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Evaluating the effects of governmental regulations on South Korean private cram schools

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Using two nationally representative datasets, this paper examines how the imposition of a curfew on private cram schools affects the consumption of private tutoring services as well as the time use patterns of Korean high school students. To identify the impact of the curfew, this study capitalizes on inter-city/province variation in private cram school regulatory ordinances and estimates a difference-in-differences estimator between the years of 2009 and 2012. The findings indicate that the curfew was ineffective in reducing the level of household expenditure or the total number of hours spent on private tutoring. However, imposition of the curfew was found to be associated with increases in time spent on sleeping as well as in internet usage for non-academic purposes. Interestingly, changes in time use patterns were not found among students in the highest socio-economic status group indicating that the curfew policy may have certain unintended consequences. Policy implications are discussed.

Keywords: private tutoring; regulation; time use; difference-in-difference; South Korea

Introduction

Private supplementary tutoring has long been a significant public concern for the South Korean (hereinafter Korean) government, generally being perceived as an avenue through which high income families consume additional educational resources and information resulting in increased social stratification and inequalities in access to higher education (Bray, 2006; J. Kim & Chang, 2010). Although the phenomenon of private supplementary tutoring is not unique to Korea, and has become increasingly more prevalent in other parts of the world, few countries have had such a long and varied history of governmental regulatory policies aimed to restrict or altogether ban the provision of such services (Bray, 2003).

From a historical perspective, the Korean household expenditure on private tutoring has been continuously increasing since the late 1970s, but it drastically jumped both in the mid-1990s and during the early 2000s with the change in college entrance exam policies in 1994, the relaxation of regulatory policies banning private tutoring during the 1990s, and the Constitutional Court's ruling in support of private tutoring in 2000 (Kang, 2010). Currently, according to official reports¹, household expenditure on private tutoring for families with children in grades 1–12 is reported to have exceeded US \$17.5 billion (19 trillion Korean won) in 2012. This is equivalent to 1.5% of the nation's Gross Domestic Product and roughly 50% of the total expenditure on public sector K-12 and early childhood education (Korea Herald, 2013; Ministry of Education, 2012). As a result,

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both the central government and academia have made great efforts to accumulate detailed information on the behaviours and attitudes related to Korean private tutoring in hopes of designing policies that can better respond to these growing concerns. This has translated into a number of rich datasets that document various aspects of private tutoring and its related consequences.

There are a number of reasons behind the high prevalence of private tutoring in Korea. Some of the most commonly cited reasons are related to the unique institutional features of the country's secondary education system which emphasizes an egalitarian approach to education (Byun, Schofer, & Kim, 2012). First, the secondary school equalization policies, introduced in 1968 for middle schools and 1973 for high schools, randomly assign students to schools within their school district regardless of school type (public versus private) or student individual level characteristics². Next, schools are subject to strict governmental regulations with regard to many managerial decisions including the imposition of a uniform curriculum as well as being forced to charge similar levels of tuition. Hence, in Korea, the degree to which one can improve the level of school quality by choosing to live in a certain neighbourhood is more limited as compared to those in other countries where school quality varies widely across geographic location. In addition to such institutional differences in the secondary education system, the fact that high-stakes exams play a vital role in gaining access to a few selective colleges also boosts demand for private tutoring (C. J. Lee, Lee, & Jang, 2010). This is associated with the strong desire for prestigious university credentials which plays an important role in status attainment in the Korean society (C. J. Lee et al., 2010). In such an environment, private tutoring functions as an essential means for families to invest in children in a so-called "hyper-competitive" society. Motivated by enrichment rather than remediation, many high-achieving Korean students utilize private tutoring to get ahead of their peers (Baker, Akiba, Letendre, & Wiseman, 2001; J. Lee, 2007).

Existing research on private supplementary tutoring has generally focused on identifying the determinants of demand for private tutoring and its effects on student outcomes (Bray, Zhan, Lykins, Wang, & Kwo, 2014; Dang & Rogers, 2008; Jung & Lee, 2010; J.-H. Kim & Park, 2010; H. Park, Byun, & Kim, 2011; Stevenson & Baker, 1992). However, there is limited evidence on the consequences and implications of regulatory policies targeting the private tutoring market in both the Korean and international contexts (J.-H. Kim, 2009; J. Kim & Chang, 2010; C. J. Lee et al., 2010; Silova, 2010). Identifying and increasing our understanding of such policies can help stem the rising tide of household expenditure on private tutoring and, most importantly, mitigate its potentially negative consequences on social stratification and inequality.

Private supplementary tutoring is defined as fee-based tutoring that provides supplementary instruction delivered to students to catch up, keep up, or get ahead of their peers in academic subjects that are studied in the mainstream education system (Bray et al., 2014; Dang & Rogers, 2008). In the Korean context, although private supplementary tutoring takes on various forms from one-to-one or small-group tutoring to large lecture classes offered by private companies called *Hagwon* (i.e., private cram schools), this paper focuses on estimating the effects of regulating the operation hours of *Hagwons* only.

Regulation of the operation hours of *Hagwon* is one of the most recent policies enacted by the Korean government towards private tutoring. The 7.30 Educational Reform implemented in 1980 prohibited students from participating in any private tutoring. However, in 2000, the Constitutional Court ruled that governmental comprehensive prohibition of private tutoring was unconstitutional. As a result, currently any willing person can consume private tutoring as well as provide tutoring services insofar as they are

not incumbent professors or teachers in the mainstream education system (J. Kim & Chang, 2010). Following the court ruling of 2000, governmental regulations have focused on imposing restrictions on the details of *Hagwon* operation including the establishment of standards on the qualifications of instructors, the mandate to publicly post lesson rates, and the regulation on the hours of operation (J. Kim & Chang, 2010).

The present paper aims to provide a rigorous evaluation of policies restricting the hours of operation of *Hagwons* by utilizing variation in regulatory policy across geographic regions within Korea. This is possible because regulations of *Hagwons* are prescribed and implemented at the city and provincial level by the Superintendent's office in Korea.³ As shown in Table 1, by midyear 2012, there were a total of 16 administratively independent cities and provinces with different curfew policies, and we capitalize on this variation to identify the effects of regulating *Hagwon* operation hours on student consumption of private tutoring as well as on their time use patterns, specifically in terms of sleeping and internet usage. Results from the analyses should provide a more complete understanding of the factors that influence parents' and youths' decisions to consume private tutoring which can assist policymakers and practitioners design a more effective policy response to curb the demand for private supplementary tutoring.

Korean policy responses toward private supplementary tutoring

Governmental efforts to dampen the demand for private tutoring in Korea can be largely summarized into two broad policy responses: (1) policies revising and improving the (public) mainstream education system and (2) policies restricting the provision of private supplementary tutoring (C. J. Lee et al., 2010). Specifically, in 1968 and in 1973, respectively, the government implemented the middle school and high school equalization policies which eliminated entrance exams and randomly assigned students to schools within their local school district in hopes that such policies would lessen the demand for private tutoring. Studies have documented that equalization policy was indeed successful in reducing competition among elementary and middle school students (C. J. Lee et al., 2010). For example, a recent study found that household expenditure on private tutoring was slightly lower among middle school students in school districts where the high school equalization policy applies as compared to those in districts where the high school equalization policy is inapplicable (Byun, 2010). However, others have remained sceptical of the impact of the equalization policy and criticized that it simply delayed the timing of tutoring to upper secondary grade levels without providing a fundamental solution to the intense competition associated with college entrance exams (Kang, 2010). Some have argued that it may have even heightened the competitive atmosphere by increasing the sheer number of college applicants (Kang, 2010).

Another major governmental effort to reduce the demand for private tutoring was the aforementioned 7.30 Educational Reform implemented in 1980. Through this policy the government explicitly banned all supplementary tutoring of commercial nature and prohibited colleges from administering their own college entrance exams (Bray, 2003; J. Kim & Chang, 2010). Although the policy goal of banning all tutoring in 1980 was ambitious, it proved to be very difficult to regulate since it was implemented without a change in people's desire to excel in the harshly competitive college entrance exams (Bray, 2003). As a result, the ban on private tutoring was gradually relaxed throughout the 1980s and 1990s, ultimately allowing elementary and secondary school students to attend *Hagwon* for academic lessons during the school year in 1991 and allowing university undergraduate and graduate students to provide tutoring services to elementary and

Table 1. Curfew policy on Hagwon (private cram schools) across the 16 cities and provinces.

Cities & Provinces	Restriction on Hagwon (HW) Operation Hours				Remarks
	<i>ES</i>	<i>MS</i>	<i>HS</i>	<i>Enforcement date or progress</i>	
Gwangju	22:00	22:00	22:00	'11.03.01	Completion
Daegu	22:00	22:00	22:00	'11.03.01	Completion
Gyeonggi	22:00	22:00	22:00	'11.03.01	Completion
Seoul	22:00	22:00	22:00	'08.04.03	Completion
Busan	22:00	22:00	23:00	Movement toward revising the current ordinance to a uniform 10pm curfew at all school levels	Partial Completion (only for ES & MS)
Daejeon	22:00	23:00	24:00	Movement toward revising the current ordinance to a uniform 10pm curfew at all school levels	In Progress
Incheon	21:00	22:00	23:00	'12.01.01	Partial Completion (only for ES & MS)
Ulsan	24:00	24:00	24:00	Movement toward revising the current ordinance to a uniform 10pm curfew at all school levels	In Progress
Chungbuk	23:00	23:00	24:00	Movement toward revising the current ordinance to a uniform 10pm curfew at all school levels	In Progress
Chungnam	21:00	23:00	24:00	'12.07.01	Partial Completion (only for ES)
Gangwon	22:00	23:00	24:00	'12.03.30	Partial Completion (only for ES)
Gyeongbuk	21:00	23:00	24:00	'12.05.28	Partial Completion (only for ES)
Gyeongnam	24:00	24:00	24:00	Movement toward revising the current ordinance to a uniform 10pm curfew at all school levels	In Progress
Jeonbuk	23:00	23:00	23:00	Movement toward revising the current ordinance to a uniform 10pm curfew at all school levels	In Progress
Jeonnam	22:00	22:00	23:50	'11.02.14	Partial Completion (only for ES & MS)
Jeju	21:00	23:00	24:00	'12.03.01	Partial Completion (only for ES)

Note: ES is abbreviation for elementary school, MS for middle school, HS for high school. The bolded cities Gwangju, Daegu, Gyeonggi are the three cities included in the treatment group of the present analyses which imposed the curfew to all students across grade levels in 2011.

Source: Ministry of Education, Science, Technology as of 29 June 2012.

secondary school students in 1989 and in 1996, respectively (Bray, 2003). As restrictions on private supplementary tutoring eased, the participation rate of private tutoring increased drastically from 14.9% in 1989, to 21.8% in 1991, and to 59.4% in 1997 (Kang, 2010). The trend of increasing participation in private tutoring excelled once again following the Korean Constitutional Court's ruling in 2000 which effectively banned the

government's comprehensive prohibition of private tutoring. Since then, the Korean government strategically focused on improving the quality of mainstream education services and thereby curbing the demand for private supplementary tutoring through efforts such as expanding after-school programmes, reducing class sizes, and increasing teacher salary (J.-H. Kim, 2009; C. J. Lee et al., 2010). In addition, regulatory efforts have been concentrated on imposing restrictions on the management and operation of *Hagwons* (i.e., private cram schools) which are passed by each city and province independently and put into effect as an ordinance rather than a law.

More recently, however, there has been quite a bit of controversy over whether the authority to regulate *Hagwons* should be under the discretion of the central government as a national law rather than an ordinance at the city and province level (Hong, Ko, & Kim, 2009). The law was amended in September 2006 to explicitly state that the decision to regulate the operating hours of *Hagwons* should be made by the Superintendent within each city and province (J.-H. Kim, 2009). An earlier attempt to yield all authority of regulating the operation hours of *Hagwons* to the central government failed in 2009, but it continues to be a hot subject of debate in current political scenes. In addition to the issue of elevating the legal status of such regulatory policy from a city ordinance to national law, there is controversy over the lack of regulation on the hours of service provision for individual one-to-one tutoring or other informal tutoring services. Critics argue that these non-regulated parties benefit from the regulations imposed on *Hagwons* since students can easily obtain additional private supplementary tutoring services elsewhere during the hours *Hagwons* are forced to shut down (Choi, 2012; Kwon, 2011).

Despite such controversy, proponents argue that regulating the operation hours of *Hagwons* serves additional important social purposes, such as protecting Korean youth's health by promoting sleep which so many are deprived of due to tutoring during extended night hours (J.-H. Kim, 2009). As is frequently cited by governmental authorities and in court ruling documentations, this ordinance gains legitimacy by addressing two major social problems in the current Korean society – that is, it aims to not only reduce household expenditure on private tutoring but also to guarantee students' sleep and health by preventing late night supplementary lessons (J.-H. Kim, 2009; Kwon, 2011).

As is shown in Table 1, Seoul was one of the first cities to impose the 10pm *Hagwon* curfew uniformly on all students across grade levels in 2008, while other cities such as Daegu, Kwangju, and Gyeonggi followed a few years later in 2011. The remaining 12 provinces/cities generally imposed restrictions that vary across student grade level, with curfew hours for high school students falling between 11pm and midnight.

Research on the demand for and regulation of private supplementary tutoring

A large and growing body of literature examining factors that determine the demand for private supplementary tutoring exists in the field of education research, ranging from studies focused on a few East Asian countries to cross-country comparative studies including Eastern and Western Europe, Central and Southeast Asia, Africa, and North America (Aurini & Davies, 2004; Bray, 2006; 2009; Bray et al., 2014; Dang, 2007; Dang & Rogers, 2008; Jelani & Tan, 2012; Jung & Lee, 2010; S. Kim & Lee, 2010; J.-H. Kim & Park, 2010; Silova, 2010). In general, findings suggest that the demand for private tutoring is created and influenced by a long list of both micro and macro level factors which include characteristics of the individual/family, school, and society (Bray et al., 2014; Dang & Rogers, 2008). Among the individual and family level factors, higher household income, higher parental education levels, and smaller family size are factors that consistently show

positive correlation with receipt of tutoring (Dang, 2007; J.-H. Kim & Park, 2010; Jelani & Tan, 2012; Jung & Lee, 2010). School level factors include institutional policies with regard to the tutoring of mainstream school teachers (Brehm, Silova, & Tuot, 2012) as well as the overall quality of the education measured through the quality of teachers, student–teacher ratio, and school size (Dang, 2007; J.-H. Kim & Park, 2010). Society level factors generally refer to cultural values on educational success as well as the strength in link between one’s educational attainment and labour market reward (Mori & Baker, 2010). Societies with high private returns to education are usually characterized with intense competition to obtain academic credentials, and in such contexts private tutoring is widely accepted as a legitimate form of education.

In addition, given that the phenomenon is sensitive to a variety of cultural, economic, and educational factors (Bray, 2003), the specific elements influencing the demand for private tutoring and the effects of those specific factors are found to vary across contexts and countries. For example, although prior research indicates that students’ academic achievement is associated with participation in private tutoring, the direction of the association is found to vary by country – academically high performing students were found more likely to use private tutoring as an enrichment strategy in Korea and Romania, whereas the opposite was true in the US and Germany in which low performing students were found more likely to participate in tutoring for remedial assistance (Baker et al., 2001). According to Silova and Bray (2006), private tutoring is more likely to be used as a tool for enrichment rather than for remedial purposes in countries where the mainstream education system is defined by clear high-stakes decision points and displays intense competition for colleges (J.-H. Kim & Park, 2010).

Despite the extensive amount of research aimed at understanding the demand for private tutoring, there are relatively few studies that focus on examining the impact of regulatory policies on private supplementary tutoring. Bray (2003, 2009) and Silova (2010) provide a comprehensive review of policies regulating the private tutoring market in many different countries including East Asia, Europe, Central Asia, and North America. A recent study by Bray and Kwo (2014) points out that different contexts require different types of government oversight and the important question lies in figuring out the type of regulatory means which best suits the country’s settings and needs. They also emphasize the potential impact regulatory policies may have on equity concerns as well as on students’ learning processes, and further discuss practical concerns in implementing various types of regulations. Although these studies make important theoretical contributions to the literature, they have been primarily descriptive in nature and are unable to provide empirical evidence on the association between regulatory policy and one’s behaviour related to private tutoring.

In the context of Korea, there are a few empirical studies that examined the effect of regulatory policies aiming to reduce private spending on tutoring services. These studies examined a number of government interventions including the high school equalization policy, the expansion of the Korean Educational Broadcasting Services (EBS), and the encouragement of after-school programming in mainstream schools (Chae, 2007; H. Kim, 2008; J.-K. Lee, Kim, & Kwon, 2009). However, these efforts were generally associated with little to no effect on reducing the consumption of private tutoring. There are two extant studies that examined the effect of the *Hagwon* curfew policy on the number of hours of tutoring and the level of monthly expenditure spent on tutoring (J.-H. Kim, 2009; J. Kim & Chang, 2010). Although both papers found that the imposition of the curfew slightly reduced household consumption of private tutoring, they analysed the policy without an appropriate comparison group and within a limited timeframe (i.e., prior to

2008). The use of data restricted to earlier years of the curfew policy is especially problematic given reports that the legal enforcement of the ordinance in certain cities and provinces was not stringent during the beginning years of implementation (Ahn, 2005).

From a theoretical perspective, it is unclear how the current curfew policy may affect the consumption of private tutoring services. This is because both possibilities exist: (1) students may abide by the curfew and decrease their overall consumption of tutoring services, which would result in reduced spending on private tutoring; (2) on the other hand, students may change the way in which they consume private tutoring due to the curfew policy, but essentially supplement any missed opportunities through other venues. For example, the latter possibility is consistent with a scenario where students opt out of late night *Hagwon* lessons but enrol in all day weekend classes or purchase alternative non-regulated forms of late night tutoring such as one-to-one individual tutoring lessons (Choi, 2012). Such ambiguity in direction also applies when considering the effect of the policy on students' time use patterns. Since the government cannot directly control how students use their time during late night hours, the curfew policy may be ineffective in increasing the total amount of youths' sleep. One can easily imagine a scenario where students choose to spend their time on other activities such as using the internet to play games or chat online (Fackler, 2007). In sum, the effect of the current Korean *Hagwon* regulation is unclear and can be determined only through rigorous analyses of empirical data.

Method

Data

The data used in this paper are drawn from two main sources. First, to identify the effects of the curfew policy on household spending and consumption of private tutoring, we used the Survey on Private Tutoring (SPT) collected by the Korean National Statistical Office. The SPT is a cross-sectional survey collected every year beginning in 2007 on a nationally representative sample of Korean households with children in grades 1 through 12. It provides some basic demographic information on the household (e.g., income, parental education level, and parental employment status) and child (e.g., gender and self-reported academic performance) in addition to detailed information on the participation in any type of education outside of the regular school hours, including after-school programming, private tutoring, and student career counselling. The SPT also includes information on the average weekly number of hours spent on private tutoring as well as information on annual household expenditure level on private tutoring activities for each sample child. The survey collects this information with a follow-up question on whether the specific activity was to supplement the child's main curricular studies such as Korean, English, and mathematics or for extracurricular purposes such as arts, music, sports, and so on.

Second, to investigate how the curfew influenced students' time use patterns with regard to the number of hours of sleep and the number of hours of internet usage, we used data from the Korean Youth Risk Behaviours Web-Based Survey (KYRBWS) collected by the Centre for Disease Control (CDC) within the Korean Ministry of Health and Welfare on a nationally representative sample of Korean middle and high school students between the grades of 7 and 12. The KYRBWS is a cross-sectional survey conducted every year since 2005 with some basic demographic information (e.g., gender, grade, self-reported economic well-being measure, education level of both parents, and household structure) as well as detailed information on the students' health status, including obesity, food consumption, exercise behaviour, dieting, risky behaviours, internet usage, and sleep. Specifically, the survey provides detailed information on the time each respondent

normally goes to bed and gets up during weekdays as well as on the average number of hours s/he uses the internet (per day) for both academic and non-academic purposes during weekdays and weekends, respectively.

Since the purpose of this paper is to examine the effects of a policy that prohibits *Hagwons* from providing late night private supplementary tutoring sessions, we restrict our sample to students who should be most affected by such regulation, namely students enrolled in academic high schools (i.e., we exclude students in vocational high schools from both samples). The decision to focus on high school students was made based on our preliminary analysis of the 2009 Korean Time Use Survey (KTUS) collected by the Korean National Statistical Office. The KTUS is based on a nationally representative sample of Koreans ages 10 and above and is collected every five years to provide detailed information on the daily time use patterns of each household member by recording various activities every 10 minutes, such as paid work, child care, volunteering, socializing, and for students “learning”. The learning activity category is further divided into those activities performed during regular school hours and non-school hours, while the non-school hour activities consist of (1) taking lessons outside of regular school classes, (2) studying by oneself outside of school, and (3) other activities related to learning, such as taking a break or preparing materials for class, and so on.

We computed the national average percentages of students who reported they were taking lessons outside of regular school classes from the hours between 9.30pm and 11.30pm, respectively. For primary school students, the percentage is below 2% and drops to 0% after 10pm. For middle school students, the percentage is close to 20% during the hours between 9.30pm and 10pm, but drops drastically to 13% at 10pm and drops below 5% after 10.30pm. However, high school students show different patterns in time use from their younger peers in that the percentage of students taking lessons outside of regular school classes during late night hours are consistent between 9.30pm and 11.30pm. That is, at 9.30pm, 10.30pm, and 11pm, students reported to be taking lessons outside of school at rates of 11%, 10%, and 9%, respectively. This implies that the 10pm *Hagwon* curfew would primarily affect, if any, the behaviours of high school students since they would essentially be the target group of such regulation. Also, it is important to note that the KTUS does not allow us to distinguish between academic high school students and vocational high school students. This would probably lead us to understate the true participation level in late night private tutoring services of students in academic high schools. In 2009, we found that roughly 24% of students were enrolled in vocational high schools nationally as opposed to academic high schools.⁴ Aside from taking lessons, a large share of high school students reported to be studying by themselves outside of school (at 10.30pm, 18.4%; at 11pm, 20.7%) during these hours, while some reported to be sleeping (at 10.30pm, 5.5%; at 11pm, 16.9%).

Empirical strategy

To evaluate the effects of regulating *Hagwon* operation hours on household consumption of private supplementary tutoring services as well as on student sleep and internet usage, we use a simple treatment and comparison group strategy and obtain a difference-in-differences (DID) estimate widely employed in evaluation research. The treatment group in our analysis is composed of academic high school students residing in the three cities/provinces that started to impose the 10pm curfew in March 2011 – Daegu, Gwangju, and Gyeonggi – uniformly across all grade levels. The comparison group consists of academic high school students residing in the four metropolitan cities of Busan, Daejeon, Incheon,

and Ulsan in which the 10pm curfew was not in effect for students in high school. Specifically, both Busan and Incheon had an 11pm curfew, while Daejeon and Ulsan imposed a midnight curfew during our study periods (refer to Table 1 for details). We chose to use these four cities as our comparison group because they were unsuccessful in imposing the 10pm curfew on *Hagwons* during the sampling period, but more importantly because we expect their residents to be more similar to the treatment group than students residing in other regions, such as Seoul (the country's capital) or the remaining eight provinces which include rural areas (T. Kim, Lee, & Lee, 2008). We further describe differences in student characteristics between those residing in the treatment group and in other areas below.

For both datasets, the SPT and KYRBWS, we used the survey responses of high school students between the years of 2009 and 2012. We chose to use these specific years despite the fact that observations from earlier years were available for both surveys for the following reasons: (1) information on the specific city and province each respondent resides in was not available during the survey years of 2007 and 2008 in the SPT; (2) collection of information on internet usage began in 2008 in the KYRBWS. Naturally, the impact of the curfew will be defined as the relative difference between the treatment and comparison groups in how they change their private tutoring consumption behaviour and time use patterns upon the imposition of the 10pm *Hagwon* curfew.

We estimated the following regression model⁵:

$$Y_{ict} = \alpha + \beta_0 Treated_c + \beta_1 (Treated_c \cdot Post_t) + \gamma X_{ict} + t_t + \varepsilon_{ict} \quad (1)$$

where the dependent variable includes respondent i 's average monthly expenditure level on private tutoring activities and average weekly number of hours spent on tutoring in city c in year t (for the SPT) as well as student i 's average number of hours of sleep during weekdays and average number of hours of internet usage for non-academic purposes during weekdays in city c in year t (for the KYRBWS). $Treated_c$ takes on the value of 1 if respondent i lives in the treatment cities/provinces which introduced the regulations in 2011 (i.e., Daegu, Gwangju, and Gyeonggi), and 0 if respondent i lives in the comparison group cities (i.e., Busan, Daejeon, Incheon, and Ulsan). $Post_t$ denotes 1 for the years 2011 and 2012, and 0 otherwise (i.e., for years 2009 and 2010). The main variable of interest is the interaction term, $Treated_c \cdot Post_t$, which is the DID estimator indicating any change in the level of our outcome variables between the two groups following the imposition of the *Hagwon* curfew regulation. X_{ict} is a vector of demographic characteristics that includes some basic student (e.g., gender, grade level) and household level information (e.g., parental education levels, household income, and household structure). Lastly, we control for year fixed effects to capture any economic, social, or policy factors that are common to all cities/provinces within a given year.⁶

The choice to classify students residing in the cities of Busan, Daejeon, Incheon, and Ulsan to be our comparison group was based on the expectation that they should be most similar to the treatment group in terms of private tutoring consumption behaviour among the 16 cities/provinces. Specifically, according to the 2009 national official reports on household monthly spending on private tutoring, the average spending for households with high school students in the treatment group was around 233,700 KRW (Korean Won), while it was 433,000 KRW for Seoul, 163,500 KRW for the remaining eight provinces, and 250,800 KRW for students in the comparison group.⁷ The participation rate in private tutoring among high school students across cities/provinces in 2009 also mirrored this

pattern: treatment group, 61.23%; Seoul, 74.2%; remaining eight provinces, 51.85%; and the comparison group, 63.75%.⁸

Despite such patterns in the behaviour of private tutoring consumption across localities, it should be important to examine whether the results are sensitive to our choice of comparison group since, as presented in Table 1, much variation exists across the 16 cities/provinces regarding their curfew regulations on *Hagwons*. To check on the robustness of our impact estimate, we presented results from employing different combinations of cities and provinces as our benchmark comparison group in the DID estimation. Such analyses will allow us to better understand the effects of the curfew policy since the alternative comparison groups vary in terms of implementing the 10pm curfew on high school students – from those that implemented the curfew in 2008 (e.g., Seoul) to those that have yet to implement it by midyear 2012 (e.g., Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam, and Jeju). If there are systematic differences between localities that were able to impose the 10pm curfew early on and those that were not, our estimate of β_I in Equation (1) may be biased. Hence, the sensitivity analyses should allow us to examine how robust β_I is in relation to such unobserved differences across cities and provinces.

Lastly, to account for observations with missing values on the covariates included in the estimation model, we used the *ice* (imputation by chained equations) command in Stata 11.2 to impute missing values on the covariates (Royston, 2004).⁹ However, imputation of missing values was not conducted for the dependent variables since imputing the dependent variable can lead to biased estimates (von Hippel, 2007).

Results

Descriptive statistics

In Table 2, we present descriptive statistics for the covariates of high school students in the treatment and comparison group cities in both the SPT and KYRBWS samples. The SPT sample includes a total of 32,474 students in the treatment group and 24,720 students in the comparison group. In terms of basic demographic characteristics, we found that students in the treatment group report similar levels of household income to students in the comparison group, although both paternal and maternal education levels are slightly higher for treatment group students. In addition, we found little difference in the average number of weekly hours spent on private tutoring as well as in the annual spending on private tutoring between the two groups. On average, students spent around 3.83–3.89 hours per week and 271–273 (10,000 KRW)¹⁰ annually on academic private tutoring services.

Next, the KYRBWS sample used for this study contains a total of 25,778 students in the treatment group and 21,712 students in the comparison group. As was observed in the SPT sample, students in the treatment group have similar levels of socio-economic status (i.e., measures of self-reported economic status) and household structure to those in the comparison group, despite having parents with slightly higher levels of educational attainment. In terms of sleep, we found that high school students in the treatment group sleep slightly more on an average weekday (i.e., 332.18 versus 329.48 minutes) than those in the comparison group. High school students in the treatment group also reported higher levels of daily internet usage for non-academic purposes, on average, than students in the comparison group (i.e., 63.38 versus 58.97 minutes).

Figure 1 shows the overall pattern of the outcome variables during the entire sampling period for high school students in the treatment and comparison groups as well as for those

Table 2. Descriptive statistics of students in the SPT and KYRBWS samples.

	Treatment Group			Comparison Groups			
	Gyeonggi	Gwangju	Daegu	3 Cities in Treatment	4 Cities	Seoul	8 Provinces
<i>Panel A: SPT</i>							
Boy	0.52	0.51	0.53	0.52	0.54	0.52	0.55
Household Income Level 1 (Low)	0.04	0.05	0.05	0.04	0.04	0.04	0.05
Household Income Level 2	0.12	0.13	0.15	0.13	0.12	0.11	0.16
Household Income Level 3	0.19	0.21	0.22	0.2	0.21	0.15	0.22
Household Income Level 4	0.22	0.23	0.22	0.22	0.23	0.18	0.21
Household Income Level 5	0.17	0.15	0.15	0.16	0.16	0.16	0.15
Household Income Level 6	0.11	0.1	0.08	0.1	0.1	0.13	0.09
Household Income Level 7	0.06	0.05	0.05	0.05	0.05	0.07	0.04
Household Income Level 8 (High)	0.10	0.09	0.08	0.09	0.09	0.16	0.07
Father Completed Middle School or Less	0.04	0.04	0.06	0.05	0.05	0.04	0.08
Father Completed High School	0.41	0.38	0.4	0.4	0.47	0.32	0.47
Father Completed College	0.45	0.5	0.47	0.47	0.41	0.5	0.39
Father Completed Graduate Programme	0.09	0.08	0.08	0.08	0.07	0.14	0.07
Mother Completed Middle School or Less	0.05	0.05	0.06	0.05	0.06	0.04	0.09
Mother Completed High School	0.59	0.54	0.54	0.56	0.61	0.46	0.61
Mother Completed College	0.33	0.38	0.37	0.35	0.31	0.44	0.27
Mother Completed Graduate Programme	0.03	0.03	0.03	0.03	0.02	0.05	0.03
Father Works	0.91	0.9	0.9	0.9	0.9	0.9	0.89
Mother Works	0.62	0.65	0.64	0.63	0.61	0.57	0.67
Academic Performance Level 1 (Low)	0.11	0.11	0.13	0.12	0.11	0.12	0.12
Academic Performance Level 2	0.21	0.22	0.21	0.21	0.22	0.2	0.21
Academic Performance Level 3	0.36	0.33	0.35	0.35	0.35	0.34	0.35
Academic Performance Level 4	0.21	0.22	0.21	0.21	0.21	0.22	0.21
Academic Performance Level 5 (High)	0.10	0.12	0.11	0.11	0.11	0.12	0.11
Gyeonggi	1.00	0	0	0.48	0	0	0
Gwangju	0.00	1	0	0.26	0	0	0
Daegu	0.00	0	1	0.26	0	0	0
Hours of Academic PT	4.46	2.87	3.62	3.83	3.89	6.18	2.66
Expenditure for Academic PT (10,000 KRW)	313.38	191.3	279.1	272.96	270.99	472.85	174.29
% of Students Participating in PT	0.59	0.47	0.58	0.56	0.57	0.67	0.44
# of Students	15,577	8,354	8,543	32,474	24,720	16,441	60,841

(Continued)

Table 2. (Continued)

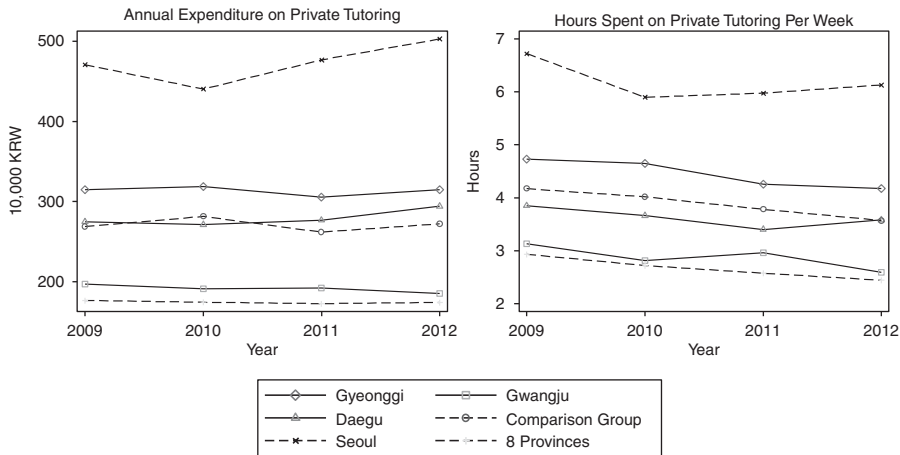
	Treatment Group			Comparison Groups			
	Gyeonggi	Gwangju	Daegu	3 Cities in Treatment	4 Cities	Seoul	8 Provinces
<i>Panel B: KYRBWS</i>							
Boy	0.49	0.52	0.52	0.50	0.52	0.48	0.52
SES Level 1 (Low)	0.05	0.05	0.05	0.05	0.04	0.05	0.06
SES Level 2	0.19	0.19	0.20	0.19	0.18	0.19	0.20
SES Level 3	0.50	0.49	0.49	0.49	0.50	0.46	0.50
SES Level 4	0.22	0.22	0.21	0.22	0.22	0.23	0.20
SES Level 5 (High)	0.05	0.05	0.04	0.05	0.05	0.06	0.04
Father Completed Middle School or Less	0.05	0.04	0.06	0.05	0.05	0.05	0.09
Father Completed High School	0.39	0.35	0.39	0.38	0.43	0.35	0.45
Father Completed College or More	0.56	0.60	0.55	0.57	0.52	0.60	0.46
Mother Completed Middle School or Less	0.05	0.04	0.06	0.05	0.06	0.05	0.09
Mother Completed High School	0.57	0.52	0.54	0.55	0.58	0.50	0.59
Mother Completed College or More	0.39	0.43	0.40	0.40	0.37	0.45	0.32
Live with Both Parents	0.95	0.95	0.95	0.95	0.95	0.95	0.93
10th grade	0.33	0.34	0.33	0.33	0.33	0.32	0.34
11th grade	0.34	0.34	0.33	0.34	0.34	0.33	0.34
12th grade	0.33	0.32	0.34	0.33	0.33	0.34	0.33
Gyeonggi	1.00	0.00	0.00	0.56	0.00	0.00	0.00
Gwangju	0.00	1.00	0.00	0.20	0.00	0.00	0.00
Daegu	0.00	0.00	1.00	0.25	0.00	0.00	0.00
Time for Sleep (minutes)	334.91	315.85	339.07	332.18	329.48	333.82	339.91
Time for Internet (minutes)	68.35	49.09	63.55	63.38	58.97	81.30	60.15
# of Students	14,375	5,079	6,324	25,778	21,712	13402	31,896
							92,788

Note:

(1) In the SPT, household income levels were reported in eight categories in 10,000 KRW units (less than 100, 100 or more & less than 200, 200 or more & less than 300, 300 or more & less than 400, 400 or more & less than 500, 500 or more & less than 600, 600 or more & less than 700, 700 or more); student academic performance levels were reported in percentile rankings of five categories (below bottom 20%, 20–39%; 40–69%; 70–89%; top 10%); hours of academic private tutoring were measured as the average weekly number of hours spent on private tutoring for curricular subjects taught in mainstream schools; and the expenditure for academic private tutoring was reported in 10,000 KRW units of household average spending on private tutoring annually.

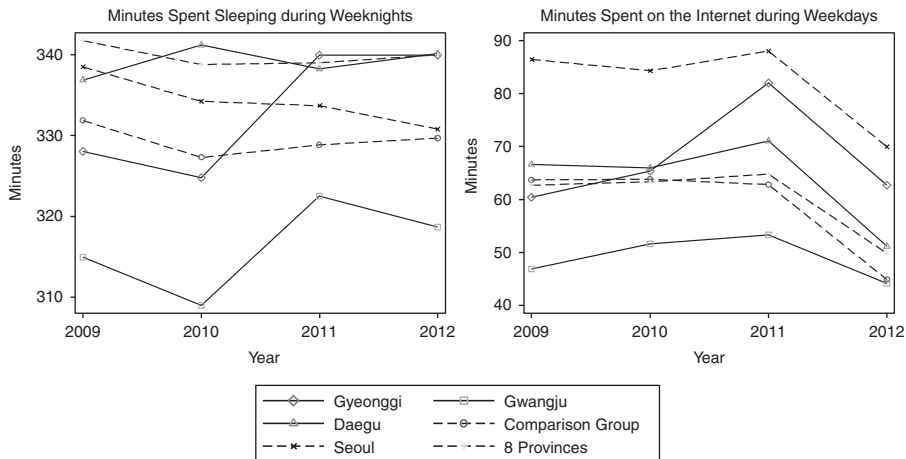
(2) In the KYRBWS, socio-economic status levels were reported in five categories based upon student reports of their household's economic state (low class, middle–low class, middle class, middle–high class, high class); time for sleep is measured as the average daily number of minutes spent sleeping during weekdays, and the time for internet is measured as the average daily number of minutes spent using the internet for non-academic purposes.

Panel A: SPT Sample



Note: Expenditure on academic private tutoring measured average annual household spending on private tutoring; and the hours of academic private tutoring measured the average weekly number of hours spent on private tutoring for curricular subjects taught in mainstream schools.

Panel B: KYRBWS Sample



Note: Sleep is measured as the average daily number of minutes students spent sleeping during weekdays, and the time for internet usage is measured as the average daily number of minutes students spent using the internet for non-academic purposes.

Figure 1. Raw plot of the outcome variables across the sampling period (2009–2012): consumption of private tutoring services, sleep, and internet usage.

residing in Seoul and the remaining eight provinces. In terms of household spending on academic private tutoring, we found that there is little fluctuation in annual expenditure levels across the sampling period for most of the cities and provinces, except for Seoul which experienced a dip in 2010 followed by a rapid increase during the years of 2011 and 2012. The unique pattern of change in spending for households in Seoul may be related to a number of factors such as higher sensitivity to economic conditions (following the financial crisis in 2009) or greater parental motivation, which cannot be tested with the current dataset. On the other hand, in terms of the number of weekly hours spent on private tutoring, the plot reveals that both the treatment and comparison groups experienced

a steady decline during the sampling period. This general trend is also apparent in the remaining eight provinces, while students in Seoul seem to recover slightly from the drop they experienced in 2010. In sum, based on the pattern of relative change in the raw outcome variables of private tutoring consumption behaviour across localities, it appears that the 10pm *Hagwon* curfew had little effect on changing the extent to which households invest in private tutoring services, both in terms of monetary spending and time allocation.

However, when examining the plots for the amount of time spent on sleeping and on using the internet, we found divergent patterns across the treatment and comparison groups. Specifically, the number of minutes slept appears to increase quite significantly in 2011 (after the imposition of the 10pm curfew) for the two treatment group cities/provinces, namely Gyeonggi and Gwangju. Such a trend is not visible for any of the remaining cities or provinces, including those in the comparison group. Next, in terms of the daily number of minutes spent on the internet for non-academic purposes, a steep rise is also noticeable for Gyeonggi and a modest rise for Gwangju and Daegu in 2011, followed by a steep drop in 2012 across all cities and provinces. It should be noted that the rise in internet usage during 2011 is not observed in the comparison group or in the remaining eight provinces. The steep drop in internet usage during 2012 is probably associated with the passage of the “Shutdown Law” which barred all children ages 16 and under in Korea from playing online games between the hours of midnight and 6am.¹¹ The fact that both sleep and internet usage increased in the treatment group following the passage of the 10pm curfew relative to the comparison group implies that the *Hagwon* regulation was effective in boosting the level of high school students’ sleep while also increasing the amount of time they spent online. In the next following sections, we formally test these associations while controlling for observed differences across students in the treatment and comparison groups.

Effects on consumption of private tutoring services, sleep, and internet usage

Results from estimating Equation (1) using the SPT sample are presented in Table 3. As is presented in columns (1) and (2), we found that the curfew had little effect on household level spending on private tutoring services as well as on the average number of hours students spent receiving tutoring lessons. Despite the lack of association between the 10pm curfew on *Hagwons* and household consumption of private tutoring services, we found that youths’ household income, parental education, and academic performance levels were all positively related to consumption of private tutoring. These positive associations are consistent with findings from extant literature examining the relationship between student level characteristics and the demand for private tutoring in the Korean context.

Next, in Table 4, results from estimating Equation (1) using the KYRBWS sample are presented. The findings indicated that the 10pm curfew increased both the amount of daily sleep and internet usage among high school students on average by about 13 minutes and 15 minutes, respectively. Although the absolute magnitude of the effects may seem small, it is important to recognize that these values are average estimates computed on all students in academic high schools regardless of whether they were taking *Hagwon* lessons during late night hours prior to the passage of the curfew policy. Naturally then, the actual effect of the policy on those who were dissuaded from taking late night lessons due to the curfew may have been much larger. For example, if we assume that roughly 20% of high school students were enrolled in late night private tutoring in *Hagwons* prior to the curfew and that these were the students who increased their sleep following the 10pm curfew, the actual magnitude of the effect on those students should amount to 65 minutes ($= 13 \times 5$) minutes.

Table 3. Effects of curfew policy on the consumption of private tutoring services.

Variables	Expenditure		Hours	
Year = 2010	− 6.922***	(2.642)	− 0.269***	(0.048)
Year = 2011	− 26.051***	(2.984)	− 0.596***	(0.079)
Year = 2012	− 11.792***	(2.091)	− 0.611***	(0.091)
Treatment Group	4.662	(16.812)	0.063	(0.339)
Treatment Group * Post Policy	6.724	(4.208)	0.032	(0.102)
Boy	− 4.073	(5.824)	− 0.013	(0.052)
Household Income Level 2	27.068***	(7.037)	0.439***	(0.120)
Household Income Level 3	85.712***	(4.718)	1.193***	(0.082)
Household Income Level 4	155.322***	(9.579)	2.040***	(0.139)
Household Income Level 5	204.872***	(10.399)	2.498***	(0.179)
Household Income Level 6	267.491***	(16.256)	2.961***	(0.208)
Household Income Level 7	311.645***	(15.338)	3.336***	(0.203)
Household Income Level 8	353.446***	(18.452)	3.359***	(0.212)
Father Completed High School	16.825	(13.587)	0.351**	(0.145)
Father Completed College or More	59.099***	(11.044)	0.784***	(0.127)
Father Completed Graduate Programme	72.649***	(17.512)	0.651***	(0.187)
Mother Completed High School	25.116***	(8.712)	0.435***	(0.159)
Mother Completed College or More	76.366***	(13.786)	0.698***	(0.217)
Mother Completed Graduate Programme	130.570***	(13.463)	0.986***	(0.202)
Father Works	6.032**	(2.619)	0.251***	(0.039)
Mother Works	− 42.993***	(5.173)	− 0.294***	(0.024)
Academic Performance Level 2	42.177***	(4.421)	0.647***	(0.080)
Academic Performance Level 3	92.572***	(8.612)	1.381***	(0.146)
Academic Performance Level 4	121.874***	(6.102)	1.841***	(0.120)
Academic Performance Level 5	122.377***	(10.534)	1.761***	(0.112)
Constant	− 13.735	(11.161)	0.129	(0.329)
N	57,194		57,194	
R ²	0.189		0.096	

Note: Sampling weights are used in estimating the models. Standard errors in parentheses are clustered by region. The bolded component refers to the DID estimate from Equation (1). Omitted groups include year 2009, comparison group, girl, household income level 1, father completed middle school or less, mother completed middle school or less, father does not work, mother does not work, and academic performance level 1. ** $p < 0.05$; *** $p < 0.01$.

To further explore whether the effects of the curfew varied across certain subgroups, we estimated Equation (1) separately for boys and girls as well as for students across the five socio-economic status categories in Table 5. The results suggested that the policy was more effective for boys than for girls especially in terms of increasing the amount of time spent on using the internet (17.2 versus 13.2 minutes). We also found that students in the highest socio-economic status bracket were not affected by the curfew policy in terms of their daily amount of sleep or internet usage. Interestingly enough, however, students in the lowest socio-economic status group experienced the greatest amount of increase in time spent using the internet by about 22 minutes daily, while students in the second, third, and fourth socio-economic status categories increased their amount of sleep following the curfew by about 10–14 minutes daily.

Sensitivity analyses

Lastly, to examine whether our results are sensitive to the composition of the comparison group, we estimated Equation (1) using three alternative comparison groups. The three alternative comparison groups consisted of (1) students residing in Seoul, (2) students

Table 4. Effects of curfew policy on students' late night time use patterns – sleep and internet usage.

Variables	Sleep		Internet Usage	
	Coef.	SE	Coef.	SE
Year = 2010	– 3.236	(2.187)	2.554	(1.918)
Year = 2011	– 1.923	(1.993)	0.953*	(2.166)
Year = 2012	– 1.073	(2.082)	– 15.513***	(2.240)
Treatment Group	– 3.279***	(1.926)	– 1.566***	(1.813)
Treatment Group * Post Policy	12.506***	(2.552)	15.207***	(2.539)
11th grade	– 9.374***	(0.919)	3.092***	(0.971)
12th grade	– 31.458***	(1.123)	3.698	(1.108)
Boy	15.398***	(1.006)	4.225***	(1.066)
SES Level 2	3.843**	(1.742)	– 4.461*	(2.296)
SES Level 3	4.645***	(1.688)	– 12.478***	(2.241)
SES Level 4	– 0.289	(1.776)	– 17.535***	(2.243)
SES Level 5	1.692	(2.393)	– 23.917***	(2.807)
Father Completed High School	– 5.484**	(1.828)	0.178	(1.930)
Father Completed College or More	– 9.723***	(1.945)	– 3.180	(2.028)
Mother Completed High School	0.437	(1.578)	– 4.048	(1.831)
Mother Completed College or More	– 0.528	(1.666)	– 5.237***	(1.984)
Live with both Parents	– 3.034	(1.643)	– 2.363*	(2.127)
Constant	343.132***	(3.185)	77.922***	(3.866)
N	47,490		47,490	
R ²	0.070		0.021	

Note: Sampling weights are used in estimating the models. Standard errors in parentheses are clustered by school. The bolded component refers to the DID estimate from Equation (1). Omitted groups include year 2009, comparison group, girl, SES level 1, father completed middle school or less, mother completed middle school or less, and does not live with both parents. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

residing in the remaining eight provinces, and (3) students residing in the 13 cities and provinces excluding those in the treatment group. As presented in Table 6, the results on household expenditure and the number of hours spent on tutoring remain largely unchanged when using the alternative comparison groups. The only exception is when using Seoul as the comparison group. In this case, we found that the curfew decreases annual household expenditure on private tutoring by approximately 171,350 KRW, but has no effect on the number of hours spent on tutoring. The observed reduction in household spending on private tutoring appears to result from the relative rise in expenditure levels after 2010 among students residing in Seoul relative to those in the treatment group.

The sensitivity analyses of the impact estimates on daily sleep and internet usage are robust to all three comparison groups. Depending on the specification of the comparison group, the impact on daily sleep ranges from nine to 14 minutes, while the impact on internet usage ranges between 11 and 15 minutes. All of the estimates are statistically significant at the 1% level.

Conclusion

The purpose of this study was to examine the effects of regulating the operation hours of private cram schools (i.e., *Hagwons*) in Korea on household consumption of private supplementary tutoring as well as on high school students' time use patterns. To our

Table 5. Differential effects of curfew policy on students' late night time use patterns – by gender and socio-economic status.

	By Gender		By Socio-economic Status				
	Girl	Boy	SES1 (Lowest)	SES2	SES3	SES4	SES5 (Highest)
<i>Panel A: Time for Sleep</i>							
Treatment * Post	11.057*** (− 3.043)	13.845*** (− 3.294)	6.990 (6.647)	13.689*** (3.478)	13.704*** (2.818)	10.060*** (3.691)	10.974 (7.164)
<i>Panel B: Time for Internet Usage</i>							
Treatment * Post	13.195*** (− 2.894)	17.200*** (− 3.393)	21.878** (8.888)	15.597*** (4.145)	14.916*** (2.811)	15.928*** (3.557)	9.299 (7.373)
N	23,265	24,225	2,207	8,972	23,683	10,385	2,243

Note: Sampling weights are used in estimating the models. Standard errors in parentheses are clustered by school. The bolded component refers to the DID estimate from Equation (1).
** $p < 0.05$; *** $p < 0.01$

Table 6. Sensitivity analyses of the curfew policy by comparison group.

	SPT		KYRBWS	
	Expenditure	Hours	Sleep	Internet Usage
<i>Panel A: Comparison group – Four Cities (Busan, Daejeon, Incheon, Ulsan)</i>				
Treatment * Post	6.724	0.032	12.506***	15.207***
	(4.208)	(0.102)	(2.552)	(2.539)
N	57,194			47,490
<i>Panel B: Comparison Group – Seoul only</i>				
Treatment * Post	- 17.135***	0.050	14.409***	10.725***
	(3.626)	(0.063)	(2.841)	(2.979)
N	48,915			39,180
<i>Panel C: Comparison Group: Eight Provinces</i>				
Treatment * Post	1.646	- 0.030	9.217***	11.591***
	(4.444)	(0.084)	(3.065)	(2.860)
N	93,315			57,674
<i>Panel D: Comparison Group - All 13 Cities and Provinces</i>				
Treatment * Post	0.751	0.047	11.627***	12.576***
	(5.719)	(0.069)	(2.367)	(2.456)
N	134,476			92,788

Note: Sampling weights are used in estimating the models. Standard errors in parentheses are clustered by region for the SPT sample and by school for the KYRBWS sample. The bolded component refers to the DID estimate from Equation (1). *** $p < 0.01$.

knowledge, this is the first study to employ a treatment and comparison group strategy in estimating the effects of such regulatory policy by utilizing variation in curfew times across the 16 cities and provinces in Korea. The findings indicated mostly null effects of the 10pm curfew on household consumption of private supplementary tutoring, whereas the total amount of daily sleep and internet usage increased following the passage of the curfew relative to those in the comparison group.

The present result of the null effect of the *Hagwon* curfew on household expenditure and time spent on private tutoring services implies that the 10pm curfew failed as a policy to curb the high demand for private tutoring among students and parents in Korea. Given the long and varied history of policies regulating private consumption of tutoring services, this is not too surprising. Yet, it is important to recognize that this does not necessarily mean that the curfew policy had no effect on household consumption behaviour – the curfew could have influenced household consumption of private tutoring in more subtle ways. That is, with the imposition of the 10pm curfew, the universe of private tutoring services available during late night hours changed, and such a change in the consumption bundle could have influenced the type and quality of private tutoring that households ultimately selected.

The failure of this policy to reduce household consumption of private tutoring services could have been related to a number of reasons. As critics argued, a fundamental problem with the policy was that it lacked any regulation on the hours of operation for other forms of private tutoring services such as individual one-to-one tutoring (Choi, 2012; Kwon, 2011). This has been pointed out as a major weakness of the policy early on, since individual tutoring sessions tend to be more expensive than group tutoring sessions offered at *Hagwons*. *Hagwons* could have also continued to supply the same amount of total private tutoring services by restructuring their course schedules to avoid late night lessons and instead concentrate on weekend classes, for instance. Regardless of what the exact reason for failure was, however, it is clear that the curfew policy did not provide enough

incentive to dampen the high demand for private tutoring and reduce total household spending on such services.

It is interesting, however, that although the *Hagwon* curfew had little effect on reducing the consumption of private tutoring, it was found to increase the overall amount of daily sleep and time spent online for non-academic purposes among students in academic high schools. Due to limitations of the dataset, we are unable to identify exactly how students used their free time after 10pm. To further investigate the mechanism behind the change in sleep time patterns, we used information on the exact time students reported going to bed and getting up in the KYRBWS and estimated Equation (1) separately using each measure as the outcome variable. Results indicated that roughly 68% ($= 100 \times 8,526 / 12,506$) of the increase in minutes slept due to the 10pm curfew policy occurred by students going to bed earlier relative to those in the comparison group. The estimate was statistically significant at the 1% level.¹² Based on this finding as well as on the fact that the daily average time spent on sleeping and using the internet increased for students residing in the treatment group relative to students residing in cities without the curfew, we can conclude that the policy encouraged students to spend time at home during the late night hours in place of taking lessons at *Hagwons*.

When examining differential effects by socio-economic status, we found that students in the highest socio-economic status group did not experience any increase in daily sleep or in internet usage following the curfew, and that these effects were generally concentrated among students in the lower socio-economic status groups. This seems to indicate that students and parents responded to the curfew in very different ways depending on their household income levels. Although we are unable to identify the exact underlying reason behind such divergence, differences in the types of resources households could have utilized may be an important factor. For example, students in the highest socio-economic status group may have had more access to financial resources as well as information networks which could have been targeted to obtain high quality tutors for individual one-to-one lessons, whereas such resources would not have been easily accessible by those in the lower socio-economic status groups.

Such a discrepancy in student reactions to the curfew policy suggests that there may be important unintended consequences of the regulation, which is in direct contrast to its original objective of reducing inequities in educational opportunities and thereby reducing social stratification. Given that the debate with regard to regulating *Hagwon* operation hours is still ongoing in many cities and provinces, the results from this study should provide invaluable information as well as insights on the effects of the curfew policy. For example, in November 2013, there was a movement to postpone the 11pm curfew to 11.50pm in Jeonbuk province, mainly because people were concerned that the curfew policy was actually increasing the financial burden associated with private tutoring due to the growing use of more costly alternatives after 11pm (Park, 2013).

Although the present study was not able to examine the potential effects of the *Hagwon* curfew policy on student academic achievement due to data limitations, it should be an important question to examine in future research. For example, existing research has extensively documented that students' sleep deprivation is detrimental to academic performance, which becomes increasingly more common among students in upper grade levels (Carrell, Maghakian, & West, 2011; Edwards, 2012; Gillen-O'Neel, Huynh, & Fuligni, 2013). Given that the average Korean high school student sleeps less than six hours per day (see Table 2), the additional sleep students potentially get by residing in

regions with the 10pm curfew policy may translate into better academic performances compared to their peers in areas with later curfews. On the other hand, given that the benefit of additional sleep was mainly concentrated among students in the low socio-economic status groups, such positive effects of additional sleep may be cancelled out by their loss in opportunities to engage in academic enrichment activities which are mainly provided by *Hagwons* in Korea.

This study presents important implications for regulatory policy of private tutoring which we believe extends beyond the realms of Korea. As was mentioned in the outset of this paper, students in many Asian countries are heavily involved with private tutoring and the private tutoring industry has been consistently growing in countries beyond Asia (Bray, 2011). Although our analyses are based on a unique curfew policy experienced by Korean students and parents, the finding that imposing curfews on only one type (i.e., *Hagwons* in Korea) of the many available private tutoring services is ineffective provides invaluable insight for other countries when planning interventions. Also, consistent with Bray and Kwo's (2014) argument, the finding that the curfew differentially affects student time use patterns by socio-economic status confirms the importance of governmental regulation on equity concerns. From a policy perspective, however, the degree to which the experience of Korea will apply to similar efforts in other countries should depend on a number of factors including the institutional features of the mainstream educational system as well as on the prevalence of private tutoring.

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Notes

1. Information available at the Korean Statistical Information Service website (<http://kosis.kr/>) accessed on 2 January 2014.
2. Although some school districts in rural areas and small cities do not implement the random assignment policy, currently the policy is applied to 70% of academic high school entrants, including those in Seoul (the capital) and the six major metropolitan areas.
3. Korea is divided into nine provinces (Chungbuk, Chungnam, Gangwon, Gyeonggi, Gyeongbuk, Gyeongnam, Jeonbuk, Jeonnam, and Jeju), one special city (Seoul), and six metropolitan cities (Busan, Daegu, Daejeon, Gwangju, Incheon, and Ulsan) for purposes of local self-governance. In July 2012, an additional special autonomous city (Sejong) was added to the original division of 16 (and thus a total 17) to accommodate for the creation of a special administrative district from parts of Chungnam and Chungbuk provinces.
4. This information is obtained from the Korean Educational Statistics Service web portal (<http://kess.kedi.re.kr>) sponsored and maintained by the Korean Educational Development Institute (KEDI). Information accessed on 20 March 2014.
5. The regression model using the SPT sample is estimated including all 0 observations for respondents reporting no participation in any kind of private tutoring. Our results do not substantively change if we exclude them from the sample. Results are available upon request.
6. The year fixed effects are especially important in the context of Korea since many policies are implemented by the central government uniformly across all cities and provinces. For example, the internet "Shutdown Law" which barred children ages 16 and under from playing online games between midnight and 6am was put into effect in November 2011 uniformly across all regions in Korea. This specific law has important implications toward our findings on the amount of time spent on the internet for non-academic purposes among high schools students during the sampling period.

7. US dollar is equivalent to 1068 KRW (checked on 18 March 2014). This implies that 10,000 KRW roughly amounts 9.36 USD.
8. Information available at the Korean Statistical Information Service website (<http://kosis.kr/>) accessed on 18 March 2014.
9. For both the SPT and KYRBWS, we have missing values only for parental education. In the SPT, the proportion of observations with missing values is 7.7% for mother's education and 8.5% for father's education. In the KYRBWS, the proportion of observations with missing values is 2.2% for mother's education and 4.0% for father's education. When imputing the missing values for our independent variables, we included the dependent variables in our model specification.
10. This roughly amounts to 2,464–2,482 USD (at 20 December 2014 official exchange rate).
11. The 2011 sample of the KYRBWS was collected in September 2011, two months prior to the passage of the Shutdown Law. This implies that estimates of the amount of time spent using the internet in the KYRBWS should not be affected by the regulation until 2012. The KYRBWS collected reports of internet usage time in 2012 on the month of June.
12. We also conducted sensitivity analyses on these estimates. When using Seoul or the remaining eight provinces as the comparison group, the relative contribution of going to bed earlier on the total minutes of sleep becomes larger and remains statistically significant at the 1% level (82–98%). Results are available upon request.

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