The Impact of Fertility on Child Education in Rural Thailand

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Introduction

There are many debates about the precise nature of the relationship between fertility and the economy (Petersen, 1979; Entwisle, Hermalin and Mason, 1982; Keyfitz, 1972; Nomani and Rahnema, 1994) as well as the relationship between fertility and child education (Anh et al., 1998; Blake, 1985, 1986, 1989; Teachman, 1987; Knodel, Havanon and Sittitrai, 1990; Gomes, 1984). In a family, the impact of fertility on family financial status may be inconsistent. For example, children are dependent in the early stage of family formation. Parents have to feed and provide them with education. They have to spend a lot of times looking after children. The times that parents rear their children, especially when the children are young, are apportioned from the times of work. The parents may lose some opportunities to work and to earn income (Goode, 1982). In addition, a family that has a lot of children will have a lot of expenses. The income that they earn may not be enough to satisfy the family's level of consumption. Consequently, the funds left over for child education may be insufficient. In some cases, families those have fewer numbers of children may have a better

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financial status than those who have a more number of children. Therefore, the families those have fewer numbers of children can support their children study through higher levels than those who have a more number of children (Anh et al., 1998; Blake, 1985, 1986, 1989; Teachman, 1987; Knodel, Havanon and Sittitrai, 1990).

Most of the studies that have considered the relationship between fertility and child educational attainment looked at some associations between fertility, which was measured from the number of the child's siblings, and the number of years children are enrolled in school. And most of the results found that fertility and child educational attainment have an inverse association, when controlling for other family background factors i.e. family production resources and school accessibility variables (Anh et al., 1998; Blake, 1985, 1986, 1989; Teachman, 1987; Knodel, Havanon and Sittitrai, 1990). Nevertheless, there are some studies which found a positive relationship between fertility and child educational attainment after controlling for some community variables (Gomes, 1984). That is to say, the relationships between the two variables are still being debated.

The purpose of Thailand's population program that has proposed since 1970 is to reduce fertility. At the beginning of the program, many people's understanding is that high fertility would be an obstruction of social and economic development. It is easier to promote quality of life, such as family financial status and child education, of families those have low fertility. At present, most of the Thai families prefer small family. Parents need only one or two children. Thus, we would like to investigate that after Thai population's fertility decline, it made a distinctive difference on child education among children who live in families those their parents have different number of children or not.

According to the Thai society, many families want their children to study in schools because they wish their children to have better opportunities not only for getting good jobs, but also for having a successful future. Education is the primary means to improve a child's quality of life. Children who have a good education can have better opportunities for good occupations, good income, and can promote themselves to a

higher social class. But, the investment in child education is both the responsibility of the government and the family. However, for those families who have many children, upper level education could be a heavy burden for the parents, since only elementary education is free in Thailand (Ministry of Education, 1998). Parents of elementary school children have to pay only for the child's daily expenses such as meals, school uniforms, transportation, and educational stationary. Parents of children in levels beyond elementary school have to pay both daily expenses and tuition fee. Therefore, parents who have low incomes will have problems supporting their children's higher education. **The research question that drives our study is whether fertility affects child educational attainment in rural Thai families.** The answers to the research question will reveal understanding of whether education affects 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.

The study focuses on the population in rural areas because they represent the majority of the Thai population. In addition, residents of rural areas generally have low education and low income when compared to the population in urban areas (Office of the National Economic and Social Development Board, 1989a, 1989b, 1996; Ministry of Education, 1980, 1990). Therefore, there is a need to promote education for the children of peasant families in rural areas. Among the rural population in Thailand, those residents in the northeastern region are the poorest (Office of the National Economic and Social Development Board, 1989a, 1989b, 1996). For that reason, it is important to investigate the association of family size and child education in rural areas of the northeastern region of Thailand. To answer the research question requires longitudinal data. Longitudinal data provides information on family background before the completion of education. In addition, the main variable of this study is "fertility." Therefore, the longitudinal data should have some variation in fertility. During the period of time when fertility is in transition, some families limit the number of their children while the others maintain high fertility. For this reason, the study employs longitudinal data of Nang Rong Project, 1984 and 1994. The project was conducted by the Institute for Population and Social Research (IPSR), Mahidol University and the Carolina Population Center (CPC), The University of North Carolina at Chapel Hill.

Nang Rong district locates in Buriram, a province in the northeastern region, Thailand. In 1984, the total fertility rate (TFR) of the northeastern region was about 3.1. And in 1994, TFR of the northeastern region was about 2.44 (National Statistical Office, 1978, 1997). We may see the variation in the number of children that families had in Nang Rong data. In addition, the duration between the two data rounds is ten years. It is long enough **to investigate the impact of fertility on child educational attainment, the main objective of this study.**

Nang Rong is a district located in the southern part of the Korat plateau, 330 kilometers from Bangkok. The ancient Nang Rong had more area than at present. It became smaller because the government divided it into three districts: (new) Nang Rong, Chamni and Nonsuwan. In this study, Nang Rong refers to the area of Nang Rong in 1984, which includes the area before it was divided. In 2000, Nang Rong's population was 83,283, with 41,052 males and 42,231 females (Ministry of Interior, 2001). The majority of the population works in the agricultural sector. And most of the population here finished only at about primary level education.

The Nang Rong data sets were census of all individuals, households and communities in fifty-one selected villages. This study used information of the children, family and community's characteristic which measured in 1984 to determine the child education in 1994, following a cause and consequence model (Blalock, 1971). The 1984 characteristics are the causes, and child educational attainment in 1994 is the consequence. Duration of follow up is limited to ten years as this is sufficient time for children aged 7-13 in 1984 to have completed their education. Conceptual framework and some details about variables and their scale of measurement are as follows.

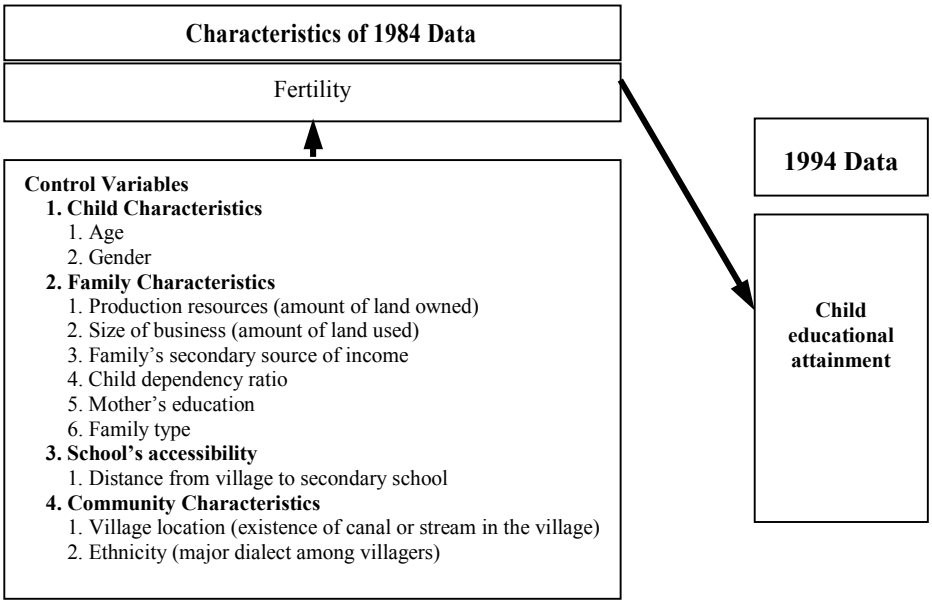
Conceptual framework

In this study, the main variable is fertility. It is measured from number of children ever born to the child's mother. The other four sets of variables are defined as control variables. They are the child characteristics, family characteristics, school's

accessibility and community's characteristics. Fertility and all the control variables are measure in the 1984 data, and child educational attainment is obtained from the 1994 data. Child educational attainment is measured from the number of years that children spent in school, counting only elementary education or higher (excluding kindergarten). **The hypothesis of this study is fertility has an inverse association with child educational attainment**. Diagram bellows describes expected relationship between independent variable and dependent variable after controlling for other family and community factors.

Figure 1

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



Methodology

This study applied Multiple Regression Analysis. The sample is children aged 7-13 years in 1984. Children who were seven in 1984 would be 17 in 1994. If they studied through to age 17, they would have completed at least grade 12. The children who were 13 in 1984 would be 23 in 1994. They could have completed a bachelor's degree if they attended school continuously between 1984 and 1994. Another reason for limiting the ages to a maximum of 13 in 1984 is that at that time the majority of children did not pursue their studies after the compulsory level of grade six. If the study included children older than 13, a high proportion of the sample would exhibit a constant educational attainment of six years in 1994. At the beginning of the follow up in 1984 there were 6,842 children aged 7-13 years. They were from 3,624 households. By 1994, 62 children died (0.91 percent) and 659 children (9.63 percent) were lost to follow up. The remaining were 6,121 adolescents and young adults. A further 57 cases were dropped from the analysis because of: 1) incomplete education information (7 cases), 2) outlier of extremely high child dependency ratio (38 cases), and 3) outlier of too high fertility (12 cases). The number of children remaining in this analysis is 6,064 children from 3,226 households. However, some children had missing data of one or more variables. The number of cases becomes 5,438 in this study.

As mentioned, the sampling for the Nang Rong data was undertaken by first selecting 51 villages to represent the Nang Rong district. The project then collected data from every person and every household in the sampled villages. The sample design, based on cluster sampling technique, can affect statistical analysis and it is necessary to correct standard errors in the regression model to account for the sampling error (Guilkey and Murphy, 1993). There is software that has an option of standard error correcting. The software is STATA. The software gives robust standard errors for multiple regression analysis. Information about variables i.e. the definition and explanation of the entire dependent, independent and control variables including scale of measurement are presented in Table 1.

Table 1: Variables' name, definition and explanation of all variables in the analysis of the impact of fertility on child educational attainment.

Variable	Definition	Explanation
1. Dependent Variable		
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. By that time, most of them would have finished high school, if conditions permitted. "Child educational attainment" is to measure complete education of the children.
2. Independent Variables		
1. Fertility	Number of children ever born of the children's mother	Only living children can consume or produce for families. However, some living children may have left home, and the families forgot to report them. In addition, the Nang Rong project of 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.
3. Control Variables		
I. Child Characteristics		
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 seven cohorts of children included in the analysis. During the seven years there may be some special events that affect child educational attainment.

Table 1: (continued)

Variable	Definition	Explanation
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 to higher grades than their daughters.
II. Family Characteristics		
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.
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. Family's secondary source of income apart from the main occupation	Activities to be counted are pig raising, fish pond, chicken farm, cloth weaving, bamboo and basket weaving, and vegetable garden. A family performs at least one activity will be classified as a family that has secondary source of income.	This variable also concerns family economy. It represents family's secondary source of income. Normally, peasant families get agricultural production only one or two times in a year. Therefore, their income is not continuous. The family's secondary source of 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.

Table 1: (continued)

Variable	Definition	Explanation
4. Child dependency ratio	(number of family members aged 0-14 in 1984)/(number of family members aged 15-59 in 1984)	Families who have a high dependency ratio will have many consumers but 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 play a major role in child rearing. Mothers who have high educations may know how to encourage their children succeed academically. 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 an extended family,	Children who live in extended families may receive some benefit from grand parents or other adults that assist them in studying. Therefore, children who live in extended families should have more opportunities to study in higher grade than children who live in nuclear families.
III. School's accessibility		
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 cost than those who reside in village far from school. They also save commuting time between home and school. Therefore, distance from village to secondary school should have an inverse association with child educational attainment.

Table 1: (continued)

Variable	Definition	Explanation
IV. Community characteristics		
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 irrigation and fishing. 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 • D_Thai • D_Kh_sui • D_Lao	Dummy variable Major dialect among villagers 1 = Thai Korat, 0 = otherwise (referrence group) 1 = Khmer and Suai 0 = otherwise 1 = Lao, 0 = otherwise	This variable is included as one of the control variables. It concerns the ethnicity of the study population. 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.)

Results

Before investigating the proposed objective, all the independent and control variables were checked for collinearity by examining Pearson correlation among variables (Gujarati, 1995). From the Pearson correlation matrix (not present here), 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 owned" is a better representative of family economy. The other variables have Pearson correlations no greater than 0.50. This indicates that there is no collinearity. Table 2 shows descriptive statistics of all the variables used in the study. To explore the impact of fertility on child educational attainment, five models of multiple regression analysis were used. Each model had a different examination purpose. Model 1 was the simple regression model. The purpose of this model is to examine only relationship between fertility and child education. This model presented the compound effect 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 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 3 shows multiple regression coefficient results for each model.

Table 2: 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.
1. Child educational attainment in 1994	0	16	6.72	2.21
2. Children ever born (in persons)	1	13	5.47	2.40
3. Age	7	13	9.97	1.98
4. Male	0	1	0.51	0.50
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

Table 2: (continued)

Variables	Minimum	Maximum	Mean	Std.
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 and 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 3: Unstandardized regression coefficients and robust standard errors from multiple regression analysis on the impact of fertility on child educational attainment

Variables	Model 1 Coefficient (Robust Std.Err.)	Model 2 Coefficient (Robust Std.Err.)	Model 3 Coefficient (Robust Std.Err.)	Model 4 Coefficient (Robust Std.Err.)	Model 5 Coefficient (Robust Std.Err.)
1. Age		-.011			-.032†
		(.019)			(.019)
2. Male		.217***			.258***
		(.059)			(.059)
3. Children ever born (CEB)	-.115***	-.113***	-.127***	-.100***	-.111***
	(.017)	(.017)	(.015)	(.017)	(.016)
4. Mother's education was 0 – 3 years			-.677***		-.553***
			(.090)		(.093)
5. Amount of land owned, in rai			.018***		.019***
			(.002)		(.002)

Table 3: (continued)

Variables	Model 1 Coefficient (Robust Std.Err.)	Model 2 Coefficient (Robust Std.Err.)	Model 3 Coefficient (Robust Std.Err.)	Model 4 Coefficient (Robust Std.Err.)	Model 5 Coefficient (Robust Std.Err.)
6. Nuclear family			.017		.037
			(.086)		(.086)
7. Families had activities to earn extra income besides the main occupation			-.141		-.221†
			(.141)		(.133)
8. Child dependency ratio			-.127*		-.110†
			(.058)		(.056)
9. Distance from village to secondary school (kms.)				-.011	-.014
				(.012)	(.012)
10. A canal or stream was near by the village				-.087	-.020
				(.149)	(.157)
11. Major dialect in the village was Khmer and Suai				-.384	-.356
				(.243)	(.230)
12. Major dialect in the village was Lao				-.544**	-.450*
				(.184)	(.179)
Constant	7.335***	7.336***	7.248***	7.600***	7.629***
	(.124)	(.182)	(.170)	(.179)	(.222)
R^2	.016	.018	.058	.031	.075
F	47. 71***	21.81***	26.35***	20.90***	16.93***
N	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 compound effect of fertility on child education without controlling for any other factors. It is 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 resulted in decline of .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 percent (goodness of fit = 0.016). The other 98.4 percent was the impact of the other variables that were not included in this analysis. The constant of Model 1 was about 7.3. This means the average of child educational attainment of children in Nang Rong, who were 17 and 23 years old in 1994, was about seven years. Most of them finished only compulsory education. Very few of them completed secondary school or college.

Looking at Model 2 that 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. As for 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. For gender issue, there should an investigation by controlling for gender of sibs, or control by family of boys only, girls only and mixed boys and girls to see the influence of gender on child educational attainment. Unfortunately, the data sets are not available for the analysis. In this model, age seemed to have an inverse relationship with child educational attainment. However, it was not statistically significant. 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 six 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 percent. The other 98.2 percent was the influence of the other variables that were not included in this model. That is to say, goodness of fit increased when adding child characteristic into the model. 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, 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 educational attainment will not increase when mothers had a lower education level. The production resources that were measured from 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 from children ever born impaired child educational attainment because child education entails costs that a family has to pay. It is a heavy burden to let all children have an education beyond the compulsory level. Thus, most families that had many children had to give their children less education than a family that had fewer children.

Regarding mother's education, children who had mothers who did not complete grade four, the compulsory level of education of Thailand around 1960–1978[1], had lower education than children who had mothers who completed grade four or higher. This might be because the child's mother did not have any experience of the benefits of education. In addition, the mothers who have lower education than four years may be poorer than the mother who complete grade four or higher. Therefore, they could not 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 in terms of the amount of land owned, showed an interesting impact on child education. The families that had more production resources had better finances than families that had fewer production resources. A

family that had more production resources could thus support their children through higher levels of education. The study showed that every 55 rai of land owned by a family increased the length of a child's education by one full year. Regarding the child dependency ratio, the higher the child dependency ratio the more consumers a family had and the fewer producers. Thus, child dependency had inverse association with child educational attainment.

When look at Model 4 and investigated the impact of fertility after controlling for the accessibility to school factor and community context such as distance from village to secondary school, whether or not the village was located near a canal or stream, and ethnicity. It was found that fertility still 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 their educational advancement.

Looking at the control variables in the model, i.e. "major dialect in the village was Khmer and 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 originated from the blending of the central Thai group and Thai-Lao group of the northeast (Premsrirat, 1999; Suwannapat, 2001). As their ancestors military personnel from the center of Thailand who were familiar with the benefits of education, belief in the value of education might be transferred to their descendants. Therefore, they assisted their children to study higher than the children who live in Lao villages. Besides, Lao populations in Nang Rong are new settlers when compare to the Thai

Korat. They may live in remote area that far from secondary school and posses hilly non-fertile soil. Therefore, many Lao's families can not support their children study in school beyond compulsory education.

Considering goodness of fit, the four variables could explain the variation of child educational attainment by about three percent (R^2= .031). The other 97 percent 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 effect on child educational attainment. In this model, the constant was not different from Model 1 to Model 3. It was about 7.6.

Even though the impact of fertility on child educational attainment is clearly found from Model 1 and Model 4. However, it is important to examine its consequences when controlling for the child's individual characteristics such as 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. Because many scholars had found that they have both negative and positive impact on child education (Anh et al., 1998; Murnane, Maynard and Ohls, 1981; Richardson and Skinner, 1990; Shavit, 1990). The results of Model 5 show that 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 weak. Fertility, age, gender, the other five family context variables and the other three community context variables could explain child educational attainment by about 7.5 percent. The other 92.5 percent 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 the government's

policy. In Thailand, the Ministry of Education stated that all Thai students who have graduated from grade 6 should enroll in secondary school every year. The children's 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 increase of land own will increase his/her children's education.

In this study, the child dependency ratio had an inverse association with child educational attainment, as expected. All models including child dependency ratio into the analysis found that a high child dependency ratio decreased child educational attainment. Interestingly, children who lived in families that had secondary source of income had lower educational attainment than those who lived in families that lacked secondary source of income. This finding was unexpected. It might be because secondary source of income did not really help the family economy but reflecting poverty. There is also the possibility that secondary source of income demand more child labor, thereby taking children out of the school environment and into the work environment. 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. Considering the level of goodness of fit (R^2), it was not 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).

Discussion

The results of the analysis lead us to accept 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 et al. (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 results that fertility 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 five models shown in Table 3, the goodness of fit of each model was quite 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 5, the goodness of fit became .075. It was almost five times larger than the goodness of fit of Model 1. Therefore, 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 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 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 than those who lived in families that possessed little land.

The results of the study which found very slightly an inverse association between fertility and child educational attainment, 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 the level compulsory education, there should be some initiatives to help the children in rural areas who have many siblings. Otherwise, the children can not enroll in schools that are appropriate to the level 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 school 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 finance 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.

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Note

1 Most urban areas and some rural areas where schools available, compulsory education became 7 years in 1960-1978

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