents the result from the data analysis of the impact of fertility on child educational attainment. It covers 4 topics: 1) characteristics of the sample, 2) collinearity diagnosis, 3) the analysis of the impact of fertility on child educational attainment, and 4) discussion.

1. Characteristics of the Sample

Table 9 shows descriptive statistics of all variables that will be analyzed for the impact of fertility on child educational attainment. The descriptive statistics that are presented comprise number of cases, minimum, maximum, mean and standard deviation.

Table 9 Descriptive statistics of child factors, family characteristics, the school accessibility variable and the community context of children 7 to 13 years of age in Nang Rong, 1984.

Variables	Minimum	Maximum	Mean	Std. Deviation
1. Child educational attainment in 1994	0	16	6.72	2.21
2. Age	7	13	9.97	1.98
3. Male	0	1	0.51	0.50
4. Children ever born (in persons)	1	13	5.47	2.40
5. Mother's education 0 – 3 years	0	1	0.13	0.33
6. Amount of land owned, in rai	0	90	22.05	20.37
7. Amount of land used, in rai ^{1/}	0	90	23.41	17.95
8. Nuclear family	0	1	0.71	0.45
9. Family had activities to earn extra income besides their main occupation	0	1	0.06	0.24
10. Child dependency ratio	0.11	3.5	1.23	0.68
11. Distance from village to secondary school (kms.)	2	37	15.72	7.18
12. A canal or stream is near the village	0	1	0.27	0.44
13. Major dialect is Khmer & Suai	0	1	0.06	0.23
14. Major dialect is Lao	0	1	0.21	0.41
N = 5,438				

Note ^{1/} Number of cases = 5,410

Reference groups: female, mother's education was 4 years or higher, non nuclear families, families did not have activities to earn extra income, no canal or stream near the village, major dialect in the village was Thai Korat.

Table 9, shows the average mean of child educational attainment in 1994 was a little higher than compulsory education, at about 6.7 years. The minimum child educational attainment was 0. This means that some children did not enroll in compulsory education. Also, the maximum of child educational attainment was 16.

This means that some children got a bachelor degree. The average of children ever born (fertility) was about 5 children per family. The minimum of children ever born in this sample was 1 child, and the maximum of children ever born was 13 children.

Considering the other variables in Table 9, the mean age of the children was about 10 years old. Half of them, 51 per cent, were males. A few of their mothers, 13 per cent, graduated with less than 4 years of education. The average mean amount of land owned and land used were about 22 rai and 23 rai (8.8 and 9.3 acres) respectively. This meant that most of the families cultivated only their own lands. There was about 71 per cent of them living in a nuclear family. Furthermore, about 6 per cent of the children lived in a family that had some activities to earn extra income besides the main occupation.

The average child dependency ratio was 1.2. The mean average of distance from the children's home to secondary school was about 16 kilometers. About a quarter of the children, 27 per cent, lived in villages located next to canals or streams.

Considering to ethnicity, which was measured by major dialect among villagers, 21 per cent of children lived in villages that spoke Lao. In addition, 6 per cent of the children lived in villages which spoke Khmer & Suai. The rest of the children, about 73 per cent, live in villages where the major dialect was Thai Korat.

2. Collinearity diagnosis

Before investigating the proposed objective, all independent variables were checked for collinearity by the Pearson correlation coefficient (Gujarati, 1995). There were 5,438 cases for the collinearity test. It excluded 659 children who were lost to follow up. And there were 683 children not included in this test, who were the outlier cases. Some of them did not have complete information i.e. educational attainment variable, or mother's information. Table 10, presents Pearson correlation coefficient's matrix.

Ph.D.(Demography) / **Table 10** Pearson correlation coefficient and number of cases of children, family, school accessibility and community characteristics of children 7 to 13 years of age in Nang Rong, 1984

	AGE	MALE	CEB	MOED0_3	NUCLEARH	INCOMSRE	LANDOW	LANDUS	CHILDEP	CANALSTR	D_KH_SUI	D_LAO
MALE	0.013											
N	a											
CEB	.143(**)	-0.002										
N	a	a										
MOED0_3	.029(*)	.042(**)	.152(**)									
N	a	a	a									
NUCLEARH	-0.009	-0.017	-0.058(**)	-0.022								
N	a	a	a	a								
INCOMES	0.01	0.002	.033(*)	-0.019	-0.011							
N	a	a	a	a	a							
LANDOW	.086(**)	-0.015	.137(**)	-.029(*)	-.167(**)	0.019						
N	a	a	a	a	a	a						
LANDUS	.077(**)	-0.012	.168(**)	-0.013	-.151(**)	0.013	.831(**)					
N	b	b	b	b	b	b	b					
CHILDEP	-.165(**)	0.025	-.160(**)	-.048(**)	.165(**)	-.043(**)	-.210(**)	-.198(**)				
N	a	a	a	a	a	a	a	b				
CANALSTR	-0.004	-0.021	0.009	-0.004	0.004	0.006	-.062(**)	-.040(**)	0.008			
N	a	a	a	a	a	a	a	b	a			
D_KHMER	-0.005	0	.074(**)	.042(**)	0.018	0.007	.027(*)	.053(**)	.042(**)	.116(**)		
N	a	a	a	a	a	a	a	a	a	a		
D_LAO	0.002	0.018	.109(**)	.175(**)	-0.013	-.052(**)	0.02	0.026	.054(**)	-.072(**)	-.124(**)	
N	a	a	a	a	a	a	a	b	a	a	a	
VILL_NR	-0.019	0.011	.070(**)	.141(**)	.047(**)	-.100(**)	.052(**)	.065(**)	.030(*)	.039(**)	.150(**)	.457(**)
N	a	a	a	a	a	a	a	b	a	a	a	a

Note: * = p < .05, ** = p < .01 (Two tailed test)

Meaning of the abbreviations; CEB = children ever born (fertility of the child's mother), MOED0_3 = mother's education 0 - 3 years (=1), NUCLEARH = Nuclear family (=1), INCOMSRE = Family has some activities to earn extra income besides main occupation (=1), LANDOW = Amount of land owned in 1984 (in rai), LANDUS = Amount of land used in 1984 (in rai), CHILDEP = Child dependency ratio, CANALSTR = Village location (a canal or stream is near the village =1), D_KH_SUI = Major dialect is Khmer & Suai (=1), D_LAO = Major dialect is Lao (=1), VILL_N = Accessibility to school (distance from village to secondary school, in kilometers)

Number of cases; a = 5,438, b=5,410

From Table 10, it was found that “amount of land that a family owned” and “amount of land that a family used” had some collinearity ($r = 0.831$). Therefore, “the amount of land that a family used” was dropped from the regression analysis, because “amount of land that a family own” is a better representative of family economy.

3. The impact of fertility on child educational attainment

To explore the impact of fertility on child educational attainment, 6 models of multiple regression analysis were used. Each model had a different examination purpose.

Model 1 was the simple regression model. This model presented the real direct additive impact of fertility on child educational attainment without controlling for any other social contexts.

Model 2 was mainly to investigate the influence of fertility on child educational attainment when controlling for children’s characteristics.

Model 3 explored the influence of fertility on child educational attainment when controlling for family contexts.

Model 4 investigated the influence of fertility on child education when controlling for the accessibility to school factor and community contexts.

Model 5 focused on the impact of fertility on child education when controlling for children's characteristics and family contexts.

Model 6 is the full model. It looked at the impact of fertility on child education when controlling for children's characteristics, family contexts, accessibility to school, and community factors.

Table 11 shows unstandardized coefficient and robust standard errors of all the 6 models.

Table 11 Unstandardized regression coefficients and robust standard errors from multiple regression analysis on the impact of fertility on child educational attainment

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)
1. Age		-.011 (.019)			-.030 (.019)	-.032 [†] (.019)
2. Male		.217*** (.059)			.254*** (.060)	.258*** (.059)
3. Children ever born (CEB)	-.115*** (.017)	-.113*** (.017)	-.127*** (.015)	-.100*** (.017)	-.124*** (.016)	-.111*** (.016)
4. Mother's education was 0 – 3 years			-.677*** (.090)		-.692*** (.091)	-.553*** (.093)
5. Amount of land owned, in rai			.018*** (.002)		.018*** (.002)	.019*** (.002)
6. Nuclear family			.017 (.086)		.027 (.085)	.037 (.086)
7. Families had activities to earn extra income besides the main occupation			-.141 (.141)		-.144 (.142)	-.221 [†] (.133)
8. Child dependency ratio			-.127* (.058)		-.145* (.058)	-.110 [†] (.056)
9. Distance from village to secondary school (kms.)				-.011 (.012)		-.014 (.012)
10. A canal or stream was near by the village				-.087 (.149)		-.020 (.157)
11. Major dialect in the village was Khmer & Suai				-.384 (.243)		-.356 (.230)
12. Major dialect in the village was Lao				-.544** (.184)		-.450* (.179)
Constant	7.335*** (.124)	7.336*** (.182)	7.248*** (.170)	7.600*** (.179)	7.415*** (.221)	7.629*** (.222)
R ²	.016	.018	.058	.031	.062	.075
F	47.71***	21.81***	26.35***	20.90***	21.40***	16.93***
N	5,438	5,438	5,438	5,438	5,438	5,438

Note: [†] = p < .10, * = p < .05, ** = p < .01 *** = p < .001

Reference groups: female, mother's education was 4 years or higher, non nuclear families, families did not have activities to earn extra income besides the main occupation, no canal or stream near the village, major dialect in the village was Thai Korat.

Model 1 investigated the real direct effect of fertility on child education without controlling for any other factors. It found that fertility had an inverse association with child education (p < .001). However, the coefficient size was rather small, - .115. The increment of one child in a family declined only .115 year or about

1.5 months of child educational attainment. In this model, fertility could explain the variation of child educational attainment at only 1.6 per cent (goodness of fit = 0.016). The other 98.4 per cent was the impact of the other variables that were not included in this analysis.

The constant of Model 1 was about 7.3. It means the average of child educational attainment of children in Nang Rong, who were 17 and 23 years old in 1994, was about 7 years. Most of them finished only compulsory education. Very few of them completed secondary school or college.

Model 2 investigated the impact of fertility on child education when controlling for age and gender of the children. It found that fertility had an inverse association with child education. However, the coefficient size was almost unchanged from Model 1. Regarding to age and gender, even if they are treated as control variables, only "gender" was associated with child education. Males were more likely to have higher education than females by about .217 year or 3 months. One may say that there is some gender bias in child education in rural northeast Thailand.

In this model, age seem to have an inverse relationship with child educational attainment. However, it was not statistically significant in Model 2. It might be because this model did not control for the family economy variables. Children in Nang Rong normally had only 6 years compulsory education. Whether their families had good finances or not, all of the children can attend 6 years of

education. Thus, age did not show any association with child educational attainment when ignoring the family finance variable in the analysis.

In Model 2, fertility, age and gender could explain the variation of child educational attainment for 1.8 per cent (goodness of fit or R^2 was .018). The other 98.2 per cent was the influence of the other variables that were not included in this analysis. That is to say, goodness of fit increased when adding child characteristic into the model.

Considering Model's constant, the constant of Model 2 was not different from Model 1 at 7.336. The average child educational attainment of children in Nang Rong was a little higher than compulsory education.

In Model 3, fertility, still remaining, had a strong negative effect on child education when controlling for family context: mother's education, production resources, family type, activities to earn extra income, and child dependency ratio. The R^2 increased to 0.058. Thus, family context, as control variables, increased the goodness of fit. Interestingly, when focusing on control variables, mother's education of 0-3 years had a negative relationship. It means that child education attainment will not increase when mothers had a lower education level. The production resources that was measured by amount of land own contributed to the increase in child education. As expected, a high child dependency ratio meant a decline in the number of years of child education.

Results from the analysis of Model 3 underlined the importance of family context on child educational attainment, especially the variables that were significant in the model: fertility, mother's education, production resources, and the child dependency ratio. High fertility measured by children ever born impaired child educational attainment because child education is costs that a family has to pay for their children aid. It is a heavy burden to let all children to have an education higher than compulsory. Thus, a family that had many children had to give their children lower education than a family that had fewer children.

Regarding mother's education, children who had mothers who did not complete grade 4, the compulsory level of education of Thailand around 1960 – 1978, had lower education than children who had mothers who completed grade 4 or higher. This might be because the child's mother did not have any experience of the benefits of education. Therefore, they did not pay much attention to support their children to study. Besides, the family could receive some financial benefit from children if they let their children work when the children had completed grade 6.

The production resources, measured by amount of land owned, shown an interesting impact on child education. The families that had more production resources would have better finances than a family that had less production resources. A family that had more production resources could thus support their children to have higher education. For every increment of 55 rai of land owned contributed to an increment of child education for one year.

Regarding the child dependency ratio, the higher the child dependency ratio the more consumers a family had and the fewer producers. Thus, it had inverse association with child educational attainment.

Model 4 investigated the impact of fertility when controlling for the accessibility to school factor and community context. There were 4 control variables included in this model: children ever born, distance from village to secondary school, whether the village was located near a canal or stream or not, and ethnicity. It was found that fertility still remained and had an inverse association with child education ($p < .001$). However, the magnitudes of regression coefficients became a little smaller when compared to the results from Model 1, Model 2, and Model 3. The goodness of fit became smaller than in Model 3 ($R^2=0.031$) This might be because child education is largely dependent on each family's characteristics rather than the community contexts. The family is the direct source that supports children in studying.

Looking at the control variables in the model i.e. "major dialect in the village was Khmer & Suai" and "major dialect in the village was Lao;" "major dialect in the village was Lao," had an inverse association with child education ($p < .01$). This means that children who lived in a village whose major dialect was Lao, had a lower educational level than those who lived in a village that spoke Thai Korat. This might be because of differences in villagers' values on education. Regarding the Thai Korat population's background, it is believed that their ancestors were Thai soldiers who were married to native Mon and Khmer in the northeast of Thailand. However, some scholars argue that they are groups of people who originated from the blending of the

central Thai group and Thai-Lao group of the northeast (Premsrirat, 1999; Suwannapat, 2001). As their ancestors' background was military from the centre of Thailand who were familiar with the benefits of education, the value of the benefits of education might be transferred to their descendants. Therefore, they assisted their children to study higher than the children who live in Lao villages.

Considering goodness of fit, the four variables could explain the variation of child educational attainment by about 3 per cent ($R^2 = .031$). The other 97 per cent was explained by the other variables that were not included in this analysis. It can be concluded that though an association of fertility, ethnicity and child educational attainment was found, the mentioned variables had very little impact on child educational attainment. In this model, the constant was not different from Model 1 to Model 3. It was about 7.6.

In Model 5, fertility was remaining and had an inverse association with child educational attainment ($p < .001$) when controlling for children and family factors. In addition, males were more likely to have higher educational attainment than females by about .254 years.

Concerning the child dependency ratio, it remained and had a statistically significant relationship ($p < .05$) and had an inverse association with child education. This confirmed the fact that if there were more consumers in families, there might have been fewer resources for the children to study. The control variables that were significant in Model 1 to Model 3 were also significant in this model.

Considering the goodness of fit and constant of Model 5, the children and family context variables could explain the variation of child educational attainment by about 6.2 per cent. As expected, when adding child characteristics and family context into the model as control variables, the goodness of fit increased. In addition, the average educational attainment of children in Nang Rong in 1994 was 7.4 years. It was only a little higher than 6 years of compulsory education because most of the children in Nang Rong had completed only compulsory education. Few of the children enrolled in secondary education.

In Model 6, when controlling for the child's age, gender and some other family and social context variables such as mother's education, production resources, child dependency ratio, accessibility to school, village location, and ethnicity, fertility was still remaining and had a strong influence on child education ($p < .001$). This confirms that high fertility mainly had an inverse association with child education. However, the coefficient size was rather small, $-.111$. It can be concluded that fertility had an inverse association with child educational attainment but the influence of fertility on child education is slight. Fertility, and age, gender, the other 5 family context variables and the other three community context variables could explain child educational attainment by about 7.5 per cent. The other 92.5 per cent were explained by the other variables which were not included in this analysis. As a result, goodness of fit increased correspondingly since it included child characteristics, family context, and community factors.

In this model, as the control variable, the child's age had a statistically significant relationship with child education ($p < .10$). The children of higher age had a lower education than the children of lower age. This might be due to the changing of parents' views on education. In Thailand, the Ministry of Education stated that all Thai students who have graduated from grade 6 should enroll secondary in school every year. Their parents may have gradually complied with this request. Therefore they assisted their children to study beyond grade 6.

Looking at the effect of the other control variables, children who were males were more likely to have higher education than females (for .258 year, $p < .001$). Children who had mothers who completed grade 4 or higher were more likely to have higher education than those whose mothers studied 3 years or less by about one year.

Considering production resources, this factor had a strongly positive effect on child education ($p < .001$). One may say that an increasing to about 52 rai (20.8 acres) of land owned will contribute to the increase in child education by one year.

In this study, the child dependency ratio, as expected, had an inverse association with child educational attainment. All models including child dependency ratio into the analysis, found that a high child dependency ratio declined child educational attainment.

Interestingly, children who lived in families that had activities to earn extra income had lower educational attainment than those who lived in families that lacked

activities to earn extra income. This finding was unexpected. It might be because activities to earn extra income did not really help the family economy. However, the families who had activities to earn extra income might also have economic hardships. They might need to find some special activities to get more income. Therefore, “activities to earn extra income” declined child educational attainment.

According to the social context variables, it was only ethnicity that showed an influence on child educational attainment. The children who lived in villages where most spoke Lao had lower educational attainment than the children who lived in villages that spoke Thai Korat.

According to the results of the sample selection bias analysis which were presented in Chapter 3, it was found that there are some biases with children who were lost to follow up in 1994. One should consider when referring to the results here, that the sample selection bias analysis suggested that older children were less likely to be lost to follow up. Consequently, children who were found in 1994 were those who had an older age but they had lower educational attainment.

Concentrating on production resources, children who lived in families that had more production resources were less likely to be lost to follow up. Interestingly, the more production resources the family had the better the educational attainment the children attained.

Regarding sample selection bias analysis, children who lived in a family that had a low child dependency ratio were mostly found. As a result, the analysis found that children who lived in families that had a lower child dependency ratio had higher educational attainment than those who lived in families that had a higher child dependency ratio.

When comparing the children who lived in a village where the major dialect was Lao to those who lived in Thai Korat villages, the sample selection bias analysis found that children who lived in a village whose major dialect was Lao were more likely to be lost to follow up. The analysis in Model 6 shows that children who were found in 1994 and lived in a village whose major dialect was Lao had lower educational attainment than those who lived in a village whose major dialect was Thai Korat.

As mentioned in Chapter III, this study had to drop 626 children from the analysis because there was missing data of their mothers' children ever born as well as some other control variables. Therefore, it is interesting to test if the cases are included in the analysis, whether fertility will remaining would have an inverse association with child educational attainment or not. Table 14 (in the Appendix) presented the results of the analysis when it allowed for the number of cases in each model as they should be. In this table, the computer software automatically dropped the cases that had missing data of children ever born and some other control variables. Therefore, the numbers of cases of each model in Table 14 were not equal. Table 17 (in the Appendix) showed the results of regression analysis of the children when

replacing the missing data of fertility (mothers' children ever born) with the mean of the variable, 5.470084. In Table 17, all models had equal number of cases, 5,999 children. Both Table 14 and Table 17 were analyzed under the same process as the former 6 models that are presented in Table 11.

Results from the analysis presented in Table 14 and Table 17 were not different from the former results provided in Table 11. Therefore, it can be concluded that, whether the analysis had a different number of cases or the analysis had an equal number of cases, the results of the analysis when analyzing the impact of fertility on child educational attainment were not different.

Considering the goodness of fit of all models in Table 11, Table 14 and Table 17, the goodness of fit of the models was low. The variables in the models could explain fertility by not more than 7.5 per cent (R^2 were between .015 and .075). It is surprising that the small sizes of the goodness of fit might be because most of the children in this analysis had only six years of compulsory education. Therefore, a new analysis was conducted to test if the goodness of fit would increase or not when considering only children who had a higher educational attainment than the compulsory level. To do so, the children who had a level of education between no education and six years were dropped. The results of the analysis were shown in Table 20 of the Appendix.

From Table 20, the goodness of fit of some models were a little higher than the goodness of fit of Table 11, Table 14 and Table 17. However, the age of the

children became more strongly significant but the direction changed to positive. This is because all of the children in the analysis had higher educational attainment. Put differently, a higher level of education mostly corresponds to the higher age of children. As a result, the higher age the children became, the higher education they could attain.

Considering the level of goodness of fit (R^2), it was not as high when it concentrated on every model because most of the samples of this analysis had finish only compulsory education. And this is a real phenomenon that has occurred in most rural societies. For example, when we look at the study of USA, which was conducted by Blake in 1986, the levels of R^2 were between 0.029 and 0.052 when focused on the levels of men's education by years of college between 1962 and 1983. The R^2 level was low because most of the samples by that time had finished only high school level. High school is compulsory education in USA. (Blake, 1986).

4. Discussion

The results of the analysis accepts the research hypothesis, "fertility has an inverse association with child educational attainment." The result is consistent with the findings from studies which were conducted by Anh, Knodel, Lam and Friedman (1998), Blake (1985; 1986; 1989), Teachman. (1987), and Knodel, Havanon, and Sittitrai (1990).

Knodel, Havanon, and Sittitrai (1990) used cross sectional data of two sites in rural areas of Thailand, while the present study used longitudinal data. Both studies revealed the same result that family size had an inverse association with child educational attainment. Therefore, whether longitudinal data or cross sectional data are employed, in rural areas of Thailand during the period of fertility decline, one is able to say that fertility had an inverse association with child educational attainment.

Regarding the goodness of fit of all the six models shown in Table 11, the goodness of fit of each model was very low, especially when the model presented only the influence of fertility on child educational attainment. For example, in Model 1, it analyzed the direct effect of fertility on child educational attainment. The goodness of fit of the model was as low as .016. However, after including the socioeconomic contexts such as amount of land owned, ethnicity etc. into the models, the goodness of fit became larger. For example in Model 6, the goodness of fit became .075. It was almost 5 times larger than the goodness of fit of Model 1. Therefore, if the influence of fertility and socioeconomic contexts are considered on child educational attainment, it could be concluded that in the period of fertility decline such as in Nang Rong around 1990, the socioeconomic contexts played a more important role on child educational attainment than fertility did.

This study found some interesting evidence which contributes to the gender bias issue. For example, considering child education, males seem to have higher educational attainment than females.

The effects of the mother's education and production resources (amount of land owned) on child educational attainment have followed expectations. From the literature review section, it was clear that children whose mothers had a higher education, and who live in family that had more resources had better support for to education. In this study, it was seen that children whose mothers graduated about grade four or higher will have a higher educational attainment than those whose mothers had less education than four years. In addition, children who lived in families that possessed much land will have higher educational attainment level than those who lived in families that possessed little land.

In northeastern Thailand, ethnicity also affected child educational attainment. Children who lived in villages where their major dialect was Lao, had a lower level of education than those who lived in villages where the major dialect was Thai Korat.

There are some control variables in this analysis which had some interesting results. For example, the type of family and village location factor, which was measured by whether the "canal or stream is nearby the village," did not have any impacts on child education.

CHAPTER V

CONCLUSION

Chapter V is the conclusion of this study. There will be two topics in this chapter. They are findings of the study and implications of the study.

1. Findings of the study

This study concentrated on peasant families in a rural area of the northeast of Thailand. The analysis focused on consequences of fertility on child educational attainment. Children's characteristics, family factors, accessibility to school, and community's context were treated as control variables. The main finding is as expected, the fertility factor which is measured by number of children ever born (CEB) had an inverse association with child educational attainment. Accordingly, hypothesis was accepted. An increase in the children ever born of the child's mother contributed to a decrease of child educational attainment. However, when considering the goodness of fit, fertility could explain child educational attainment very slightly. The socioeconomic context variables of the children played a more important role on child education than fertility did. Accordingly, it is important to promote child quality rather than quantity of the child such had suggested by Gerry Becker (1960) in his economic analysis of fertility in 1960.

In addition, the control variables also produced some interesting results. For example, children who lived in families who had a lower child dependency ratio were more likely to have higher education than those who were from families that had a higher child dependency ratio. The other important findings were the effects of some other control variables such as production resources, which was measured by amount of land owned, and amount of land which a family used for cultivation on child educational attainment. They had a positive association with child educational attainment.

Importantly, the study also found an unequal educational opportunity among children who had different ages. The children who had an older age had lower educational attainment than those who had a younger age. In addition, some gender bias on child educational attainment was found between boys and girls. Boys had a higher education level than girls.

The study also showed the impact of mother's education on child educational attainment. Children who had mothers who graduated at least grade 4 of elementary school, had higher educational attainment than those who had mothers who graduated lower than grade 4.

Regarding community characteristics, there was only one variable that had an effect on child educational attainment, which was ethnicity. Children from villages

those major dialect was Lao had lower educational attainment than those who were from villages those major dialect was Thai Korat.

2. Implications of the study

Regarding to the results of the study found very slightly an inverse association between fertility and child educational attainment, however, it implies that fertility could draw back child educational attainment. That is to say, the finding here could supported the government's policy on its family planning program. In addition, it confirmed the family's belief that fertility control was one of several ways in which families could promote their children's quality. Moreover, if the Ministry of Education wants to promote all children in rural areas of Thailand to have higher education than compulsory education, there should be some initiatives to help the children in rural areas who have many siblings. Otherwise, the children can not enroll schools that are appropriate to the grade that the Ministry of Education wishes.

Even though the objective of this study was to investigate the association of fertility and child educational attainment, there were some interesting outcomes from the analysis when considering the control variables. For example:

1. There was a difference in child education between boys and girls in the rural area of northeastern Thailand. Thus, for the rural areas of the northeastern Thailand, the girls should be promoted to enroll in higher than compulsory education.

2. There was a positive association between child educational attainment and production resources. According to the findings, if peasant families could use the land for cultivation more than once a year, the increased production could improve the family finances and it could have some positive impact on child education. As a result, some measures to help peasant families to use the land more than once a year should be implemented.

In this study it was found that children who lived in a village whose major dialect was Lao had lower education than those who lived in the villages whose major dialect was Thai Korat. Therefore, it is interesting to investigate the reason why children in Lao villages had lower education than those who lived in Thai Korat villages. The result could provide some information that enables children who live in Lao village to attend school. The emergency measurement that should be performed is that education office in Nang Rong should promote children in villages whose major dialect is Lao to enroll in education higher than compulsory education.

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APPENDIX

1. Results from the analysis when allowed the computer software automatically dropped the cases those had some missing data of independent or control variables

Table 12 Descriptive statistics of child factors, family characteristics, the school accessibility variable and the community context of children 7 to 13 years of age in Nang Rong, 1984 (allowed the computer software automatically dropped the cases those had some missing data).

Variables	Minimum	Maximum	Mean	Std. Deviation
1. Child educational attainment in 1994	0	16	6.72	2.22
2. Age	7	13	9.97	1.98
3. Male	0	1	0.51	0.50
4. Children ever born (in persons)	1	13	5.47	2.40
5. Mother's education 0 – 3 years	0	1	0.13	0.33
6. Amount of land owned, in rai	0	90	22.05	20.37
7. Amount of land used, in rai ^{1/}	0	90	23.38	17.96
8. Nuclear family	0	1	0.71	0.46
9. Family had activities to earn extra income beside their main occupation	0	1	0.06	0.24
10. Child dependency ratio	0.11	3.50	1.22	0.68
11. Distance from village to secondary school (kms.)	2	37	15.71	7.17
12. A canal or stream is near the village	0	1	0.27	0.44
13. Major dialect is Khmer & Suai	0	1	0.06	0.23
14. Major dialect is Lao	0	1	0.21	0.41
N = 5,482				

Note ^{1/} Number of cases = 5,417

Reference groups: female, mother's education was 4 years or higher, non nuclear families, families did not have activities to earn extra income, no canal or stream near the village, major dialect in the village was Thai Korat.

Table 13 Pearson correlation coefficient and number of cases of children, family, school accessibility and community characteristics of children 7 to 13 years of age in Nang Rong, 1984 (allowed the computer software automatically dropped the cases those had some missing data).

	AGE	MALE	CEB	MOED0_3	NUCLEARH	INCOMES	LANDOW	LANDUS	CHILDDPEP	CANALSTR	D_KHMER	D_LAO
MALE	0.013											
N	a											
CEB	.144(**)	-0.001										
N	a	a										
MOED0_3	.029(*)	.043(**)	.156(**)									
N	a	a	a									
NUCLEAR	-0.01	-0.017	-.055(**)	-0.021								
N	a	a	a	a								
INCOMES	0.011	0.005	.034(*)	-0.02	-0.008							
N	a	a	a	a	a							
LANDOW	.086(**)	-0.015	.137(**)	-.029(*)	-.167(**)	0.019						
N	b	b	b	b	b	b						
LANDUS	.077(**)	-0.012	.168(**)	-0.016	-.150(**)	0.013	.831(**)					
N	b	b	b	b	b	b	5410					
CHILDDPEP	-.165(**)	0.023	-.161(**)	-.048(**)	.166(**)	-.044(**)	-.210(**)	-.198(**)				
N	a	a	a	a	a	a	b	b				
CANALSTR	-0.005	-0.022	0.005	-0.008	-0.001	0.003	-0.62(**)	-0.041(**)	0.006			
N	a	a	a	a	a	a	b	b	a			
D_KHMER	-0.005	0	.074(**)	.042(**)	0.018	0.007	.027(*)	.054(**)	.042(**)	.115(**)		
N	a	a	a	a	a	a	a	b	a	a		
D_LAO	0.002	0.017	.112(**)	.180(**)	-0.01	-.053(**)	0.02	0.025	.054(**)	-.075(**)	-.124(**)	
N	a	a	a	a	a	a	b	b	a	a	a	
VILL_NR	-0.019	0.011	.070(**)	.140(**)	.049(**)	-.099(**)	.052(**)	.066(**)	.030(*)	.035(*)	.150(**)	.456(**)
N	a	a	a	a	a	a	b	b	a	a	a	a

Note: * = p < .05, ** = p < .01 (Two tailed test)

Meaning of the abbreviations: CEB = children ever born (fertility of the child's mother), MOED0_3 = mother's education 0 - 3 years (=1), NUCLEARH = Nuclear family (=1), INCOMSRE = Family has some activities to earn extra income beside main occupation (=1), LANDOW = Amount of land owned in 1984 (in rai), LANDUS = Amount of land used in 1984 (in rai), CHILDDPEP = Child dependency ratio, CANALSTR = Village location (a canal or stream is near the village =1), D_KH_SUI = Major dialect is Khmer & Suai (=1), D_LAO = Major dialect is Lao (=1), VILL_N = Accessibility to school (distance from village to secondary school in kilometers)

Number of cases: a = 5,482, b = 5,438, c = 5,417

Table 14 Unstandardized regression coefficients and robust standard errors from multiple regression analysis on the impact of fertility on child educational attainment (allowed the computer software automatically dropped the cases those had some missing data).

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)
1. Age		-.012 (.018)			-.030 (.019)	-.032 [†] (.019)
2. Male		.217*** (.059)			.254*** (.060)	.258*** (.059)
3. Children ever born CEB)	-.114*** (.016)	-.112*** (.017)	-.127*** (.015)	-.098*** (.016)	-.124*** (.016)	-.111*** (.016)
4. Mother's education was 0 – 3 years			-.677*** (.090)		-.692*** (.091)	-.553*** (.093)
5. Amount of land owned, in rai			.018*** (.002)		.018*** (.002)	.019*** (.002)
6. Nuclear family			.016 (.086)		.027 (.085)	.037 (.086)
7. Families had activities to earn extra income out of main occupation			-.142 (.141)		-.144 (.143)	-.221 [†] (.133)
8. Child dependency ratio			-.127* (.058)		-.145** (.058)	-.110 [†] (.056)
9. Distance from village to secondary school (kms.)				-.011 (.012)		-.014 (.012)
10. A canal or stream is near by the village				-.091 (.149)		-.020 (.157)
11. Major dialect in the village was Khmer & Suai				-.395 (.243)		-.356 (.230)
12. Major dialect in the village was Lao				-.559** (.182)		-.450* (.179)
Constant	7.344*** (.122)	7.349*** (.178)	7.248*** (.170)	7.594*** (.177)	7.415*** (.221)	7.629*** (.222)
R ²	.015	.018	.058	.031	.062	.075
F	47.26***	22.00***	26.35***	21.32***	21.40***	16.93***
N	5,482	5,482	5,438	5,482	5,438	5,438

Note: [†] = p < .10, * = p < .05, ** = p < .01 *** = p < .001

Reference groups: female, mother's education was 4 years or higher, non nuclear families, families did not have activities to earn extra income, no canal or stream near the village, major dialect in the village was Thai Korat.

2. Results from the analysis when the cases those have missing data of fertility were replacing by mean of fertility

Table 15 Descriptive Statistics of child factors, family characteristics, the school accessibility variable and the community context of children 7 to 13 years of age in Nang Rong, 1984 (the cases those have missing data of children ever born were replacing by mean of the variable, 5.470084).

	Minimum	Maximum	Mean	Std. Deviation
1. Child educational attainment in 1994	0	16	6.67	2.21
2. Age	7	13	10.01	1.98
3. Male	0	1	0.51	0.50
4. Children ever born (in persons)	1	13	5.47	2.28
5. Mother's education 0 – 3 years	0	1	0.13	0.33
6. Amount of land owned, in rai	0	90	22.08	20.30
7. Amount of land used, in rai ^{1/}	0	90	23.36	17.94
8. Nuclear family	0	1	0.68	0.47
9. Family had activities to earn extra income beside their main occupation	0	1	0.06	0.24
10. Child dependency ratio	0.11	3.50	1.20	0.68
11. Distance from village to secondary school (kms.)	2	37	15.76	7.18
12. A canal or stream is near the village	0	1	0.27	0.44
13. Major dialect is Khmer & Suai	0	1	0.06	0.23
14. Major dialect is Lao	0	1	0.21	0.41
15. The cases are missing for "Mother's children ever born	0	1	0.09	0.29

N = 5,999

Note ^{1/} Number of cases = 5,970

Reference groups: female, mother's education was 4 years or higher, non nuclear families, families did not have activities to earn extra income, no canal or stream near the village, major dialect in the village was Thai Korat.

Table 16 Pearson correlation coefficient and number of cases of children, family, school accessibility and community characteristics of children 7 to 13 years of age in Nang Rong, 1984 (the cases those have missing data of children ever born were replacing by mean of the variable, 5. 470084).

	AGE	MALE	CEB	MOED0_3	NUCLEARH	INCOMES	LANDOW	LANDUS	CHILDDPEP	CANALSTR	D_KHMER	D_LAO	VILL_NR
MALE	0.013												
N	a												
CEB	.137(**)	-0.002											
N	a	a											
MOED0_3	0.024	.047(**)	.146(**)										
N	a	a	a										
NUCLEAR	-0.018	-0.02	-0.054(**)	0									
N	a	a	a	a									
INCOMES	0.013	0	.032(*)	-0.025	-0.006								
N	a	a	a	a	a								
LANDOW	.086(**)	-0.015	.131(**)	-0.032(*)	-0.165(**)	0.013							
N	a	a	a	a	a	a							
LANDUS	.076(**)	-0.012	.161(**)	-0.011	-0.145(**)	0.009	.833(**)						
N	b	b	b	b	b	b	b						
CHILDDPEP	-.159(**)	0.024	-.152(**)	-0.041(**)	.175(**)	-0.029(*)	-0.210(**)	-0.196(**)					
N	a	a	a	a	a	a	a	b					
CANALSTR	-0.002	-0.022	0.009	-0.01	0	0.005	-0.057(**)	-0.040(**)	-0.001				
N	a	a	a	a	a	a	a	b	a				
D_KHMER	-0.009	0.002	.071(**)	.052(**)	0.021	0.003	0.022	.048(**)	.043(**)	.118(**)			
N	a	a	a	a	a	a	a	b	a	a			
D_LAO	0.001	0.01	.103(**)	.188(**)	-0.001	-0.046(**)	0.025	.034(**)	.054(**)	-0.078(**)	-0.125(**)		
N	a	a	a	a	a	a	a	b	a	a	a		
VILL_NR	-0.018	0.006	.066(**)	.139(**)	.040(**)	-0.092(**)	.052(**)	.064(**)	.030(*)	.041(**)	.150(**)	.458(**)	
N	a	a	a	a	a	a	a	b	a	a	a	a	
MISSCH94	.054(**)	0.000	0.000	-0.022	-0.177(**)	0.000	0.004	-0.009(**)	-0.055**	0.016	0.006	0.009	0.016
N	a	a	a	a	a	a	a	b	a	a	a	a	a

Note: * = p < .05, ** = p < .01 (Two tailed test)

Meaning of the abbreviations: CEB = children ever born (fertility of the child's mother), MOED0_3 = mother's education 0 - 3 years (=1), NUCLEARH = Nuclear family (=1), INCOMSRE = Family has some activities to earn extra income beside main occupation (=1), LANDOW = Amount of land owned in 1984 (in rai), LANDUS = Amount of land used in 1984 (in rai), CHILDDPEP = Child dependency ratio, CANALSTR = Village location (a canal or stream is near the village =1), D_KH_SUI = Major dialect is Khmer & Suai (=1), D_LAO = Major dialect is Lao (=1), VILL_N = Accessibility to school (distance from village to secondary school in kilometers)

Number of case: a = 5,999, b = 5,970

Table 17 Unstandardized regression coefficients and robust standard errors from multiple regression analysis on the impact of fertility on child educational attainment (all models have an equal number of cases by replacing the cases those missing data of children ever born by mean of the variable, 5.470084).

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)
1. Age		-.014 (.017)			-.032 [†] (.018)	-.034* (.017)
2. Male		.193*** (.056)			.230*** (.057)	.230*** (.057)
3. Children ever born (CEB)	-.115*** (.017)	-.113*** (.017)	-.126*** (.015)	-.100*** (.016)	-.122*** (.016)	-.111*** (.016)
4. Mother's education was 0 – 3 years			-.647*** (.084)		-.663*** (.086)	-.517*** (.088)
5. Amount of land owned, in rai			.017*** (.002)		.018*** (.002)	.018*** (.002)
6. Nuclear family			.014 (.086)		.024 (.086)	.038 (.085)
7. Families had activities to earn extra income beside main occupation			-.081 (.134)		-.080 (.135)	-.149 (.120)
8. Child dependency ratio			-.100 [†] (.056)		-.117* (.058)	-.083 (.058)
9. Distance from village to secondary school (kms.)				-.012 (.012)		-.015 (.012)
10. A canal or stream was near by the village				-.084 (.153)		-.028 (.159)
11. Major dialect in the village was Khmer & Suai				-.335 (.261)		-.300 (.248)
12. (Major dialect in the village was Lao				-.517** (.181)		-.427* (.179)
13. Missing data of children ever born	-.452*** (.092)	-.447*** (.091)	-.483*** (.098)	-.437*** (.093)	-.471*** (.098)	-.445*** (.100)
Constant	7.345*** (.124)	7.379*** (.168)	7.219*** (.161)	7.605*** (.179)	7.412*** (.213)	7.634*** (.231)
R ²	.018	.020	.056	.033	.060	.071
F	40.06***	23.00**	23.82***	21.55***	19.65***	14.70***
N	5,999	5,999	5,999	5,999	5,999	5,999

Note [†] = p < .10, * = p < .05, ** = p < .01 *** = p < .001

Reference groups: female, mother's education was 4 years or higher, non nuclear families, families did not have activities to earn extra income, no canal or stream near the village, major dialect in the village was Thai Korat.

3. Results from the analysis when the children who had educational attainment lower than grade 6 were dropped

Table 18 Descriptive Statistics of child factors, family characteristics, the school accessibility variable and the community context of children 7 to 13 years of age in Nang Rong, 1984 when consider only on the children who had educational attainment higher than six years.

Variables	Minimum	Maximum	Mean	Std. Deviation
1. Child educational attainment in 1994	7	16	10.82	2.06
2. Age	7	13	9.71	2.04
3. Male	0	1	.57	.50
4. Children ever born, in persons	1	13	4.92	2.32
5. Mother's education 0 – 3 years	0	1	.05	.23
6. Amount of land owned, in rai	0	90	28.53	23.02
7. Amount of land used, in rai ^{1/}	0	90	27.38	20.50
8. Nuclear family	0	1	.68	.45
9. Family has some activities to earn extra income beside their main occupation	0	1	.06	.23
10. Child dependency ratio	0.11	3.50	1.14	.63
11. Distance from village to secondary school, kms.	2	37	14.26	6.36
11. There was a canal or stream near the village	0	1	.25	.43
12. Major dialect is Khmer & Suai	0	1	.04	.20
13. Major dialect is Lao	0	1	.10	.30
N = 980				

Note ^{1/} Number of cases = 977

Reference groups: female, mother's education was 4 years or higher, non nuclear families, families did not have activities to earn extra income, no canal or stream near the village, major dialect in the village was Thai Korat.

Table 20 Unstandardized regression coefficients and robust standard errors from multiple regression analysis on the impact of fertility on child educational attainment when consider only on the children who had educational attainment higher than six years.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)	Coefficient (Robust Std.Err.)
1. Age		.227*** (.032)			.216*** (.035)	.216*** (.035)
2. Male		.039 (.140)			.090 (.141)	.092 (.143)
3. Children ever born, in persons	-.037 (.026)	-.064* (.026)	-.058* (.026)	-.026 (.026)	-.078** (.027)	-.069** (.026)
4. Mother's education 0 – 3 years			-1.044*** (.208)		-.974*** (.218)	-.932*** (.233)
5. Amount of land owned, in rai			.011*** (.003)		.011*** (.003)	.010*** (.003)
6. Nuclear family			-.052 (.133)		-.099 (.133)	-.100 (.127)
7. Families had activities to earn extra income beside their main occupation			-.209 (.287)		-.172 (.291)	-.154 (.310)
8. Child dependency ratio			-.112 (.113)		-.021 (.110)	-.012 (.107)
9. Distance from village to secondary school (kms.)				-.004 (.016)		.002 (.016)
10. A canal or stream was near by the village				-.123 (.201)		-.045 (.188)
11. Major dialect in the village was Khmer & Suai)				-.852 [†] (.484)		-.729 (.404)
12. Major dialect in the village was Lao				-.424 (.260)		-.352 (.264)
Constant	10.997*** (.133)	8.905*** (.285)	11.012*** (.219)	10.987*** (.207)	8.906*** (.373)	8.900*** (.393)
R ²	.002	.052	.035	.012	.080	.087
F	2.02	18.68***	9.37***	1.94	15.00***	11.65***
N	980	980	980	980	980	980

Note † = p < .10, * = p < .05, ** = p < .01 *** = p < .001

Reference groups: female, mother's education was 4 years or higher, non nuclear families, families did not have activities to earn extra income, no canal or stream near the village, major dialect in the village was Thai Korat.

BIOGRAPHY

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