

Master's thesis in Economics [NEKP01]

Does Hagwon Curfew Work?

Effect of a Regulation over Operating Hours of Private Tutoring
Institutions on Private Tutoring Expenditures in Korea

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Abstract

This investigation aims at estimating the effect of a regulation over operating hours of hagwon on private tutoring expenditures in Korea. The average treatment effect is measured with a difference-in-differences (DD) estimator using data from the survey of private education expenditure, conducted by the Statistics Korea (KOSTAT). By exploiting the fact that all education offices have placed a restriction on operating hours of hagwon in their ordinances since 2009 and some of them changed their curfew on hagwon in 2011 and 2012, the DD estimator measures the average treatment effect of the policy. The main finding of this study is that the reinforcement of the curfew on operating hours of hagwon does not generate a significant reduction in hours spent on private tutoring and that the policy is only successful in significantly decreasing middle school students' private tutoring costs. The standard economic theory suggests that the policy increases high school students' private tutoring costs due to their inelastic demands for private tutoring services. Furthermore, when the analysis is restricted to the group of students most likely to be affected by the policy, i.e. those who receive private tutoring intensively, the policy causes a sizable decrease in private tutoring expenses at all school levels. Given that those with intensive private tutoring tend to have higher socio-economic backgrounds, this evidence implies that the policy may be producing fruitful consequences in terms of a reduction in inequality of educational opportunities.

Keywords: Difference-in-Differences; Private tutoring; Expenditures, Hagwon; Korea

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This dissertation is dedicated to my soon-to-be-born daughter, Ann Choi.

1. Introduction

In South Korea (Korea, hereafter), there exist extensive markets for private tutoring¹ outside the formal education system, and Korean families spend a great deal of money on the private tutoring markets for their children. According to the 2009 survey of private education expenditures conducted by the Statistics Korea (KOSTAT), the total private tutoring expenditures amounted to 21.626 trillion won in 2009, which is approximately equivalent to 2% of Korea's GDP. The average monthly private tutoring expenditures per student were 242 thousand Korean won (approximately 220 U.S dollar) in 2009 and 75% of the primary and secondary students were reported to receive private tutoring. The Organization for Economic Cooperation and Development (OECD, 2012a, p.24) points out that the pervasiveness of private tutoring places a heavy financial burden on Korean households, reaching 10.7% of average household income per student in 2010, and that such financial burden is a key factor explaining Korea's exceptionally low fertility rate.

As Bray (1999, p.18) argues, private tutoring can be seen as a mechanism through which students enhance their learning outcomes, thereby increasing the accumulation of human capital. The workload of school teachers may also decrease, given that private tutoring aids students to better understand the materials covered in class. Furthermore, given that the increased education of individuals gives positive externalities in the form of greater economic productivity, lower unemployment rates, and higher political participation rates, private tutoring can be beneficial not only to individuals but also to the society (Weisbrod, 1964).

Despite these benefits, private tutoring also produces different negative impacts. Yoon (2003) identifies the negative effects of private tutoring by categorizing them into two major types: educational and economical problems. First, from an educational point of view, private tutoring distorts the curriculum in mainstream classes and disturbs the education system functioning normally. Long hours devoted to private tutoring deteriorates pupils' health, hindering their well-rounded development. It is also a concern that students' self-directed learning and active problem-solving abilities could be hampered when they rely excessively on private tutoring (Yoon, 2003, p.32). Second, from an economic standpoint, private tutoring is detrimental since it commonly perpetuates or even exacerbates social inequalities. Pupils

¹ Private tutoring (sometimes called shadow education) consists of a series of activities, supplementary to regular school education, that involve financial transactions outside the public education system (Bray 2005).

from high-income households are likely to consume more private tutoring services, so that such inequality of educational opportunity largely contributes to a widening income gap across generations. Also, as it overlaps with public education, private tutoring wastes human and financial resources that could be used for other activities in a more efficient way. In addition, a decrease of household consumption and retirement saving caused by the burden of private tutoring expenses has a negative influence on the national economy (Bray, 1999; Choi, 2007; Kim, 2004; OECD, 2012a).

Due to these problems, private tutoring has been widely debated in Korea, and a variety of measures have been introduced to curtail the soaring private tutoring costs. However, despite efforts from the Korean government, these policies have not been effective, and household spending on private tutoring has managed to grow at an alarming pace. Consequently, in an attempt to curb the thriving private tutoring and to revive public education, the Korean government took stronger measures against private tutoring institutions (called *hagwon*²) by directly limiting their operating hours to 10 p.m. Before the 10 p.m. curfew on hagwon was imposed, each city and province education offices restrained operating hours of hagwon in their ordinances, so that the business hours were different by region. For instance, in 2009 hagwon in Seoul was not allowed to remain open after 10 p.m., while the Gyeonggi Provincial Office of Education had its own curfew on hagwon to 11 p.m. for lower-secondary school students, and 12 a.m. for upper-secondary school students, but these rules did not have any legal binding (Kang, 2010). In October 2009, the Ministry of Education, Science and Technology reported that the government was expected to urge amendment of ordinances of education offices in each city and province regarding the hagwon curfew, so that all city and provincial education offices set the same curfew at 10 p.m. At the same time, the government helped the intervention to produce actual results by toughening its crack down on hagwon that violated business hours and offering a financial reward to citizens who reported such cases. As a result, a total of 13 education offices have completed or partly completed the revision of ordinances regulating operating hours of hagwon to 10 p.m (Korean Educational Development Institute, 2012, p.15-16).

Fortunately, household spending on private tutoring has gradually decreased since it reached its highest point in 2009. The government believes that the fall in private tutoring

² Hagwon is the Korean-language word for a private for-profit school-like learning institution, academy, or cram school prevalent in Korea (Wikipedia).

costs reflects that the reforms have begun to take effect and that the 10 p.m. curfew on hagwons played a substantial role in the reduction of private tutoring costs (Han, 2011). However, it is ambiguous to conclude that the cut is attributed to the hagwon curfew since other factors, such as sluggish real economy, could also have an impact on the fall in private tutoring expenditures. This is not to say that the government measures have been completely ineffective: these policies led by the government may have paid off. Therefore, the main aim of this thesis is to evaluate the effectiveness of the policy by investigating whether the curfew on hagwon's operating hours contributed to the reduction in private education expenditures³.

This study applies a difference-in-differences (DD) estimator. By exploiting the fact that all education offices have placed a restriction on operating hours of hagwon in their ordinances since 2009 and some of them changed their curfew on hagwon in 2011 and 2012, the DD estimator aims at measuring the unbiased average treatment effect of the policy.

The data analyzed in the current paper come from the survey of private education expenditure conducted by the Statistics Korea (KOSTAT). The survey is answered by 46000 parents of students who are attending 1081 elementary, middle, and high school across the country twice a year⁴. Data from 2009 to 2012 are used for the analysis.

The main finding of this study is that the reinforcement of the curfew on operating hours of hagwon does not generate a significant reduction in hours spent on private tutoring and that the policy is only successful in decreasing middle school students' private tutoring costs. The standard economic theory suggests that the policy increases high school students' private tutoring costs due to their inelastic demands for private tutoring services. Furthermore, when the analysis is restricted to the group of students most likely to be affected by the policy, i.e. those who receive private tutoring intensively, the policy causes a sizable decrease in private tutoring expenses at all school levels. Given that those with intensive private tutoring tend to have higher socio-economic backgrounds, this evidence implies that the policy may be producing fruitful consequences in terms of a reduction in inequality of educational opportunities.

The overall structure of the study takes the form of 9 chapters, including this introductory

³ It is also important to analyze the effect of the policy on hours spent on private tutoring in that long hours devoted to private tutoring deteriorates pupils' health, hindering their well-rounded development. However, the main problems on the issue of private tutoring from an economic point of view (efficiency and equity issues) are more closely related to expenditures spent on private tutoring. Thus, the current paper focuses more on doing in-depth analysis of the effect of the policy on private tutoring expenditures.

⁴ The survey had answered by 44000 parents in 2009 and 2010, and the sample size was expanded in 2011.

chapter. Chapter 2 begins by giving a general description on the extent of private tutoring in Korea and the government's response to the issue, in order to establish a background. Chapter 3 reviews previous research on this field of study, and a theoretical model is developed in chapter 4. Chapter 5 is concerned with the methodology, a difference-in-differences (DD) estimator, and chapter 6 describes the data and variables used for this study. The main results are reported in chapter 7, and chapter 8 discusses the policy implications of the research. Finally, the conclusion gives a brief summary and critique of the findings.

2. Background

This chapter establishes a background concerning the pervasiveness of the private tutoring sector in Korea and the various measures the Korean government used to curtail expenditures in that sector. Subchapter 2.1 presents a brief description on the “education fever⁵” and private tutoring in Korea, while the causes and effects of the proliferation of private tutoring in Korea is analyzed in subchapter 2.2 and 2.3, respectively. Subchapter 2.4 introduces diverse policies attempted by the Korean government to curb the overheated private tutoring demands, and finally subchapter 2.5 focuses on one of the government's latest measure, the 10 p.m. curfew on operating hours of hagwon.

2.1. “Education fever” and private tutoring in Korea

Since 1950, Korea has had a 6-3-3-4 educational system: grade 1 to 6 for elementary school (primary school), grade 7 to 9 for middle school (lower-secondary school), grade 10 to 12 for high school (upper-secondary school), and 4 years in universities (Kim and Lee, 2001, p.3). The high schools are divided into two types: general or academic high schools where pupils are educated to advance to universities and vocational high schools that specialize in a number of fields such as commerce, engineering, or art. Currently, 9 years of schooling up to middle school education is compulsory and free; nevertheless, high school education is virtually universal with modest tuitions (Kim, 2004, p.3).

The zeal for higher education in Korea is so great that it is thought to be excessive.

⁵ Education fever is a terminology often used in this field of study to describe a situation in countries like Korea where the enthusiasm for education is very high.

According to OECD (2011, p.12-13), in 2009, 98% of 25-34 year-old Koreans attained high school education, and 63% of the same group of young Korean adults have completed their tertiary education: both proportions are the highest among OECD countries. The percentage of high school graduates who enter 4-year universities or 2-year technical colleges was reported to be 83.8% in 2008, which was also very high compared to other OECD countries (Korean Educational Development Institute, 2009, p.66). As university degrees do not guarantee good career prospects anymore, the competition for admission to prestigious universities became notoriously keen. College entrance mainly depends on academic achievement at school and on the College Scholastic Achievement Test (CSAT), an objectively graded examination that can be taken once a year. Consequently, high school students have no opportunity to relax from the endless study routines and Korean families end up spending a significant amount of money on private tutoring to support their children.

Private tutoring in Korea is not limited to children from higher socio-economic groups, but widespread across different income groups. The 2009 survey of private education expenditures (2009) reports that 87.4% of elementary school students, 74.3% of middle school students, and 62.8% of general high school students took private tutoring in 2009. When it comes to average monthly private tutoring expenditures per pupil, general high school students spent the most and elementary school students spent the least. This is attributed to the reason that elementary students consume a wide variety of private tutoring services, such as a swimming lesson, while general high school students focus more on private tutoring related to academic subjects covered in the CSAT that are relatively more costly. According to the 2009 survey of private education expenditure (2009), most common type of private tutoring is 'Taking lessons at private academic institutes, hagwon': about two third of those who receive private tutoring uses hagwons. Except for 'Paid internet and correspondence lecture', 'One-on-one tutoring' is least frequently practiced and the most expensive, implying that private tutoring can raise equity issues given that one-on-one tutoring is the most effective way of improving pupils' academic performance.

2.2. Causes of the pervasiveness of private tutoring in Korea

Many scholars have pointed out that private tutoring market flourishes due to a deficient public education system and adverse labor condition of school teachers. Kim and Lee (2004)

claim that parents demand private tutoring as a tool to compensate for bad quality of public schooling because private tutoring offers more individualized lessons. This argument is partly persuasive, but seems insufficient to explain the entire excessive demand for private tutoring in Korea, considering the historical experience that inputs to schools have significantly increased, but private tutoring costs have also risen in Korea⁶. The fact that Korea's expenditure on its public education as a percentage of GDP is 4.7%, a larger proportion than the 2009 OECD average of 4.0% implies that the relative competitiveness of public education may be low not because of low level of public investment, but because of more consumer-oriented high quality private tutoring services (OECD, 2012b, p.4). As Bray (2005) asserts, low salaries given to mainstream teachers may also yield an increase in demand for private tutoring in some developing countries. For example, in countries such as Cambodia, teachers can work for both a public school and a private education institution. Thus, teachers do not explain all the contents in school, and they encourage their students to take private tutoring in order to complement their low salaries. However, this is not the case for Korea, where teachers are well-paid in comparison to teachers in other OECD countries⁷.

Researchers such as Bray and Kwok (2003) assume that the cultural background of Korea is another critical reason for the overheated private tutoring demand. Many Asian countries including Korea were affected by Confucian ideas in which the importance of education is emphasized as a personal development tool and the main social mobility mechanism (Choi, 2010, p.24). The Confucian heritage culture might affect Korean people to place more value on education than its actual value based on the rate of return to education. Therefore, the unique cultural influence can also explain why private tutoring is relatively prevalent in societies like Korea.

Along with such cultural background, large economic and non-economic premiums of graduating from an elite university further complicates a scenario in which Korea is obsessed with private tutoring. As mentioned in subchapter 2.1, the chief objective behind the hiring of private tutoring services by Korean households is to enhance their children's academic performance at school and on the CSAT, thereby boosting their chances of being admitted to

⁶ Public expenditure per pupil increased by 102% from 2000 to 2009 (OECD, 2012b, p.4).

⁷ Korean elementary school teachers and middle school teachers with at least 15 years of experience earn on average 46338 and 46232 U.S dollar, above the OECD average of 37603 and 39401 U.S dollar (OECD, 2012, p.7).

one of top universities (Choi, Calero, and Escardibul, 2011, p.2). It may be that admittance into one of such universities provides better job opportunities and social rewards in other countries as well; however, the Korean case seems quite outstanding. Chae, Hong, and Lee (2005) show that in 2004, 63.7% of senior officials and 58.1% of congressmen were alumni of one of Korea's top 3 universities⁸ (from a total of 190 universities). According to Choi, Calero, and Escardibul (2011, p.2), in 2007, 38% of CEOs of Korea's top 100 companies and 88% of high court and Supreme Court judges had graduated from the best university in Korea, Seoul National University (SNU). Besides, as Lee and Brinton (1996) highlights, attendance at an elite university gives benefits in the labor market beyond the fact that it reflects their human capital, since school ties provides additional advantages as a crucial source of social capital in Korea. Thus, graduates from elite universities monopolize positions of leadership in Korean society, and affiliation with an elite university has a strong impact on the success of one's life and on social status in Korea. Thus, young students are pressured to face a tremendous degree of competition for the few places offered by prestigious universities and parents are willing to take any strategy that helps their children to get the upper hand of other competitors, which is reflected in the form of high private tutoring costs.

2.3. Consequences of the pervasiveness of private tutoring in Korea

The intense use of private tutoring has both advantages and disadvantages. First, pupils enhance their learning outcomes through private tutoring. This is the main aim of private tutoring, and the existence of positive effect of private tutoring on academic performance is supported by a number of previous studies (see for example, Dang and Rogers, 2007; Kang, 2007). Private tutoring helps students grasp the materials covered in mainstream classes and enjoy learning activities. Not only that, the improved academic achievement of students is also beneficial to the whole economy given that accumulation of human capital increases labor productivity, thereby leading to economic growth.

However, many experts have emphasized that the proliferation of private tutoring produces a greater number of harmful impacts. First of all, it deteriorates pupils' health. This undoubtedly applies to Korean students who attend private tutoring until late at night and on weekends. Second, the heavy reliance on private tutoring collapses public education. As

⁸ Seoul National University, Korea University, and Yonsei University are regarded as Korea's top 3 universities.

students are already familiar with the lesson taught in school due to prerequisite learning by private tutoring, motivation of both students and teachers is lowered (Choi, Calero, and Escardibul, 2011, p.3). Third, the excessive dependence on private tutoring impedes students' development of self-directed learning and problem-solving abilities (Kim, 2010, p.7).

In addition to the various problems mentioned above, another serious problem that draws economists' attention is that private tutoring brings up an efficiency issue as well as an equity issue. First of all, private tutoring activities may yield negative externalities: a student's relative ranking in the academic performance distribution can be lowered by enhanced performance of another student who receives private tutoring (Kim, 2010, p.6). In such a case, all students are likely to demand a higher amount of private tutoring services than their optimum level to at least maintain their relative positions. As a result, private tutoring can be over-consumed compared to the socially optimum level even though the amount of private tutoring consumed by each student is individually optimal. The overheated private tutoring market in Korea can also be explained in the framework of a classic prisoners' dilemma. In a typical prisoners' dilemma setting where a student's outcome is affected not only by her private tutoring decision, but also by other student's private tutoring decisions, each student gets higher reward by hiring more private tutoring services than her optimum level regardless of the decision of the other student. Since both students rationally decide to over-consume private tutoring services compared to their own optimum levels, each student ends up receiving a lower pay-off than when both were to hire their optimum amount of private tutoring. No matter which economic terminology is employed, it is obvious that the situation of over-consumption in private tutoring in Korea is not socially efficient.

Moreover, private tutoring raises an equity issue. Private tutoring is a more expensive way of learning compared to public education, and not every household can afford it. Thus, students from wealthier families are likely to consume more or higher quality of private tutoring services, which worsens the equality of educational opportunities⁹. Also, since the financial burden of private tutoring is more painful for low-income households, the rampancy of private tutoring in Korea is not desirable.

2.4. Policies against private tutoring

⁹ This concern is supported by studies such as Im, Woo, and Chae (2008) and Lee and Hong (2008) reporting a positive correlation between private tutoring expense and the level of household income in Korea.

As subchapter 2.3 illustrates, the tremendous amount of financial and human resources devoted to private tutoring produces a series of efficiency and equity problems, along with several educational problems. Thus, in order to alleviate these negative impacts, the Korean government has taken various measures.

In 1969, the government suspended the school choice for middle schools by abolishing entrance exams. It was the first governmental response whose primary aim was to control the wasteful private tutoring competition among children preparing for entrance exams at prestigious middle schools (Chung, 2002, p.9). For the same purpose, in 1974, the high school equalization policy was implemented in Seoul and Busan, the two largest cities in Korea and was gradually expanded to several major cities until 1980¹⁰ (Kim and Lee, 2001, p.4). However, contrary to the government's expectation, private tutoring costs showed no signs of abating. Rather, the equalization policy significantly contributed to raising the demand for individualized education as there are virtually no private high schools that are independent of the government's control¹¹ (Kang, 2007, p.7). Consequently, the households with higher demand for education further sought for private tutoring, as a supplementary tool for the equalized public education, because private schools in Korea do not function in a way that is expected to be (Kim and Lee, 2001).

As the growth of private tutoring continued, despite implementation of equalization policies, in 1980 the Korean government took a very strong measure against private tutoring by prohibiting all forms of private tutoring. However, such a ban was not able to stop the increase in private tutoring either. Parents in high socio-economic groups were still willing to hire private tutoring services at any expense, which led to a formation of a black private tutoring market. Moreover, suppliers of the illegal private tutoring called for risk premiums, so that the price of private tutoring services increased. As a result, regulation on private tutoring, paradoxically, exacerbated inequality of educational opportunities by polarizing the consumption of private tutoring.

The outright ban on private tutoring has been gradually relaxed under the influence of democratization and liberalization; however, the government did not give up the strong

¹⁰ Since 1980s, the implementation of the high school equalization policy has been slowed down due to growing opposition, so that some small cities and rural areas still retain the traditional student enrollment system.

¹¹ Due to the equalization policy, private schools in Korea are not very different from public schools in terms of curriculum and administration, since they are heavily subsidized and controlled by the government (Kang, 2007, p.7).

controls over private tutoring that it had established in previous years. Until the Constitutional Court judged that the prohibition on private tutoring was unconstitutional in 2000, the government had allowed only two types of private tutoring: private instruction by college students and hagwon¹². Particularly, the government has maintained strict restrictions on hagwons by imposing specific requirements in terms of academic qualifications regarding instructors at hagwon, facilities, and fees (Kang, 2007, p.8). Nevertheless, the number of hagwons has dramatically increased from 381 in 1980 to 14043 in 2000, and the number of students enrolled at hagwons has increased from 118000 in 1980 to 1388000 in 2000 (Kim and Lee, 2001, p.8).

The government has tried to strengthen public education as well. The rationale behind this effort is that the gap between the quality of mainstream education and private tutoring is the main reason why households hire private tutoring services. The government has substantially increased inputs to public education so as to improve the school facilities, the student-teacher ratio, and the quality of school teachers. However, despite the large scale of increase in government spending, the household spending on private tutoring has also risen at a remarkable pace, indicating that the increase in public spending on education alone might not be sufficient to curtail the burgeoning private tutoring (Kim and Lee, 2001, p.9).

Since 2000s, the government has been actively involved in providing low-cost substitutes for private tutoring so that demand for private tutoring could be absorbed into public education. Such reforms include the Educational Broadcasting System¹³ (EBS) lectures that specialize in the CSAT and the “after-school” programs that offer hagwon-like lessons in schools. By basing CSAT questions on the EBS CSAT lectures, the government tried to eliminate advantages of taking expensive private tutoring. In a similar vein, the “after-school” lessons were introduced in 2006 and have gradually expanded¹⁴. These measures however failed to substitute for private tutoring¹⁵. As the EBS-CSAT connection rate increased, i.e. more CSAT questions come from the EBS lectures; hagwons focusing on the EBS CSAT

¹² All the other forms of private tutoring including the private tutoring by school teachers outside school grounds, the private tutoring by hagwon educator outside hagwon, and the private tutoring through mails, phones, and TVs have been banned by the government (Kim and Lee, 2001, p.7).

¹³ EBS is a state-run broadcaster specializing education and provides tutoring lectures for high school students via TV, radio, and the internet, and the EBS CSAT lectures first started in 2004.

¹⁴ The participate rate of the “after school” programs is 63% in 2012 (OECD, 2012a, p.24).

¹⁵ Studies such as Chae (2007), Lee, Kim, and Kwon (2009), and Park (2008) reveal that the EBS CSAT lectures and the “after-school” programs do not significantly decrease private tutoring expenditures.

lectures became popular. The “after-school” classes were partly successful, in that they provided low-income pupils with additional education opportunities. However, the “after-school” programs were not able to draw the attention of students with wealthier backgrounds due to the relatively low quality of the lessons. High-income students did not reduce hours devoted to private tutoring: they either participated only in private tutoring or both private tutoring and the “after-school” programs.

Many education experts have pointed out that all types of the government’s anti-tutoring policies are futile as long as there remain enough incentives for achieving a better academic performance than other students to boost the chance of entering an elite university. Actively taking these advices, the government revised the university entrance system many times under the belief that such reforms would help ease the competition for test scores, the ultimate motivation for private tutoring. For example, the recent reform of the university entrance system deemphasized the role of the CSAT in the university admission process. Instead, the importance of other selection criteria, such as high school records, essay exams, extra-curricular activities, social services, and socio-economic disadvantages was stressed. However, these reforms were not effective either and yielded the advent of new forms of private tutoring specializing in the enhancement of the new selection criteria.

2.5. 10 p.m. curfew on operating hours of hagwon

As diverse measures aiming to curb private tutoring demands failed, the government once again took a strong measure against private tutoring by directly regulating hagwon’s operating hours to 10 p.m. Operating hours of hagwon had already been controlled in some regions by their ordinances, but these rules did not have any legal binding. In September, 2006, the revision of [Act on the establishment and operation of private teaching institutes and extracurricular lessons] strengthened the role of each education office in terms of a regulation over hagwon; thereby, all education offices have completed to enact their own curfew on operating hours of hagwon by 2009.

In April, 2009, Seungjoon Kwak, chairman of the Presidential Council on Future and Vision first raised the issue of setting the same curfew at 10 p.m. He claimed that such a ban would help households to spend less on private tutoring as well as to protect health of their children. However, the plan faced strong opposition from a group of hagwon owners and

parents. The group of hagwon operators criticized that the policy would drive many students to attend hagwon in the early morning and weekends because many high schools have already kept pupils at schools until 10 p.m. or 11 p.m (Kang, 2009). Other critics pointed out that the policy might reduce the time spent in private tutoring activities in hagwon, but the demand for private tutoring services provided by hagwon might be substituted by those provided by a private tutor. They were concerned that in such a case, the curfew might widen the gap between high and low income earners since high income households could still hire top private tutors and let their children study (Bae, 2009).

A group of hagwon operators along with parents and students in Seoul and Busan filed a petition with the Constitutional Court, claiming the curfews of the cities violated the educational rights of parents and students¹⁶. However, as the curfews were declared to be constitutional by the court in October, 2009, the nationwide implementation of the 10 p.m. curfew gained momentum. As a consequence, Daegu, Gwangju, and Gyeonggi completed the revision of their ordinances that restrain operating hours of hagwon to 10 p.m. in 2011, and the rest of the regions have been pushing ahead with the reform of their ordinances.

3. Previous research

While most studies in this field have focused on the determinants of private tutoring, the effect of private tutoring on academic performance, or the effectiveness of other educational policies, only one study has investigated the effects of a regulation over operating hours of hagwon on the time and money devoted to private tutoring. Kim (2009) first tried to evaluate the effectiveness of the governmental regulation on hagwon's operating hours by applying a panel Tobit model to the Korean Education and Employment panel survey data from 2005 to 2007. The main finding of his research work is that the negative effects of the regulations on hagwon's operating hours by 10 p.m. or 11 p.m. on the weekly hours of private tutoring and monthly expenditure on private tutoring are statistically significant; however, the marginal effects are trivial. Based on this result, he predicts that the government's movement toward uniform regulation for hagwon will contribute to moderately decrease private tutoring costs. The marginal effects of the regulations revealed in his study are actually very minute:

¹⁶ Seoul has already implemented the 10 p.m. curfew since 1996, and the Busan education office had its own curfew on hagwon to 10 p.m. for elementary and middle school students, and 11 a.m. for high school students.

students living in areas with a curfew on hagwon spend only 6 won (approximately 0.005 U.S dollar) less on private tutoring compared to the reference group of students in areas with no curfew. Moreover, he has not found sufficient evidence on the argument that the regulation over operating hours of hagwon may significantly increase monthly household spending on one-to-one type tutoring.

The current study however is distinguished from his research in at least three main respects. Firstly, Kim (2009) analyzes the effect of a regulation on hagwon's operating hours on household spending on private tutoring before the issue on the enactment of the 10 p.m. curfew was raised. The primary intention of Kim (2009) is to provide empirical evidence on the effects of different curfews on hagwon set by local education offices on the time and money dedicated to private tutoring, thereby predicting whether the enactment of the uniform curfew at 10 p.m. would contribute to a decrease in private tutoring costs and hours spent on private tutoring, and if so, the magnitude of such effect. Contrary to his study, the current paper measures the actual effect of the implementation of the 10 p.m. curfew on private tutoring expenditures by focusing on changes in the curfews that have been made since 2009.

Secondly, while the analysis in Kim (2009) is restricted to general high school students, the current study covers all school levels. The data used for this analysis contain detailed information on private tutoring expenditures for all school levels, which renders it possible to analyze the treatment effects for elementary, middle, and high school students.

Thirdly, a different method, a difference-in-differences (DD) is employed to answer the research question. This research design is a more reliable way of estimating the effect of the regulation over hagwon's operating hours on private tutoring expenditures compared to cross-region research using the OLS regression framework. Given that the policy is not completely exogenous, i.e. some unobserved region-level characteristics may affect both the regulation over hagwon's operating hours and private tutoring expenditures¹⁷, the error term can be correlated to the independent variable. In this case, the OLS estimator is biased, and thus does not measure a causal effect, but only a correlation. However, under some assumptions, the

¹⁷ Endogeneity arises not only from omitted variables, but also from measurement errors in independent variables and reverse causality. Applied to the current context, the endogeneity problem caused by measurement errors in independent variables is expected to be relatively less serious in that the current analysis uses reliable national survey data conducted by the Statistic Korea, a central government organization for statistics. It may also be probable that regions with high private tutoring expenditures are more likely to adopt the tightened curfew on operating hours of hagwon. However, this reverse causation is not expected to be strong either since enactment of the ordinance is influenced by many other complicated factors such as political interests.

DD method allows us to at least control for the unobserved region-level characteristics that are fixed over time, thereby removing a potentially large source of omitted variables bias. Thus, the DD approach can give us consistent estimates of the causal effect of the regulation over hagwon's operating hours on private tutoring costs while it does not require that the treatment is randomized. Further explanations regarding the methodology will be provided in chapter 5. Therefore, the current research is expected to extend and complement the discussion presented in his pioneer work.

4. Theoretical framework

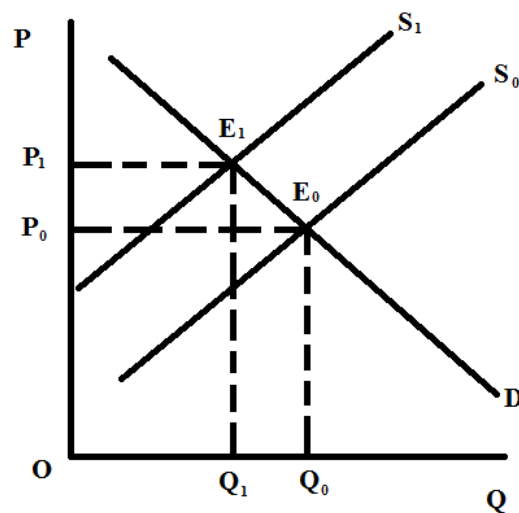
Unlike other measures that aim at reducing private tutoring expenses through an attempt to curb the demand for private tutoring, the 10 p.m. curfew on hagwon is a policy that controls the supply of private tutoring. In other words, the policy tries to decrease expenditures devoted to private tutoring by directly limiting hagwon's provision of private tutoring services after certain hours, thus impacting the total number of hours that hagwon can provide private tutoring services for.

Consider a private tutoring market illustrated in Figure 1, where there are many buyers and sellers, so that no single buyer or seller can have any impact on the price of private tutoring services. Assume that the other rules of perfect competition apply: each unit of private tutoring is homogeneous, buyers and sellers have perfect knowledge of the market and are perfectly mobile. Under these circumstances, the price and quantity of private tutoring services are determined by the intersection of the market supply (S_0) and demand (D) curves as shown in Figure 1. At the equilibrium (E_0), the price of private tutoring is P_0 and the quantity¹⁸ is Q_0 , so that total expenditures spent in the private tutoring market is illustrated by the area of rectangle $OP_0E_0Q_0$.

A shift in the supply curve can occur when the 10 p.m. curfew on operating hours of hagwon is implemented. To be more specific, the supply curve shifts to the left from S_0 to S_1 as some of private tutoring providers (hagwon operators) are forced to supply less private tutoring services by the curfew. In this case, the intersection of the demand curve (D) and the new supply curve (S_1) determines a new market equilibrium, where P_1 is the equilibrium

¹⁸ In the current study, weekly hours spent on private tutoring can be interpreted as a proxy for quantity of private tutoring.

Figure 1. Supply shift on the private tutoring market

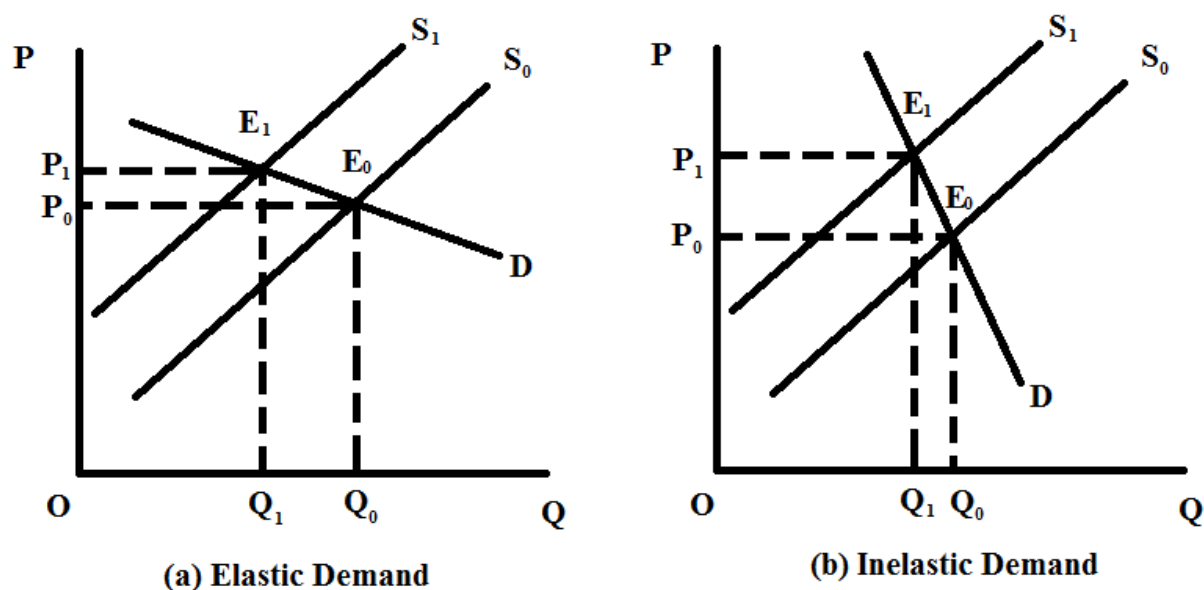


price and Q_1 is the equilibrium quantity. Thus, the leftward shift of the supply curve by the curfew on hagwon in turn increases the price, but decreases the quantity, as described in Figure 1. Of course, it may also be probable that the initial supply curve does not shift despite the introduction of the 10 p.m. curfew on hagwon. Hagwon owners may increase a provision of lessons that can be taken on weekends or early in the morning while they stop providing lessons taken after 10 p.m. In such a case, the newly offered classes may offset the reduction in classes after 10 p.m., so that the original supply curve may remain unchanged.

Even if the supply curve shifts leftwards, total private tutoring expenditures at the new equilibrium, illustrated by the area of rectangle $OP_1E_1Q_1$ in Figure 1, may increase or decrease depending on price elasticity of demand. As can be seen in Figure 2, private tutoring expenditures decrease if a demand curve is elastic. This is because a slight increase in price leads to a sharp decrease in the quantity demanded, thus reducing the area of rectangle $OP_1E_1Q_1$ in Figure 2 (a). On the other hand, private tutoring expenditures increase if a demand curve is inelastic. Since a marginal increase in price results in only a modest decrease in the quantity demanded as Figure 2 (b) shows, the area of rectangle $OP_1E_1Q_1$ becomes larger than the initial area of rectangle $OP_0E_0Q_0$.

Therefore, this standard economic theory states that elasticity of private tutoring demand plays a critical role in determining whether or not the 10 p.m. curfew on hagwon will decrease private tutoring expenditures. As many critics of the policy point out, if private tutoring services are insensitive to price changes because consumers are willing to buy these

Figure 2. Different effects of a supply shift on the private tutoring market by demand elasticity



services regardless of price movements, the implementation of the curfew on hagwon may produce unwanted results, such as an increase in private tutoring expenditures without a significant decrease in the quantity demanded. Historical evidence of private tutoring consumption patterns (discussed in subchapter 2.4), along with the lack of substitutes for private tutoring, suggest that the demand for private tutoring is inelastic, therefore implying that such a scenario is probable.

Moreover, elasticity of private tutoring demand can vary widely depending on school levels. For instance, high school students' demand for private tutoring can be more inelastic given that private tutoring services are more necessary for high school students. If that is the case, the effect of the curfew on private tutoring expenses for high school students can differ from that of elementary or middle school students. This may signal the presence of heterogeneous policy effects depending on the school level.

5. Methodology

This chapter outlines the empirical strategy of the paper, a difference-in-differences (DD) estimation. In subchapter 5.1, a brief overview of DD method is provided, and subchapter 5.2 gives a detailed explanation of how the method is applied to the current research on the effect

of a regulation over hagwon's operating hours on private tutoring costs. Finally, the empirical specification used for this study is presented in subchapter 5.3.

5.1. Difference-in-Differences (DD) estimation

The intuition behind the difference-in-differences (DD) method is that to investigate the effect of a specific intervention ("treatment"), one compares the difference in outcomes after and before the intervention for groups affected by the intervention ("treatment groups"), to the same difference for unaffected groups ("control groups"¹⁹) (Bertrand, Duflo, and Mullainathan, 2004, p.249). Applied to the issue of the 10 p.m. curfew's impact on private tutoring expenditures, the DD approach suggests that one compares changes in private tutoring expenditures for students from regions imposing the 10 p.m. curfew to students from regions not imposing the 10 p.m. curfew²⁰.

The main advantage of the DD estimation is that it can circumvent many of the omitted variables problems. When a causal variable of interest varies at the group level, any omitted variable bias must come from unobserved group-level variables that relate to both the variable of interest and to the outcome variable. By including group-level fixed effects, in some cases, the DD method can control for such unobserved group-level variables (Angrist and Pischke, 2009, p.227). This also applies to the current research where the causal variable of interest is at the region level. If one compares private tutoring costs in regions with different curfews using a simple OLS estimator, the estimate will be biased since other characteristics that affect private tutoring costs may differ across regions. It is usually difficult to control for all these characteristics in a regression because some of them are in fact unobservable. On the other hand, if the research question is analyzed by comparing private tutoring expenses of the same region before and after the policy change, it will also produce bias since other characteristics affecting private tutoring costs may have changed as well. However, the DD approach can control for time-invariant region-level characteristics by comparing private tutoring costs within regions over time and shared time trends by comparing differences across regions. Therefore, the use of the DD estimation enables us to

¹⁹ In principle, the control group shows what would have happened to the treatment group in the absence of any treatment (Slaughter, 2001, p.209).

²⁰ Strictly speaking, imposing the 10 p.m. curfew is not the treatment in this research. This will be further discussed in subchapter 5.2.

aim at measuring the unbiased treatment effect of the regulation over operating hours of hagwon on private tutoring expenditures.

Several econometric issues concerning the validity of the DD method are worth being considered. First, the parallel trend assumption needs to hold for a DD estimator to yield a consistent estimate of the treatment effect. The parallel trend assumption in the current analysis states that the private tutoring expenditure trends would be the same in both treatment and control groups in the absence of treatment. The treatment and control groups are allowed to differ since the difference is captured by the region fixed effects. However, the treatment and control groups should follow parallel trends in order for the DD method to isolate the treatment effect by subtracting the trend in the control groups from the change in the treatment groups. This is the key identifying assumption, and thus will be graphically assessed in subchapter 7.1.

A second issue is that the DD estimator is inconsistent if an Ashenfelter-dip occurs. The Ashenfelter-dip describes that treated individuals might have had bad outcomes just before the treatment assignment due to selection of individuals or anticipation of treatment participation. However, that is not the case where anticipation of the implementation of the 10 p.m. curfew does not lead parents to increase private tutoring expenditures just before the tightened curfew is imposed.

Finally, the DD estimates will be biased if the composition of the treatment and control groups changes as a result of the treatment. However, this should not be a problem in the current analysis because households are not expected to move to regions with less strict curfew on operating hours of hagwon in order to consume more private tutoring services.

5.2. Difference-in-Differences (DD) estimation applied to the curfew on hagwon

As mentioned in subchapter 2.5, all education offices have set their own curfew on operating hours of hagwon by 2009, and some of them changed their curfew on hagwon in 2011 and 2012. This makes it suitable to exploit a difference-in-differences (DD) estimator to investigate the effect of a regulation over hagwon's operating hours on private tutoring expenditures.

However, unlike typical DD studies in economics where the treatment is a one-time change in government policy applied equally to all members of the treatment group, it is

more complex to identify the treatment and control groups in the current study. First of all, the 10 p.m. curfew policy is not applied uniformly to all regions. For instance, as seen in Table 1, hagwon in Daegu was allowed to remain open until 12 a.m. until 2010, but in 2011, the Daegu education office changed its curfew on hagwon to 10 p.m. for all students. In this simple case, Daegu is identified as a treatment group, and the treatment, imposing the 10 p.m. curfew on hagwon, has an equal impact on all students in Daegu. However, the case of Incheon is much more complicated. In 2012, the Incheon education office changed its curfew on hagwon from 10 p.m. to 9 p.m. for elementary school students, from 12 a.m. to 10 p.m. for middle school students, and from 12 a.m. to 10 p.m. for high school students. Incheon had different curfews across school levels in 2009, the further restriction over operating hours of hagwon was undertaken to different extents across levels of school, and it even imposed a 9 p.m. curfew on hagwon for elementary school students. Thus, precisely speaking, the treatment in this research is not imposing the 10 p.m. curfew on operating hours of hagwon, but it is identified as further strengthening the existing curfew.

Table 1 summarizes curfews on operating hours of hagwon set by each education office. Considering the treatment issue discussed in the paragraph above, 7 treatment groups and 9 control groups are identified for elementary school students. In the same way, 7 treatment groups and 4 control groups are identified for middle and high school students, respectively. In 2011, the Jeonnam education office changed its curfew on hagwon from 12 a.m. to 11:50 p.m. for high school students. However, only a 10 minute difference in the curfew is not expected to make a significant difference in private tutoring costs, so that Jeonnam is categorized as a control group for high school students.

Another issue to consider is the timing of the implementation of the reforms. As will be further described in chapter 6, the data used for this analysis come from a survey answered by parents twice a year. The problem is that some regions' reforms were implemented during the reference periods: the first reference period is from March to May, and the second reference period is from July to September. For example, Gangwon implemented its reform on the 30th of March in 2012, and Daejeon enacted its initial curfew on the 10th of April in 2009. Including such regions into the analysis may have an influence on the results, so that these regions are dropped from the analysis²¹. Therefore, this exclusion in turn produces 4

²¹ These regions are Daejeon, Gangwon, Chungnam, Jeonbuk, and Gyeongbuk, and they are written in bold type in Table 1.

Table 1. Curfews on operating hours of hagwon

Region	Elementary school				Middle school				High school			
	2009	2010	2011	2012	2009	2010	2011	2012	2009	2010	2011	2012
Incheon	10	10	10	9	12	12	12	10	12	12	12	11
Daegu	12	12	10	10	12	12	10	10	12	12	10	10
Jeonnam	12	12	10	10	12	12	10	10	12	12	11:50	11:50
Jeju	12	12	12	9	12	12	12	11	12	12	12	12
Gyeonggi	10	10	10	10	11	11	10	10	12	12	10	10
Gwangju	10	10	10	10	10	10	10	10	12	12	10	10
Seoul	10	10	10	10	10	10	10	10	10	10	10	10
Busan	10	10	10	10	10	10	10	10	11	11	11	11
Ulsan	12	12	12	12	12	12	12	12	12	12	12	12
Chungbuk	11	11	11	11	11	11	11	11	12	12	12	12
Gyeongnam	12	12	12	12	12	12	12	12	12	12	12	12
Gangwon	12	12	12	10	12	12	12	11	12	12	12	12
Chungnam	11	11	11	9	12	12	12	11	12	12	12	12
Gyeongbuk	11	11	11	9	11	11	11	11	12	12	12	12
Daejeon	10	10	10	10	11	11	11	11	12	12	12	12
Jeonbuk	11	11	11	11	11	11	11	11	11	11	11	11

Notes: Curfews on operating hours of hagwon are taken from [Ordinance on the establishment and operation of private teaching institutes and extracurricular lessons] specified on each city and province education office's website. Numbers in bold type indicate that the curfew of the region changed. Regions in bold type indicate the regions whose reforms were carried out during survey periods.

treatment groups for elementary school students (Daegu, Incheon, Jeonnam, and Jeju), 5 treatment groups for middle school students (Daegu, Incheon, Jeonnam, Jeju, and Gyeonggi), and 4 treatment groups for high school students (Daegu, Incheon, Gyeonggi, and Gwangju).

Moreover, the extents of a reinforcement of the curfew also differ depending on regions and school levels. For instance, the difference between the initial curfew and the revised curfew is two hours for middle school students in Daegu, while that for high school students in Incheon is one hour and that for elementary school students in Jeju is three hours. Therefore, the current study will also measure the three different types of treatment effects depending on the magnitudes of tightening the curfew.

5.3. Empirical framework

As Table 1 shows, curfews have been tightened in some regions at different points in time; thus, it is necessary to use a regression framework to tackle the research question at hand. With multiple groups and time periods, it is useful to consider a general framework suggested by Bertrand, Duflo, and Mullainathan (2004, p.250) in which DD estimates and their standard

errors derive from using OLS in repeated cross sections of data on individuals in both treatment and control groups for several years before and after a specific intervention. The equation at the individual level is

$$Y_{irt} = \alpha_r + \lambda_t + \gamma X_{irt} + \beta I_{rt} + \varepsilon_{irt}$$

where Y_{irt} is the outcome of interest for individual i in region r in year t (private tutoring expenditure, hours devoted to private tutoring, and so on); α_r is a full set of region dummies; λ_t is a full set of year dummies; X_{irt} is individual-specific covariates (gender, dummies for income, dummies for parents' educational attainment, and dummies for size of the region); I_{rt} is an indicator for whether the curfew is further strengthened in region r in year t ; and ε_{irt} is an error term²². The region fixed effects α_r capture any time-invariant difference in outcomes between the treatment and control groups, while the year fixed effects λ_t capture how both groups are affected over time by any non-treatment forces²³ (Slaughter, 2001, p.210). Following the argument of Bertrand, Duflo, and Mullainathan (2004) that conventional DD standard errors severely understate the standard deviation of the estimators due to serial correlation, the current study computes robust standard errors to prevent overestimation of t-statistics and significance levels. Therefore, the DD estimator β examines the effect of a reinforcement of a curfew on operating hours of hagwon on private tutoring expenses.

Since curfews are different across school levels, I divide the whole sample into three major school levels (elementary school, middle school, and general high school) and apply the same estimation model to the three different samples. Thus, the estimates can be interpreted as the effect of a reinforcement of the curfew on hagwon's operating hours on private tutoring expenditures for elementary school, middle school, and general high school students, respectively.

6. Data

²² A set of region/year control variables such as region-level GDP is not included in the model since data on individual income are available.

²³ With the dataset of 16 regions and 4 years, 15 region dummies and 3 year dummies are included to avoid perfect multicollinearity.

This chapter introduces data used for this thesis. Brief descriptions of the data and variables are provided in subchapter 6.1 and 6.2, respectively, and subchapter 6.3 discusses descriptive statistics.

6.1. Description of the data

For empirical analysis, the current paper employs the survey of private education expenditure conducted by the Statistics Korea (KOSTAT), a central government organization for statistics. The survey is answered by 46000 parents of students who are attending 1081 elementary, middle, and high school across the country twice a year (June and October)²⁴. Students of each school level are drawn by a stratification method to reflect the national population of the school level. More precisely, after stratifying schools into 4 levels (elementary, middle, general and vocational high school) and 16 cities and provinces, schools are independently sampled by grades. For elementary school, grades are stratified into 1~3 grades and 4~6 grades, and then three classes are randomly chosen per school. For middle and high school, one class is sampled per school (KOSTAT, 2011).

The survey was first carried out in 2007, but data from 2009 to 2012 are used for the analysis. The rationale behind this is that since 2009, the data provides information on administrative districts²⁵, which is key information to perform a DD estimation. Each administrative district has its own education office, and operating hours of hagwon differ by the ordinance enacted by each education office. Thus, the availability of information on administrative districts makes it possible to analyze the effect of a regulation over hagwon's operating hours on private tutoring expenses by using a DD estimator.

As mentioned in subchapter 5.2, several regions whose amendment of the ordinance was implemented during the reference periods of the survey are excluded from the sample. Such regions include Daejeon and Jeonbuk that completed the enactment of their initial curfews during the reference periods in 2009 and Gangwon, Chungnam and Gyeongbuk that changed their curfews during the reference periods in 2012. Also, I limit the sample to elementary, middle, and general high school students because vocational high school students are not in

²⁴ The survey conducted in June contains information on private tutoring expenditures for March, April and May, and the survey conducted in October has the same information for July, August and September.

²⁵ Korea is divided into 1 special city, Seoul, 6 metropolitan cities, 8 provinces, and 1 special autonomous province, Jeju.

the majority of students taking private tutoring. Vocational high school students are fundamentally distinguished from general high school students in terms of purposes and contents of education, so that their patterns of private educational investment are different from students whose ultimate aim of education is to advance into university. Therefore, from the initial number of 349365, 239911 are left for the analysis.

6.2. Description of the variables

The dataset provides detailed information on hours and expenditures devoted to private tutoring. Private tutoring expenses are reported for each subject (Korean, English, math, and science²⁶) as well as for each type of tutoring methods (one-to-one tutoring, group tutoring, lessons at hagwon, textbook with tutor's visit, and paid internet and correspondence lecture tuition). All the variables concerning costs are expressed in nominal terms, so the effects of inflation are not accounted for. Nevertheless, the full set of year dummies expected to capture such effects of inflation. All the variables mentioned in this paragraph are used as dependent variables in the regression model.

Additionally, the dataset contains information on student characteristics (gender and academic performance in class), household characteristics (monthly household income and education level of parents), and size of the region that the household resides in. All of these variables, except for academic performance in class, are added in the regression model as individual specific covariates. Academic performance in class is not employed as a covariate due to the potential problem of endogeneity, i.e. some unobserved individual characteristics such as innate ability may have an impact on both academic achievement and private tutoring expenditures.

Treatment variables are identified as follows. A regulation dummy is simply defined to be one for regions and time periods subject to the policy of strengthening of the initial curfew on hagwon. The regulation dummy is also subdivided by the extent of the reinforcement of the curfew (One hour, two hours, and three hours) to examine different treatment impacts depending on the degree of the policy. Lastly, region-specific regulation dummies are added in the regression for the purpose of evaluating the treatment effects by region. Since the identification of treatment groups differs depending on school levels as illustrated in

²⁶ Science consists of social sciences and natural sciences.

subchapter 5.2, these regulation dummies are created for each school level. Table A1 in the Appendix summarizes definitions of all the variables used for the empirical analysis.

6.3. Descriptive statistics

Table 2 presents means of the main variables by different sample. The second column of the table illustrates means of the variables for all observations, while the next three columns report those for each school level. The sixth and seventh columns compare student characteristics depending on whether they are participating in private tutoring or not. Finally, the last column shows distinguishing features of pupils who receive tutoring intensively.

As subchapter 2.1 demonstrates, elementary school students spend the longest hours on private tutoring, while they spend the least amount of money on private tutoring. English and math are the major subjects that need to be covered by private tutoring, and the average household spends two third of total private tutoring expense on those subjects. Yearly spending on hagwon tutoring is the highest among middle school students, while the biggest consumers of the other forms of private tutoring services are high school students, with the exception that workbook tutoring is the most popular among elementary school students. It is not surprising that elementary school students' parents report higher educational attainment as well as lower household income compared to parents with middle or high school students. This may be simply because the parents with elementary school students are relatively young, reflecting the trend that the younger parental generation tends to invest more on their human capital and have less work experience.

More interestingly, there are systematic differences in student characteristics depending on whether they are taking private tutoring or not. In general, those receiving private tutoring are likely to be female, high academic achievers, and students from high socio-economic backgrounds. The positive correlation between students' achievement and private tutoring participation indicates that the primary objective of taking private tutoring in Korea is not to complement deficient academic achievement, but it is a strategy for high academic performers to maintain and to strengthen their competitive advantage. This finding is in line with most previous research such as Kim(2007) and Kim (2009)²⁷. When it comes to socio-

²⁷ Kim (2007) finds that private tutoring is very widely practiced around the world, mainly for the remedial purpose while Korea is the sole exception in that private tutoring is taken for the purpose of enrichment.

Table 2. Means of key variables

Variables	Mean						
	All Students	Elementary School Students	Middle School Students	High school students	No Tutoring (Hour = 0)	Positive Tutoring (Hour > 0)	Intensive Tutoring (Hour > 15)
Hour	6.401	7.912	7.570	4.679	0	9.112	19.953
Expenditure	306.357	280.795	320.106	312.157	0	436.120	626.631
Korean tutoring	26.175	20.931	27.362	28.502	0	37.262	66.348
English tutoring	100.322	96.015	116.049	91.961	0	142.815	184.721
Math tutoring	106.111	51.170	117.396	131.294	0	151.055	164.536
Science tutoring	17.614	12.799	27.125	13.888	0	25.075	54.521
One-to-one tutoring	54.451	15.002	46.650	83.607	0	77.514	77.949
Group tutoring	28.725	20.799	30.492	32.260	0	40.891	41.520
Hagwon tutoring	162.832	128.199	209.313	151.297	0	231.802	353.253
Workbook tutoring	11.249	32.186	7.985	0.931	0	16.014	16.476
Internet tutoring	4.710	1.689	4.137	6.926	0	6.705	8.277
Female	0.476	0.475	0.470	0.480	0.457	0.484	0.479
Father education							
High school	0.420	0.401	0.437	0.419	0.526	0.377	0.360
University	0.459	0.496	0.443	0.447	0.341	0.507	0.517
Graduate school	0.078	0.077	0.070	0.083	0.045	0.091	0.100
Mother education							
High school	0.550	0.494	0.567	0.573	0.647	0.511	0.493
University	0.374	0.449	0.358	0.340	0.250	0.424	0.446
Graduate school	0.030	0.033	0.027	0.031	0.016	0.036	0.041
Household income							
1~2 million won	0.133	0.127	0.141	0.130	0.224	0.094	0.073
2~3 million won	0.210	0.232	0.204	0.201	0.246	0.195	0.163
3~4 million won	0.217	0.228	0.213	0.214	0.188	0.230	0.220
4~5 million won	0.157	0.155	0.154	0.160	0.111	0.176	0.178
5~6 million won	0.097	0.091	0.096	0.102	0.058	0.113	0.129
6~7 million won	0.050	0.049	0.050	0.051	0.025	0.061	0.071
More than 7 million won	0.089	0.078	0.086	0.098	0.046	0.108	0.149
Academic performance							
10~30%	0.234	0.309	0.214	0.204	0.161	0.266	0.273
30~60%	0.329	0.321	0.310	0.347	0.319	0.333	0.324
60~80%	0.189	0.114	0.210	0.221	0.249	0.164	0.152
Lower 20%	0.121	0.079	0.149	0.126	0.197	0.089	0.080
Number of observations	239911	62796	72700	104415	71383	168528	21136

Note: All the variables regarding private tutoring expenditure are presented in 10 thousands of Korean Wons.

economic backgrounds, the sixth and seventh column of Table 2 indicate that the proportion of students whose parents have at least a university degree and the proportion of students whose monthly household income is more than 4 million won are substantially higher among students with positive private tutoring compared to those with no private tutoring. These

figures clearly demonstrate that households with high socio-economic status tend to provide their children with additional educational opportunities in the form of private tutoring.

Such differences in student characteristics are more dramatic when comparing students with no private tutoring to those taking private tutoring intensively²⁸. It is illustrated in Table 2 that pupils with intensive private tutoring tend to come from higher socio-economic backgrounds than those with moderate private tutoring or no private tutoring. On average, these students spend about 6266 thousand Korean won a year, which is more than twice as much as the average private tutoring expenditure of the whole sample. Furthermore, they spend 19.953 hours a week on private tutoring and most of their private tutoring expenditures is concentrated to hagwon type tutoring, implying that they might be the group most affected by the policy of regulating operating hours of hagwon. Therefore, the current study will also place special attention to this particular group of students.

7. Results

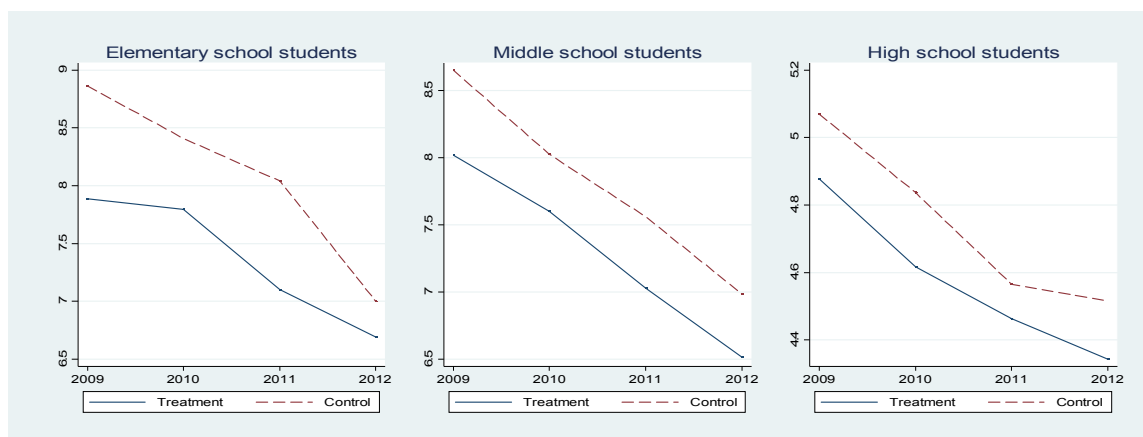
In this chapter, empirical results are provided. This chapter begins by graphically testing the credibility of the parallel trend assumption in subchapter 7.1. Subchapter 7.2 presents the average treatment effects of the regulation over hagwon's operating hours on hours and expenditures devoted to private tutoring while subchapter 7.3 compares different average treatment effects depending on sample. The treatment effects on private tutoring expenditures by each type and subject are presented in subchapter 7.4 and 7.5, respectively, and the chapter ends with subchapter 7.6 showing the treatment effects on private tutoring expenditures by the extent of the regulation and region-specific treatment effects.

7. 1. The parallel trend assumption

As subchapter 5.1 explains, the parallel trend assumption is the key identifying assumption in the DD estimation. Thus, it is worth conducting a test of the validity of the assumption before reporting the main results. Figure 3 and 4 illustrate the trends in the average weekly hours

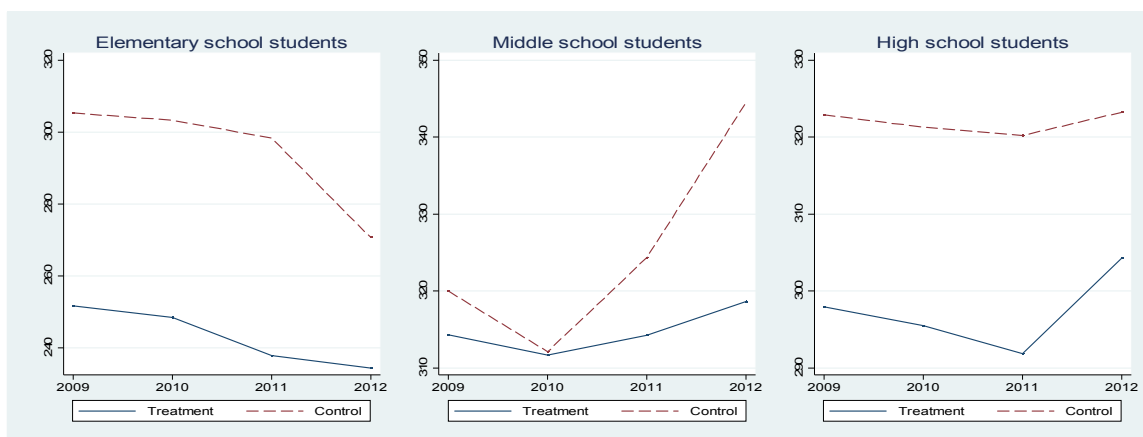
²⁸ For the current empirical analysis, students ranked in the top 10% of the entire sample in terms of hours devoted to private tutoring are identified as students taking private tutoring intensively. However, for analytic convenience, the group of students is actually defined as students whose weekly hours spent on private tutoring are longer than 15 hours. Such students roughly account for 10% of the sample.

Figure 3. Trends in the average weekly hours spent on private tutoring (from 2009 to 2012)



The y-axis displays the average weekly hours spent on private tutoring, while the x-axis displays years.

Figure 4. Trends in the average yearly expenditures spent on private tutoring (from 2009 to 2012)



The y-axis displays the average yearly expenditures spent on private tutoring, while the x-axis displays years.

spent on private tutoring and trends in the average yearly expenditures spent on private tutoring, respectively. In general, the trends appear to be very similar in both treatment and control groups at all school levels. Caution is required in the interpretation of the trends since the time span measured is too short: the graphs only cover a four-year time span (from 2009 to 2012) and the reinforcement of the curfew on hagwon's operating hours is implemented in the treatment group in 2011 or 2012. Nevertheless, the fact that the average weekly hours and yearly expenditures spent on private tutoring in the two groups followed a parallel evolution between 2009 and 2010 (prior to the reinforcement of the curfew on hagwon's operating hours) gives some support to the parallel trend assumption. Therefore, now it is more credible that the DD estimator can yield a consistent estimate of the treatment effect.

7. 2. DD estimates of the regulation over operating hours of hagwon

Table 3 and 4 present the DD estimates, which give the causal effects of the regulation over operating hours of hagwon on hours and expenditures devoted to private tutoring, respectively. The second, fourth, and sixth columns of the tables show the basic DD regressions without individual specific covariates and the third, fifth, and seventh columns show the DD regressions with covariates. Interpretation of the results relies more on the estimates obtained from the models with covariates given that those with covariates have more explanatory power. The first row of Table 3 shows that the reinforcement of the regulation on hagwon's operating hours does not substantially decrease total hours spent on private tutoring activities. The regulation has a statistically significant positive influence on elementary school students' weekly hours dedicated to private tutoring; however, the increase in hours spent on private tutoring is less than 15 minutes. For middle and high school students, the coefficients of the regulation dummy are not very different from zero.

The first row of Table 4 indicates a statistically significant negative impact of the strengthened curfew on private tutoring expenditures for middle school students. The size of the reduction in yearly private tutoring expenditure is 117.19 thousand Korean won, which is equivalent to about 3.7% of the average yearly spending on private tutoring for middle school students. The policy leads elementary and high school students to moderately raise their private tutoring costs, but these increases are not statistically significant.

The coefficients of the control variables are consistent with results reported in most previous studies. Students whose parents have higher household income and educational attainment are likely to invest more hours in private tutoring as shown in Table 3; however, the effect of the socio-economic backgrounds seems to describe a diminishing returns pattern. Elementary school students whose parents have a university degree even spend more hours on private tutoring than those whose parents have at least a graduate degree, but the general pattern seems to hold. The coefficients of the father's and mother's education, along with the household income dummies in Table 4 also indicate that yearly spending on private tutoring is significantly and positively correlated to household income and parental education. However, the marginal effect of the socio-economic status on private tutoring expense is relatively constant, implying that parents with high socio-economic status are inclined to provide their children with better educational opportunities by increasing the quality of

Table 3. Effects of the reinforcement of the curfew on hours spent on private tutoring (all observations)

	Elementary school		Middle school		High school	
	Basic	Covariates	Basic	Covariates	Basic	Covariates
Regulation	0.301*** (0.109)	0.224** (0.108)	-0.015 (0.096)	0.026 (0.096)	0.021 (0.069)	0.068 (0.070)
Female		-0.096** (0.048)		-0.356*** (0.050)		0.422*** (0.035)
Father education						
High school		0.757*** (0.183)		1.007*** (0.141)		0.280*** (0.081)
Undergraduate		1.015*** (0.189)		1.568*** (0.150)		0.865*** (0.088)
Graduate school		0.819*** (0.209)		1.634*** (0.177)		0.892*** (0.110)
Mother education						
High school		0.902*** (0.175)		0.709*** (0.140)		0.436*** (0.077)
Undergraduate		0.938*** (0.182)		1.012*** (0.152)		0.835*** (0.088)
Graduate school		0.677*** (0.226)		1.045*** (0.214)		0.835*** (0.139)
Household income						
1~2 million won		1.501*** (0.152)		1.449*** (0.135)		0.479*** (0.103)
2~3 million won		3.149*** (0.147)		3.356*** (0.131)		1.370*** (0.101)
3~4 million won		4.434*** (0.150)		4.604*** (0.132)		2.109*** (0.102)
4~5 million won		5.115*** (0.155)		5.140*** (0.137)		2.559*** (0.105)
5~6 million won		5.672*** (0.165)		5.640*** (0.146)		3.086*** (0.112)
6~7 million won		5.778*** (0.180)		6.052*** (0.164)		3.453*** (0.126)
More than 7 million won		6.342*** (0.172)		6.385*** (0.151)		3.913 (0.116)
Size of the region						
Metropolitan city		0.385* (0.205)		-1.378*** (0.245)		-3.303*** (0.189)
Small city		-0.003 (0.128)		-0.553*** (0.123)		-2.644*** (0.089)
Rural area		-0.020 (0.161)		-1.533*** (0.144)		-3.658*** (0.100)
Observations	62796	59671	72700	67211	104415	98166
R ²	0.018	0.087	0.016	0.100	0.047	0.105

Notes: Robust standard errors are in brackets. *Significant at 10%; **Significant at 5%; ***Significant at 1%. All regressions include region dummies and year dummies.

Table 4. Effects of the reinforcement of the curfew on private tutoring expenditures

	Elementary school		Middle school		High school	
	Basic	Covariates	Basic	Covariates	Basic	Covariates
Regulation	5.531 (3.837)	2.403 (3.624)	-12.395*** (4.385)	-11.719*** (4.095)	0.584 (4.568)	6.100 (4.402)
Female		-0.273 (1.707)		-6.616*** (2.078)		32.214*** (2.264)
Father education						
High school		27.002*** (5.257)		44.231*** (4.485)		15.069*** (4.092)
Undergraduate		53.429*** (5.494)		98.592*** (4.957)		68.303*** (4.566)
Graduate school		75.044*** (6.949)		146.408*** (7.235)		109.676*** (7.101)
Mother education						
High school		26.812*** (4.943)		14.918*** (4.640)		17.945*** (3.882)
Undergraduate		49.281*** (5.231)		68.300*** (5.323)		78.680*** (4.720)
Graduate school		62.672*** (8.780)		89.220*** (9.854)		122.636*** (11.167)
Household income						
1~2 million won		42.211*** (4.268)		38.188*** (4.390)		36.025*** (4.609)
2~3 million won		99.308*** (4.157)		109.009*** (4.292)		95.124*** (4.506)
3~4 million won		152.016*** (4.275)		173.457*** (4.404)		155.537*** (4.650)
4~5 million won		195.296*** (4.548)		228.224*** (4.820)		205.840*** (5.008)
5~6 million won		239.772*** (5.174)		281.692*** (5.491)		263.138*** (5.756)
6~7 million won		273.577*** (6.359)		324.849*** (6.920)		313.743*** (7.252)
More than 7 million won		347.500*** (6.205)		386.763*** (6.495)		418.028*** (7.058)
Size of the region						
Metropolitan city		-108.094*** (6.753)		-52.263*** (9.471)		-337.829*** (14.474)
Small city		-91.670*** (4.553)		-68.566*** (5.100)		-262.978*** (5.400)
Rural area		-122.810*** (5.351)		-121.581*** (5.681)		-336.940*** (5.759)
Observations	62796	59671	72700	67211	104415	98166
R ²	0.052	0.228	0.026	0.236	0.093	0.231

Notes: Robust standard errors are in brackets. *Significant at 10%; **Significant at 5%; ***Significant at 1%. All regressions include region dummies and year dummies.

private tutoring services than by simply increasing the quantity of private tutoring services.

When it comes to the size of the region, Table 3 shows that middle and high school students in Seoul, the reference group, are exposed to the longest hours on private tutoring activities, followed by those in small cities, metropolitan cities, and rural areas. For elementary school students, the differences are not significant except for pupils in metropolitan cities spending more hours than those in Seoul. For private tutoring expenditures, students in Seoul spend the most amount of money, while those in rural areas spend the least amount of money as seen from Table 4. Pupils in small cities are reported to be more active than those in metropolitan cities in terms of the time and money spent on private tutoring. One possible explanation is that many small cities in Gyeonggi are located in the suburbs of Seoul, so that their consumption patterns for private tutoring are similar to the consumption patterns of pupils in Seoul. Additionally, Table 3 and 4 describe a tendency that female students are likely to spend less time and money on private tutoring during their elementary and middle school days but more time and money on private tutoring during their high school days.

The overall message of the results from the DD estimation reported in Table 3 and 4 is that the reinforcement of the curfew on operating hours of hagwon does not cause a significant reduction in hours spent on private tutoring as intended and that the policy is only successful in decreasing middle school students' private tutoring costs. In reference to the finding of no reduction in hours devoted to private tutoring, the economic theory considered in chapter 4 suggests that three possible scenarios could happen. For starters, the policy might fail to decrease hours dedicated to private tutoring by hagwon in the first place. In this case, a leftward shift of the supply curve does not take place, so that the policy ends up with no impact on both total hours spent on private tutoring and total private tutoring costs. Second, the policy might actually succeed to lessen the amount of time spent on hagwon type tutoring, but the cut might be completely supplemented by an increase in the use of other types of private tutoring. In such a case, the supply curve stays in the initial position, so total hours devoted to private tutoring and total spending on private tutoring are not affected by the policy. Third, a moderate leftward shift of the supply curve might occur as the reduced time spent on private tutoring by hagwon is partly replaced by other forms of private tutoring activities. If that is the case, the slight change in total hours spent on private tutoring can increase or decrease total private tutoring expenditures depending on the demand elasticity,

as the economic theory illustrates. This scenario seems the most probable in that the main results presented in Table 3 and 4 show no evidence of substantial change in hours spent on private tutoring and a significant amount of decrease in middle school students' private tutoring costs simultaneously. If the cut in hagwon type tutoring is completely supplemented by an increase in the use of other types of private tutoring as the second scenario illustrates, the significant decrease in middle school students' expenditures in private tutoring cannot be explained. Therefore, I suspect that an insignificant level of leftward shift of the supply curve might take place and middle school students who have a relatively elastic demand for private tutoring might respond to the policy by reducing private tutoring expenses²⁹.

7. 3. Treatment effects on hours and expenses devoted to private tutoring by sample

In order to conduct detailed research on the effects of the regulation on hagwon's operating hours on the time and money dedicated to private tutoring, I try to restrict the analysis to the subgroups that are more likely to be affected by the policy. First, I exclude pupils who do not take any private tutoring from the sample since these students are not the main target of the policy. I refer to the remaining group of students as the positive tutoring subsample. As will be presented in Table 5 and 6, the exclusion of pupils with no tutoring does not substantially change the average treatment effects reported in Table 3 and 4. However, the results obtained with the positive tutoring subsample more clearly describes how differently elementary, middle, and high school students respond to the policy, as the students who are supposed to be unaffected by the policy (students with no tutoring) do not contribute to the estimates. This may help us to understand hidden implications of the average treatment effects of the regulation over hagwon's operating hours. Therefore, I regard the positive tutoring sample as the sample of interest, and the results obtained with the positive tutoring subsample are paid special attention as the main finding of the analysis.

Additionally, I further narrow down the sample to pupils who receive private tutoring intensively and refer to them as the intensive tutoring subsample (hour > 15). The rationale behind this is that all of the students with positive private tutoring can be subject to the policy but the group most likely to be affected by the policy is the group of students with intensive

²⁹ A rightward shift of the supply curve is not considered since the regulation over operating hours of hagwon is not expected to increase the total amount of private tutoring services provided in the market.

tutoring. For instance, pupils who take private tutoring 5 hours a week are less likely to be influenced by the 10 p.m. curfew; however, for those taking private tutoring 20 hours a week, the policy is more likely to have a direct impact on their decision making for private tutoring. Thus, I employ the intensive tutoring subsample to understand how this group's reactions to the policy are distinguished from the average reactions to the policy in general.

Table 5 compares the DD estimates of the regulation on hours spent on private tutoring over the three samples. Compared to the estimates computed by using the whole sample, hours elementary school students spend on private tutoring rise to a smaller extent when the analysis is restricted to the positive tutoring subsample. For students with intensive private tutoring, the coefficients of the regulation are more inclined to have negative values; however, the negative impacts are marginal and insignificant. In general, the estimated effect of the regulation on hours spent on private tutoring is similar regardless of which sample is used for the analysis. Thus, the results in Table 5 further support the main message reported in Table 3 that the policy does not yield a substantial change in hours devoted to private tutoring.

On the other hand, the DD estimates of the regulation on private tutoring costs provided in Table 6 give us a few points of note. First, the coefficients of the regulation with the positive tutoring subsample demonstrates an obvious tendency that the policy significantly decreases private tutoring costs for middle school students and significantly increases private tutoring costs for high school students, while it does not have any specific influence on elementary school students' private tutoring costs. This is distinguished from the result obtained with the entire sample in that the positive impact on private tutoring costs for high school students is significant at a 10% significance level. Thus, the result with the positive tutoring subsample is interpreted as that the reinforcement of the curfew on hagwon drives middle school students to spend less money on private tutoring by 122.51 thousand Korean won a year and high school students to spend more money on private tutoring by 109.56 thousand Korean won a year.

Second, the last three rows of Table 6 clearly indicate sizeable negative impacts of the regulation on private tutoring expenses for all school levels. Although only the coefficients for middle school students are significant at a 10% significance level, the fact that all the coefficients have negative signs and the degree of the negative impacts are considerable seems to deserve special attention. This implies that the policy might be quite effective to decrease private tutoring costs for students with intensive tutoring. Furthermore, given that

Table 5. Effects of the reinforcement of the curfew on hours spent on private tutoring by sample

	Elementary school		Middle school		High school	
	Basic	Covariates	Basic	Covariates	Basic	Covariates
All observations						
Regulation	0.301*** (0.109)	0.224** (0.108)	-0.015 (0.096)	0.026 (0.096)	0.021 (0.069)	0.068 (0.070)
Observations	62796	59671	72700	67211	104415	98166
R^2	0.018	0.087	0.016	0.100	0.047	0.105
Positive private tutoring (hour > 0)						
Regulation	0.215** (0.109)	0.181* (0.110)	0.055 (0.098)	0.061 (0.100)	0.099 (0.086)	0.134 (0.088)
Observations	53481	51669	52669	50253	62348	59926
R^2	0.013	0.045	0.022	0.039	0.039	0.049
Intensive private tutoring (hour > 15)						
Regulation	-0.291 (0.258)	-0.230 (0.266)	-0.067 (0.147)	-0.082 (0.150)	0.056 (0.284)	0.065 (0.290)
Observations	6288	6103	9185	8811	5663	5478
R^2	0.017	0.020	0.007	0.008	0.008	0.016

Notes: Robust standard errors are in brackets. *Significant at 10%; **Significant at 5%; ***Significant at 1%. All regressions include region dummies and year dummies.

Table 6. Effects of the reinforcement of the curfew on private tutoring expenditures by sample

	Elementary school		Middle school		High school	
	Basic	Covariates	Basic	Covariates	Basic	Covariates
All observations						
Regulation	5.531 (3.837)	2.403 (3.624)	-12.395*** (4.385)	-11.719*** (4.095)	0.584 (4.568)	6.100 (4.402)
Observations	62796	59671	72700	67211	104415	98166
R^2	0.052	0.228	0.026	0.236	0.093	0.231
Positive private tutoring (hour > 0)						
Regulation	0.438 (3.908)	-1.347 (3.712)	-11.816** (4.618)	-12.251*** (4.336)	4.067 (5.666)	10.956** (5.438)
Observations	53481	51669	52699	50253	62348	59926
R^2	0.060	0.211	0.043	0.211	0.114	0.229
Intensive private tutoring (hour > 15)						
Regulation	-19.507 (14.973)	-6.391 (13.646)	-29.103** (13.836)	-22.835* (12.522)	-47.142* (25.273)	-24.915 (23.495)
Observations	6288	6103	9185	8811	5663	5478
R^2	0.082	0.284	0.078	0.287	0.192	0.340

Notes: Robust standard errors are in brackets. *Significant at 10%; **Significant at 5%; ***Significant at 1%. All regressions include region dummies and year dummies.

those with intensive private tutoring tend to have higher socio-economic backgrounds as described in subchapter 6.3, this finding infers that the policy may be producing fruitful consequences in terms of a reduction in inequality of educational opportunities.

7. 4. Treatment effects on private tutoring expenditures by type

Why does the reinforcement of the curfew on hagwon's operating hours decrease middle school students' spending on private tutoring while it increase high school students' spending on private tutoring? Do middle and high school students have different demand elasticities for private tutoring as the economic theory explanation in chapter 4 suggests? In order to answer these questions, how expenditure spent on each type of private tutoring is affected by the policy is further investigated.

Table 7 shows the effects of the regulation over operating hours of hagwon on private tutoring expenses by type. In Table 7 and the remaining tables in this chapter, I restrict the analysis to the positive tutoring subsample to precisely capture the change in consumption patterns of private tutoring services. The first row of the table indicates that elementary school students paradoxically increase private tutoring by hagwon and decrease one-to-one and group tutoring. The size of the increase in hagwon type tutoring is approximately identical to the decrease in one-to-one and group tutoring, maintaining total private tutoring costs unchanged. For middle school students, there is a significant decrease in hagwon type tutoring, while other forms of tutoring remain relatively unchanged. The reduction in middle school students' spending on private tutoring by hagwon (136.20 thousand Korean won) is similar to the reduction in their total spending on private tutoring (122.51 thousand Korean won), indicating that the average treatment effect on total private tutoring costs for middle school students is mainly explained by the decrease in their consumption of hagwon type tutoring. The increased use of workbook tutoring and the decreased use of internet tutoring for middle school students are statistically significant, but the absolute magnitude of the change is not large. The case of middle school students might seem the most desirable to the educational authorities since the policy only cuts private tutoring expenses for hagwon type tutoring as they intended. High school students also respond to the policy by significantly decreasing their costs spent on private tutoring by hagwon as intended. The degree of the reduction is 120.22 thousand Korean won, which is approximately as much as the decrease in middle school students' spending on private tutoring by hagwon. This implies that both middle and high school students are the groups mainly exposed to private tutoring lessons taken after 10 p.m. and the governmental regulation on operating hours of hagwon is actually successful in curtailing their expenditures on private tutoring by hagwon.

Table 7. Effects of the reinforcement of the curfew on expenditures for each type of private tutoring for the positive tutoring takers (hour>0)

	One-to-one tutoring		Group tutoring		Hagwon tutoring		Workbook tutoring		Internet tutoring	
	Basic	Covariates	Basic	Covariates	Basic	Covariates	Basic	Covariates	Basic	Covariates
Elementary school										
Regulation	-2.030	-2.861**	-3.044**	-3.066**	5.026	5.882*	-1.056	-1.016	0.250	0.264
	(1.391)	(1.385)	(1.380)	(1.409)	(3.234)	(3.224)	(1.181)	(1.212)	(0.336)	(0.347)
R^2	0.009	0.036	0.004	0.013	0.025	0.086	0.009	0.014	0.001	0.003
Middle school										
Regulation	-1.762	-1.565	-1.107	-1.761	-12.743***	-13.620***	0.872	1.123*	-1.574***	-1.464**
	(2.983)	(3.031)	(2.200)	(2.271)	(4.158)	(4.180)	(0.602)	(0.621)	(0.571)	(0.588)
R^2	0.009	0.056	0.012	0.026	0.025	0.078	0.004	0.006	0.001	0.005
High school										
Regulation	5.867	8.259*	-1.874	-0.775	-16.161***	-12.022***	-0.278	-0.306	-1.125	-0.660
	(4.696)	(4.709)	(2.526)	(2.580)	(4.431)	(4.487)	(0.226)	(0.233)	(0.748)	(0.770)
R^2	0.012	0.064	0.007	0.018	0.091	0.118	0.002	0.004	0.006	0.008

Notes: Robust standard errors are in brackets. *Significant at 10%; **Significant at 5%; ***Significant at 1%. All regressions include region dummies and year dummies.

However, unlike middle school students, high school students seem to supplement the reduction in hagwon type private tutoring by the significantly increased use of one-to-one tutoring. The raise in expenditure spent on one-to-one private tutoring for high school students is 82.59 thousand Korean won a year and it is significant at a 10% significance level. This clearly demonstrates that middle and high school students differently deal with the “crisis” in which they have to reduce their usable time allocated for private tutoring by hagwon. For high school students who are supposed to take the CSAT in the near future, private tutoring services are regarded as necessities, so that private tutoring might be something they cannot give up. They are more likely to seek any other types of private tutoring services available regardless of price of the services, when the access to hagwon type tutoring is limited. Hence, such inelastic private tutoring demands of high school students might be the main cause of the raise in their spending on private tutoring driven by the policy. On the other hand, middle school students might have less incentive to keep the high level of investment in private tutoring compared to high school students. Given that the CSAT in which their academic performance should be reached to a peak comes at least three years later, it might not be a big deal for them to give up some private tutoring lessons now. If that is the case, the reduction in middle school students’ private tutoring expenditures caused by the policy can also be explained by their elastic demands for private tutoring.

7. 5. Treatment effects on private tutoring expenditures by subject

More evidence on how middle and high school students treat private tutoring in a different way can be found in Table 8. Table 8 provides different treatment effects of the regulation on private tutoring expenditures by each subject. For elementary school students, the policy insignificantly decreases their spending on English and math tutoring, while it significantly increases their spending on Korean and science tutoring. The increases in yearly spending on Korean and science tutoring are not economically important (both figures are less than 20 thousand Korean won), but statistically significant due to relatively low levels of investment made in those subjects.

Under the influence of the regulation over operating hours of hagwon, middle school students reduce expenditures spent on all of the four subjects; however, they particularly decrease more costs devoted to the major subjects: the regulation lessens their yearly

Table 8. Effects of the reinforcement of the curfew on expenditures for each subject of private tutoring for the positive tutoring takers (hour>0)

	Korean tutoring		English tutoring		Math tutoring		Science tutoring	
	Basic	Covariates	Basic	Covariates	Basic	Covariates	Basic	Covariates
Elementary school								
Regulation	1.525** (0.736)	1.567** (0.735)	-1.739 (2.154)	-2.146 (2.095)	-0.840 (1.421)	-0.455 (1.422)	1.659** (0.664)	1.922*** (0.676)
R^2	0.008	0.025	0.004	0.158	0.021	0.066	0.005	0.016
Middle school								
Regulation	-0.691 (1.041)	-1.071 (1.071)	-4.289* (2.244)	-3.847* (2.160)	-9.879*** (2.209)	-10.129*** (2.115)	-0.159 (1.140)	-1.206 (1.172)
R^2	0.013	0.023	0.027	0.153	0.042	0.177	0.015	0.025
High school								
Regulation	-4.446*** (1.629)	-2.701* (1.634)	2.092 (2.743)	4.840* (2.753)	-5.532* (3.159)	-2.906 (3.135)	-4.589*** (1.195)	-3.373*** (1.221)
R^2	0.067	0.120	0.034	0.078	0.036	0.100	0.030	0.049

Notes: Robust standard errors are in brackets. *Significant at 10%; **Significant at 5%; ***Significant at 1%. All regressions include region dummies and year dummies.

spending on English and math tutoring by 38.47 and 101.29 thousand Korean won, respectively. This may reflect that middle school students choose to eliminate their excessive consumption of English and math tutoring given that their total private tutoring expenditures are highly concentrated to these two subjects.

For high school students, this pattern is reversed. Results in Table 8 illustrate that high school students choose to significantly decrease private tutoring costs spent on relatively less important subjects such as Korean and science; however, they appear reluctant to reduce their spending on major subjects such as English and math. The decline in science tutoring is reported to be the largest (33.73 thousand Korean won) among the 4 subjects and private tutoring expenditures devoted to English tutoring increase in spite of the reinforcement of the curfew. The sizes of negative impacts on Korean and math tutoring are similar, but only the cut in Korean tutoring is statistically significant.

There are two possible explanations why high school students significantly decrease their consumption of Korean and science tutoring. First, the subject “science” defined in this analysis has a lower weight on the final score of the CSAT³⁰ compared to Korean, English, and math. Thus, this might lead high school students to choose to actively give up science tutoring lessons among the 4 subjects. Second, the decreased consumption of Korean tutoring may be explained by a characteristic of the subject that short-term intensive investment in Korean tutoring does not firmly guarantee academic performance enhancement in that subject. Given that most high school students are native speakers of Korean language, it is critical to have outstanding reading comprehension ability for excellent academic performance in Korean on the CSAT. However, such ability is developed over a long period of time; thus, it is not easy to improve academic achievement in Korean in the short run. On the other hand, grade in English can be enhanced by many other ways such as enriching vocabulary or improving grammar. Thus, high school students might want to concentrate more on English and math tutoring which give them higher short-term expected returns when they are forced to reallocate their resources by the reinforcement of the curfew on operating hours of hagwon. Therefore, Table 8 provides another evidence that how differently middle and high school students respond to the policy according to their different elasticity of demand for private

³⁰ The CSAT consists of 5 sections: Korean language, Math, English, a second foreign language/Chinese character, and social studies/sciences/vocational education. The first three subjects are mandatory while examinees are supposed to choose one language among 9 foreign languages and one subject between social studies, sciences, and vocational education.

tutoring services, especially for the major subjects.

7. 6. Treatment effects on private tutoring expenses by the extent of the treatment

The estimates reported in Table 6 are the average impact of the reinforcement of the curfew, and as such may mask some interesting heterogeneity. Here the average treatment effects on private tutoring expenditures are decomposed into three treatment effects by the magnitude of the regulation or 6 region-specific treatment effects. As can be seen in Table 9, both one-hour and two-hour reinforcements of the curfew insignificantly decrease private tutoring expenses for elementary school students. However, the three-hour reinforcement of the curfew implemented in Jeju increases elementary school students' private tutoring expenses by 329.77 thousand Korean won, which is quite exceptional. Although the precise reason for this exceptional raise is unknown, it is suspected to be the key explanation for the unexpected positive correlation between the policy and elementary school students' expenditures for hagwon type tutoring.

Middle school students lessen their spending on private tutoring by both one-hour and two-hour reinforcements of the curfew. Contrary to my expectation, the one-hour reinforcement of the curfew decreases more expenditures (164.51 thousand Korean won) than the two-hour reinforcement of the curfew does (122.13 thousand Korean won). For high school students, positive impacts of the regulations are observed for both one-hour and two-hour reinforcements of the curfew. The size of the increase is larger in the one-hour reinforcement, but the effect of the two-hour reinforcement is significant at a 10% level. In overall, the results reveal that the effect of each treatment is not proportional to the level of the treatment.

The bottom half of Table 9 apparently indicates that there are heterogeneous treatment effects depending on region. The further restriction over operating hours of hagwons in Incheon and Jeonnam does not seem to make significant changes in private tutoring costs: all the estimates for students in Incheon and Jeonnam are not statistically significant. The treatment effects in Daegu are similar to the average treatment effects presented in the first row of Table 9, in that the policy significantly reduces private tutoring expenditures for middle school students, it significantly raises those for high school students, and it does not have a significant impact on those for elementary school students. Similar pattern can be

Table 9. Effects of the reinforcement of the curfew on private tutoring expenditures by the extent of the regulation and region-specific treatment effects for the positive tutoring takers (hour>0)

	Elementary school		Middle school		High school	
	Basic	Covariates	Basic	Covariates	Basic	Covariates
	Average treatment effect					
Regulation	0.438 (3.908)	-1.347 (3.712)	-11.816** (4.618)	-12.251*** (4.336)	4.067 (5.666)	10.956** (5.438)
	Treatment effect by the extent of the reinforcement of the curfew					
Regulation 1 hour	-29.438*** (6.916)	-9.131 (6.826)	-14.789*** (5.562)	-16.451*** (5.158)	-0.694 (12.296)	13.424 (12.069)
Regulation 2 hours	0.611 (4.721)	-5.107 (4.434)	-15.572** (7.042)	-12.213* (6.669)	4.745 (5.976)	10.607* (5.721)
Regulation 3 hours	48.761*** (9.297)	27.687*** (8.982)				
	Region-specific treatment effect					
Regulation Incheon	-29.519*** (6.916)	-9.163 (6.826)	7.435 (9.226)	13.037 (9.256)	-0.649 (12.297)	13.452 (12.070)
Regulation Daegu	-8.871 (6.357)	-8.778 (5.843)	-33.645*** (9.844)	-32.025*** (8.941)	14.255 (10.098)	15.494* (9.410)
Regulation Jeonnam	14.980*** (5.843)	0.430 (5.803)	11.207 (10.104)	7.272 (9.705)		
Regulation Jeju	48.678*** (9.297)	27.667*** (8.982)	-32.101*** (11.228)	-29.499*** (11.140)		
Regulation Gyeonggi			-11.401* (6.098)	-14.195** (5.599)	0.181 (7.596)	6.049 (7.236)
Regulation Gwangju					4.073 (9.057)	15.439* (9.131)

Notes: Robust standard errors are in brackets. *Significant at 10%; **Significant at 5%; ***Significant at 1%. All regressions include region dummies and year dummies.

found in the remaining regions, except that Jeju shows unusual increase in elementary school students' private tutoring costs and a positive impact on high school students' private tutoring cost in Gyeonggi is statistically insignificant.

8. Discussion

As illustrated in chapter 7, the reinforcement of the curfew on hagwon's operating hours does not have a strong influence on yearly spending of elementary school students that are less likely to stay at hagwon late at night. Middle and high school students, the primary target groups, are actually affected by the policy; however, the direction and the degree of the treatment effects are totally different between the two groups. Middle school students who decrease their spending on private tutoring by hagwon do not increase the use of other types

of private tutoring to make up the reduction. Conversely, high school students significantly increase their spending on one-to-one tutoring when they have to significantly decrease the use of hagwon type tutoring. This is consistent with the prediction of the theory in chapter 4 that different demand elasticity can yield different treatment effects on private tutoring expenses given that the policy shifts the supply curve leftwards to some extents. It may be safe to assume that middle school students' demand for private tutoring is elastic; so that they might simply reduce their total tutoring costs in compliance with the policy. The results reveal that they especially reduce more expenditure spent on tutoring for English and math, subjects considered to be excessively covered by private tutoring. However, high school students' demand for private tutoring may be more inelastic. They are more likely to regard private tutoring services indispensable to achieve excellent academic performance on the CSAT, the crucial point in their academic life. Thus, they might respond to the pressure of the policy by decreasing private tutoring costs for hagwon and by increasing private tutoring costs for one-to-one tutoring. Furthermore, they tend to give up private tutoring devoted to relatively less important subjects such as Korean and science to at least maintain the same levels of investment in private tutoring for the major subjects. This is exactly what many parents and educational experts were concerned about. Consequently, households with high school students end up with the increased financial burden in spite of the policy aiming to reduce private tutoring expenses.

The main findings of the study mentioned above, along with the theory presented in chapter 4 thus give us several policy implications. Firstly, efforts to curb demands for private tutoring are still the best way to curtail private tutoring expenditures; and therefore, such efforts have to be continuously made. As the standard economic theory illustrates, a leftward shift of the demand curve decreases both quantity and price of private tutoring services, thereby unconditionally resulting in a reduction in total private tutoring expenditures. Thus, diverse measures to shift the demand curve leftwards, such as narrowing the gap in education quality between public education and private tutoring should be incessantly taken.

Secondly, policies regulating the supply side of private tutoring market can also be effective to reduce private tutoring expenditures under the condition that demand for private tutoring services is elastic. Thus, for the regulation over operating hours of hagwon to produce actual results, the government needs to entail efforts to increase the elasticity of demand for private tutoring. This is why the governmental measures aiming to increase the

availability of substitutes for private tutoring, such as the EBS lectures and the “after-school” programs are of importance. Since the more and closer the substitutes for private tutoring services available, the higher the elasticity is likely to be, improving the quality of the EBS lectures and the “after-school” programs would play a key role in making the regulation over operating hours of hagwon more successful.

9. Conclusion

This paper empirically examines the effect of a regulation over operating hours of hagwon on private tutoring expenditures in Korea. By exploiting the fact that all education offices have placed a restriction on operating hours of hagwon in their ordinances since 2009 and some of them changed their curfew on hagwon in 2011 and 2012, a DD estimator measures the average treatment effect of the policy. The main finding of this study suggests that the policy regulating hagwon’s operating hours can be evaluated as a half success. Although the policy does not yield a significant reduction in hours spent on private tutoring and in private tutoring expenditures for elementary and high school students, it obviously contributes to significantly decreasing middle school students’ private tutoring expenditures. Furthermore, when the analysis is restricted to the group of students most likely to be affected by the policy, i.e. those who receive private tutoring intensively, the policy causes a sizable decrease in private tutoring expenses at all school levels. Given that those with intensive tutoring tend to have more educational resources, this evidence implies that the policy can also be assessed as a contribution to alleviating educational inequality problem.

However, several caveats and limitations need to be noted regarding the present study. To begin with, some caution is required in interpreting the findings. Although the government toughened its crack down on hagwon that violated operating hours, many hagwon operators are still skeptical about the possibility for regulators to monitor all hagwons, thus breaking the regulation. It is not known precisely how serious this situation is, but we should be aware that this situation may undermine the credibility of the estimated effect of the regulation over hagwon’s operating hours on private tutoring expenditures.

Second, the current analysis is based on a simple theoretical framework. The theory used in this study presumes a perfectly competitive private tutoring market; however, obviously, it is not the case. Private tutoring services are not homogenous: different types and qualities of

private tutoring services are provided on the private tutoring market. Also, suppliers of private tutoring services tend to have more or better information than consumers. False and exaggerated advertisements creating an air of anxiety actually further worsen the scenario in which Korea is obsessed with private tutoring. Future study should therefore concentrate on analyzing the research question on the basis of a more elaborate theory where the assumptions of perfect competition are relaxed.

Lastly, potential econometric problems regarding the DD methods can be alleviated by richer data. One of the main reasons why few studies have investigated the effect of the regulation over hagwon's operating hours may be lack of available data. Although the dataset used in this study has many observations and detailed information on private tutoring expenditure, only data from 2009 to 2012 are suitable for the analysis. Longer time frame enables us to relax the parallel trend assumption by adding region-specific time trends to the list of controls. This more flexible specification allows treatment and control groups to follow different linear trends, so that the DD estimation is likely to be more robust and convincing (Angrist and Pischke, 2009, p.238-239). In addition, individual-level panel data can be a powerful tool for estimating the policy effects. By controlling for individual fixed effects, we can further get rid of the source of omitted variables bias. Thus, the availability of individual-level panel data in future research would also help us to establish a greater degree of accuracy on this matter.

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Appendix

Table A1. Definition of variables

Variables	Definition
Hour	Weekly hours spent on private tutoring
Expenditure	Yearly spending on private tutoring
Korean tutoring	Yearly spending on Korean private tutoring
English tutoring	Yearly spending on English private tutoring
Math tutoring	Yearly spending on Math private tutoring
Science tutoring	Yearly spending on Science private tutoring
One-to-one tutoring	Yearly spending on 'one-to-one tutoring'
Group tutoring	Yearly spending on 'group tutoring'
Hagwon tutoring	Yearly spending on 'taking lessons at hagwon'
Workbook tutoring	Yearly spending on 'textbooks with tutor's visit' type tutoring
Internet tutoring	Yearly spending on 'paid internet and correspondence lectures' type tutoring
Female	1 if female; 0 otherwise
Father education	(The reference group is middle school degree)
High school	1 if father has a high school degree; 0 otherwise
University	1 if father has a university degree; 0 otherwise
Graduate school	1 if father has a graduate degree or more; 0 otherwise
Mother education	(The reference group is middle school degree)
High school	1 if mother has a high school degree; 0 otherwise
University	1 if mother has a university degree; 0 otherwise
Graduate school	1 if mother has a graduate degree or more; 0 otherwise
Household income	(The reference group is less than 1 million won)
1~2 million won	1 if monthly household income is between 1~2 million won; 0 otherwise
2~3 million won	1 if monthly household income is between 2~3 million won; 0 otherwise
3~4 million won	1 if monthly household income is between 3~4 million won; 0 otherwise
4~5 million won	1 if monthly household income is between 4~5 million won; 0 otherwise
5~6 million won	1 if monthly household income is between 5~6 million won; 0 otherwise
6~7 million won	1 if monthly household income is between 6~7 million won; 0 otherwise
More than 7 million won	1 if monthly household income is more than 7 million won; 0 otherwise
Academic performance	(The reference group is top 10% of the class)
10~30%	1 if student is between 10~30% of the class; 0 otherwise
30~60%	1 if student is between 30~60% of the class; 0 otherwise
60~80%	1 if student is between 60~80% of the class; 0 otherwise
Lower 20%	1 if student is below bottom 20% of the class; 0 otherwise
Size of the region	(The reference group is Seoul)
Metropolitan city	1 if metropolitan city; 0 otherwise
Small city	1 if small city; 0 otherwise
Rural area	1 if rural area; 0 otherwise
Regulation	1 if the strengthened curfew is implemented; 0 otherwise
Regulation 1 hour	1 if 1 hour-reinforcement of the curfew is implemented; 0 otherwise
Regulation 2 hours	1 if 2 hour-reinforcement of the curfew is implemented; 0 otherwise
Regulation 3 hours	1 if 3 hour-reinforcement of the curfew is implemented; 0 otherwise
Regulation Incheon	1 if the strengthened curfew is implemented and the region is Incheon; 0 otherwise
Regulation Daegu	1 if the strengthened curfew is implemented and the region is Daegu; 0 otherwise
Regulation Jeonnam	1 if the strengthened curfew is implemented and the region is Jeonnam; 0 otherwise
Regulation Jeju	1 if the strengthened curfew is implemented and the region is Jeju; 0 otherwise
Regulation Gyeonggi	1 if the strengthened curfew is implemented and the region is Gyeonggi; 0 otherwise
Regulation Gwangju	1 if the strengthened curfew is implemented and the region is Gwangju; 0 otherwise