



THE EFFECTS OF PRIVATE TUTORING ON
ACADEMIC ACHIEVEMENT IN THAILAND

BY

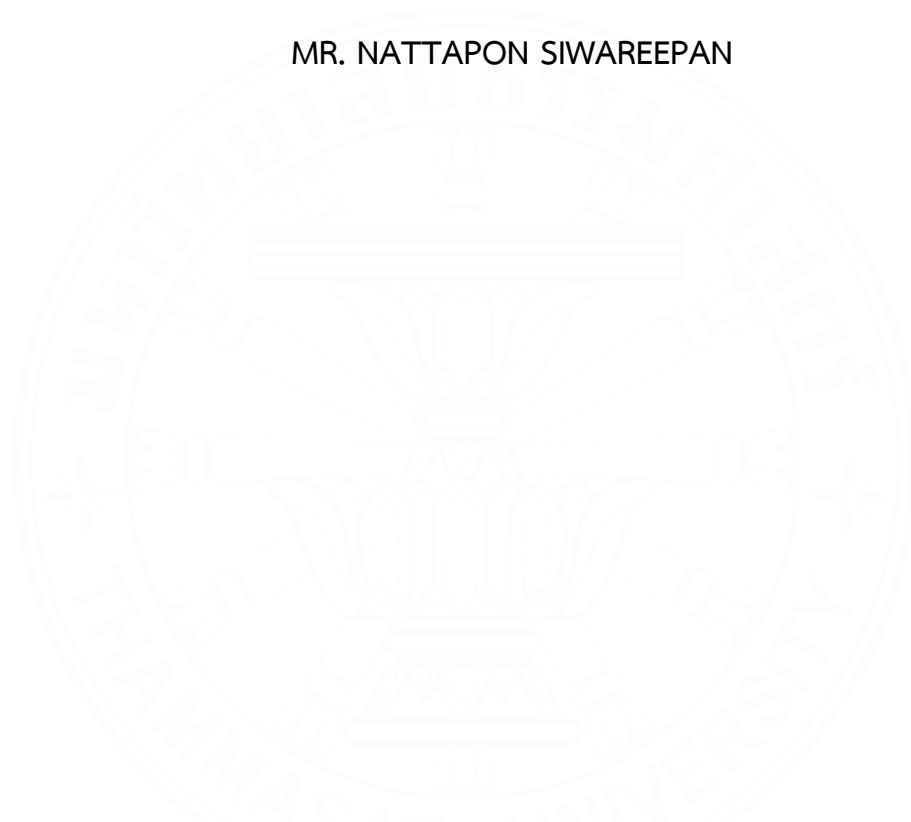
MR. NATTAPON SIWAREEPAN

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ECONOMICS
(INTERNATIONAL PROGRAM)
FACULTY OF ECONOMICS
THAMMASAT UNIVERSITY
ACADEMIC YEAR 2020
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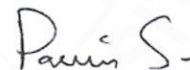
ENTITLED

THE EFFECTS OF PRIVATE TUTORING ON ACADEMIC ACHIEVEMENT IN THAILAND

was approved as partial fulfillment of the requirements for
the degree of Master of Economics (International Program)


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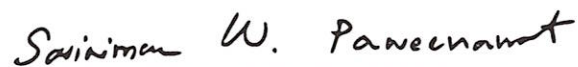
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ABSTRACT

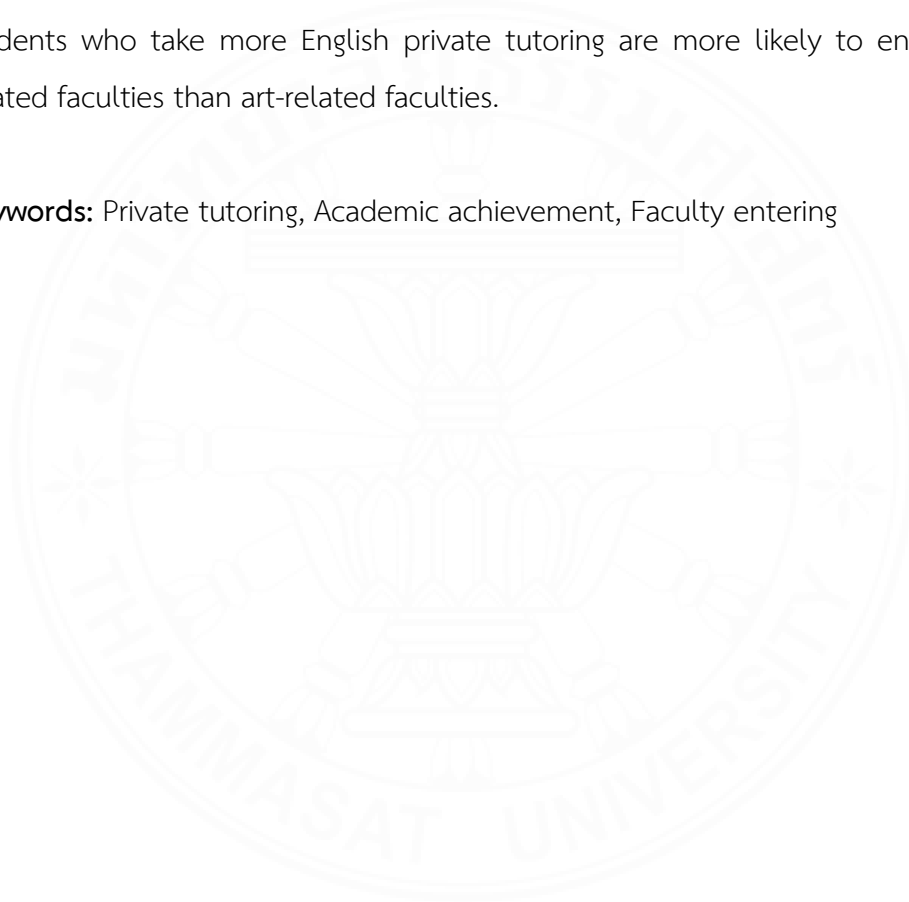
This study attempts to understand the private tutoring situations in Thailand using survey techniques via an online questionnaire on Mathematics and English tutoring. The data was collected from 412 Bachelor's degree students in Thailand. The result shows that 310 students (75.24 percent) took private tutoring in both Mathematics and English, 46 students (11.17 percent) did not take any private tutoring in neither subject. Furthermore, 37 students (8.96 percent) took only Mathematics private tutoring and 19 students (4.61 percent) took only English private tutoring.

To analyze the effect of private tutoring on students' academic scores, the two-stage least square with the instrumental variable is used to correct the endogeneity problem from a two-way relationship between students' academic scores and private tutoring participation. The results reveal that Mathematic and English tutoring help increase the students' O-net scores when compared to those who have not taken any tutoring. Furthermore, the more English tutoring received, the higher English O-net score. However, unlike English, the Mathematics O-net score does not go up in proportion to the amount of time spent on private tutoring. Whereas students with higher O-net scores are likely to progress more significantly than students with

lower O-net scores. This shows the inequality of academic outcomes due to private tutoring.

In addition to the O-net score, faculty entering is used to measure the academic outcome. The multinomial logistic regression is used to investigate the effect of private tutoring on faculty entering into Bachelor's degree programs. The results show that students who take more private tutoring in Mathematics subjects are more likely to enter science-related faculties than social science-related faculties. And students who take more English private tutoring are more likely to enter science-related faculties than art-related faculties.

Keywords: Private tutoring, Academic achievement, Faculty entering



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Nattaopon Siwareepan



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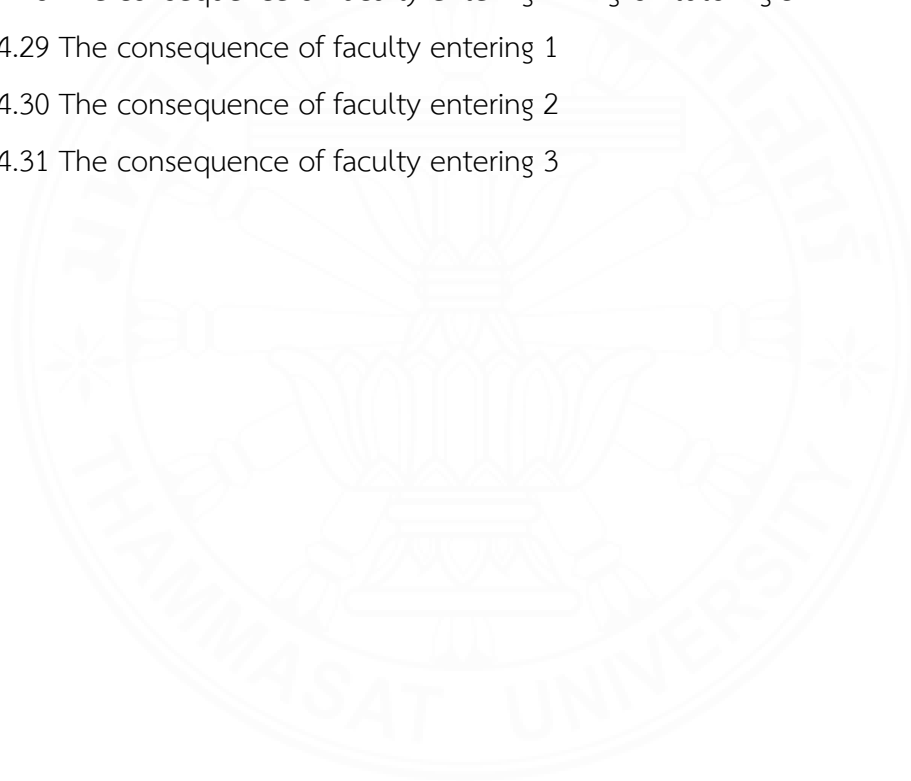
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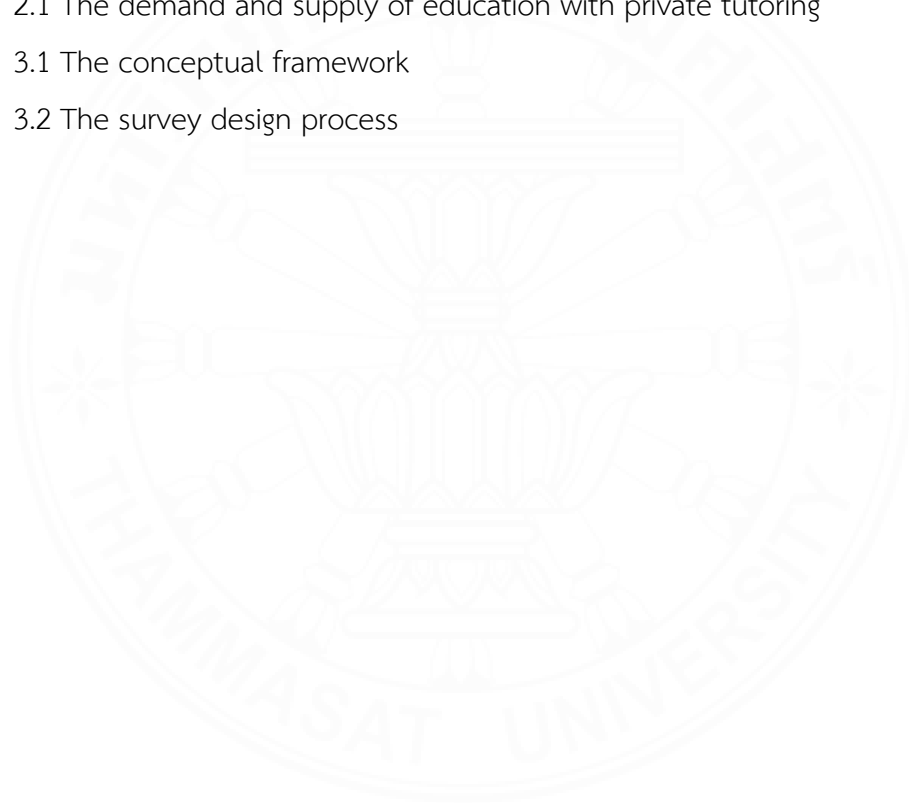
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CHAPTER 1

INTRODUCTION

1.1 Statement of problem

Education has been one of the most important activities in human life. The investment toward education allows the growth of human capital that can increase individual productivity, which leads to greater individual earning and economic growth. The educational sector does not only provide mainstream schools but also supplementary schools. Most previous studies focused on how to improve the quality of mainstream schools for the development of student outcomes and labor market outcomes. However, there is a lack of studies that focus on supplementary school. The supplementary school is an interesting area of education because students can acquire more skills and knowledge to strengthen their human capital from supplementary school.

Investment in education can improve labor productivity, which helps countries to be able to escape the middle-income trap. Thailand has been stuck in the middle-income trap for a long period of time already as a result of the abilities of competitions that are not adequate, such as education, innovation, technology, and infrastructure. The average education of the Thai population is merely within middle school knowledge. As a consequence, the development of innovation and technology in the country has been at a slow pace because of the low quality of human resources. (Bank of Thailand, 2017)

The educational sector in Thailand is invested mostly by the government of approximately 20 percent of the total government budget (figure 1). With that said, the quality of education in Thailand is quite not good. The quality is represented by standard test scores such as the PISA score test and O-net score test in figure 2. The PISA tests do not direct link to the school curriculum. The tests are designed to assess to what extent students at the end of compulsory education have the ability to apply their knowledge to real-life situations and be equipped for full participation in society.

(Organization for Economic Co-operation and Development, 2019). Figure 3 shows O-net test scores collected from grades 12 students. The test's primary concern is to test the students' knowledge and ability to think in accordance with the Basic Education Core Curriculum (National Institute of Educational Testing Service, 2014). In both scores, PISA and O-net, represent the low quality of education in Thailand as O-net scores turn out to be less than half in every examination of the year. Moreover, Thailand's PISA score performs consistently below the international average in every subject. Therefore, the results demonstrate that Thai students are underperforming when compared to other participating countries in the evaluation.

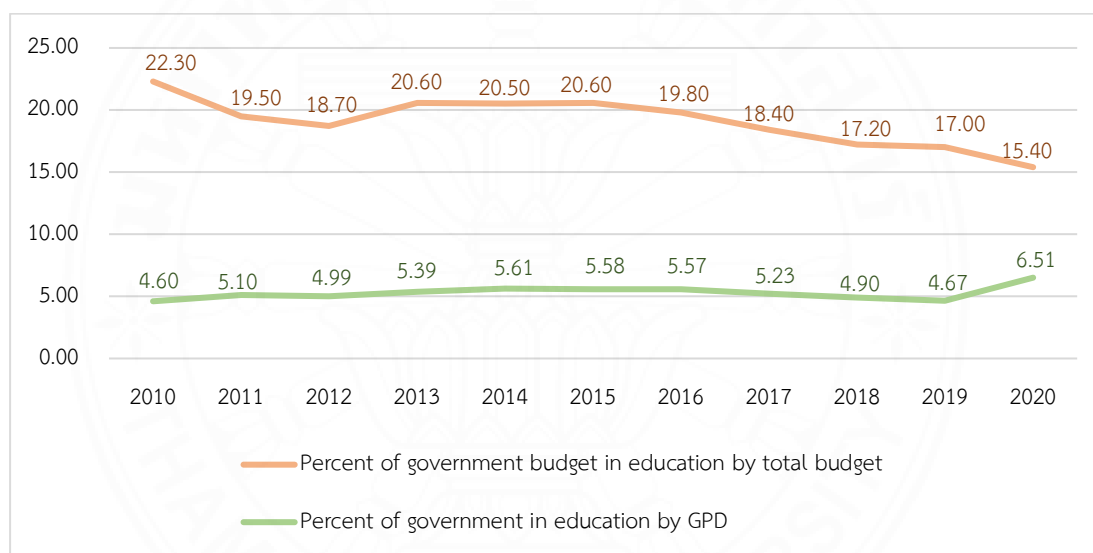


Figure 1.1 Thailand government budget in education

Source: Author's calculation based on Thailand education statistic by Ministry of Education.

Accordingly, students apparently not only study in mainstream school but also would like to study in supplementary school to enhance their performance. The definition of supplementary school has 3 criteria for private tutoring that are 1) Supplementation: Some subjects are not taught in mainstream school, however, some people wish to study as they have interests or development in this subject. 2) Privatizes: The students want to be provided with private education because of the privacy of the interaction between the tutors and the students to show whether or

not the students are able to understand the content. 3) Academies: Tutors are commonly perceived as people who assist students to carry the heavy academic load of formal school. (Lee, 2013)

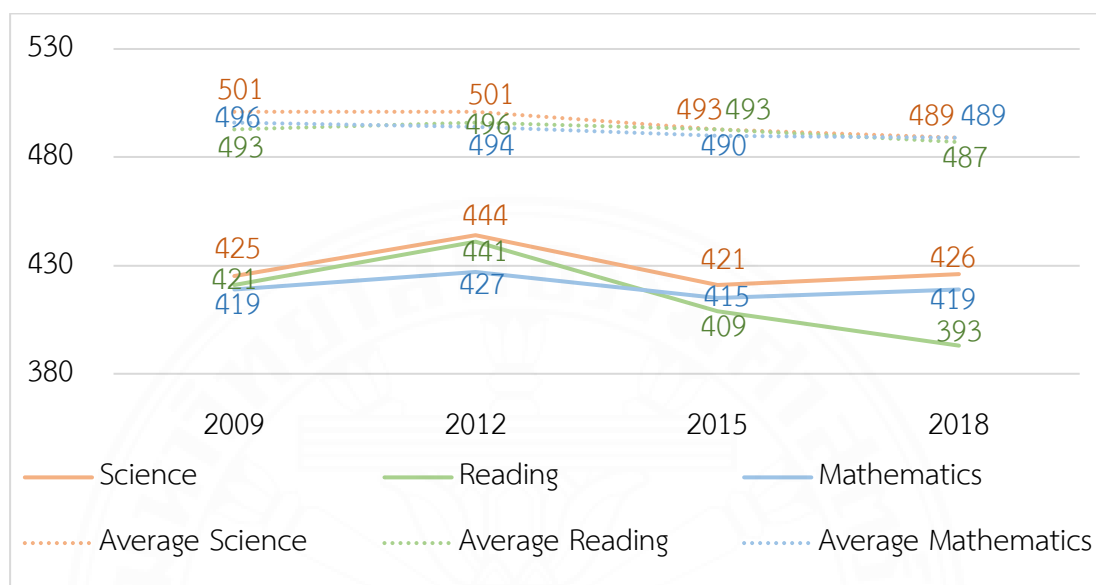


Figure 1.2 Thailand PISA score

Source: Author's calculation based on PISA Database by Organization for Economic Co-operation and Development.

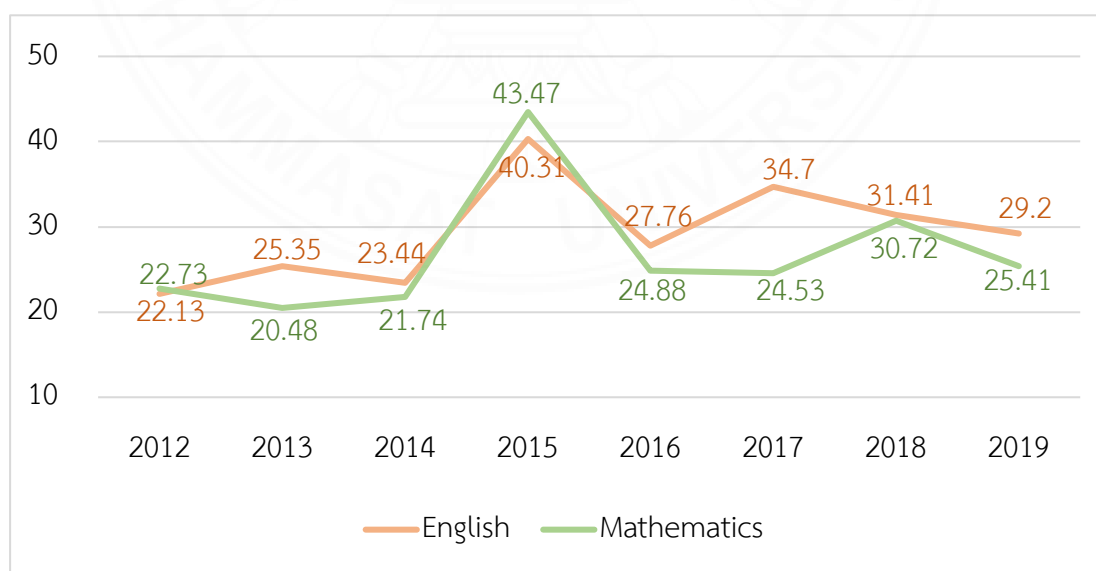


Figure 1.3 Thailand O-net score

Source: Author's calculation based on O-net score statistic by National Institute of Educational Testing Service.

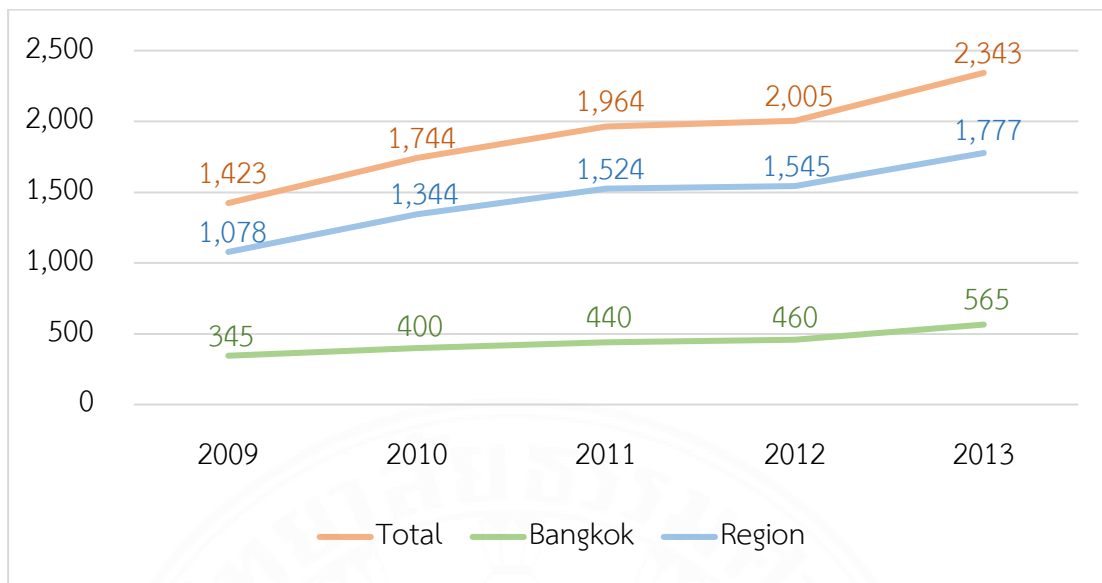


Figure 1.4 Number of private tutoring school in Thailand

Source. Author's calculation based on the private tutoring school's statistic by Thai publica.

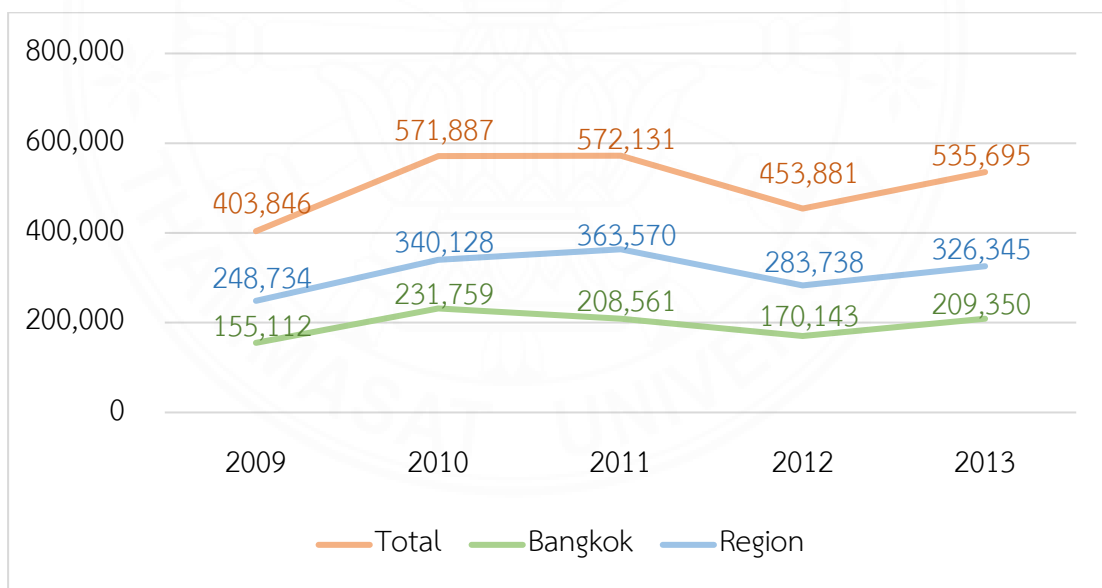


Figure 1.5 Number of students that enroll in private tutoring in Thailand

Source. Author's calculation based on the quality of education statistic by Thai publica.

Supplementary schools and private tutoring schools appear at all educational levels, which makes the private tutoring sector expand in many countries. There are several possible reasons for the existence of private tutoring. Most students

want higher achievement in education, including passing an examination in public school, preparing for university entrance examinations, and improving their grade average. The types of private tutoring do not only involve one-to-one tutoring but also group classes (Russell, 1997). Private tutoring is not solely a unique issue within developing countries but can occur worldwide. The demand for private tutoring appears at all levels of education, although students may have different perceptions towards private tutoring. Some students prefer enrolling in private tutoring by themselves, whereas other students are forced by their parents to participate in private tutoring.

However, private tutoring in Thailand has been very popular and can occur in every province. Figure 4 provides statistics to reveal that private tutoring schools have been a growing phenomenon in Thailand. And figure 5 shows that the statistics of demand for private tutoring has been a gradually increasing trend. Both statistical pieces of evidence concluded that the private tutoring sector in Thailand has been expanding every year and at every level of education because most Thai students are becoming aware of their educational performance. The growth of private tutoring in Thailand can reflect the quality of mainstream schools that are unable to push students forward to their goals. If students invest in private tutoring to increase their GPA, it reflects that the students do not understand the contexts that are taught in mainstream schools. And if students study in private tutoring to prepare for the entrance exam, it may indicate that students or parents are more concerned with the test score, implying that the students do not understand the details taught in mainstream schools in order to apply for the test.

If private tutoring is very popular because of both the quality of mainstream schools and non-understanding contexts of students in mainstream schools, which represents the failure of the education system. Bray and Lykins (2012) studied that some policymakers have achieved in mainstream school curriculum reforms. Whereas, the reforms sometimes have unexpected results. Therefore, policymakers should learn from experience. The government cannot manage these problems alone, it is important to have partnerships such as mainstream schools,

teacher unions, and the tutoring industry. In some countries, the cooperation of the tutoring industry with the government for extensive social welfare.

Although students prefer to enroll in private tutoring schools, the expenditures for private tutoring are very expensive. When comparing the education expenditures of high school students between mainstream schools and private tutoring schools, which found that private tutoring schools are 2 times more expensive than mainstream schools. The average tuition fees are around 9,000 baht per semester, whereas the average fees of private tutoring schools are around 15,000 baht per semester, with an additional 3,500 bahts if students enroll in courses for university preparation. Moreover, if the students prefer to study in a private class or one-by-one tutoring, the expenditures per student are around 250 to 300 baht per hour (Thai Publica, 2013). Due to the cost of private tutoring schools being quite expensive, some families do not have enough ability to provide access for their child to a private tutoring school. Because of this, private tutoring does not necessarily have accessibility to all students. Therefore, it shows the education inequality of private tutoring schools.

Students in Thailand have been facing educational competition in both high school and middle school. In high school, students are facing competition to the entrance in university by acquiring high-grade point average (GPA) and scores of several standard tests such as the Ordinary National Education Test (O-net), administered annually by the National Institute of Educational Testing Service to test the knowledge and thinking ability in 5 subjects that are Thai language, Mathematics, Science, Social Studies, and Foreign languages for students in grade 6, grade 9, and grade 12 (National Institute of Educational Testing Service, 2014). Most students are aware of their academic achievement, which makes them prefer enrollment in private tutoring in order to achieve their achievement goals.

Private tutoring has several impacts. The most obvious impact is academic achievement. Most people think that private tutoring has a positive impact on academic outcomes. However, the achievement depends on both the quality of the tutor and the student's potential. If students have good skills but low ability to learn, then private tutoring might not be efficient. Moreover, private tutoring creates social inequalities because wealthy families can afford higher quality and more quantities of

private tutoring school than unwealthy families. Lastly, private tutoring not only creates academic achievement and social inequality but also generates broader skills and values, which develop student's self-esteem and sense of achievement. Besides, in this industry might have some corruption, some teachers provide extra private classes to reveal examination questions in those classes (Bray and Lykins, 2012).

Private tutoring impacts academic achievement. Academic achievement is measured in several ways such as, grade point average, national examination score, faculty entering, university ranking, etc. Thus, this thesis attempts to understand the tutoring behavior of students and demonstrate the consequences of private tutoring on academic achievement in the aspect of O-net score and faculty entering.

1.2 Objectives

This thesis would like to examine private tutoring behavior in Thailand, specifically academic subjects in Mathematics and English. The analysis data obtained from the survey technique to answer the research questions as follow.

1.2.1 The impact of private tutoring on academic outcome

Student' academic achievement is measured by students' O-NET scores in Mathematics and English, which will be utilized to investigate the relationship between private tutoring and students' academic outcome in Thailand.

1.2.2 The impact of private tutoring on educational inequality

This thesis would like to examine the heterogeneous effect of private tutoring on students' academic outcomes via the different academic outcome levels in Mathematics and English.

1.2.3 The impact of private tutoring on faculty entering.

Academic achievement is measured by faculty entering in bachelor's degree. This thesis would like to investigate the effect of private tutoring in Mathematics and English in terms of the faculty entering in bachelor's degree.

CHAPTER 2

REVIEW OF LITERATURE

This chapter describes the private tutoring phenomenon of theoretical literature and previous studies in several countries about the influence of private tutoring on students' academic achievement (students' outcomes and faculty entering) and the inequality of academic achievement. Subsequently, the last section analyses the gaps of previous research to fulfill this thesis.

2.1 The theoretical literature

2.1.1 The education production function

An education production function is a relationship between school and student inputs and a measure of school output. An education production function relates educational inputs to the encouragement of productive ability. This part will discuss the relationship between school inputs and measures of outputs.

The education production function is far more complex than this and includes many more variables. An early study of the education production function is explained in several ways, as following

First, Bowles (1970) explains the relationships between scholastic inputs and achievement scores. An education production function is defined as

$$A = F (X_1, \dots, X_M, X_N, \dots, X_V, X_W, \dots, X_Z) \quad (2.1)$$

Where A is some measure of school output, such as a score on scholastic achievement. X_1, \dots, X_M are variables measuring the school environment, including the amount and quality of school facilities, teacher services, etc. X_N, \dots, X_V are environmental influences on learning outside the school, such as parents' education and etc. X_W, \dots, X_Z are student's abilities.

Second, Psacharopoulos and Woodhall (1993) argued that a simple educational production function would be

$$A = F(T, B, E, \dots \text{ and so on}) \quad (2.2)$$

Where A is an achievement, T is a teacher-student ratio, B is books and other materials, E is equipment, and so on.

Third, Glewwe and Kremer (2006) studied the structure of education production function represented as

$$A = a(S, Q, C, H, I) \quad (2.3)$$

Where A is the performance of the student, S is the number of years of schooling, Q is the school and the teacher characteristics, C is the student characteristics, H is a vector of household characteristics, and I is educational inputs under the control of parents (such as children's daily attendance or purchases of textbooks, etc.)

However, this framework can explain the aspects of private tutoring. For example, this framework can explain the factors that impact academic achievement by adopting private tutoring into the function. Therefore, this research will apply the education production function of Glewwe and Kremer (2006) to investigate all of the research questions.

2.1.2 Demand and supply of education with private tutoring

Dang & Rogers, (2008) presented the simple framework of demand and supply of education for a typical household in the case where private tutoring is available as shown in figure 6.

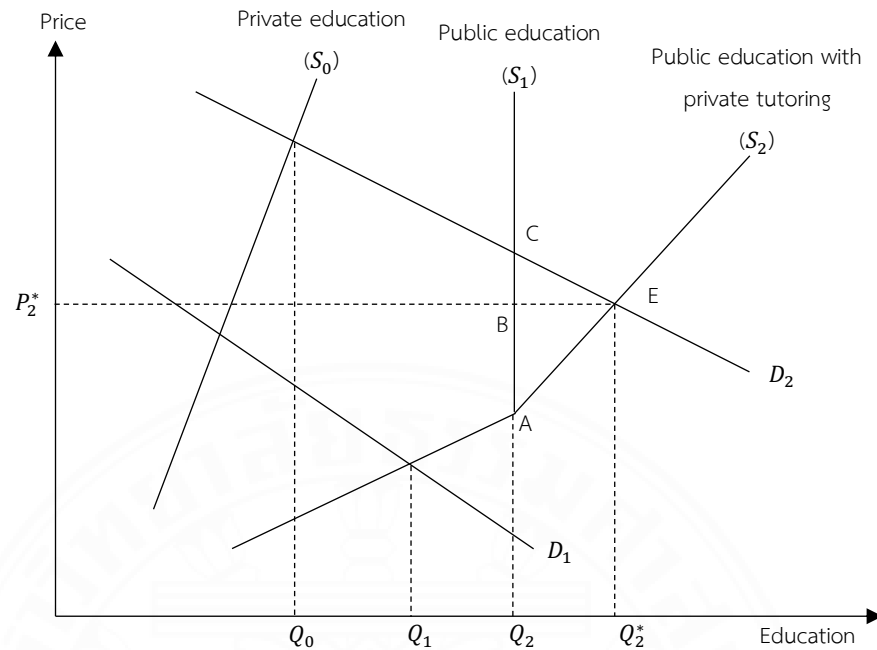


Figure 2.1 Demand and supply of education with private tutoring by Dang, H. A., & Rogers, F. H. (2008). *The World Bank Research Observer*, 23(2), 161-200.

From figure 2.1, assume that 3 supply curves of education, S_0 , S_1 and S_2 represent private education, public education, and public education with private tutoring, respectively. S_0 is placed on the left-hand side when compared with S_1 and S_2 because private education has higher costs. S_0 has greater inelasticity in price because parents are less sensitive to the price of education to sending their children to enroll in private school. S_1 has an upward slope until at point A and line becomes a perfect inelasticity because public schools reach their capacity limit, as a consequence, preventing them from offering as much education in terms of both quantity and quality. S_2 shares a common positive slope with S_1 until at point A, at which point the slope will be steeper because the cost of private tutoring is greater than the cost of public school.

The household demand for education is represented by either D_1 or D_2 . Although schools provide free tuition fees, households also have costs to send their children to school. D_1 is the demand curve of less-income households. However, D_2

represents high-income households, stronger education preferences, and higher expectations of future returns.

The quantity of education at equilibrium is determined by the intersection between demand and supply curves. For example, if the household D_2 the amount of private education the household consumes Q_0 units and the amount of public education consumes Q_2 units. In the presence of private tutoring, the same household can consume Q_2^* units which is a larger amount of education when being compared to Q_2 .

This framework is only a basic concept. It incorporates certain assumptions that may not always be valid. The assumption of this framework is that the markets for private tutoring are competitive and that households are independent to choose whether to take tutoring courses or not. And the second assumption is that public schooling reaches a limited capacity after a certain point.

However, this framework fails to explain several aspects of private tutoring. For example, this framework cannot explain the demand for private tutoring by students in private schools. Moreover, the price of education at equilibrium is unobservable in real life. Therefore, we are not able to apply this framework to further investigate the aspect of private tutoring.

2.2 The empirical literature

2.2.1 The determinants of academic achievement

Academic achievement is measured in several ways, such as grade point average, national examination score, faculty entering, university ranking, etc. The determinants of academic achievement presented that variations in inputs of education affect educational output. The relationship between educational inputs and academic achievement can be analyzed from several perspectives.

Psacharopoulos and Woodhall (1993) summarize that investment in school inputs affect the increase in student outcome. The schooling inputs have a weakly insignificant impact on student achievements such as school class size or teacher salaries. The achievement is more correlated with textbook availability than

other measures of school inputs. Other school variables which impact student achievement are teacher attributes and physical factors (including the availability of libraries, visual aids, and basic equipment). Whereas, home background and individual personality have a strong significance on student achievement. The teacher-student ratio has not shown a significant relationship with student achievement. But the important factor is teacher qualifications. Moreover, social-economic status has much less effect on student achievement in developing countries than in developed countries.

Verstegen and King (1998) found that the teacher characteristics in terms of teacher ability and teaching experience have a strong and consistent relationship with student achievement. The lower school class size is also significant to student performance. The number of students per teacher is a very important factor at the primary school level.

Valentine and Cooper (2004). Studies investigate the correlation between self-beliefs, and achievement. The result found that self-concept, self-efficacy, and self-esteem have a positive effect on academic achievement.

Motivation is separated into 5 parts, which are self-efficacy, work ethic, competitiveness, intrinsic motivation, and extrinsic motivation. Consequently, the motivation factors which have a positive correlation with grade point average are self-efficacy and extrinsic motivation. Moreover, the school climate and family environment have a positive correlation with academic achievement. However, a strong correlation between ability and academic achievement. Whereas, when the participants were separated into 2 groups, by race, which found that ability and academic achievement have a positive effect only for black students but not for white students. (Niebuhr, 1995)

Salam, Paul, Tabassum, Mahmud, Ullah, and Rahman (2018) study the factors which influence academic achievement. The results found that the number of courses has an effect on grade point average in a positive direction via the pressure of studies. When students fail the exam or fail to understand the contexts, then students can take more classes from tutorials to help them to understand the topic in school. Moreover, teachers' and parents' factors are factors that can help students

to improve performance, such as parental guidance. Whereas, students have depression, stress levels, family issues or immense pressure, etc. which affect student performance.

Sangkalan and Laeheem (2014) found that gender has a significance in academic achievement, Male students have lower academic outcome than female students because female students spend much more time on academic activities than males. If students have insufficient rest, which leads to poor health, class absenteeism, and then low academic abilities. Moreover, students' responsibility has a positive effect on grade point average. Students with low responsibilities tended to pay less attention in school class than high responsibility students, such as lack of class attendance, no submission, or late submission assignments. Furthermore, the quality of instruction has a statistically significant positive relationship with academic achievement. It means instructors do not generate low achiever students by spending more time reviewing the lessons.

2.2.2 Demand for private tutoring

The existing literature on the determinants of private tutoring is separated into 2 parts that are micro and macro factors.

In terms of micro factors, the students' characteristics significant are only age factor in the negative direction, referring to that as students grow up, the opportunity to enroll the private tutoring will also decrease. Whereas the gender factor does not have statistical significance with the demand for private tutoring in Vietnam (Dang, 2007) and Sri Lanka (Damayanthi, 2018). However, in Poland, females tend to have more chances to attend private tutoring than males (Safarzynska, 2011). Moreover, the student's objective is to increase their performance, which has statistical significance to enrolling in private tutoring in Sri Lanka (Damayanthi, 2018). For parents characteristics, if the parents have a higher level of education, they tend to direct their children to participate in private tutoring in Sri Lanka (Damayanthi, 2018), Turkey (Tansel and Brican, 2006), Japan (Dang and Rogers, 2008), and Korea (Lee, 2013) but in Vietnam (Dang, 2007) and Poland (Safarzynska, K., 2011) have statistical significance for only on the mother's level of education in the positive correlation with students' participation in private tutoring. On the other hand, in Egypt, only the father's level of

education influences to push their children to participate in private tutoring. (Dang and Rogers, 2008). Lastly, in Sri Lanka, if the students have parents of a better socioeconomic status family will have more opportunities for private tutoring services (Damayanthi, 2018). In term of geographic location, the students who live in urban areas tend to have more chance of private tutoring than students living in rural areas in Vietnam (Dang, 2007), Egypt (Dang and Rogers, 2008), Japan (Dang and Rogers, 2008), and Korea (Lee, 2013) because most of the time, tutors prefer to teach in the downtown areas and some students can't come to urban especially the poor families.

In terms of macro factors, the household income has a positive direction to the demand for private tutoring in Japan (Dang and Rogers, 2008), Korea (Lee, 2013), Vietnam (Dang, 2007), Turkey (Tansel and Brican, 2006), and Poland (Safarzynska, 2011). Since private tutoring uses a lot of money in order to enroll. Thereby, if the household has a higher average monthly income after taxes which will increase the potential to provide their children to participate in private tutoring. In addition to the quality of mainstream schools, teachers in mainstream schools are statistically significant with participation in private tutoring in Vietnam (Dang, 2007) and Sri Lanka (Damayanthi, 2018). For example, if mainstream schools and teachers have poor quality, which can lead to an increase in demand for private tutoring, because every student and the parents of the students prefer to have an efficient education and parents believe that if the teachers have good performance, they can encourage the students to achieve their goals. Mostly, tutors have good performance in their knowledge. As a result, parents believe that tutors can supply supplemental knowledge to their children better than poor mainstream schools.

The factors that determine private tutoring are used to control the variables which impact the demand for private tutoring in the econometrics model. We can conclude the factors from both micro and macro factors that determinant the demand for private tutoring in table 2.1.

Table 2.1

The determinants of private tutoring

	Egypt	Japan	Korea	Vietnam	Sri Lanka	Poland	Turkey
Age	-	-	-	Negative	Negative	-	-
Gender	-	-	-	Insig	Insig	Female	-
Improve individual's performance	-	-	-	-	Positive	-	-
Parent education level	-	Positive	Positive	-	Positive	-	Positive
Mother education level	Insig	-	-	Positive	-	Positive	-
Father education level	Positive	-	-	-	-	-	-
Social status family	-	-	-	-	Positive	-	-
Geographic location	Urban	Urban	Urban	Urban	-	-	-
Household expenditure and household income	-	Positive	Positive	Positive	-	Positive	Positive
Quality of mainstream school and teacher in mainstream school	-	-	-	Negative	Negative	-	-

Note: "-" denoted this variable doesn't have results in that country.

"Insig" denoted this variable doesn't have statistical significance in that country.

"Positive" denoted this variable has positive statistical significance in that country.

"Negative" denoted this variable has negative statistical significance in that country.

Source: Author's illustration

2.2.3 Private tutoring and academic achievement

Empirical studies on the relationship between private tutoring and students' academic outcomes. Academic achievement is measured in several ways such as standard academic score, grade point average, school entering, university entering and faculty entering. Whereas the previous empirical studies mostly focus on standard academic scores and grade point average.

The goal for most students who enroll in private tutoring is to accomplish in education or to improve academic performance in mainstream schools. However, it is impossible for every student who joins in private tutoring has been successful in achieving their goals. Therefore, this section would like to analyze

whether or not private tutoring can impact students' academic scores in both international countries and Thailand.

The empirical studies in national countries such as Korea, Turkey, Germany, Japan, Pakistan, the United States, and China have found several results. Ünal, Özkan, Milton, Price, and Curva, (2010) incorporate a linear regression model to estimate the effect of private tutoring on academic outcomes. The results were found that private tutoring has a positive impact on math scores and for every hour of tutoring, students receive an extra twelve to fifteen points on the PISA math knowledge exam.

Likewise, Guill and Bos, (2014) employ both propensity score matching and hierarchical linear regression to investigate the effect of private tutoring on mathematics scores in Germany. The results have found that private tutoring had improved the students' mathematics achievement in both estimation methods. The results consist of Seo, E. H. (2018) perform multiple regression to investigate the relationship between private tutoring and academic achievement in Korea. The results found that private tutoring is positively significant with academic achievement in Mathematics subjects.

Suleman and Hussain, (2014) studied private tuition after school time and discovered that it plays a crucial role in strengthening and improving students' academic achievement. It is investigated by the differences of means that were computed for each group which found a significant difference between the mean scores of private tuitions on the academic achievement of students in mathematics subjects at secondary school in which it was recommended that parents should arrange private tuition for their children to move up their achievement level in the subject of mathematics. However, for both studies are assumed no omitted variables. Therefore, it should add more important factors to control the different characteristics between groups such as students' motivation and self-regulated learning.

Moreover, not only impact the mathematic score but also private tutoring can improve academic performance in English language, Latin, and French scores argued by Mischo & Haag, (2002). The study applies a t-test to analyze the improvement of private tutoring which shows that private tutoring has statistical

significance to improve academic scores. Students who are provided with tutoring can generate more motivation to study and the appropriate time to receive tutoring is four days per week for 90 minutes. However, emotional development not only affects achievement outcomes but also affects the learning process. Therefore, the researcher suggests that future research should include tutoring behavioral characteristics such as time spent on private tutoring and students' motivation.

The same study of Rothman & Henderson, (2011) found that students who participate in private tutoring have higher performance on standardized test scores in the areas of mathematics and language arts than those who did not participate in private tutoring. Tutor knowledge of the curriculum and tutor-student relationships are important components of the successful tutoring program which has been a contributing factor in the current study.

Stevenson and Baker, (1992) incorporated logistic regression to analyze the efficiency of private tutoring and found that private tutoring can help students increase their knowledge while enhancing the probability of students to university attendance in Japan. An interesting point is the fact that high school shadow education has a diminishing effect on the factor toward university entrance since private tutoring can increase an understanding of the process by which students are allocated within formal schooling. The transition to university proposes benefits to students in preparation activities.

Zheng, X., Wang, C., Shen, Z., & Fang, X. (2020) using data from the china education panel survey and employed hierarchical linear modeling to investigate the relationship between private tutoring and student academic performance. The results found that private tutoring is significantly and positively with student scores in English and Mathematics. Whereas, in the Chinese language, tutoring has not strongly improved score tests. Private tutoring could increase the inequality of opportunity in education, which generates socioeconomic inequality in the long run.

At the same time, private tutoring does not necessarily improve academic achievement in every subject. Choi, Calero, and Escardibul (2012), have found that private tutoring has a positive impact on PISA scores in mathematics and increases linearly. This is comparable to reading score which has a positive impact but

also a decreasing effect. But private tutoring does not affect science scores. The different effects among these subjects seem to be related to both the nature of the competence assessed and the structure of the examination. In Korea, mathematics examinations are more serious than science examinations, this reflects the likelihood of the weight in the examinations. Similarly, Berberoğlu and Tansel, (2014) apply multiple linear regression analyses to investigate the effectiveness of private tutoring in Turkey. The results showed that private tutoring has a positive statistically significant impact on mathematics and the Turkish language, but it is not the case of natural sciences.

Furthermore, Lee (2013) utilized OLS, an instrumental variable and propensity score matching, to investigate the effect of private tutoring in which it found similar results of the effect of private tutoring becomes larger as the number of years in private tutoring increases. It means that the benefits from private tutoring (academic score) become larger as the students continue to participate in private tutoring. Verbal tutoring does not influence verbal performance because verbal is mostly designed to practice analytical reading, also verbal tutoring is more focused on the number of materials rather than the quality of education. Simultaneously, English and math tutoring show positive significance because understanding English and math contents in early grades of middle school is important for the students to understand in advanced contents in the higher grades. Moreover, private tutoring has no long-term significant effect on the curriculum contents. However, it should be used more accurate information to robust the bias results which come from measurement error. Moreover, the education outcomes of students come from diverse measures in terms of academic outcomes. And researcher suggested the future research should consider the cost-effectiveness of private tutoring.

Zhang, (2013) investigates whether private tutoring improves students' National College Entrance Exam performance on mathematics, Chinese language, and English language via several methods such as OLS, instrumental variable, hierarchical linear model, and control function. The results have shown an instrumental variable that proxied by expenditure in private tutoring, number of private tutoring participants among the five closest friends, and distance between home and

the private tutoring center are similarly found that private tutoring has a positive effect on NCEE English score. On the other hand, for urban students, private tutoring does not affect any of the subjects. For rural students, private tutoring has a negative effect on mathematics and Chinese subjects. The results from the CF model and hierarchical linear model are in the same direction that an average effect and the urban/rural are not significant. The limitation is data observed from only one metropolis, which is the results might be biased. Moreover, the study only quantity perspective (such as time participation and tuition fee) but not a study in the quality perspective.

Ömeroğulları, M., Guill, K., & Köller, O. (2020) found that no systematic positive effect from a longer tutoring duration or higher qualified tutors. private tutoring might have positive outcomes on non-cognitive factors such as students' motivation or family conflicts on students' achievement and learning behavior. Future studies should consider to what family members support students with their mainstream school and additionally, whether the parental support creates a positive learning environment at their home.

Therefore, empirical pieces of evidence from national countries have several consequences that private tutoring does not necessarily improve students' academic outcomes. The result concluded in table 2.2 regarding the variables used in the model, methodology, and main finding.

Besides, the empirical studies in Thailand concern the relationship between private tutoring and academic achievement is not in great amount. The results showed that if the students invest more in private tutoring, it can help with the increase in academic outcomes. Poovudhikul (2013) explores the relationship between tutoring expenditure and the student outcome via logistic regression to which has found a statistically significant effect of private tutoring expenditure on student outcome but the magnitude for different family social-economic status. However, the results do not tell much information because the sample size and date available are limited. Then, the research suggests that in the future research should be adding more variables to control the effectiveness of private tutoring.

Thongphat (2012) evaluates the private tutoring effect on mathematic and English scores by applying the propensity score matching technique.

The results for mathematics demonstrated a significant relationship between private tutoring and student's mathematics GPA. Students who study in foreign language program has a negative relationship with mathematics score when compared to students who study in mathematics program that have positive significant. If the students who study in a special program in this subject have higher scores than those who study in ordinary programs. Likewise, the English scores also have positive significance with private tutoring. In addition, the English special program found a positive relationship with English score. Nevertheless, the major studies that are positively related to English scores are mathematics and foreign language departments. Moreover, this study investigates the relationship between private tutoring and students' academic achievement only via compares between private tutoring students and non-private tutoring students. But it does not compare among students who take more or less in private tutoring school.

Moreover, Saengboon (2019) investigates the effect of private tutoring on English subjects through the tutor's perspective via the interview method. The results showed that private tutoring can help students improve their English language skills. Private tutoring help students through the native speaking teacher and give grammatical lessen. Motivation is the most important factor in the success or failure of learning English such as high-quality teachers. It is not the only motivation for the improvement of English but also a passion for learning English. The limitation is this study only elucidate in tutor's perspective, but it is a lack of parents and student's perspective.

Therefore, the results summarized the variables used in the model, methodology, and main empirical evidence from Thailand in table 2.3.

Table 2.2

Effect of private tutoring on academic outcome in national countries

Study	Country	Methodology	The proxy of private tutoring variable	Main finding
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Table 3.1 Previous study found that has positive significant

Ünal, Özkan, Milton, Price, and Curva, (2010)	Turkey	Multiple regression analysis with OLS	Private tutoring in mathematics measured in hours received	private tutoring had greater impacts on math PISA scores.
Guill and Bos, (2014)	Germany	Propensity score matching and hierarchical linear regression	A student who received private tutoring	Private tutoring can improve the student' mathematics score
Mischo and Haag, (2002)	Germany	Test equality of school in the test score using single t-tests	tutoring measured by engaged 90 minutes a day, four days a week, in teaching small groups	Private tutoring can improve academic performance in mathematics, English, Latin, and French.

Table 2.2

Effect of private tutoring on academic outcome in national countries (Cont.)

Study	Country	Methodology	The proxy of private tutoring variable	Main finding
Rothman and Henderson, (2011)	United States	Analysis of Covariance (ANCOVA)	Student participate in private tutoring in language arts and math	Private tutoring in language and math can improve students' standardized test scores
Stevenson and Baker, (1992)	Japan	logistic equation	participation in different types of shadow education during high school	High school shadow education increases the likelihood of university attendance
Suleman and Hussain, (2014)	Pakistan	Differences of means were computed for each group	tuition for two hours after school time	a positive effect of private tuition on the academic achievement of students in the subject of mathematics at secondary school
Zheng, X., Wang, C., Shen, Z., & Fang, X. (2020)	China	Hierarchical linear modeling	A student who received private tutoring	private tutoring is significantly and positively with student score in English and Mathematics

Table 2.2

Effect of private tutoring on academic outcome in national countries (Cont.)

Study	Country	Methodology	The proxy of private tutoring variable	Main finding
The previous study found that not necessarily significant in all subject				
Choi, Calero, and Escardíbul, (2012)	Korea	Hierarchical linear model	Time spent on private tutoring	Positive effect on mathematics and reading of PISA score. In part of science is insignificant.
Berberoğlu and Tansel, (2014)	Turkey	Multiple linear regression	A student who received private tutoring during high school	Positive effect on HEEE score in mathematics and Turkish language but cannot help student in sciences.
Lee, (2013)	Korea	OLS, Instrumental variable, and propensity score matching	Students take private tutoring whether or not and total years of private tutoring	The results depend on several reasons in middle and high school

Table 2.2

Effect of private tutoring on academic outcome in national countries (Cont.)

Study	Country	Methodology	The proxy of private tutoring variable	Main finding
A previous study found that nonsignificant				
Zhang, (2013)	China	OLS, Instrumental variable, Hierarchical linear model, and Control function	Private tutoring variable separated into 3 categories are dummy variable, expenditure in private tutoring, and time spent in private tutoring	The average effect of private tutoring is not significant on the National College Entrance Exam (NCEE) but it may have a significant and positive effect on urban students with lower achievement

Source: Author's illustration

Table 2.3

Effect of private tutoring on academic outcome in Thailand

Study	Methodology	The proxy of private tutoring variable	Main finding
Saengboon, (2019)	Interview two Thai tutor teaching	A student that participates in private tutoring school of the interviewee	Supplementary tutoring has the potential to improve English language skills
Thongphat, (2012)	Propensity score matching	A student that enrolls in private tutoring in mathematics or English within last 4 semesters	Private tutoring can improve student's school grade in both mathematics and English
Poovudhikul, (2013)	Logistic regression	Tutoring expenditure	Households that invest more in private tutoring have more education outcomes.

Source: Author's illustration

2.2.4 Private tutoring and education inequality

The students who join in private tutoring school as most students prefer to succeed in their goals. For example, improving students' school grades or preparing for university entrance examinations. Whereas, the students who have different characteristics may impact their abilities such as family status, residence, and students' potential, etc. For example, students from high-income families have more ability to take private tutoring than students from low-income families. Private tutoring has more benefits toward low achieving students who have more potential to grow but in the same private tutoring for students who have less potential to grow, the benefit becomes smaller in high school (Lee, 2013) means that private tutoring creates an expansion of social inequalities.

According to previous empirical studies on inequality from several perspectives. Zhang, (2013) applies quantile regression to study the heterogeneous effect across different students' academic scores. The results have shown no effect of math private tutoring on math scores for all the quantiles. For Chinese scores, private tutoring does not affect an entire sample. If we are to look deeper, Chinese private tutoring does not affect urban students but has negative effects on students from rural areas. Likewise, private tutoring has no effect on English scores for all quantiles in which has a positive effect and negative effect on urban and rural students, respectively.

Lee, (2013) studied inequality in the effectiveness of tutoring by quantile. The amount of private tutoring in each quantile group is being separated by the weekly hours spent on private tutoring. The results shown that English and Maths tutoring in middle school, the effect of private tutoring to improve the academic scores for high achievers than low achievers which exacerbate educational inequality in middle school. Whereas, private tutoring in high school can help reduce the achievement gap between high achievers and low achievers. This means private tutoring in high school does not help improve the academic score of high achievers, however, it can help low achievers. Moreover, private tutoring effects by increasing the

academic score for low achieving students who have more ability to grow, but it has a small effect for high achievers who have less ability to grow.

Moreover, private tutoring can impact students' math PISA scores among 4 occupation groups: children of parents with white-collar/ high skills jobs; white-collar/ low skills jobs; blue-collar/ high skills jobs; and blue-collar /low skills jobs. The results shown that the factors related to education had an impact on math scores such as home educational resources, parents' education, and private tutoring. Moreover, parents' education impacts on mathematics performance only for the children of white-collar parents. (Ünal, Özkan, Milton, Price, and Curva, (2010). Therefore, the results have concluded and can be seen in table 2.4 about the variables, methodology, and main findings.



Table 2.4

Heterogeneous effect of private tutoring

Study	Country	Methodology	Variable	Main finding
Zhang, (2013)	China	Quantile regression	Math score	No significant of math tutoring between the urban and rural student
			Chinese score	Chinese tutoring no effect on urban students but significant in rural in negative effect.
			English score	English tutoring has a positive effect on low achievement of urban student
Ünal, Özkan, Milton, Price and Curva, (2010)	Turkey	Regression separate group	Math PISA score	The result shows that the coefficients are different among the occupation group
Lee, (2013)	Korea	Quantile regression	The average score in middle school	If student take private tutoring to create the gap between high achieving student and low achieving student in middle school
			The average score in high school	If student participate in private tutoring can help to decrease the achievement gap between high achieving student and low achieving in high school

Source: Author's illustration

2.3 The private tutoring in Thailand

Private tutoring in academic subjects, which takes time outside of mainstream school, is a very expanding phenomenon in Thailand. The office of the national education council argued that in 1983 Thailand had 2 reasons which impacted on the demand for private tutoring. First, the competitive environment of high school students to pass the entrance examination to enroll in a university. Second, parents and students prefer to enroll in a popular university. Then, the students believed that private tutoring could help them to achieve their goal to getting a better entrance examination score and enrolling in their selected university.

Bray and Lykins (2012) analyze the prevalence of private tutoring situations in Thailand. To comprehend both the private tutoring situations and the Thai government's policy, which contributes empirical data as shown below.

The private tutoring was tacked as a part of mainstream school. Students have been spending time at a private tutoring school after finishing class in mainstream school or during weekends. There were some private tutoring institutions which were legitimate institutions. Whereas, the other institutions did not have legitimate permits. There are several types of informal private tutoring schools, for example, one-by-one or group classes tutoring which teach students in public spaces (coffee shops, restaurants, or student's houses). The tutor has several types such as mainstream school teachers, university students, and freelance tutors.

The objectives of students who enroll in private tutoring schools include. First, to summarize the academic contexts in mainstream school. Second, to prepare the supplementary knowledge. Lastly, to guide some techniques to do the examination and techniques to memorize the contexts.

For formal private tutoring institutions. The registration and license of private tutoring, there are 2 types of private tutoring institution license are individual and corporate. Moreover, the ministry of education allows private tutoring institutions to guide the examination techniques for students, but there must have followed the curriculum of the ministry of education. And the rules of private tutoring intuitions must have sufficient infrastructure, an appropriate teachers-students ratio (not more

than 45 students per 1 teacher), and appropriate tuition fees (not more than 20 percent of profits)

In the perception of Thai private tutoring, students and parents are considering private tutoring as a commodity. They want to successfully maximize the benefits of private tutoring. The state of private tutoring institutions is a business because the institutions can continue in operation with sufficient profits.

2.4 Gaps in the empirical literature

For the education sector, not only does it include mainstream schools, but also have a private tutoring school. Most previous studies, as mentioned above, focused on academic outcomes, whereas private tutoring does not only affect the academic outcome but also generates positive and negative consequences such as on society, mainstream schools, and human capital, etc. Moreover, the previous research in Thailand still does not have an adequate amount of research on private tutoring and, in turn, it is being undeveloped.

Private tutoring has several social outcomes, such as pressure on the students to successfully follow their parents and social inequality. It can be explained by the students' opportunity to access private tutoring schools. If students who have more of the parent's income or live in urban areas, their chance to participate in private tutoring is greater than those who have lower-income families or living in rural areas. It showed an increase in education inequality. In terms of the impact on social inequality, a previous research study looked at several perceptions such as parent occupation, student residence, and a difference in student potential. On the other hand, the previous study on this perception has not been in Thailand. Therefore, this thesis would like to study the academic inequality of private tutoring at different levels of student's academic outcomes.

Academic achievement is measured in several ways, such as standard academic score, grade point average, school entering, university entering and faculty entering. Previous empirical studies concentrated solely on standard academic scores

and grade point average. Whereas, there is a lack of interesting points such as university entering and faculty entering, which is one of the academic achievements for students.

Moreover, previous empirical studies have only measured the difference between tutored students and non-tutored students. But there is a lack of comparison among less tutored students and more tutored students.

At the same time, the existing previous studies in both Thailand and national literature lack empirical studies to investigate the relationship between private tutoring and faculty entering. Therefore, this study attempts to fulfill this gap and explores the relationship between private tutoring and faculty entering.



CHAPTER 3

THEORETICAL FRAMEWORK AND RESEARCH METHODOLOGY

To investigate the effect of private tutoring on student outcomes and education inequality. This chapter describes the theoretical framework and research methodology.

3.1 Theoretical Framework

3.1.1 Education production function

The education production function can explain the relationship between input vectors of education and academic achievement. The appropriate education production function theory that is used to apply in this paper is Glewwe and Kremer (2006), which studied the structure of education production function represented as

$$A = a(S, Q, C, H, I) \quad (3.1)$$

Where A is the performance of the student, S is the number of years of schooling, Q is the school and the teacher characteristics, C is the student characteristics, H is a vector of household characteristics, and I is educational inputs under the control of parents (such as children's daily attendance or purchases of textbooks, etc.)

Therefore, this thesis would like to adjust the function through the inclusion of private tutoring (PT) into the education production function to measure the different academic outcomes among students who participate in different volumes of private tutoring participation. The new education production function is

$$A = a(S, Q, C, H, I, PT) \quad (3.2)$$

Function 3.2 is being used to answer research questions. The student performance measured by O-net scores and faculty entering in bachelor's degree. However, this theoretical framework has limitations in terms of the equation (3.2) as mentioned above, which cannot use ordinary least squares. The results of OLS estimation may be an error term which can correlate with explanatory variables. As a result, incomplete relationship, unobserved variables, or omitted variables are confounding both independent and dependent variables, or when independent variables are measured with error. With that said, this area should consider the econometrics problem to avoid the problems for better results.

Therefore, the conceptual framework is an understanding of how the particular variables in this study connect with each other. Consequently, it identifies the variables required in the research investigation in figure 3.1.

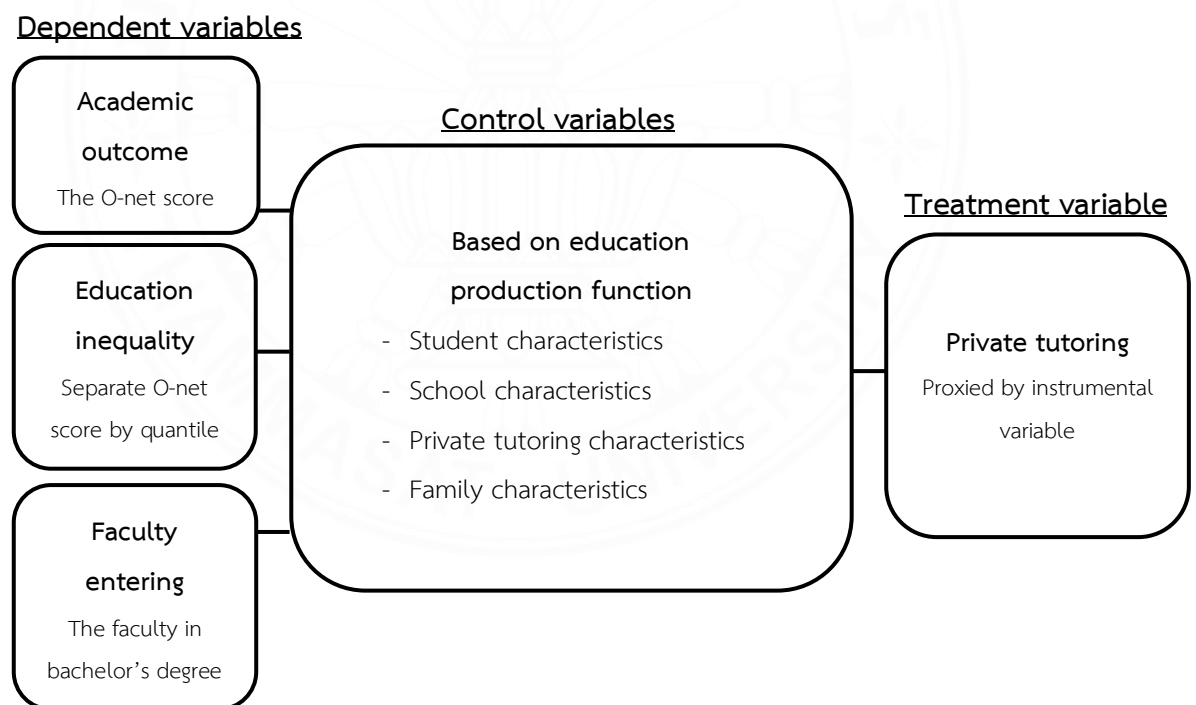


Figure 3.1 The conceptual framework

Source: Author's illustration

3.2 Research methodology

This section is separated into 2 parts that are data description and analysis methodology. This paper assesses students' private tutoring behavior based on two academic achievements: student O-net score and faculty entering.

3.2.1 Data description

3.2.1.1 Population and Sample

Cochran (1963) provides a simplified formula to calculate appropriate sample sizes in order to represent the population. The formula was used to calculate the sample sizes which are shown in the formula below. (Singh & Masuku, 2014)

$$n = \frac{P(1-P)Z^2}{e^2} \quad (3.3)$$

Where n is a sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails. P is an estimated proportion of an attribute that is present in the population size and e is the desired. Assumes there is a large population, however, we do not know the variability in the proportion. In practice, assumes $p = 0.5$ (maximum variability). Also, we desire a 95 percent confidence level, and the level of precision is 0.05. It means Z is 1.96

$$n = \frac{0.5(1-0.5)1.96^2}{0.05^2} \approx 385 \quad (3.4)$$

The appropriate sample size is not least than 385 samples that can reflect the behavior of private tutoring in Thailand. The target population is bachelor's degree students in Thailand.

3.2.1.2 Survey Methodology

To obtain the data, we use the convenience sampling method to collect the representative samples to answer the questionnaires. Convenience sampling is a type of non-probability sampling, which is taken from bachelor's degree students in Thailand. This thesis uses a Google form or online questionnaire to collect data and then distributes the questionnaire via social media to bachelor's degree students in Thailand.

The data set used in this paper is the primary data obtained through a survey technique. To set up the variables used in the model, apply the education production function. The information in the questionnaires is separated into 5 parts that are 1) students' characteristics, 2) private tutoring characteristics, 3) family characteristics, 4) school characteristics, and 5) students' academic achievement (O-net score and faculty entering). The representative samples are asked backward about information in high school.

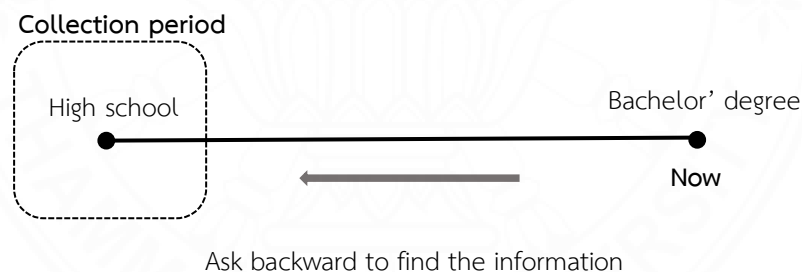


Figure 3.2 Survey design process

Source: Author's illustration

3.2.2 Analysis methodology

3.2.2.1 Estimation Method

The ordinary least square (OLS) estimation method is the simplest way of measuring the returns from private tutoring. However, this estimate has risks because students who participate in private tutoring tend to be different in various unobservable ways. Therefore, we should understand the characteristics of students to control these variables in the models because these variables affect

students' academic outcomes and decision behavior of students to enroll in private tutoring schools. For example, if the students' study in special programs in a mainstream schools which not only influences students to participate in private tutoring, but also provides the opportunity of receiving a good performance. (Special program in the classroom that focuses on learning to enhance student academic ability) Whereas, it is impossible to find all characteristics and control all of them in the regression model.

The estimation methods are separated into 2 parts. First, the two-stage least square with instrumental variable applied in the first-two objective. Second, the multinomial logistic regression is applied in the third objective.

The problem is a two-way relationship between the dependent variable (students' academic score) and the control variable (private tutoring) for the first two objectives. For example, if students take additional private tutoring courses, this can have an impact on better performance (high academic scores). But, if the students already have good performance, they would like to take more private tutoring courses because the students are becoming more academic competition with classmates. Therefore, the OLS estimation has a problem that is endogeneity bias which can occur from 2 causes. First of all, omitted variable comes from some variables in education production function that are unable to observe, then the unobserved characteristics become part of an error term in the model such as school or teacher characteristics (Q), student characteristics (C), household characteristics (H) and price related to schooling (P). Second of all, measurement error is an explanatory variable that comes from inaccurate and out-of-date data. Both causes lead to the coefficient of the results that are going to be biased.

To correct the endogeneity bias, this can be solved by finding an accurate measurement. There are several ways to solve the bias, such as the quasi-experimental method and the instrumental variable method.

The instrumental variable method can control the endogeneity problem. The basic idea is that we can replace the actual values (private tutoring variable) which are correlated with an error term by predicted values that are related to actual values and uncorrelated with the error term. However, the

instrumental variable technique has a problem since we do not know the best-predicted values that can reflect the actual values.

The propensity score matching is one of the quasi-experimental methods that create sets of participants for the treatment group (students who participate in private tutoring) and control groups (students who do not participate in private tutoring) to compare each other by matching the set which consists of at least one participant from the treatment group and one from the control group with similar propensity scores. The goal is to approximate a random experiment through the elimination of the problems that come with observational data analysis. Simultaneously, it is difficult to find students who do not enroll in private tutoring in Thailand. Therefore, this method is hard to apply to estimate the effect of private tutoring.

The propensity score matching cannot apply in this case because, in Thailand, it is difficult to find students who have not enrolled in private tutoring. However, it is possible to compare students who are more or less participate in private tutoring. Therefore, this thesis will apply the instrumental variables to study the effect of private tutoring. For the instrumental variable in previous studies about private tutoring variables used to proxy the actual private tutoring variable. For example, Suryadarma (2006) incorporated a proportion of classmates that are taking extra courses as an instrumental variable. Zhang (2013) utilized expenditure on private tutoring, several private tutoring participants among the five closest friends, and distance between home and private tutoring center as an instrumental variable. Lastly, Lee (2013) used the proportion of student costs of private tutoring or overall in monthly household income during the educational period.

The two criteria of the instrumental variable should be satisfied are 1) it causes variation in the treatment variable (private tutoring participation), 2) it does not have a direct effect on the outcome variable (students' academic achievement), but only indirectly through the treatment variable (private tutoring participation).

This study will examine the validity of an instrumental variable. To test the strength or weakness of instrumental variable using several

statistics to measure the relevance of instrumental variable among 1) the number of private tutoring participants among the five closest friends, 2) the average distance between home and private tutoring center, and 3) a student's monthly cost of private tutoring as a proportion of monthly household income.

The statistics to test for appropriate instrumental are R-square, adjusted R-square, F-statistic, and minimum eigenvalue statistic. The basic conditions to imply appropriate instrument are 1) all the R-square statistics are relatively high, R-square in the first stage is high which represents the high proportion of the dependent variable (private tutoring variable) that is explained by an independent variable (instrumental variable), 2) the F-statistic is statistically significant in the first stage, and 3) the minimum eigenvalue statistic which exceeds the critical value. It means that the first stage has been fitted to the data set. However, we should undertake a test of over-identifying restrictions test to verify the validity of our excluded instrument. If we reject the null hypothesis, meaning that an instrument is valid.

The third objective, the dependent variables are the quantitative variables. To prediction the probabilities of the different possible outcomes of a categorically distributed dependent variable given a set of independent variables.

The multinomial logistic regression was applied in the third objective. The statistics, multinomial logistic regression is a regression that allows for more than two categories of the dependent variable and applies maximum likelihood estimation to evaluate the probability of categorical membership.

Subsequently, the appropriate estimation method to evaluate the effect of private tutoring on academic achievement and educational inequality in the first two objectives is two-stage least square with instrumental variable. The multinomial logistic regression is an appropriate estimation method to evaluate students' faculty choice in the third research question.

3.2.2.2 Estimation Model

This section represents the estimation model used in this thesis. The appropriate estimation model can be explained by 3 following research questions.

(1) The impact on academic outcome

The first research question would like to investigate the effect of private tutoring on students' academic outcomes. To investigate the first objective, this paper employs the education production function to set up an adequate equation. This equation can tell whether private tutoring can improve students' academic scores (O-net score). The model can be seen below.

$$PT_{i(s)} = \tau_0 + \tau_1 Z_{i(s)} + \tau_2 X_i + e_i \quad (3.5)$$

$$O_{i(s)} = \delta_0 + \delta_1 \widehat{PT}_{i(s)} + \delta_2 X_i + e_i \quad (3.6)$$

For the two-stage least square estimation method is separated into 2 stages and applied the instrumental variable to measure private tutoring. The first stage in equation (3.5) uses the superior instrumental variable ($Z_{i(s)}$) to proxy private tutoring of student i on subject s ($\widehat{PT}_{i(s)}$). The superior instrumental variable is proved by over-identifying restrictions as mentioned in part 3.2.2.1. Then, instead of the private tutoring variable obtained from the first stage, enter it into equation 3.6 and estimate it to see if there is a relationship between private tutoring and students' academic outcomes.

The dependent variable in the first stage is private tutoring participation of student i on subject s ($PT_{i(s)}$), measured by a number of years that participate in private tutoring in high school. For the second stage, the O-net score of students i in subject s ($O_{i(s)}$).

The education production function reveals clarification that there are different criteria or indicators of improved academic achievement which do not necessarily lead to the same results. Because of this, the control variables endeavor to control the different characteristics of observation using variables X_i . This

thesis is based on empirical studies and theoretical frameworks. The appropriate control variables consisted of student characteristics, family characteristics, school characteristics, and tutoring characteristics. The details of control variables are shown in table 3.1 and e_i is an error term.

(2) The impact on educational inequality

The second research question is to investigate the inequality of students' outcomes due to private tutoring. This section is to test whether or not private tutoring has more power to improve student scores for both high and low achievers.

The model in this case is comparable to the one used in the first research question. However, this research question attempts to test whether or not there are different effects of private tutoring on student academic outcomes by separating the academic outcome in each quantile (Q) by the level of academic achievement (students' academic score).

To investigate educational inequality by determining whether private tutoring affects which level of academic score. The difference in the significance of private tutoring in each quantile is used to measure educational inequality. If private tutoring does not influence all quantiles, it indicates that educational inequality has occurred in private tutoring.

The methodology to investigate applies a two-stage least square with instrumental variable. The instrumental variable also uses the same as the first part. The models are estimated by the separation of equations into 4 models (by quantile) which are high achiever, quite high achiever, quite low achiever, and low achiever. For the first stage of 2SLS in equation (3.7), use a proxy private tutoring variable, then plug the proxy private tutoring variable from the first stage into the second stage in equation (3.8) to investigate the effect of private tutoring on a different level of academic outcome in each quantile (q).

$$PT_{i(s),q} = \tau_0 + \tau_1 Z_{i(s),q} + \tau_2 X_{i,q} + e_i \quad (3.7)$$

$$O_{i(s),q} = \delta_0 + \delta_1 \widehat{PT}_{i(s),q} + \delta_2 X_{i,q} + e_i \quad (3.8)$$

The dependent variable in the second stage is the O-net score of students i in subject s for quintile q ($O_{i(s),q}$). The control variable is X_i , which uses the same as the first research question. And e_i is an error term.

(3) The impact on faculty entering

The faculty is one of the academic achievements, which students want to achieve in their goal. The third research question has 2 issues to investigate the relationship between private tutoring and faculty entering. First, to test the private tutoring has an influence on students' decisions about faculty entering. Second, to test the effectiveness of private tutoring on faculty entering

To investigate this objective, employ the multinomial logistic regression in order to estimate this equation to test whether there is a relationship between private tutoring and faculty entering. The first issue is that private tutoring helps students to decide on which faculty. The appropriate model for the first issue showed as a model (3.9)

$$F_i = \gamma_0 + \gamma_1 PT_{i(s)} + \gamma_2 X_i + e_i \quad (3.9)$$

The dependent variable is faculty entering (F_i), which is measured by faculty branches in higher education institutions, which are separated by 1) social science-related faculties, 2) science-related faculties, and 3) art-related faculties. The $PT_{i(s)}$ is private tutoring participation of student i on subject s , measured by a number of years that participate in private tutoring in high school. The control variables in this model use explanatory variables in vector X_i . Base on the empirical studies and theoretical frameworks, the appropriate control variables consisted of first-two research questions which show the detail in each set can be seen in table 5.

The second issue, to analyze the effectiveness of private tutoring on faculty entering. To test whether the effectiveness of private tutoring to faculty entering among 1) students take only mathematic tutoring, 2) students take only English tutoring, and 3) students take both mathematic and English tutoring. This part performs the model as (3.10) but changes the private tutoring participation variables to be dummy variables and also employs the multinomial logistic regression.

$$F_i = \gamma_0 + \gamma_1 M_i + \gamma_2 E_i + \gamma_3 B_i + \gamma_4 X_i + e_i \quad (3.10)$$

The dependent variable is faculty entering (F_i), which is measured by faculty branches in higher education institutions. M_i , E_i and B_i are dummy variables (Students participate in private tutoring whether or not). M_i is measured by a student who participates only in mathematic tutoring. E_i is measured by a student who participates only in English tutoring. B_i is measured by a student who participates in both mathematic and English tutoring. The vector X_i is also control variables.

3.2.2.3 Variables in the model

(1) Dependent variable

The dependent variable in the first stage for the first-two objective is private tutoring participation which is measured by the number of years that the students enroll in private tutoring courses in high school.

For the second stage, the academic outcomes can be measured by O-net scores and faculty entering. The first research study that showed the effect of private tutoring on academic achievement using O-net scores ($O_{i(s)}$) of students on English and mathematics in high school as the dependent variable. The second, shown the educational inequality of private tutoring on academic achievement using the O-net scores which is separated by quantile or 4 levels of academic scores ($O_{i(s),q}$). Lastly, the third study showed the effect of private tutoring on faculty entering (F_i) using faculty branches in bachelor degrees which are separated by 1) Social science-related faculties, including business administration, geography, history, political science, education, and sociology. 2) Science-related faculties, including medicine, physics, chemical, biology, engineering, statistics, mathematics, and computer systems. 3) Art-related faculties, including dance, music, the performing arts, and languages.

(2) Treatment variable

For the treatment variable that proxied private tutoring variable has checked the validity of instrumental variable among 1) the number of

private tutoring participants among the five closest friends, 2) the average distance between home and private tutoring center and 3) a student's monthly cost of private tutoring as a proportion of monthly household income. In addition, the superior's instrumental will be used in the first stage for first-two objectives to proxy private tutoring participation.

(3) Control variables

To control for observed differences between representatives, this paper uses various explanatory variables in a vector X as shown in all the equations. To control the differences in characteristics of the model based on the education production function and the existing literature which are the determinants of private tutoring. Therefore, many kinds of literature have explored the micro and macro factors that determine the demand for private tutoring as mentioned in part 2.2.2.

Base on the education production function. Lamdin (1996) studied the input factors in education production function that determine the output of education. The input variables were proxies for student and school inputs. The student input measure was socioeconomic. The school input measures were used for: the teacher-student ratio, number of principals, librarians, and counselors. An alternative school input measure, namely, operating expenditure per student. Bowles (1970) represents the input vector in education production function that is the school environment (amount and quality of teaching services and the physical facilities of the school), environmental influences on learning outside the school (e.g. parent education), students' ability, and the initial level of learning attained.

Thus, in this paper, the control variable X is divided into five characteristics: student characteristics, school characteristics, family characteristics, and private tutoring characteristics.

Therefore, all variables used in the model are separated into 3 parts that are dependent variables, treatment variables, and control variables. The details concluded in Table 3.1.

Table 3.1

Variables in the model

Variable name (Variable type, expected sign)	Description	Details
Student characteristics		
Gender (Control variable, +/-)	Gender of students	G is a dummy variable G = 1 if student is female G = 0 if student is male
Student self-study (Control variable, +)	Self-study includes homework, reviewing, or previewing academic content.	SSS is a quantitative variable and converts to Z-score. SSS is measured by the average number of hours per week spent on independent study.
Student self-esteem (Control variable, +)	The level of self-esteem in high school was measured by a scale of 1 to 5 (Strongly confident until strongly no confidence) of each question. The question asks about 1) The level of student can understand in advance context; 2) Student confident that there do well in the exam and 3) Student confident that there can apply the concept that learns in class.	SSE is a quantitative variable and converts to Z-score. SSE is measured by the level of self-esteem in high school.

Table 3.1

Variables in the model (Cont.)

Variable name (Variable type, expected sign)	Description	Details
Grade point average (Control variable, +/-)	The student's grade point average in high school.	GPA is a quantitative variable
Student's motivation (Control variable, +/-)	The student's motivation to enroll in private tutoring.	<p>EPT_n are dummy variables. Assume non-tutoring is the base case. EPT₁ =1 if a student receives peer effect from a friend, 0 if not EPT₂ =1 if student learns by themselves, 0 if not EPT₃ =1 if student is forced by a parent, 0 if not</p>
School characteristics		
Department in school (Control variable, +/-)	The school department in a mainstream school. (The curriculum or program in mainstream school)	<p>SD_n are dummy variables. Assume math and science are the base case. SD₁ =1 if it is an international program, 0 if not SD₂ =1 if it is a mathematics program, 0 if not SD₃ =1 if it is other department, 0 if not</p>
School class size (Control variable, -)	The average number of students in your class when studied in high school	S is Quantitative variables

Table 3.1

Variables in the model (Cont.)

Variable name (Variable type, expected sign)	Description	Details
The area of schooling of the student (Control variable, +/-)	The area of schooling of a student when studied in high school	ARS _n are dummy variables. ARS ₁ = 1 if it is in Bangkok Metropolitan, 0 if not ARS ₂ = 1 if it is other, 0 if not
Type of school (Control variable, +/-)	Type of school when studied in high school	TS are dummy variables. TS = 1 if it is a public school TS = 0 if it is a private school
Private tutoring characteristic		
The Reason to study private tutoring (Explanatory variable)	This information can explain the reason why students prefer to enroll in private tutoring in Mathematics and English.	Descriptive statistics
Private tutoring cost (Control variable, +/-)	The average monthly cost of private tutoring in Mathematics and English in terms of Thai baht.	PTC is a quantitative variables in them of a logarithm
Weekly hours spend on private tutoring (Explanatory variable)	The average number of hours spent per week on private tutoring in Mathematics and English.	Descriptive statistics

Table 3.1

Variables in the model (Cont.)

Variable name (Variable type, expected sign)	Description	Details
Types of private tutoring (Control variable, +/-)	Types of private tutoring in this case separated for each subject in each grade	TPT _n are dummy variables. Assume non-tutoring is the base case. TPT ₁ =1 if it is group tutoring, 0 if not. TPT ₂ =1 if it is online or VDO tutoring, 0 if not. TPT ₃ =1 if it is one by one tutoring, 0 if not
Close friends' participation (Treatment variable)	Number of private tutoring participation among five close friends	CF is a quantitative variable
Number of semesters to participate in private tutoring (Dependent variable in the first stage)	The number of semesters of a student to enroll in Mathematics and English subject in a private tutoring school	NP is a quantitative variable and convert to Z-score
Family characteristic		
Family income (Treatment variable)	The average family income in terms of Thai baht per month when studied in high school	FI is s quantitative variable in them of a logarithm

Table 3.1

Variables in the model (Cont.)

Variable name (Variable type, expected sign)	Description	Details
Father's occupation (Control variable, +,-)	The father's occupation when studied in high school	<p>FO_n are dummy variables. Assume other occupation is the base case. FO₁ =1 if it is a hirer and farmer, 0 if not. FO₂ =1 if it is a state enterprises, public officer and employee 0 if not. FO₃ =1 if it is a business owner, 0 if not.</p>
Mother's occupation (Control variable, +,-)	The mother's occupation when studied in high school	<p>MO_n are dummy variables. Assume other occupation is the base case. MO₁ =1 if it is a hirer and farmer, 0 if not. MO₂ =1 if it is a state enterprises, public officer and employee 0 if not. MO₃ =1 if it is a business owner, 0 if not.</p>
Father's educational level (Control variable, +/-)	The father's education level when studied in high school	<p>FE_n are dummy variables. Assume not more than primary school is the base case FE₁ =1 if it is a high school, 0 if not FE₂ =1 if it is a bachelor's degree, 0 if not FE₃ =1 if it is more than a bachelor's degree, 0 if not</p>

Table 3.1

Variables in the model (Cont.)

Variable name (Variable type, expected sign)	Description	Details
Mother's educational level (Control variable, +/-)	The Mother's education level when studied in high school	<p>ME_n are dummy variables. Assume not more than primary school is the base case ME₁ =1 if it is a high school, 0 if not ME₂ =1 if it is a bachelor's degree, 0 if not ME₃ =1 if it is more than a bachelor's degree, 0 if not</p>
Student academic outcome		
O-net score (Dependent variable in first-two research question)	O-net score of students in high school on Mathematics and English.	O _{i(s)} are quantitative variables and converted to Z-score
Faculty in bachelor's degree (Dependent variable in the third objective)	Faculty branches in a bachelor's degree	<p>F are nominal variables. F=1 if it is a social science-related faculties F=2 if it is a science-related faculties F =3 if it is a art-related faculties</p>

Source: Author's illustration

CHAPTER 4

EMPIRICAL RESULTS AND DISCUSSION

This chapter demonstrates the private tutoring phenomenon in Thailand by using primary data to provide the results of the survey study. Start from the private tutoring situations in Thailand. Following that, an examination of the impact of private tutoring on students' academic achievement, as well as an examination of the heterogeneous impact of private tutoring on academic achievement. Finally, the analysis of faculty entering into bachelor's degree.

4.1 The private tutoring situations in Thailand

The survey used 412 bachelor's degree students in Thailand. The study finds that 46 students (11.17 percent) did not take any private tutoring in neither Mathematics nor English subjects, but 310 students (75.24 percent) took private tutoring in both Mathematics and English. 19 students (4.61 percent) took only English private tutoring, and 37 students (8.96 percent) took only Mathematics private tutoring.

In the Mathematics subject, on average, 84.22 percent of students have participated in private tutoring, but there is only 15.78 percent of students that have not participated in private tutoring. Most students have enrolled in Mathematics private tutoring in high school for at least 4 semesters. 24.76 percent of the amount of enrollment had taken Mathematics private tutoring for 6 semesters. Following that, 21.36 percent of the enrollment had taken Mathematics private tutoring for 4 semesters. And 17.72 percent of the amount of enrollment had taken Mathematics private tutoring for 5 semesters.

In the English subject, on average, 79.85 percent of students have participated in private tutoring, but there is only 20.15 percent of students that have not participated in private tutoring. Most students have enrolled in English private tutoring in high school for at least 4 semesters. 20.63 percent of the amount of enrollment had taken English private tutoring for 5 semesters. Following that, 19.66% of the total enrollment had taken Mathematics private tutoring for 4 semesters. And

16.02 percent of the amount of enrollment had taken Mathematics private tutoring for 6 semesters.

The data is comprised of 149 males (36.17%) and 263 females (63.83%) from 412 students. Male students are more likely to take private tutoring than females, both in Mathematics and English subjects. On average, 88.59 percent of male students have participated in Mathematics private tutoring, while 81.75 of female students have participated in Mathematics private tutoring, quite the same with English subject, 83.22 percent of male students have participated in English private tutoring, while 81.75 of female students have participated in English private tutoring.

Table 4.1

The number of semesters to participate in private tutoring in high school

	Mathematic		English	
	Number	Percent	Number	Percent
Non-tutoring	65	15.78	83	20.15
Tutoring	347	84.22	329	79.85
Tutoring 1 semester	20	4.85	9	2.18
Tutoring 2 semesters	32	7.77	42	10.19
Tutoring 3 semesters	32	7.77	46	11.17
Tutoring 4 semesters	88	21.36	81	19.66
Tutoring 5 semesters	73	17.72	85	20.63
Tutoring 6 semesters	102	24.76	66	16.02
Total	412	100.00	412	100.00

Source: Author's calculation

Table 4.1 shows that most students have enrolled in private tutoring almost every semester in high school in both subjects. Interestingly, the most influential motivation of students to participate in private tutoring is receiving peer effect by their friends to participate in private tutoring, which accounted for 63.40 and

59.27 percent for Mathematics and English tutoring, respectively. Followed by students willing to participate in private tutoring by themselves, which accounted for 27.67 and 21.88 percent for Mathematics and English tutoring, respectively. Lastly, students are forced by parents to participate in tutoring, which accounted for 8.93 and 18.84 percent for Mathematics and English tutoring, respectively. (Table 4.2)

Table 4.2

The Motivation to participate in Private tutoring

	Mathematic		English	
	Number	Percent	Number	Percent
Students are forced by parents	31	8.93	62	18.84
Students are received peer effect by friends	220	63.40	195	59.27
Students are willing to participate in tutoring by themselves	96	27.67	72	21.88
Total	347	100.00	329	100.00

Source: Author's calculation

The average monthly cost of private tutoring, students have spent money on English (1,920.64 baht) less than Mathematics (1936.69 baht). In the amounts of private tutoring time during high school, on average, students have spent about 5.03 and 4.51 hours per week on private tutoring lessons in Mathematics and English, respectively. By dividing the monthly cost of private tutoring by monthly hours of private tutoring, the hourly cost of private tutoring in Mathematics and English is about 96.26 and 106.46 baht, respectively. So, the hourly cost of English tutoring is higher than mathematic tutoring. (Table 4.3)

Table 4.3

The private tutoring cost

	Mathematic	English
The average private tutoring cost per month	1936.69	1920.64
The average weekly hours spent on private tutoring	5.03	4.51
The average cost of private tutoring per hour	96.26	106.46

Source: Author's calculation

Table 4.4 represents the private tutoring types of tutored students. The results found that the popular mathematic tutoring type is group tutoring (51.30 percent), followed by online or VDO tutoring (29.97 percent) and one by one tutoring (18.73 percent). The popular English tutoring is one by one tutoring (37.99 percent), followed by group tutoring (34.35) and online or VDO tutoring (27.66 percent).

Table 4.4

The private tutoring types

	Mathematic		English	
	Number	Percent	Number	Percent
One-by-one tutoring	65	18.73	125	37.99
Group tutoring	178	51.30	113	34.35
Online or VDO tutoring	104	29.97	91	27.66
Total	347	100.00	329	100.00

Source: Author's calculation

The students' perceptions of participating in private tutoring revealed that the top three highest reasons for participating in private tutoring school are 1) Students did not understand the contexts in mainstream school and students could not catch up with classmates, which accounted for approximately 26.80 percent and 26.75

percent, respectively, for Mathematics and English tutoring. 2) Develop understanding in contexts, practice the problem set and improve grade point average in mainstream school, around 25.07 percent and 29.18 percent for Mathematics and English tutoring, respectively. 3) Preparing for university exams accounts for approximately 13.26 percent of Mathematics tutoring and 17.63 percent of English tutoring.(Table 4.5)

Interestingly, one reason for students to enroll in private tutoring schools is that tutoring teachers reveal the examination techniques and examination guidelines which are not disclosed in mainstream schools (10.95 percent for Mathematics tutoring and 7.60 percent for English tutoring). Moreover, some content in both examinations in mainstream schools and national examinations (such as O-net, GAT, PAT and etc.) is not covered in mainstream schools, resulting in students enrolling in private tutoring.

Table 4.5

The reasons to participate in private tutoring

	Mathematic		English	
	Number	Percent	Number	Percent
Developing understanding in contexts	87	25.07	96	29.18
Not understanding the contexts in school	93	26.80	88	26.75
Preparing for university examination	46	13.26	58	17.63
Seeking Exam techniques and guidelines	38	10.95	25	7.60
Willing to study and enjoy learning	9	2.59	15	4.56
Cannot self-study	8	2.31	5	1.52
Studying in advance	8	2.31	3	0.91
Being forced to study in private tutoring	3	0.86	8	2.42
Following their friends	10	2.88	2	0.61
Other reasons	45	12.97	29	8.81
Total	347	100.00	329	100.00

Source: Author's calculation

Table 4.6

The reasons to not participate in private tutoring

	Mathematic		English	
	Number	Percent	Number	Percent
High cost	14	21.54	21	25.30
Not necessary to study	12	18.46	0	0.00
Not enjoy learning	8	12.31	28	33.73
Can self-study	4	6.15	6	7.23
Not study in that field	5	7.69	0	0.00
Other reasons	22	33.85	28	33.73
Total	65	100.00	83	100.00

Source: Author's calculation

The highest reason for students not participating in mathematic private tutoring is the high cost of enrolling in a tutoring school, which accounts for approximately 21.54 percent. In English tutoring, students gave reasons that they do not like to learn an English subject, around 33.73 percent. (Table 4.6)

The supplement education is highly cost to enroll in a tutoring school. It means students who have more family income, participate in private tutoring more than students who have less family income. Table 4.7 represents the descriptive statistics which are sorted by family income to show the inequality of students' ability to access private tutoring schools. The data separated into 4 groups by quantile, which are low-income families, quite low-income families, quite high-income families and high-income families.

Table 4.7

The descriptive statistic which sorted by family income

	Low income	Quite low income	Quite high income	High income	All
Observation	103	103	103	103	412
Average family income (S.D.)	23,920.38 (9,719.89)	58,155.33 (10,589.26)	89,747.57 (7,894.79)	168,728.68 (109,216.12)	85,137.99 (117,506.51)
Number of students who do not participate in tutoring (percent)	28 (60.87)	13 (28.26)	3 (6.52)	2 (4.35)	46 (100.00)
Number of students who participate in both Mathematics and English tutoring (percent)	40 (12.90)	81 (26.13)	92 (29.68)	97 (31.29)	310 (100.00)
Number of students who participate only Mathematics tutoring (percent)	22 (59.46)	7 (18.92)	4 (10.81)	4 (10.81)	37 (100.00)
Number of students who participate only English tutoring (percent)	12 (63.16)	2 (10.53)	4 (21.05)	1 (5.26)	19 (100.00)
The average weekly hours spend on Mathematics tutoring (S.D.)	4.12 (3.46)	4.44 (3.82)	4.69 (3.99)	4.76 (3.54)	4.29 (3.64)
The average weekly hours spend on English tutoring (S.D.)	3.56 (2.91)	3.44 (2.86)	3.45 (2.82)	4.04 (2.78)	3.64 (2.89)
Average Mathematic O-net score (S.D.)	56.14 (22.28)	56.60 (20.95)	57.36 (20.58)	57.21 (20.55)	55.80 (22.05)
Average English O-net score (S.D.)	56.02 (17.48)	57.09 (16.80)	57.46 (16.59)	57.44 (16.77)	56.02 (17.41)

Source: Author's calculation

Table 4.7 shows that students in the high-income group participate in private tutoring at a higher rate than students in the low-income group in both Mathematics and English tutoring, indicating that the cost of tutoring school is very high. The average weekly hours spend on Mathematics private tutoring are 4.12, 4.44, 4.69, and 4.76 for students in low-income families, quite low-income families, quite high-income families, and high-income families, respectively. The average weekly hours spend on English private tutoring are 3.56, 3.44, 3.45, and 4.04 for students in a low-income family, quite low-income family, quite high-income family, and high-income

family, respectively. Interestingly, students spend more time participating in Mathematic tutoring than English tutoring in every income group.

At a higher income level, the number of students who participate in both English and Mathematics tutoring will be higher, and the number of students who do not participate in both tutoring is less. Moreover, if a student enrolls in only one subject, students choose to participate in Mathematic tutoring more than English tutoring.

Therefore, income is an important factor to enrolling in private tutoring, which shows the students' ability to participate in more subjects and more time in private tutoring. It means private tutoring is a very large inequality of accession.

Table 4.8 sorts the data by private tutoring participation. The total number of students is 412 bachelor's degree students. The students who have participated in private tutoring in both subjects are around 310 students (75.24 percent), but there are 46 students (11.17 percent) who have not participated in both private tutoring. However, there are 37 students (8.98 percent) and 19 students (4.61 percent), who have participated only in Mathematics private tutoring and English private tutoring, respectively. Interestingly, students who participate in both tutoring have higher Mathematic and English O-net scores than students who participate in only one subject (either Mathematics or English tutoring) and non-tutored students.

The students participated in private tutoring because to develop an understanding of the contexts in mainstream school and prepare for university examinations in order to succeed in their academic goals. Therefore, the next parts will analyze the relationship between private tutoring participation and students' academic achievements (O-net score and faculty entering) by econometrics methods.

Table 4.8

The average O-net score in each group of private tutoring participation

	Number (Percent)	Average Mathematic O-net score (S.D.)	Average English O-net score (S.D.)
A student who participates in both Mathematics and English tutoring	310 (75.24)	58.15 (13.38)	59.19 (15.33)
A student who participates only in Mathematics tutoring	37 (8.98)	53.12 (18.21)	46.13 (16.78)
A student who participates only in English tutoring	19 (4.61)	51.94 (44.25)	52.68 (16.99)
A student who does not participate in tutoring	46 (11.17)	43.71 (29.31)	44.79 (18.11)
Total	412 (100.00)	55.80 (22.05)	56.02 (17.40)

Source: Author's calculation

4.2 Analytical static

To evaluate the effect of private tutoring and academic achievements, the achievements separated into 2 outcomes are O-net score and faculty entering. This study performed an endogeneity test which is the Dubin and Wu-Hausman tests to check whether the better method between the ordinary least square or the two-stage least square. The null hypothesis is exogenous variables. The P-value of the Dubin and Wu-Hausman test in this paper is 0.075, which is less than the critical value at 90 percent (0.10). Therefore, the null hypothesis is rejected, which means this test confirms that the two-stage least square is better than the ordinary least square.

As mentioned in the estimation method, this thesis used an instrumental variable with a two-stage least square method to correct the endogeneity problem.

This paper checks whether the best instrumental variable for private tutoring among 1) the number of private tutoring participants among the five closest friends, 2) the average distance between home and private tutoring center, and 3) a student's monthly cost of private tutoring.

Table 4.9 shows the results from the first stage equation. The null hypothesis is that the instrumental is weak. If the minimum eigenvalue statistic exceeds the critical value. It means rejecting the null hypothesis that the first stage has been fitted to the data set.

The first stage equation results revealed that the minimum eigenvalue of the number of private tutoring participants among the five closest friends (5.089) exceeded the critical value of 10 percent (4.86). Therefore, the thesis use this instrumental variable to proxy the private tutoring variable in first-two objectives.

Table 4.9

The first stage equation

Instrumental variable	minimum eigenvalue	critical value at 5%	critical value at 10%
The number of private tutoring participants among the five closest friends	5.089	7.38	4.86 **
The average distance between home and private tutoring center	1.085	7.38	4.86
A student's monthly cost of private tutoring	1.360	7.38	4.86

Source: Author's calculation

The dependent variable (O-net scores) and treatment variable (private tutoring participation) are converted to Z-score, because the interpretation is making sense as if the treatment variable deviated 1 standard deviation from their mean, the dependent variable will deviate how many standard deviations from their mean.

The model separates the private tutoring variable into 3 components. First, the private tutoring participation (PT_i): this variable is the main variable that converts the number of semesters enrolled in private tutoring school in high school into a Z-score. If the sign is positive, it means the private tutoring helps students to increase their O-net scores and vice versa. Second, private tutoring multiplies by grade point average ($PT_i * GPA_i$): this variable is the control variable which represents the influence of private tutoring on high GPA students or low GPA students. If the sign is positive, it means private tutoring affects high GPA students more than low GPA students. Third, the private tutoring square (PT_i^2): this variable is also a control variable which shows whether private tutoring has a diminishing effect or not. If the sign is negative, it means private tutoring has a diminishing effect on an academic outcome. Therefore, the main variable to investigate in this study is the first component (the private tutoring participations: PT_i), and others included to control in the model.

4.2.1 The consequence of students' academic outcome

Private tutoring is divided into two subjects: English private tutoring and Mathematic private tutoring. To study the effect of private tutoring on academic outcome using students' O-net score. As mentioned above, the two-stage least square with the number of private tutoring participants among the five closest friends as the instrumental variable is an appropriate estimation method. The results of Mathematics and English tutoring are show in tables 4.10 and 4.11, respectively. In each table, compare the results of the ordinary least squares and the instrumental variable to determine the consistency of the sign and significance level.

After controlling for private tutoring, student, school, and family characteristics, the results revealed that the O-net score has a positive relationship with private tutoring in both Mathematics and English subjects. Using the IV method, the magnitude of the estimate is larger than the OLS estimate in both Mathematics

and English subjects. Private tutoring has a diminishing effect on Mathematics, but in English it has no diminishing effect. Furthermore, in Mathematics and English, private tutoring has a greater impact on low-GPA students than on high-GPA students. According to English tutoring, English private tutoring is statistically significant in O-net score, and consistent between OLS and IV estimate. However, there are consistent in terms of statistically insignificant in Mathematics private tutoring on O-net score between OLS and IV estimate.

Therefore, the better approach is the IV method. Private tutoring is statistically significant only for English O-net score. According to the OLS estimate, if students take English tutoring more than 1 standard deviation from their mean, they show a higher English O-net score of 0.472 standard deviation, this estimate is statistically significant at 95 percent confidence level. Also, the size effect is less than the IV estimate, the IV estimate shows an increase in English O-net score of 3.569 standard deviations at a 90 percent confidence level. Instead of using the Mathematic O-net score, the effect of Mathematic tutoring has a positive and insignificant impact on Mathematic O-net score.

Based on the IV estimate, there are four factors which are significant to the Mathematic O-net score and consistent in terms of statistical significance between OLS and the IV method. First, students' self-study (significance at 99 percent), the more students' self-study, the more O-net scores (Self-study is independent study such as homework, reviewing, or previewing academic contents). Second, students' self-esteem (significance at 99 percent), the more students' self-esteem, the more O-net score (Self-esteem included understanding in the advanced context, confidence in doing well in the examination, and applying well the concept that learned in the class). Third, income (significance at 99 percent), the income is the main factor that helps the student to access the private tutoring school. Lastly, Other programs (significance at 99 percent), if students who have not studied in international program and Mathematics program in mainstream school, they have a lower O-net score than the students who studied in the science program.

Moreover, there are three factors which are student self-study, student self-esteem, and income, statistically significant at 90 percent confidence level

with English O-net score and consistent in terms of statistical significance between OLS and IV estimate. These factors have a positive relationship with English O-net score, and also have the same direction and statistical significance as Mathematics tutoring.

Participation in English private tutoring shows a positive and significant effect on the academic outcome as similar to the results obtained by Mischo and Haag, (2002), Rothman and Henderson, (2011) and Saengboon, (2019). In mathematic tutoring show positive and insignificant effect on the academic outcome as opposed to the results obtained by Ünal, Özkan, Milton, Price, and Curva, (2010), Guill and Bos, (2014), Mischo and Haag, (2002), Rothman and Henderson, (2011), Suleman and Hussain, (2014), Choi, Calero, and Escardíbul, (2012), Berberoğlu and Tansel, (2014) and Thongphat, (2012).

To investigate whether the increase in private tutoring participation helps students to increase their O-net score or not. The results found that if student more participates in private tutoring, which helps students to increase their O-net score only English subject, but if a student takes more Mathematic tutoring does not help to increase O-net score. Then, investigating the impact of private tutoring participation on O-net score, by comparing tutored students and non-tutored students.

Table 4.12 and 4.13 represent the consequences of tutored students on academic outcome in Mathematics and English tutoring, respectively. These two results, the private tutoring participation measured by students participating in private tutoring or not (dummy variable). The results found that both English and Mathematic tutoring help students to increase O-net scores when compared with non-tutor students. Based on the IV estimate, if students participate in Mathematic private tutoring, they show a higher Mathematic O-net score of 0.698 standard deviation when compare with non-tutored students, statistically significance at 90 percent confidence level. If students participate in English private tutoring, they show a higher English O-net score of 0.688 standard deviation when compared with non-tutored students, statistically significant at 95 percent confidence level.

Therefore, the English tutoring, tutored students have higher English O-net scores than non-tutored students, and if students take more English tutoring, show higher English O-net scores. The Mathematic tutoring, tutor students have higher

Mathematic O-net score than non-tutored students, and if students take more Mathematic tutoring does not help students to increase Mathematic O-net score. Means that over-standing does not generates benefits from Mathematics tutoring but generate a waste of money to participate in private tutoring school. A student should participate in private tutoring at the optimal level to maximize their benefit from tutoring to increase the academic score.



Table 4.10

The consequence of students' academic outcome in mathematic

Mathematic		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.252	0.377	3.221	0.153
	(GPA)*(Private tutoring)	-0.071	0.390	-0.916	0.153
	Private tutoring square	0.015	0.825	0.081	0.364
	One by one tutoring	-0.183	0.949	0.080	0.811
	Group tutoring	-0.100	0.709	0.040	0.900
	VDO or online tutoring	0.163	0.538	0.291	0.350
	Private tutoring cost	0.194	0.142	0.211	0.180
Student characteristics	Student self-study	1.134	0.003***	0.205	0.003***
	Student self-esteem	0.388	0.000***	0.413	0.000***
	Student forced to enrollment	-0.065	0.280	0.178	0.616
	Student received peer effect	0.065	0.785	0.326	0.310
	Student willing to learn	-0.079	0.754	0.225	0.519
	GPA	0.045	0.389	-0.583	0.153
	Gender	-0.067	0.441	-0.025	0.805
School characteristics	Region	0.093	0.280	0.079	0.419
	School type	0.037	0.716	0.086	0.478
	Number of students in class	-0.007	0.079*	-0.006	0.174
	International program	-0.265	0.038*	-0.176	0.257
	Mathematic program	0.036	0.734	0.026	0.826
	Other programs	-1.383	0.000***	-2.020	0.001***
Family characteristics	ln(income)	0.237	0.001***	0.198	0.017***
	Father education 1	-0.264	0.108	-0.138	0.497
	Father education 2	-0.101	0.556	-0.002	0.992
	Father education 3	-0.061	0.796	0.072	0.800
	Mother education 1	-0.134	0.371	-0.095	0.580
	Mother education 2	-0.187	0.234	-0.148	0.412
	Mother education 3	-0.779	0.715	-0.099	0.681

Note: Number of observations = 412

Source: Author's calculation

Table 4.11

The consequence of students' academic outcome in English

English		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.472	0.047**	3.569	0.098*
	(GPA)*(Private tutoring)	-0.151	0.027**	-1.557	0.161
	Private tutoring square	-0.063	0.312	-0.869	0.750
	One by one tutoring	0.376	0.116	-1.313	0.823
	Group tutoring	0.299	0.198	-1.318	0.815
	VDO or online tutoring	0.102	0.659	-2.394	0.778
	Private tutoring cost	0.183	0.251	0.251	0.196
Student characteristics	Student self-study	0.058	0.095*	0.573	0.098*
	Student self-esteem	0.398	0.000***	0.034	0.078*
	Student forced to enrollment	-0.115	0.634	-2.050	0.758
	Student received peer effect	-0.046	0.836	-2.211	0.765
	Student willing to learn	-0.213	0.358	-1.837	0.745
	GPA	0.121	0.027**	6.803	0.761
	Gender	0.024	0.753	0.162	0.809
School characteristics	Region	0.055	0.456	0.292	0.752
	School type	-0.121	0.183	-0.632	0.727
	Number of students in class	-0.011	0.005***	-0.019	0.607
	International program	-0.007	0.945	0.678	0.777
	Mathematic program	0.123	0.192	0.778	0.733
	Other programs	-0.043	0.181	8.170	0.778
Family characteristics	ln(income)	0.308	0.000***	0.576	0.056*
	Father education 1	0.041	0.773	-0.381	0.821
	Father education 2	0.373	0.014**	-0.774	0.845
	Father education 3	0.325	0.119	0.302	0.820
	Mother education 1	0.002	0.999	-0.441	0.795
	Mother education 2	0.003	0.982	-0.203	0.855
	Mother education 3	-0.108	0.561	0.242	0.855

Note: Number of observations = 412

Source: Author's calculation

Table 4.12

The consequence of tutored students on Mathematic O-net score

Mathematic		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.011	0.066*	0.698	0.054*
	One by one tutoring	-0.047	0.835	-0.789	0.196
	Group tutoring	-0.127	0.556	-0.895	0.145
	VDO or online tutoring	0.136	0.498	-0.587	0.315
	Private tutoring cost	0.425	0.174	0.428	0.183
Student characteristics	Student self-study	0.139	0.059*	0.081	0.074*
	Student self-esteem	0.390	0.001***	0.388	0.001***
	Student forced to enrollment	-0.047	0.835	-0.401	0.303
	Student received peer effect	0.0660	0.729	-0.312	0.409
	Student willing to learn	0.075	0.690	0.359	0.296
	GPA	0.001	0.001***	0.001	0.726
	Gender	-0.063	0.422	-0.021	0.835
School characteristics	Region	0.094	0.184	0.159	0.147
	School type	0.043	0.580	0.053	0.647
	Number of students in class	-0.071	0.103	-0.011	0.039**
	International program	-0.258	0.013	-0.138	0.406
	Mathematic program	0.033	0.798	0.082	0.509
	Other programs	-1.431	0.001***	1.502	0.001***
Family characteristics	ln(income)	0.231	0.002***	0.118	0.293
	Father education 1	-0.256	0.209	-0.341	0.078*
	Father education 2	-0.094	0.646	-0.195	0.341
	Father education 3	0.051	0.845	-0.203	0.480
	Mother education 1	1.334	0.460	0.043	0.835
	Mother education 2	-0.189	0.265	-0.139	0.435
	Mother education 3	0.080	0.698	0.105	0.700

Note: Number of observations = 412

Source: Author's calculation

Table 4.13

The consequence of tutored students on English O-net score

English		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.501	0.071*	0.688	0.036**
	One by one tutoring	0.449	0.044**	-0.249	0.520
	Group tutoring	0.366	0.095*	-0.283	0.552
	VDO or online tutoring	0.182	0.406	-0.401	0.365
	Private tutoring cost	0.472	0.185	0.481	0.138
Student characteristics	Student self-study	0.067	0.096*	0.041	0.018**
	Student self-esteem	0.401	0.001***	0.301	0.001***
	Student forced to enrollment	-0.059	0.802	-0.601	0.166
	Student received peer effect	0.001	0.981	-0.573	0.192
	Student willing to learn	-0.160	0.482	-0.546	0.126
	GPA	0.001	0.456	0.001	0.821
	Gender	0.206	0.789	0.075	0.430
School characteristics	Region	0.050	0.502	0.071	0.418
	School type	-0.112	0.216	-0.135	0.205
	Number of students in class	-0.102	0.006***	-0.015	0.004***
	International program	-0.019	0.857	0.005	0.966
	Mathematic program	-0.019	0.254	0.018	0.880
	Other programs	0.108	0.057*	-0.065	0.082
Family characteristics	ln(income)	0.301	0.001***	0.169	0.071*
	Father education 1	0.048	0.736	0.106	0.558
	Father education 2	0.395	0.009***	0.351	0.049**
	Father education 3	0.339	0.106	0.540	0.049**
	Mother education 1	0.001	0.991	-0.050	0.747
	Mother education 2	0.001	0.004***	-0.033	0.836
	Mother education 3	-0.132	0.476	-0.272	0.244

Note: Number of observations = 412

Source: Author's calculation

4.2.2 The consequence of educational inequality

To evaluate the heterogeneous effect of private tutoring on students' O-net scores in Mathematics and English subjects via the different groups of O-net scores. To test whether private tutoring has more power to improve student O-net scores for which groups. The groups are separated by quantile (4 groups), which are low achiever (low O-net score), quite low achiever (quite low O-net score), quite high achiever (quite high O-net score), and high achiever (high O-net score).

There are three issues to determine whether private tutoring causes inequality in academic achievement due to private tutoring participation. First, the inequality of the influence of private tutoring on students' grade point average. Second, there are differentials among private tutoring participation by each quantile group. Third, the inequality of effectiveness of private tutoring, which this chapter mostly focuses on.

The first issue studies the inequality of the influence of private tutoring on students' grade point average. This issue represents that private tutoring has more influence on high GPA students or low GPA students. To analyze, this issue can be observed from the private tutoring multiplied by grade point average ($PT_i * GPA_i$) in table 4.10 and 4.11 for Mathematic and English tutoring, respectively. If the sign is positive, which means private tutoring has more effect on high-GPA students than low-GPA students. Based on the instrumental variable method, the results found that ($PT_i * GPA_i$) is statistically insignificant in both mathematic and English tutoring. It means private tutoring has the same power among GPA students. Therefore, the inequality in this perception does not occur.

The second and third issues are rearranging the data by sorting the O-net score and separating the data into 4 parts, which are low achiever (low O-net score), quite low achiever (quite low O-net score), quite high achiever (quite high O-net score), and high achiever (high O-net score). Each group is comprised of 103 students out of a total of 412 students.

The second issue studies the average weekly hours spent on private tutoring by quantile. Table 4.13 found that the students in upper quantiles show higher participation in private tutoring compared with students in lower quantiles.

Nevertheless, the differences in weekly hours spend on private tutoring among quantile are not massive in both mathematic and English subjects.

Table 4.14

The statistic on private tutoring in each quantile

	Quantile 1 Low achiever	Quantile 2 A quite low achiever	Quantile 3 A quite high achiever	Quantile 4 High achiever
Mathematic tutoring				
The average weekly hours spend on private tutoring	2.88 (3.69)	4.19 (4.21)	4.97 (2.95)	5.13 (3.19)
Average O-net score	27.91 (9.17)	50.97 (5.42)	64.53 (3.59)	79.78 (19.14)
English tutoring				
The average weekly hours spend on private tutoring	2.05 (2.26)	3.93 (4.65)	4.28 (4.65)	4.30 (2.18)
Average O-net score	31.62 (8.53)	52.20 (4.65)	64.43 (2.54)	75.84 (5.98)

Note: () represent the standard deviation

Source: Author's calculation

The third issue studies the inequality of effectiveness of private tutoring. As mentioned, there are endogeneity problems, then the ordinary least square is going to be biased. Thus, to elimination the endogeneity problem by implementing the instrumental variable with two-stage least square as the same as the first objective. Therefore, in this part, the models are separated into 4 models by quantiles, and then implement the two-stage least square with the number of private tutoring participants among the five closest friends as an instrumental variable.

The results of Mathematics tutoring are shown in table 4.14 – 4.17. Based on the instrumental variable estimates suggest that the Mathematic private tutoring shows a heterogeneous effect on O-net score. Private tutoring shows significance in the first quantile (low achievers) and last quantile (high achievers). Students in the first and last quantiles increased mathematic O-net scores by 2.592 and 3.967 standard deviations after taking more private tutoring, respectively, while students in the second and third quantiles show insignificance after taking more private tutoring. In other words, when compared to students in the first and last quantiles, students in the middle group (second-third quantiles) do not benefit from private tutoring.

The results of English tutoring are shown in table 4.18 – 4.21. Based on the instrumental variable estimates suggest that English private tutoring shows a heterogeneous effect on O-net scores. The private tutoring shows significance only on the last quantile (high achievers). Students in the last quantile increased their English O-net score by 1.643 standard deviations after taking more private tutoring.

Therefore, both Mathematics and English results show that private tutoring generates educational inequality via the difference in the ability of private tutoring to increase O-net score by difference academic score level, the Mathematics tutoring generates educational inequality less than English tutoring because English tutoring only helps students who are high achievers, the effect size of English tutoring is 1.643 standard deviation. Whereas Mathematics tutoring helps students in both low achievers and high achievers parallel together, the effect size of low and high achievers are 2.59 and 3.96, respectively. The Mathematic tutoring pushes students' ability in low achievers to pursue higher achievers, but the tutoring of high achievers also pushes the students' ability to escape low achievers. The effect size of high achievers is bigger than low achievers, meaning the high achievers have more ability to grow more than low achievers. Then the educational inequality remains to occur but less than English tutoring which helps high achievers' students only.

According to instrumental variable estimates, the interesting factors which affect the Mathematic O-net score in each quantile are represented as follows. The first quantile, having two factors affected to O-net score are school type and other

programs, if the students study in public school and/or do not study in an international or mathematic program, private tutoring affects their O-net score positively. Second quantile, students having more self-esteem and more income positively affect their O-net score. The third quantile, having no factor which affects to O-net score. Last quantile, students having more self-study or studying in Mathematics program positively affect their O-net score. If students enroll in the private tutoring school willingly to learn by themselves or receive peer effect from their friends, this positively affects their O-net score.

For the English O-net score, the first quantile, the other programs (do not study in an international program and mathematic program) positively affect to English O-net score with the same direction as the Mathematic O-net score. The second quantile, if students participate in private tutoring school willingly to learn by themselves or receive peer effect from their friends, this positively affects their O-net score. The third quantile, having no factor which affects to O-net score as same as Mathematic results. Lastly, in the fourth quantile, the number of students in the class in school positively affects to English O-net score, and female students have higher English O-net scores than male students.

In summary, private tutoring generates the achievement gap between low and high achieving students, which exacerbates inequality in the educational sector. Private tutoring differentially affects students' academic outcomes depending on students' academic ability. Overall results explain that private tutoring does not help to improve the academic outcome for low achievers, but it is more beneficial to high achievers. These findings are similar to Lee, (2003), which stated that private tutoring generates educational inequality. Whereas Lee, (2003) found that private tutoring increases the academic outcome of high achievers more than low achievers.

Table 4.15

The consequence of students' academic outcome in Mathematic in quantile 1

Mathematic in quantile 1		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.118	0.721	2.592	0.092*
	(GPA)*(Private tutoring)	-0.011	0.907	1.353	0.195
	Private tutoring square	0.132	0.064*	0.029	0.835
	One by one tutoring	-0.112	0.761	-1.221	0.239
	Group tutoring	-0.329	0.239	-1.431	0.132
	VDO or online tutoring	-0.178	0.534	-1.372	0.178
	Private tutoring cost	0.246	0.321	0.523	0.252
Student characteristics	Student self-study	0.021	0.662	0.111	0.283
	Student self-esteem	0.042	0.366	-0.001	0.989
	Student forced to enrollment	0.505	0.146	1.739	0.111
	Student received peer effect	0.363	0.206	1.562	0.126
	Student willing to learn	0.417	0.144	1.651	0.113
	GPA	0.130	0.314	1.252	0.152
	Gender	-0.100	0.208	-0.357	0.148
School characteristics	Region	0.037	0.262	-0.146	0.480
	School type	0.304	0.687	0.385	0.095*
	Number of students in class	0.001	0.026**	0.008	0.420
	International program	-0.133	0.228	-0.207	0.276
	Mathematic program	0.160	0.180	0.123	0.532
	Other programs	-0.503	0.015**	-0.966	0.046**
Family characteristics	ln(income)	0.100	0.262	-0.041	0.820
	Father education 1	0.004	0.973	0.331	0.303
	Father education 2	-0.153	0.289	-0.117	0.624
	Father education 3	-0.144	0.542	0.496	0.424
	Mother education 1	-0.045	0.732	-0.312	0.296
	Mother education 2	-0.113	0.942	0.041	0.872
	Mother education 3	0.064	0.766	0.016	0.936

Note: Number of observations = 103

Source: Author's calculation

Table 4.16

The consequence of students' academic outcome in Mathematic in quantile 2

Mathematic in quantile 2		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.008	0.971	1.536	0.357
	(GPA)*(Private tutoring)	0.005	0.934	-0.433	0.366
	Private tutoring square	0.037	0.333	-0.002	0.997
	One by one tutoring	0.038	0.837	0.026	0.899
	Group tutoring	0.024	0.887	-0.044	0.828
	VDO or online tutoring	-0.021	0.898	-0.025	0.892
	Private tutoring cost	0.343	0.362	0.139	0.424
Student characteristics	Student self-study	-0.020	0.408	-0.016	0.555
	Student self esteem	0.115	0.001***	0.123	0.001***
	Student forced to enrollment	0.046	0.777	-0.080	0.723
	Student received peer effect	0.066	0.651	0.036	0.824
	Student willing to learn	0.117	0.459	0.007	0.970
	GPA	-0.028	0.680	0.008	0.920
	Gender	0.001	0.998	-0.090	0.442
School characteristics	Region	-0.006	0.901	-0.013	0.820
	School type	-0.009	0.988	0.026	0.719
	Number of students in class	-0.002	0.358	-0.008	0.782
	International program	-0.004	0.956	-0.024	0.792
	Mathematic program	-0.034	0.606	-0.016	0.824
	Other programs	omitted	omitted	omitted	omitted
Family characteristics	ln(income)	0.061	0.066*	0.068	0.063*
	Father education 1	-0.103	0.286	-0.094	0.378
	Father education 2	-0.119	0.237	-0.112	0.308
	Father education 3	-0.177	0.238	-0.224	0.191
	Mother education 1	0.105	0.218	0.103	0.270
	Mother education 2	0.110	0.226	0.109	0.272
	Mother education 3	0.224	0.136	0.179	0.293

Note: Number of observations = 103

Source: Author's calculation

Table 4.17

The consequence of students' academic outcome in Mathematic in quantile 3

Mathematic in quantile 3		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.334	0.101	1.745	0.688
	(GPA)*(Private tutoring)	-0.082	0.179	0.505	0.698
	Private tutoring square	-0.0624	0.079*	-0.034	0.708
	One by one tutoring	-0.352	0.042*	-0.488	0.287
	Group tutoring	-0.352	0.035*	-0.487	0.282
	VDO or online tutoring	-0.269	0.079*	-0.398	0.355
	Private tutoring cost	0.361	0.017*	0.219	0.142
Student characteristics	Student self-study	-0.033	0.158	0.321	0.698
	Student self-esteem	0.078	0.036	-0.045	0.318
	Student forced to enrollment	-0.026	0.783	-0.011	0.920
	Student received peer effect	-0.023	0.781	-0.065	0.681
	Student willing to learn	-0.052	0.577	-0.103	0.584
	GPA	0.052	0.178	0.321	0.698
	Gender	-0.021	0.560	0.321	0.829
School characteristics	Region	-0.024	0.476	-0.081	0.649
	School type	0.047	0.234	0.043	0.337
	Number of students in class	-0.005	0.010*	-0.007	0.370
	International program	0.010	0.858	0.049	0.717
	Mathematic program	-0.042	0.313	-0.033	0.519
	Other programs	Omitted	Omitted	Omitted	Omitted
Family characteristics	ln(income)	0.059	0.096	0.125	0.543
	Father education 1	0.036	0.644	0.136	0.671
	Father education 2	0.020	0.790	0.079	0.693
	Father education 3	0.006	0.950	-0.089	0.778
	Mother education 1	0.007	0.916	-0.119	0.765
	Mother education 2	-0.034	0.625	-0.120	0.661
	Mother education 3	0.069	0.440	-0.052	0.893

Note: Number of observations = 103

Source: Author's calculation

Table 4.18

The consequence of students' academic outcome in Mathematic in quantile 4

Mathematic in quantile 4		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	1.346	0.091*	3.967	0.056*
	(GPA)*(Private tutoring)	0.431	0.077*	1.176	0.139
	Private tutoring square	0.146	0.337	0.146	0.293
	One by one tutoring	0.177	0.759	0.327	0.552
	Group tutoring	0.146	0.804	0.208	0.702
	VDO or online tutoring	0.116	0.874	0.144	0.293
	Private tutoring cost	0.159	0.316	0.291	0.214
Student characteristics	Student self-study	0.226	0.015**	0.244	0.004***
	Student self-esteem	-0.015	0.910	-0.003	0.980
	Student forced to enrollment	-0.596	0.337	-0.495	0.389
	Student received peer effect	1.005	0.066*	0.952	0.055*
	Student willing to learn	0.991	0.075*	1.033	0.041*
	GPA	0.087	0.657	0.025	0.893
	Gender	-0.105	0.512	-0.133	0.371
School characteristics	Region	0.149	0.398	0.174	0.287
	School type	-0.150	0.429	-0.165	0.341
	Number of students in class	0.002	0.725	-0.004	0.687
	International program	0.109	0.707	0.301	0.363
	Mathematic program	0.265	0.186	0.348	0.083*
	Other programs	Omitted	Omitted	Omitted	Omitted
Family characteristics	ln(income)	0.108	0.461	0.088	0.519
	Father education 1	-1.389	0.002***	-1.606	0.001***
	Father education 2	-1.653	0.000***	-1.885	0.000***
	Father education 3	-1.581	0.004***	-1.897	0.001***
	Mother education 1	-0.132	0.710	0.081	0.837
	Mother education 2	0.009	0.977	0.185	0.600
	Mother education 3	-0.458	0.267	-0.439	0.244

Note: Number of observations = 103

Source: Author's calculation

Table 4.19

The consequence of students' academic outcome in English in quantile 1

English in quantile 1		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.310	0.551	1.044	0.300
	(GPA)*(Private tutoring)	-0.081	0.572	1.449	0.299
	Private tutoring square	-0.104	0.329	0.208	0.508
	One by one tutoring	-0.177	0.655	0.416	0.580
	Group tutoring	-0.036	0.914	0.225	0.659
	VDO or online tutoring	0.075	0.821	0.191	0.674
	Private tutoring cost	-0.152	0.325	0.193	0.219
Student characteristics	Student self-study	-0.064	0.456	0.017	0.898
	Student self-esteem	0.038	0.551	-0.124	0.467
	Student forced to enrollment	-0.454	0.327	1.082	0.475
	Student received peer effect	-0.203	0.548	0.386	0.579
	Student willing to learn	-0.447	0.188	0.540	0.588
	GPA	0.167	0.413	1.553	0.223
	Gender	-0.127	0.363	-0.084	0.657
School characteristics	Region	-0.131	0.328	-0.122	0.494
	School type	0.202	0.413	-0.086	0.836
	Number of students in class	-0.008	0.145	0.003	0.779
	International program	0.211	0.220	0.409	0.158
	Mathematic program	0.126	0.488	0.079	0.746
	Other programs	-0.711	0.084*	-1.262	0.086*
Family characteristics	ln(income)	0.116	0.264	0.230	0.182
	Father education 1	-0.024	0.887	-0.224	0.440
	Father education 2	0.019	0.929	-0.291	0.476
	Father education 3	-0.084	0.837	-0.049	0.928
	Mother education 1	-0.229	0.203	-0.055	0.845
	Mother education 2	-0.041	0.840	0.002	0.994
	Mother education 3	-0.195	0.579	-0.323	0.504

Note: Number of observations = 103

Source: Author's calculation

Table 4.20

The consequence of students' academic outcome in English in quantile 2

English in quantile 2		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.060	0.814	1.195	0.610
	(GPA)*(Private tutoring)	-0.025	0.738	-0.354	0.602
	Private tutoring square	-0.057	0.203	-0.054	0.207
	One by one tutoring	-0.186	0.380	-0.301	0.333
	Group tutoring	-0.236	0.253	-0.318	0.220
	VDO or online tutoring	-0.273	0.197	-0.369	0.191
	Private tutoring cost	-0.291	0.271	0.152	0.182
Student characteristics	Student self-study	0.027	0.290	0.007	0.868
	Student self-esteem	0.049	0.161	0.039	0.323
	Student forced to enrollment	0.329	0.166	0.382	0.129
	Student received peer effect	0.375	0.094*	0.424	0.072*
	Student willing to learn	0.408	0.062*	0.396	0.059*
	GPA	-0.030	0.669	-0.052	0.522
	Gender	-0.021	0.723	-0.064	0.542
School characteristics	Region	0.021	0.731	0.031	0.324
	School type	-0.106	0.184	-0.077	0.612
	Number of students in class	-0.002	0.491	-0.001	0.427
	International program	0.009	0.908	-0.009	0.913
	Mathematic program	0.029	0.691	0.078	0.524
	Other programs	0.175	0.431	0.629	0.510
Family characteristics	ln(income)	0.038	0.408	0.048	0.324
	Father education 1	-0.006	0.947	0.032	0.799
	Father education 2	-0.007	0.945	0.081	0.698
	Father education 3	-0.244	0.159	-0.100	0.765
	Mother education 1	-0.045	0.603	-0.026	0.775
	Mother education 2	-0.048	0.579	-0.060	0.488
	Mother education 3	0.023	0.869	0.053	0.722

Note: Number of observations = 103

Source: Author's calculation

Table 4.21

The consequence of students' academic outcome in English in quantile 3

English in quantile 3		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.100	0.599	0.480	0.784
	(GPA)*(Private tutoring)	0.038	0.505	-0.134	0.797
	Private tutoring square	-0.001	0.985	-0.009	0.826
	One by one tutoring	-0.001	0.994	-0.028	0.871
	Group tutoring	-0.019	0.910	-0.033	0.833
	VDO or online tutoring	-0.041	0.800	-0.064	0.696
	Private tutoring cost	-0.291	0.119	0.120	0.249
Student characteristics	Student self-study	0.032	0.120	0.025	0.396
	Student self-esteem	-0.021	0.490	-0.022	0.424
	Student forced to enrollment	-0.005	0.966	0.087	0.770
	Student received peer effect	-0.317	0.787	0.056	0.843
	Student willing to learn	0.032	0.795	0.122	0.675
	GPA	-0.039	0.417	0.030	0.887
	Gender	0.022	0.531	0.017	0.610
School characteristics	Region	-0.009	0.768	-0.009	0.754
	School type	0.003	0.915	0.101	0.773
	Number of students in class	0.002	0.149	0.003	0.130
	International program	-0.058	0.235	-0.045	0.439
	Mathematic program	-0.014	0.735	-0.017	0.652
	Other programs	-0.291	0.149	-0.209	0.491
Family characteristics	ln(income)	0.008	0.798	0.038	0.685
	Father education 1	0.103	0.291	0.052	0.765
	Father education 2	0.149	0.136	0.075	0.754
	Father education 3	0.162	0.151	0.116	0.496
	Mother education 1	0.032	0.716	0.054	0.602
	Mother education 2	-0.038	0.671	-0.005	0.964
	Mother education 3	-0.119	0.244	-0.096	0.405

Note: Number of observations = 103

Source: Author's calculation

Table 4.22

The consequence of students' academic outcome in English in quantile 4

English in quantile 4		OLS		IV	
		Coefficient	P-value	Coefficient	P-value
Private tutoring	Private tutoring participation	0.154	0.077*	1.643	0.090*
	(GPA)*(Private tutoring)	0.052	0.615	-0.450	0.300
	Private tutoring square	0.059	0.460	-0.030	0.782
	One by one tutoring	0.001	0.901	0.005	0.980
	Group tutoring	-0.244	0.909	0.210	0.922
	VDO or online tutoring	-0.116	0.579	-0.069	0.743
	Private tutoring cost	0.194	0.253	0.093	0.539
Student characteristics	Student self-study	0.017	0.765	0.003	0.957
	Student self-esteem	0.063	0.273	0.019	0.776
	Student forced to enrollment	-0.282	0.277	-0.346	0.188
	Student received peer effect	-0.272	0.247	-0.339	0.156
	Student willing to learn	-0.233	0.339	-0.231	0.341
	GPA	-0.041	0.615	0.357	0.300
	Gender	0.179	0.032*	0.241	0.013*
School characteristics	Region	0.004	0.948	-0.030	0.701
	School type	-0.090	0.281	-0.084	0.312
	Number of students in class	0.008	0.069*	0.009	0.040*
	International program	0.011	0.115	0.076	0.549
	Mathematic program	-0.073	0.101	-0.001	0.988
	Other programs	Omitted	Omitted	Omitted	Omitted
Family characteristics	ln(income)	0.098	0.201	0.134	0.101
	Father education 1	0.038	0.839	0.219	0.368
	Father education 2	-0.057	0.688	0.071	0.690
	Father education 3	Omitted	Omitted	Omitted	Omitted
	Mother education 1	-0.120	0.485	-0.081	0.642
	Mother education 2	-0.058	0.725	0.001	0.995
	Mother education 3	-0.059	0.773	0.044	0.842

Note: Number of observations = 103

Source: Author's calculation

4.2.3 The consequence of faculty entering

To evaluate the effect of private tutoring in Mathematics and English subjects on faculty entering. This part implemented the multinomial logistic regression technique to evaluate the private tutoring helps students to enter which type of faculty for a bachelor's degree.

The faculty entering is separated into 3 faculty groups. 1) Social science-related faculties including Business Administration, Geography, History, Political Science, Education, and Sociology. 2) Science-related faculties including Medicine, Physics, Chemistry, Biology, Engineering, Statistics, Mathematics, and Computer Systems. 3) Art-related faculties including Dance, Music, Performing Arts, and Languages.

The multinomial logistic regression is the appropriate method to test which faculty in a bachelor's degree will a student enter after participating in a private tutoring school. The dependent variable in question is nominal variables and 3 categories.

To the interpretation of the multinomial logistic regression in terms of relative risk ratio (RRR). The relative risk ratio indicates how the risk of the outcome falling in the comparison group compared to the risk of the outcome falling in the referent group changes with the variable in question. If RRR more than one indicates that the risk of the outcome falling in the comparison group relative to the risk of the outcome falling in the referent group increases as the variable increases. If RRR less than one indicates that the risk of the outcome falling in the comparison group relative to the risk of the outcome falling in the referent group decreases as the variable increases. It means, if the RRR is less than 1, the outcome is more likely to be in the referent group.

The third research question has 2 issues to investigate the relationship between private tutoring and faculty entering. The first issue, analyzing private tutoring has an influence on students' decision about faculty entering, which is shown in table 4.22 – 4.27. The second issue, to analyze the effectiveness of private tutoring on faculty entering, which is shown in table 4.28 – 4.30.

Table 4.22 represents the consequence of faculty entering in Mathematics tutoring by assuming social science-related faculties as a base outcome, which means the relative risk ratio for a one-unit increase in mathematic private tutoring for science-related faculties and art-related faculties relative to faculty of social sciences given other variables remain the same. The result found that if students participate in mathematic private tutoring increased by 1 standard deviation from their mean, the relative risk of science-related faculties relative to social science-related faculties would be expected to increase by a factor of 7.740 at a 90 percent confidence level.

Table 4.23 represents the consequence of faculty entering in Mathematics tutoring by assuming science-related faculties as a base outcome, which means the relative risk ratio for a one-unit increase in mathematic private tutoring for social science-related faculties and art-related faculties relative to science-related faculties given other variables remain the same. The result found that if students participate in mathematic private tutoring increased by 1 standard deviation from their mean, the relative risk of social science-related faculties relative to science-related faculties would be expected to decrease by a factor of 0.129 at a 90 percent confidence level.

Table 4.24 represents the consequence of faculty entering in Mathematics tutoring by assuming art-related faculties as a base outcome, which means the relative risk ratio for a one-unit increase in mathematic private tutoring for social science-related faculties and science-related faculties relative to art-related faculties given other variables remain the same. The result found that if students participate in mathematic private tutoring increased by 1 standard deviation from their mean, the relative risk of social science-related faculties and science-related faculties relative to art-related faculties would be expected to not be changed.

Table 4.25 represents the consequence of faculty entering in English tutoring by assuming social science-related faculties as a base outcome, which means the relative risk ratio for a one-unit increase in English private tutoring for science-related faculties and art-related faculties relative to social science-related faculties given other variables remain the same. The result found that if students participate in

English private tutoring increased by 1 standard deviation from their mean, the relative risk of science-related faculties and art-related faculties relative to social science-related faculties would be expected to not be changed.

Table 4.26 represents the consequence of faculty entering in English tutoring by assuming science-related faculties as a base outcome, which means the relative risk ratio for a one-unit increase in English private tutoring for social science-related faculties and art-related faculties relative to science-related faculties given other variables remain the same. The result found that if students participate in English private tutoring increased by 1 standard deviation from their mean, the relative risk of art-related faculties relative to science-related faculties would be expected to decrease by a factor of 0.196 at a 90 percent confidence level.

Table 4.27 represents the consequence of faculty entering in English tutoring by assuming art-related faculties as a base outcome, which means the relative risk ratio for a one-unit increase in English private tutoring for social science-related faculties and science-related faculties relative to art-related faculties given other variables remain the same. The result found that if students participate in English private tutoring increased by 1 standard deviation from their mean, the relative risk of science-related faculties relative to art-related faculties would be expected to increase by a factor of 5.096 at a 90 percent confidence level.

The results of the first issue in table 4.22 – 4.27 summarize that students who take more Mathematic tutoring are more likely to enter science-related faculties than social science-related faculties. And students who take more English tutoring are more likely to enter science-related faculties than art-related faculties. Therefore, private tutoring has more influence on students to enter social science-related faculties. This finding is consistent with Stevenson and Baker's (1992) finding that private education increases the likelihood of attending university.

Moreover, to analyze the effectiveness of private tutoring on faculty entering among 1) students only take Mathematic tutoring, 2) students only take English tutoring, and 3) students take both Mathematics and English tutoring. The results are shown in table 4.28 - 4.30.

Table 4.28 represents the consequence of faculty entering by assuming social science-related faculties as a base outcome. The results found that the relative risk ratio comparing tutored students in both Mathematics and English tutoring to non-tutored students of art-related faculties relative to social science-related faculties given the other variable remains the same, the relative risk for art-related faculties would be expected to increase by 7.573 at 95 percent confidence level.

Table 4.29 represents the consequence of faculty entering by assuming art-related faculties as a base outcome. The results found that the relative risk ratio comparing tutored students in both Mathematics and English tutoring to non-tutored students of art-related faculties relative to science-related faculties given the other variable remains the same, the relative risk for art-related faculties would be expected to decrease by 0.041 at 95 percent confidence level. Moreover, the relative risk ratio comparing tutored students only in English tutoring to non-tutored students of art-related faculties relative to science-related faculties given the other variable remain the same, the relative risk for art-related faculties would be expected to decrease by 0.076 at 90 percent confidence level.

Table 4.30 represents the consequence of faculty entering by assuming art-related faculties as a base outcome. The results found that the relative risk ratio comparing tutored students in both mathematic and English tutoring to non-tutored students of social science-related faculties relative to art-related faculties given the other variable remain the same, the relative risk for social science-related faculties would be expected to decrease by 0.132 at 95 percent confidence level. The relative risk ratio comparing tutored students in both mathematic and English tutoring to non-tutored students of science-related faculties relative to art-related faculties given the other variable remain the same, the relative risk for social science-related faculties would be expected to increase by 4.019 at 95 percent confidence level. Moreover, the relative risk ratio comparing tutored students only in English tutoring to non-tutored students of science-related faculties relative to art-related faculties given the other variable remain the same, the relative risk for science-related faculties would be expected to increase by 9.483 at 90 percent confidence level.

The results for the second issue in table 4.28 – 4.30 summarize that if students take both Mathematics and English tutoring, the students are more likely to enter social science-related faculties than art-related faculties, and more likely to enter art-related faculties than social science-related faculties. Moreover, if students take only English tutoring, the students have more likely to enter science-related faculties than art-related faculties. Whereas, students taking only Mathematic tutoring is not significant to faculty entering. Therefore, students participating in both tutoring simultaneously (Mathematics and English tutoring) is more effective than participating in only one subject. Moreover, when comparing the effectiveness between English and Mathematic tutoring, English tutoring has more effectiveness than Mathematic tutoring in increasing students' probability of faculty entering.

The students will pay much attention to their faculty and university entrance. They want to get the important information in order to improve their academic skills and prepare for admission to a bachelor's degree program. Private tutoring provides support for parents to supplement their children's likelihood in the educational allocation competition. The highly competitive university entrance examination represents a turning point for young people in Thailand. Private tutoring is designed to encourage students to increase their abilities in order to improve their performance on the entrance examinations. Then, the student's willingness to participate in private tutoring in order to prepare for the entrance examination.

Table 4.23

The consequence of faculty entering in mathematic tutoring 1

Mathematic tutoring		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Private tutoring participation	Base Outcome		7.740	0.091*	3.061	0.364
	(GPA)*(Private tutoring)			0.584	0.164	0.813	0.557
	Private tutoring square			0.849	0.493	0.645	0.085*
	One by one tutoring			0.652	0.654	0.234	0.133
	Group tutoring			0.512	0.476	0.192	0.067*
	VDO or online tutoring			0.711	0.700	0.083	0.007***
	Private tutoring cost			0.825	0.193	0.426	0.171
Student characteristics	Student self-study			0.911	0.554	1.144	0.326
	Student self-esteem			1.090	0.679	0.660	0.034**
	Student forced to enrollment			0.679	0.688	0.943	0.943
	Student received peer effect			0.671	0.629	0.545	0.376
	Student willing to learn			0.781	0.777	0.283	0.108
	GPA			1.415	0.257	1.151	0.651
	O-net score			1.425	0.047**	0.915	0.668
School characteristics	Gender			1.013	0.962	1.701	0.090*
	Region			0.592	0.087*	1.511	0.187
	School type			0.954	0.896	0.807	0.543
	Number of students in class			0.995	0.757	0.968	0.028**
	International program			0.085	0.002***	0.726	0.467
	Mathematic program			0.221	0.001***	0.511	0.729
Family characteristics	Other programs			0.792	0.001***	1.379	0.651
	ln(income)			0.845	0.496	0.883	0.585
	Father education 1			0.758	0.657	1.920	0.217
	Father education 2			1.609	0.445	2.096	0.225
	Father education 3			0.827	0.828	2.029	0.379
	Mother education 1			1.550	0.465	1.317	0.570
	Mother education 2			0.851	0.787	1.475	0.486
Mother education 3			1.578	0.547	0.659	0.603	

Note: Number of observations = 412

Source: Author's calculation

Table 4.24

The consequence of faculty entering in mathematic tutoring 2

Mathematic tutoring		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Private tutoring participation	0.129	0.091*	Base Outcome		0.395	0.513
	(GPA)*(Private tutoring)	1.710	0.164		1.390	0.422	
	Private tutoring square	1.177	0.493		0.760	0.376	
	One by one tutoring	1.533	0.654		0.359	0.372	
	Group tutoring	1.919	0.476		0.369	0.360	
	VDO or online tutoring	1.404	0.700		1.116	0.045**	
	Private tutoring cost	0.825	0.471		0.142	0.193	
Student characteristics	Student self-study	1.091	0.554		1.255	0.209	
	Student self-esteem	0.917	0.679		0.605	0.064*	
	Student forced to enrollment	1.471	0.688		1.389	0.753	
	Student received peer effect	1.488	0.629		0.812	0.816	
	Student willing to learn	1.279	0.777		0.363	0.309	
	GPA	0.706	0.257		0.813	0.430	
	O-net score	0.701	0.758		0.642	0.056*	
	Gender	0.986	0.962		1.677	0.178	
School characteristics	Region	1.686	0.087*		2.549	0.018**	
	School type	1.018	0.896		0.846	0.716	
	Number of students in class	1.004	0.757		0.973	0.162	
	International program	11.637	0.002***		8.450	0.011**	
	Mathematic program	4.513	0.001***		2.309	0.132	
	Other programs	12.623	0.001***		17.410	0.001***	
Family characteristics	ln(income)	1.183	0.496		1.045	0.880	
	Father education 1	1.318	0.657		2.532	0.205	
	Father education 2	0.621	0.445		1.302	0.740	
	Father education 3	1.208	0.828		2.453	0.423	
	Mother education 1	0.644	0.465		0.849	0.814	
	Mother education 2	1.174	0.787		1.733	0.464	
	Mother education 3	0.633	0.547		0.417	0.395	

Note: Number of observations = 412

Source: Author's calculation

Table 4.25

The consequence of faculty entering in mathematic tutoring 3

Mathematic tutoring		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Private tutoring participation	0.326	0.364	2.528	0.513	Base Outcome	
	(GPA)*(Private tutoring)	1.229	0.557	0.719	0.422		
	Private tutoring square	1.548	0.085*	1.314	0.376		
	One by one tutoring	4.269	0.133	2.784	0.372		
	Group tutoring	5.197	0.067*	2.708	0.360		
	VDO or online tutoring	12.024	0.007***	8.558	0.045**		
	Private tutoring cost	3.815	0.361	1.352	0.214		
Student characteristics	Student self-study	0.873	0.326	0.796	0.209		
	Student self-esteem	1.514	0.034**	1.651	0.064*		
	Student forced to enrollment	1.059	0.943	0.719	0.752		
	Student received peer effect	1.831	0.376	1.230	0.816		
	Student willing to learn	3.522	0.108	2.752	0.309		
	GPA	0.868	0.651	1.229	0.430		
	O-net score	1.091	0.668	1.556	0.056*		
	Gender	0.587	0.090*	0.596	0.178		
School characteristics	Region	0.661	0.187	0.392	0.018**		
	School type	1.238	0.543	1.184	0.716		
	Number of students in class	1.032	0.028**	1.027	0.162		
	International program	1.377	0.467	0.118	0.011**		
	Mathematic program	1.954	0.085*	0.432	0.132		
	Other programs	0.724	0.729	0.574	0.001***		
Family characteristics	ln(income)	1.132	0.585	0.956	0.880		
	Father education 1	0.520	0.217	0.394	0.205		
	Father education 2	0.476	0.225	0.767	0.740		
	Father education 3	0.492	0.379	0.407	0.423		
	Mother education 1	0.759	0.570	1.177	0.814		
	Mother education 2	0.677	0.486	0.577	0.464		
	Mother education 3	0.515	0.603	2.392	0.395		

Note: Number of observations = 412

Source: Author's calculation

Table 4.26

The consequence of faculty entering in English tutoring 1

English tutoring		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Private tutoring participation	Base Outcome		3.151	0.365	0.618	0.661
	(GPA)*(Private tutoring)			0.727	0.378	1.275	0.445
	Private tutoring square			1.358	0.196	0.572	0.038**
	One by one tutoring			0.359	0.372	0.248	0.147
	Group tutoring			0.369	0.360	0.296	0.211
	VDO or online tutoring			0.116	0.045*	0.344	0.250
	Private tutoring cost			0.183	0.129	0.528	0.518
Student characteristics	Student self-study			1.255	0.209	1.363	0.073*
	Student self-esteem			0.605	0.064*	1.409	0.122
	Student forced to enrollment			1.389	0.752	1.950	0.165
	Student received peer effect			0.812	0.816	0.252	0.204
	Student willing to learn			0.363	0.309	0.192	0.187
	GPA			0.813	0.430	0.924	0.795
	O-net score			1.642	0.056*	1.341	0.155
School characteristics	Gender		1.088	0.780	1.838	0.058*	
	Region		2.549	0.018**	1.163	0.627	
	School type		0.846	0.716	0.841	0.630	
	Number of students in class		0.973	0.162	0.970	0.030**	
	International program		0.084	0.001***	1.083	0.843	
	Mathematic program		0.231	0.002***	0.463	0.063*	
Family characteristics	Other programs		0.150	0.000***	2.443	0.503	
	ln(income)		1.045	0.880	0.657	0.082*	
	Father education 1		2.532	0.205	2.206	0.224	
	Father education 2		1.302	0.740	1.373	0.650	
	Father education 3		2.453	0.423	1.632	0.585	
	Mother education 1		0.849	0.814	1.559	0.391	
	Mother education 2		1.733	0.464	2.052	0.194	
Mother education 3		0.417	0.395	0.819	0.825		

Note: Number of observations = 412

Source: Author's calculation

Table 4.27

The consequence of faculty entering in English tutoring 2

English tutoring		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Private tutoring participation	0.317	0.365	Base Outcome		0.196	0.073*
	(GPA)*(Private tutoring)	1.374	0.378		1.754	0.068*	
	Private tutoring square	0.736	0.196		0.423	0.002***	
	One by one tutoring	0.068	0.043**		0.017	0.002***	
	Group tutoring	0.095	0.077*		0.028	0.005***	
	VDO or online tutoring	0.116	0.097*		0.040	0.011**	
	Private tutoring cost	0.524	0.254		0.417	0.184	
Student characteristics	Student self-study	1.101	0.577		1.501	0.055*	
	Student self-esteem	1.232	0.215		1.736	0.029*	
	Student forced to enrollment	11.392	0.052*		2.221	0.504	
	Student received peer effect	16.239	0.021**		4.103	0.202	
	Student willing to learn	15.523	0.027**		1.797	0.402	
	GPA	0.693	0.258		0.641	0.070*	
	O-net score	0.607	0.011**		0.814	0.400	
	Gender	0.918	0.780		1.688	0.162	
School characteristics	Region	1.803	0.053*		2.097	0.051*	
	School type	1.122	0.767		0.944	0.901	
	Number of students in class	0.995	0.749		0.966	0.063*	
	International program	11.835	0.001***		12.823	0.022***	
	Mathematic program	4.312	0.002***		2.001	0.221	
	Other programs	8.691	0.000***		2.124	0.001***	
Family characteristics	ln(income)	1.082	0.722		0.711	0.209	
	Father education 1	1.278	0.686		2.820	0.176	
	Father education 2	0.634	0.467		0.871	0.863	
	Father education 3	0.957	0.961		1.563	0.690	
	Mother education 1	0.892	0.844		1.391	0.623	
	Mother education 2	1.548	0.478		3.178	0.103	
	Mother education 3	0.864	0.854		0.708	0.749	

Note: Number of observations = 412

Source: Author's calculation

Table 4.28

The consequence of faculty entering in English tutoring 3

English tutoring		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Private tutoring participation	1.617	0.661	5.096	0.073*	Base Outcome	
	(GPA)*(Private tutoring)	0.783	0.445	0.570	0.068*		
	Private tutoring square	1.737	0.038**	2.359	0.002***		
	One by one tutoring	4.017	0.147	8.569	0.002***		
	Group tutoring	3.370	0.211	5.121	0.005***		
	VDO or online tutoring	2.906	0.250	4.876	0.011**		
	Private tutoring cost	4.252	0.165	1.425	0.291		
Student characteristics	Student self-study	0.733	0.073*	0.665	0.055*		
	Student self-esteem	0.709	0.122	0.575	0.029**		
	Student forced to enrollment	5.127	0.165	0.450	0.504		
	Student received peer effect	3.957	0.204	0.243	0.202		
	Student willing to learn	5.192	0.187	0.357	0.402		
	GPA	1.081	0.795	1.559	0.070*		
	O-net score	0.745	0.155	1.227	0.400		
	Gender	0.544	0.058*	0.592	0.162		
School characteristics	Region	0.859	0.627	0.476	0.051*		
	School type	1.188	0.630	1.058	0.901		
	Number of students in class	1.030	0.030**	1.035	0.063*		
	International program	0.922	0.843	0.077	0.002***		
	Mathematic program	2.155	0.063*	0.499	0.221		
	Other programs	0.409	0.503	0.471	0.001***		
Family characteristics	ln(income)	1.521	0.082*	1.405	0.209		
	Father education 1	0.453	0.224	0.354	0.176		
	Father education 2	0.728	0.650	1.147	0.863		
	Father education 3	0.612	0.585	0.639	0.690		
	Mother education 1	0.641	0.391	0.718	0.623		
	Mother education 2	0.487	0.194	0.314	0.103		
	Mother education 3	1.220	0.825	1.412	0.749		

Note: Number of observations = 412

Source: Author's calculation

Table 4.29

The consequence of faculty entering 1

		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Mathematic tutoring	Base Outcome		1.231	0.864	1.439	0.701
	English tutoring		0.126	0.176	2.465	0.436	
	Both tutoring		0.315	0.372	7.573	0.026**	
	Private tutoring cost		0.625	0.129	0.092	0.271	
	One by one tutoring (Math)		1.184	0.876	0.535	0.510	
	Group tutoring (Math)		1.049	0.963	0.552	0.495	
	VDO or online tutoring (Math)		1.534	0.677	0.231	0.095*	
	One by one tutoring (Eng)		1.571	0.128	0.382	0.327	
	Group tutoring (Eng)		3.953	0.167	0.395	0.349	
	VDO or online tutoring (Eng)		1.422	0.094*	0.553	0.550	
Student characteristics	Student self-study		0.861	0.495	1.458	0.061*	
	Student self-esteem	0.885	0.540	1.221	0.364		
	Student forced to enrollment (Math)	0.803	0.844	1.657	0.564		
	Student received peer effect (Math)	0.915	0.926	0.961	0.958		
	Student willing to learn (Math)	1.062	0.952	0.505	0.421		
	Student forced to enrollment (Eng)	0.125	0.998	0.262	0.300		
	Student received peer effect (Eng)	0.095	0.053*	0.222	0.218		
	Student willing to learn (Eng)	0.084	0.041*	0.281	0.354		
	GPA	1.128	0.679	1.131	0.673		
	Math O-net score	1.309	0.229	0.939	0.796		
School characteristics	English O-net score	1.503	0.077*	1.406	0.155		
	Gender	1.103	0.744	1.952	0.041**		
	Region	0.538	0.054*	1.370	0.322		
	School type	0.953	0.904	0.798	0.525		
	Number of students in class	1.011	0.508	0.966	0.021**		
	International program	0.085	0.002***	0.751	0.505		
Family characteristics	Mathematic program	0.237	0.003***	0.398	0.027**		
	Other programs	0.406	0.679	0.893	0.925		
	ln(income)	0.822	0.382	0.771	0.271		
	Father education 1	0.847	0.791	1.993	0.259		
	Father education 2	1.557	0.469	1.769	0.380		
	Father education 3	0.869	0.870	2.024	0.416		
	Mother education 1	1.228	0.728	1.316	0.598		
Mother education 2	0.712	0.575	1.555	0.442			
Mother education 3	1.495	0.607	0.564	0.540			

Note: Number of observations = 412

Source: Author's calculation

Table 4.30

The consequence of faculty entering 2

		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Mathematic tutoring	0.812	0.864	Base Outcome	1.168	0.903	
	English tutoring	7.901	0.176		0.051	0.076*	
	Both tutoring	3.170	0.372		0.041	0.019**	
	Private tutoring cost	0.251	0.158		0.371	0.195	
	One by one tutoring (Math)	0.845	0.876		0.451	0.517	
	Group tutoring (Math)	0.953	0.963		0.526	0.580	
	VDO or online tutoring (Math)	0.561	0.677		0.150	0.096*	
	One by one tutoring (Eng)	0.048	0.028**		0.018	0.006***	
	Group tutoring (Eng)	0.071	0.065*		0.283	0.016**	
	VDO or online tutoring (Eng)	0.095	0.093*		0.532	0.048**	
Student characteristics	Student self-study	1.162	0.495		1.397	0.237	
	Student self-esteem	0.957	0.688		0.587	0.079*	
	Student forced to enrollment (Math)	1.243	0.844		2.061	0.569	
	Student received peer effect (Math)	1.091	0.962		1.049	0.965	
	Student willing to learn (Math)	0.941	0.952		0.475	0.531	
	Student forced to enrollment (Eng)	7.989	0.100		2.094	0.603	
	Student received peer effect (Eng)	10.517	0.053*		2.345	0.523	
	Student willing to learn (Eng)	11.867	0.041*		3.345	0.403	
	GPA	0.886	0.679		1.002	0.001***	
	Math O-net score	0.763	0.229		0.717	0.260	
	English O-net score	0.665	0.077*	0.935	0.817		
	Gender	0.906	0.744	1.769	0.141		
School characteristics	Region	1.857	0.054*	2.545	0.020**		
	School type	1.049	0.054*	0.837	0.707		
	Number of students in class	0.988	0.904	0.954	0.029**		
	International program	11.703	0.002***	8.798	0.011**		
	Mathematic program	4.207	0.003***	1.676	0.371		
	Other programs	2.468	0.001***	2.201	0.001***		
Family characteristics	ln(income)	1.215	0.382	0.938	0.815		
	Father education 1	1.179	0.791	2.351	0.279		
	Father education 2	0.642	0.469	1.136	0.873		
	Father education 3	1.151	0.870	2.330	0.450		
	Mother education 1	0.814	0.728	1.072	0.919		
	Mother education 2	1.403	0.575	2.182	0.289		
	Mother education 3	0.668	0.607	1.072	0.383		

Note: Number of observations = 412

Source: Author's calculation

Table 4.31

The consequence of faculty entering 3

		Social science-related faculties		Science-related faculties		Art-related faculties	
		RRR	P-value	RRR	P-value	RRR	P-value
Private tutoring	Mathematic tutoring	0.694	0.701	0.855	0.903	Base Outcome	
	English tutoring	0.405	0.436	9.483	0.076*		
	Both tutoring	0.132	0.026**	4.019	0.019**		
	Private tutoring cost	0.561	0.315	0.175	0.196		
	One by one tutoring (Math)	1.869	0.501	2.213	0.517		
	Group tutoring (Math)	1.809	0.495	1.898	0.580		
	VDO or online tutoring (Math)	4.336	0.095*	6.653	0.096*		
	One by one tutoring (Eng)	2.612	0.327	3.652	0.006***		
	Group tutoring (Eng)	2.526	0.349	5.257	0.016**		
	VDO or online tutoring (Eng)	1.806	0.550	8.826	0.048**		
Student characteristics	Student self-study	0.685	0.061*	0.715	0.237		
	Student self-esteem	1.548	0.032**	1.702	0.079*		
	Student forced to enrollment (Math)	0.603	0.564	0.485	0.569		
	Student received peer effect (Math)	1.047	0.958	0.953	0.965		
	Student willing to learn (Math)	1.978	0.421	2.102	0.513		
	Student forced to enrollment (Eng)	3.813	0.300	0.477	0.603		
	Student received peer effect (Eng)	4.484	0.218	0.426	0.523		
	Student willing to learn (Eng)	5.547	0.354	0.298	0.403		
	GPA	0.887	0.673	0.997	0.001***		
	Math O-net score	1.064	0.798	1.393	0.260		
	English O-net score	0.710	0.515	1.068	0.817		
	Gender	0.512	0.041**	0.565	0.141		
	School characteristics	Region	0.729	0.322	0.392		0.020**
School type		1.252	0.525	1.193	0.707		
Number of students in class		1.035	0.021**	1.047	0.029**		
International program		1.330	0.505	0.113	0.011**		
Mathematic program		2.509	0.027**	0.596	0.374		
Other programs		1.228	0.925	0.455	0.001***		
Family characteristics	ln(income)	1.295	0.271	1.065	0.815		
	Father education 1	0.501	0.259	0.425	0.279		
	Father education 2	0.565	0.380	0.880	0.873		
	Father education 3	0.494	0.416	0.429	0.450		
	Mother education 1	0.759	0.598	0.936	0.919		
	Mother education 2	0.642	0.442	0.458	0.289		
	Mother education 3	1.770	0.540	2.647	0.383		

Note: Number of observations = 412

Source: Author's calculation

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This thesis uses a google form or online questionnaire to observe the data from 412 bachelor's degree students in Thailand. The study finds that there are only 46 students (11.17 percent) who had not participated in private tutoring in both Mathematics and English subjects, but there are 310 students (75.24 percent) who had participated in private tutoring in both Mathematics and English. However, there were 37 students (8.96 percent) who had participated only in Mathematics private tutoring and 19 students (4.61 percent) who had participated only in English private tutoring.

When looking deeper, 24.76 percent of participants had taken Mathematics private tutoring in high school for 6 semesters. 21.36 percent had taken Mathematics private tutoring for 4 semesters. And 17.72 percent had taken Mathematics private tutoring for 5 semesters. For English tutoring, 20.63 percent of participants had taken English private tutoring for 5 semesters. 19.66 percent had taken English private tutoring for 4 semesters. And 16.02 percent had taken English private tutoring for 6 semesters.

Peer effect and tutor's reputation have an influence on whether high school students decide to take private tutoring. Regular tutoring time for Mathematics and English is around 5.03 and 4.51 hours per week respectively. The average cost of private tutoring in mathematics and English is about 96.26 and 106.46 baht per hour, which shows the hourly cost of English tutoring is higher than mathematic tutoring. Moreover, the data shows that students who have more family income, can participate in private tutoring more than students who have less family income because of high tutoring costs.

The top four students' reasons for participating in private tutoring are 1) Catching up with classmates. 2) More understanding in contexts, practicing harder problems and improving their grade point average (GPA) 3) Preparing for university

examinations and 4) Learning new examination techniques and guidelines which are not normally disclosed in mainstream schools.

These reasons represent the failure of education standards in mainstream schools which cannot meet students' academic goals. Education in Thailand prioritizes educational ranking and competition, which affects the students' learning methods. They are consistently forced to be one step above their classmates and to be able to understand and utilize their lessons in a more effective way. Private tutoring is one of the choices students can make that can help them to achieve their goals.

As an empirical result, the instrumental variable technique found that students with private tutoring show significantly higher O-net scores in both Mathematics and English than students without private tutoring. Moreover, students who take more English private tutoring show a statistically significant increase in their English O-net score. However, students who take more Mathematic tutoring show a statistically insignificant increase in Mathematic O-net score.

The result of Mathematic tutoring shows a positive significant and non-increasing effect of participation rate on O-net score. The non-increasing effect may imply that mathematics subject is based on self-study or the effort of doing exercises on their own. For example, students should concentrate on more review or preview academic contents and do homework or practice problem sets by themselves. The result of English tutoring shows a positive significant and increasing effect of participation rate on O-net score, which may imply that the English subject relies on consistency in practicing, especially practicing with private tutoring teachers. The techniques and guidelines from tutoring school are important in English subjects. And the instruction strategy of English tutoring can lead to higher scores on the tests.

The students' characteristics related statistically significant to student's O-net scores in Mathematics and English which are students' self-study, and students' self-esteem. If a student takes more time to practice doing problem sets or review academic content before or after studying in a mainstream school, which is an important thing to drive up the academic score. Furthermore, if students have higher self-esteem in advance context and examination, this is an important factor in improving academic score.

Not only O-net score but also faculty entering is academic outcomes of students. This study applies the multinomial logistic regression to investigate which faculty students will enter after participating in private tutoring. For a student who takes more private tutoring in Mathematic subject, the student is more likely to enter the science-related faculties than social science-related faculties. And a student who takes more English private tutoring, the student is more likely to enter the science-related faculties than are related faculties.

Moreover, if students take both Mathematics and English tutoring, the student is more likely to enter science-related faculties than art-related faculties, and the student is more likely to enter art-related faculties than social science-related faculties. And if students take only English tutoring, the student is more likely to enter science-related faculties than art-related faculties. Whereas, students taking only Mathematic tutoring is not significant to faculty entering.

All empirical results concluded that the effectiveness of English private tutoring is more impactful than Mathematic tutoring. English tutoring helps students to enhance their English O-net score when comparing the tutored students with the non-tutored students. If students are more participate in English tutoring, their English O-net score will improve. And more English tutoring will have a greater impact on smart students (high O-net score) and poor students (low O-net score) than average achievers (medium O-net score), which means English tutoring helps low achievers (low O-net score) to pursue other students. This effectiveness of English tutoring could be the reason that students practice English subjects regularly in tutoring school because English subject requires consistent work. Therefore, English tutoring school is the best choice for students to acquire their knowledge to improve the academic score.

Mathematic tutoring promotes students to increase Mathematic scores when comparing the tutored students with the non-tutored students. Nevertheless, we do not find that more Mathematic tutoring leads to a better Mathematic O-net score. Interestingly, significant improvement in Mathematics O-net score will be seen only in smart students. But poor students will not receive benefits from mathematic tutoring. This ineffectiveness of mathematic tutoring in low achieving students (low O-net score) may imply that low achievers (low O-net score) is likely to less frequently

review lessons by themselves than high achievers (high O-net score) because Mathematic subject is more of a self-practice subject. It is possible that students do not fully understand the context and cannot apply them in the examination. Therefore, both Mathematic tutoring and self-study help students to acquire their knowledge to improve their academic scores, unlike English subjects that are based on consistency of using the language which tutoring school is a better choice if students want to improve language skills.

Consequently, the academic program in mainstream schools is the main way to generate student's academic skills to increase their academic score but it might be not enough for some students. Private tutoring schools are one of the academic programs to strengthen student's skills to increase their academic scores together with studying in their school. It means tutoring schools are a complement to mainstream schools for students to improve academic outcomes. Moreover, students should participate in tutoring school at an optimal level, but should not rely on tutoring without self-practice and not attend mainstream school classes.

Participating in both English tutoring and Mathematic tutoring simultaneously is more effective than enrolling in only one subject because students should balance their skills to achieve a noticeable academic outcome. It means students should not dedicate themselves to either Mathematics or English subject alone. One main reason why students cannot take private tutoring in both subjects are the private tutoring' expenditure. When students have to choose to study either Mathematics tutoring or English tutoring, the results show that the students should enroll in English tutoring because the effectiveness of English private tutoring is more impactful than Mathematic tutoring.

Private tutoring not only generates positive consequences, but also negative consequences. The negative consequences of private tutoring are inequality and household burden (Cost of private tutoring). The inequality in private tutoring is analyzed in 2 ways, which are inequality in opportunity and inequality in the outcome.

First, inequality in opportunity, private tutoring is not accessible for all students. This generates social inequalities since prosperous families can participate in private tutoring more than poor families in terms of quantity and quality.

Second, inequality in outcome represents a heterogeneous academic outcome because private tutoring in this study found that Mathematics and English private tutoring generate inequality that is beneficial to some students. Private tutoring has more influence on the academic outcome of high achieving students who have more ability to grow, but the same amount of tutoring time has a relatively small impact on low achieving students who have less growth ability.

Therefore, private tutoring is effective in increasing academic outcomes. Whereas private tutoring does not necessarily effective for all students.

5.2 The policy implications

Private tutoring has some advantages which do not appear in mainstream schools. For example, private tutoring schools provide techniques, academic guidelines, and contexts to summarize the lessons for their students. Also, private tutoring seems to improve students' O-net scores, generating a household burden from high private tutoring costs.

This study does not indicate that private tutoring is an important educational activity to increase academic achievement. The policy recommendation suggests that the educational policy should focus on academic programs to support students' academic outcomes and enhance the quality of a mainstream school. The mainstream school educational policy cannot be concluded in this study, but at least we see an opportunity to improve mainstream schools to be more like private tutoring schools. The Thailand education sector should apply the advantages of private tutoring to improve the mainstream school curriculum and show mainstream school's teachers how to teach students more effectively in order that students can get higher academic scores. For example, a mainstream school should provide techniques and context summary to students like a private tutoring school.

5.3 The limitations of the study and directions for future research

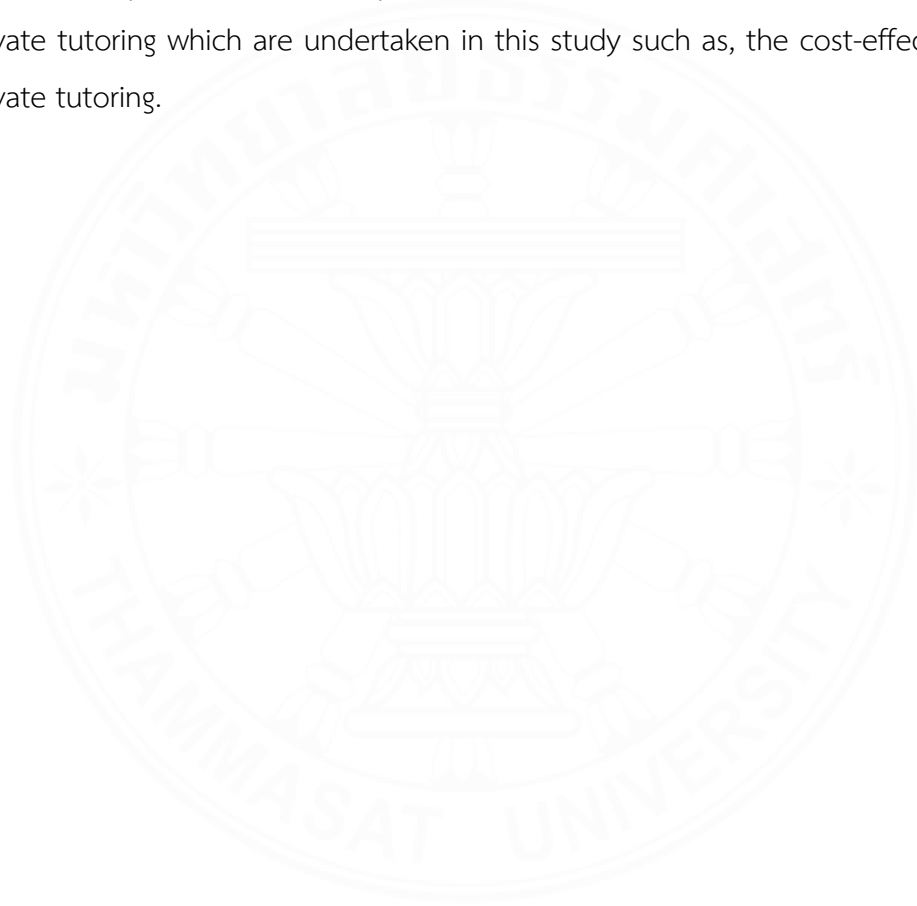
First, the education production function explains the relationship between input vectors of education and academic achievement (O-net score and faculty entering). The educational inputs are measured by several factors such as school characteristics, teacher characteristics, student characteristics, household characteristics, and educational inputs under the control of parents. Even though the model uses a set of controls to account for these observable differences, it is still impossible to control for unobserved characteristics, which may distort the estimate of the private tutoring effect. The example of unobserved characteristics such as teachers' ability, teachers' motivation, school quality, school supplies, etc. Future research should try to reduce this omitted variable bias.

Second, our faculty entering model leaves out relevant independent variables. This condition forces the model to attribute the effects of omitted variables, which biases the coefficient estimates. This paper uses English and Mathematics private tutoring participation, and English and Mathematics academic O-net scores, which are incomplete data to determine faculty entering, because entering faculty requires other subject scores and hence other private tutoring subjects. For example, sciences-related faculties require science academic scores, and we should include Sciences private tutoring to determine sciences-related faculty entering. The omitted variable (e.g., Sciences tutoring) might correlate with independent variables on a regression model (e.g., Mathematics tutoring). This correlation is a cause of the bias estimates. If the included (e.g., Mathematics tutoring) and omitted variable (e.g., sciences tutoring) have a positive correlation, we can expect a positive bias (coefficient is overestimated). Future research should include relevant variables to reduce biases.

Third, to address the endogeneity problem, this paper applies the instrumental variable approach. However, the validity of an instrumental variable rests heavily on the validity of the instrument. It is not always possible to identify a plausible or sufficiently strong instrument. Even when a compelling instrument exists, authors and readers must think skeptically about whether the instrument truly acts as a randomizer. Future research should try other methods to investigate the impact of

private tutoring, such as propensity score matching, the hierarchical linear model, the difference in difference method, panel data approach, randomized or experimental data.

Lastly, more several academic measures are also interesting to study, such as university ranking, grade point average, or other national scores. Then, this paper only focuses on private tutoring's quantities in terms of enrollment but does not analyze the private tutoring's quality. However, there are more several aspects of private tutoring which are undertaken in this study such as, the cost-effectiveness of private tutoring.



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