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INUI Tomohiko
RIETI

KODAMA Naomi
RIETI

NAGASHIMA Masaru
National Graduate Institute for Policy Studies

The Research Institute of Economy, Trade and Industry
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Days of Schooling and Educational Inequality: Evidence from schools with Saturday class in Japan *

INUI Tomohiko (RIETI)
KODAMA Naomi (Nihon University and RIETI)
NAGASHIMA Masaru (National Graduate Institute for Policy Studies)

Abstract

Past literature suggests that fewer days of public schooling in a week may increase educational inequality based on household income, as richer households have the capacity to increase their private educational expenditures to take better advantage of increased leisure time, while poorer ones do not. Contrarily, does inequality decrease with additional public school days? We empirically assess this question by using the unique policy change in Japan that increased schools with class on Saturday in addition to the usual Monday-to-Friday class. Our estimation with child-level panel data reveals that when review sessions are offered for free by school teachers on Saturdays, households decrease educational expenditures, and this effect is significant for poorer households, while it is insignificant for richer ones. This suggests the possibility that increased school days may reduce educational inequality. We further report heterogeneous impacts of different types of Saturday classes, and discuss policy implications based on the results.

Keywords: School education, Private education, Educational inequality, Socioeconomic background, Days of schooling, Saturday class.
JEL classification: I24, I28, H75, N35

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1. Introduction

As one of the most important aspect of human capital, education has long been discussed in policy debate. Topics of education policies most extensively analysed include public expenditure (Hanushek, 2002; Papke, 2005; Glewwe, 2002), quality and characteristics of teachers (Dee, 2005; Rothstein, 2010), class size (Angrist and Lavy, 1999; Kruger, 2003), school district size (Driscoll, Halcoussis, and Svorny, 2003), and curriculum and pedagogy reform (Alexander, 2000; Chiang, 2009). Different policies are meant to achieve different objectives, and through rigorous programme evaluations, researchers and policy makers are in continuous search of better educational systems and designs.

Among all, we investigate the impact of a unique reform that changed the days of schooling in a week in Japan. In 2002, a reform mandated five days of schooling to all public schools, a result of a long transition from the six-day schooling system since 1992. It was aimed to reduce working hours of teachers which had been said to be too long, as well as to give children longer free time. This reform was somewhat similar to the debate in the contemporary United States where some states are considering reducing schooling days (Hill and Heyward, 2015), but Japan's case is different in that the reduction in days of schooling was accompanied by also a reduction in national curriculum contents. These educational reforms have since been criticised for two reasons. First, it was thought that rich households could increase their private investment in child education and enjoy the enlarged free time, whereas poor households could not, which might increase educational inequality, for which Kawaguchi (2016) provides theoretical observation and empirical evidence. Second, schooling children performed worse and worse in the 2000's in internationally comparable tests (Takayama, 2007; 2008). These criticisms intensified ever since the reform in 2002.

In recent years, in order to counter-attack the criticisms, schools gradually resumed Saturday class (Ministry of Education, Culture, Sports, Science, and Technology (MEXT), 2013a). The MEXT relaxed the regulation on the days of schooling and granted the local education board a greater autonomy (MEXT, 2013b). Data available at

hand exhibit a substantial increase in the share of schools with curricular Saturday class within a few years in the 2010's. Combined with the child-level panel data, we assess whether or not this reform has changed household private educational investment of children. Particularly, we investigate the heterogeneity across households in different income groups and examine whether the inequality in private educational investment has intensified due to the Saturday class re-opening.

Our research question is simple: what effect did the reemergence of Saturday class have on educational opportunities of children? In addition, we seek to understand how heterogeneous the effects were across households with different levels of income, and what implications were to be drawn for educational inequality. These questions are important because educational attainments are one of the most influential predictors in income persistence (Blanden, Gregg, and Macmillan, 2007, among others), and private expenditure makes non-negligible contributions to accumulating educational human capital. And Japan is well suited to analyse household behaviours on private educational investment, since cram schooling and related sorts of private education in East Asia has been an important, and growing, part of educational development of children (Bray and Lykins, 2012).

The estimation of the effect of Saturday class on household educational investment behaviours does, however, involve an econometric difficulty. As noted above, schools may start teaching on Saturday if the local education board decides so, but the board members are usually self-nominated local residents; thus, the decisions of the board may be correlated with parents' behaviours of educational investment. We address the possible bias arising from this correlation by utilising child-level panel data—to control for unobservable parental attitude toward educational investment—and instrumental variables—to break the above correlation. Specifically, our instruments are the shares of teachers who join major teachers' unions, namely the Japan Teachers Union, All Japan Teachers and Staff Union, and National Teachers Federation of Japan. Because unions are meant to unite workers and negotiate with employers on improving work conditions, their presence is considered correlated with the local

education board's decisions on Saturday class that may change the working conditions of teachers; and because whether to join a union is a decision of each school teacher, it is unrelated to parental educational investment behaviours. Our identification strategy is to instrument whether Saturday class takes place by the labour union participation rates, conditioning on major household and administrative characteristics and child fixed effects.

We find that private education investments respond differently to different types of Saturday class. Curricular Saturday class—where the usual curricular courses are taught on Saturday—is found to increase household education expenditure, while the non-curricular Saturday class—where school teachers take care of students who voluntarily come to school and review what has already been taught—is found to decrease the household education expenditure. We interpret the former effect as the complementarity effect, since the increased course contents may leave behind the relatively worse performing students who would need paid private education to catch up with the school education. We interpret the latter effect as the substitution effect, since if parents use private education services to help their child review the school study, then they can decrease their private education expenditure when non-curricular Saturday class is offered.

The latter substitution effect carries an important implication to education inequality. We find that the substitution effect is much larger for poorer households than for richer households. That is, poorer households are more likely to switch from the paid private education to the free review sessions offered by school teachers. In the data, we indeed find a larger substitution effect for children from poorer households. On the other hand, we find no change—both the complementarity and substitution—in private education expenditure for richer households. This contrasting evidence suggests that non-curricular Saturday class may have the role to narrow the gap between the rich and the poor in terms of private educational investment. However, the recent trends in Japan are actually the continuous increase in curricular Saturday class and decrease in non-curricular Saturday class. This is likely to reflect the increasing amount of course contents stipulated in the national curriculum

guidelines. Therefore, the inequality-reducing effect may be gradually receding.

Our research contributes new evidence to the literature on educational inequality. Many countries, including Japan, consider that reducing educational inequality is a key objective for governmental policy on improving social mobility. Using data from Japan, Kawaguchi (2016) shows the decreased school days in Japan led to a reduction in study hours and test scores—and the effect was larger for children with less educated parents. To the extent that education and income correlate, the finding by Kawaguchi (2016) implies the gap in education opportunities increases based on parental socio-economic characteristics, given that children in poor households generally have less access to quality private education services (Kim, 2015). Our study analyses what happens when the policy is reverted; and we find the gap can be narrowed by an educational reform, depending upon the type of education provided for free. That is, once-widened inequality by a policy can be reversed by turning around the policy again.

The remainder of this paper is organized as follows. Section 2 explains the institutional background. Section 3 describes the data sets and major variables used in our study. Section 4 explains the identification strategy to estimate the effect of Saturday class on household education investments. Descriptive and regression results are presented in Sections 5 and 6. Section 7 concludes with a brief discussion on policy implications from our study.

2. Recent Educational Reforms and the Days of Schooling in Japan

Japan's compulsory education consists of six years of primary, and three years of lower secondary, education. An academic year begins in April, and ends in March, and this is the same as a fiscal year. The primary education begins in the academic year in which a child turns the age 6, and the lower secondary education begins in the year in which a child turns the age 12. After the enactment of the School Education Act[1] and the release of the Ordinance for Enforcement of the School Education Act[2] in 1947, the convention was

[1] *Gakkou Kyouiku Hou* (学校教育法).
[2] *Gakkou Kyouiku Hou Shikou Kisoku* (学校教育法施行規則).

six days a week of schooling, where full-day class was taught from Monday to Friday and half-day class on Saturday. The Ordinance explicitly specified Sunday as a holiday, while it did not clearly state that Saturday is a working day. It instead articulated the hours to be dedicated to each subject. To fulfil the requirement of hours of study of each subject, a half-day class on Saturday was the *de fact* standard at public schools.

The six-day system came under criticism in the 1970's and 1980's. It was when the international society even called Japan an '*economic animal*.' At around the same time, teachers' unions started attempts to reduce their working hours and improve their working conditions. The largest teachers' union in Japan, the Japan Teachers Union (JTU), proposed the five-day schooling as one of its primary goals in 1973 (Kitagawa, 1992). The central government also started considering reducing the school days. The National Personnel Authority,[3] in 1972, touched upon the issue of working days of public workers including teachers, and then-Minister of Education, Science and Culture in 1973 was also said to mention the possibility of introducing the five-day system (Teshima, 2013). After the reduction in teaching contents laid out in the national curriculum guidelines[4] in 1977, and particularly in the 1980's, the five-day work in the public sector became one of the important topics discussed in the government. In 1988, a few primary schools were selected for an experimental introduction of the bi-weekly, as well as every-week, five-day teaching system.

The formal introduction of the nation-wide five-day system was in September 1992. To be precise, this first attempt made the second Saturday of every month a holiday at all the public schools (Teshima, 2013). This reform was preceded by the revision of Labor Standard Law in 1988 that made national public offices closed on Saturdays. Yet, the opinion polls (Cabinet Office, 1988) showed a limited public support for the reduction in school days (24.8% for the primary school and 21.7% for the lower secondary school). In April 1995, the fourth Saturday of every month, in addition to the second, was also set to a holiday (Teshima, 2013). In April 2002, the Ordinance was

[3] *Jinji-in* (人事院).
[4] *Gakushuu Shidou Youryou* (学習指導要領).

amended and the transition to the five-day schooling was completed, so that all Saturdays officially become a holiday. Combined with the reduction in class hours at the Ordinance amendment in 1998, these policy changes were commonly called the low-pressure reforms.[5]

The response to the reduction in schooling days, or to the low-pressure reforms in general, was not uniform to different groups of people and at different points in time. Before the first move in 1992, parents of schooling children, represented by the National Congress of Parents and Teachers Association of Japan, announced its opposition to the Saturday-off schooling system (Kitagawa, 1992). Their arguments pointed out that the use of private education services would increases using the freed Saturdays, and that it would intensify the already-harsh academic competition among children. Underlying their argument was the thought, held by some for long in Japanese society, that competition based on academic achievement, stringent entrance examinations of upper high schools and colleges, and the excessive emphasis on academic records were undesirable. However, the National Congress of Parents and Teachers Association of Japan changed their attitude in 1991, and they finally joined the policy design (Kitagawa, 1992). Moreover, the opinion polls in October 1993, conducted one and a half years later than the Saturday holiday policy, revealed that 64.1% of the Japanese adults considered making one Saturday off to be a good change (Kitagawa, 1994).

On the other hand, teachers' unions welcomed the reforms in general. As noted earlier, the JTU had long been proposing the five-day schooling since 1970. All Japan Teachers and Staff Union (AJTSU), which was founded in 1989 by relatively radical groups of the former JTU member unions and is the second largest union group in Japan at present, also put much emphasis on increasing holidays as its objectives (MEXT Elementary and Secondary Education Bureau Elementary and Secondary Education Planning Division, 2013). The third largest union group of teachers, the National Teachers Federation of Japan (NTFJ), declared the introduction of five-day school system as one of its objectives (Kitagawa, 1992). These union groups have different slogans and political views, but the reduction in their work days was

[5] *Yutori* (ゆとり).

perhaps one of the few values shared by all of them.

The low-pressure educational reforms were, however, not free from criticism. For one thing, the criticism and public debate were escalated particularly by the decline of Japan's rankings in internationally comparable academic tests such as Trends in International Mathematics and Science Study (TIMMS) and Programme for International Student Assessment (PISA). Particularly when the results of the PISA 2003 and the TIMSS 2003 came out and showed Japan's downgrading, the reduced curriculum contents and the decreased teaching hours in the low-pressure reforms were severely criticised (Takayama, 2007, 2008). Facing the rise of critical opinions, the revision of the national curriculum guidelines in 2008 substantially increased the curriculum contents, marking the turning point of Japan's education policies that have long been in the direction of reducing the burdens of both teachers and students (Kirita, 2010). For another thing, the increased leisure was suspected to contribute to educational inequality. That is, different types of households may change their private educational investments in their children differently, and the difference was found to be such that better educated parents made their children study longer and score better (Kawaguchi, 2016). To the extent that education and income correlate, this heterogeneous response to the reduced schooling and increased leisure may widen the gap between the rich and the poor.

Faced by the rise in the opposition to the low-pressure reforms, the national curriculum guidelines were again amended, and the once-reduced class hours were again increased in 2008 (Kirita, 2013). Since the school days remained unchanged, schools increased classes per day. Another response was to increase school days with the special permission by the local education board,[6] which was first done in Tokyo Prefecture in 2010 (Kirita, 2013) and later recognised as legitimate by the Minister of Education, Culture, Sports, Science and Technology in 2012 (House of Representatives, 2012). The MEXT revised

[6] *Kyouiku iinkai* (教育委員会). At this time, the reasoning for the introduction of Saturday class was that, by allowing parents and local residents to come and see the class, it would facilitate schools' communication with the local community, as well as make school education transparent and open to the public.

the Ordinance in 2013, granting to the local education board, both at the prefecture and municipality level, the autonomy to decide whether to offer Saturday class (MEXT, 2013b). Our data from school surveys by the MEXT show an increase in the share of schools with Saturday class to teach curricular subjects around this year (discussed in details later).

In summary, Saturday class was first reduced and finally abandoned between 1992 and 2002. Ever since, however, the opposing view have attracted more public attention throughout the 2000's. After the increase in the contents of the national curriculum guidelines in 2008, schools gradually shifted to the restoration of Saturday class. The amendment of the Ordinance in 2013 boosted the restoration trend. And whether the school teaches class on Saturday is determined by the local education board.

3. Data and variables

We use the panel data drawn from the Longitudinal Survey of Newborns in the 21st Century. The survey is organized into 15 waves and collected by the Ministry of Health, Labour, and Welfare of Japan between 2001 (Wave 1) and 2015 (Wave 15), and the survey investigate growth of children and change in household characteristics for children born in Japan on the 10th to 17th of January 2001 and the 10th to 17th of July 2001. For our analysis, we use the waves in 2014 and 2015 when the sample children were in the 1st and 2nd grades at the lower secondary school. Although the survey year is the same for the January-borns and the July-borns, the academic years they are in are different: in Japan, an academic year begins in April and ends in March, so the July-borns are one academic year ahead of the January-borns.[7] Attrition rates of the survey are low: numbers of observations were 30,331 in 2014 and 29,506 in 2013, respectively, and the rate of attrition is only 2.72%. The data contains variables about child and parental characteristics, household income, and expenditure for

[7] More precisely speaking, the January-born sample children were in the 1st grade of the lower secondary education in 2014, but this was within the 2013 academic year that began in April 2013 and ended in March 2014. The July-born sample children in 2014 were also in the 1st grade of the lower secondary, and this was within the 2014 academic year. The same complex academic year system applies to the data in 2015.

different aspects of child education.

Saturday class measures are drawn from school-based surveys conducted by the MEXT (MEXT, 2013c; 2014). The surveys cover all the public primary and lower secondary schools, and reports the proportion of schools with Saturday class in 2012 and 2014 academic years.[8] For our analysis, we focus on the two types of Saturday class: curricular and non-curricular.[9] Curricular class refers to the normal mandatory class based on national standard curriculum. Non-curricular class refers to a study opportunity, offered by school teachers, for voluntarily participating students, mainly for the purpose of reviewing the contents that are already studied during usual class from Monday to Friday.

In our analysis, we also use the data on teachers' labour unions (MEXT Elementary and Secondary Education Bureau Elementary and Secondary Education Planning Division, 2013; 2014; 2015). The MEXT surveys school teachers in October every year, and reports the shares of teachers who belong to major unions of teachers by prefecture in a monthly magazine that one of its divisions publishes. The major unions include the JTU, AJTSU, and NTFJ. There are two other categories in the data, namely the others and no union membership, but these are not used in our study. The JTU is the largest teachers' union in Japan, and found in every prefecture, while the other two are missing in some prefectures. Overall, the share of teachers who are a member of any union has been continuously declining over years, marking 39.3% in October 2012 and 37.2% in October 2014 (MEXT Elementary and Secondary Education Bureau Elementary and Secondary Education Planning Division, 2013; 2015).

Table 1 shows summary statistics of major variables observed at the individual level. The first two variables are the key outcomes in our analysis, namely the expenses for the child's extra-curricular

[8] The data for 2013 is not available, and thus we interpolate the value for this year using the adjacent years. Also, data for 2015 is extrapolated using data in 2012 and 2014. This inevitably introduces measurement error, but is addressed in our regression framework.

[9] In 2014 survey, the Ministry also asked about non-academic class, in which schools offer the place and adults in the local area instruct physical and cultural activities. This is not analysed in our study because it was not queried in 2012 and the variable is not available over time.; also, this type of Saturday class has little to do with academic learning.

activities[10] and private study.[11] As children go from the 1st to the 2nd grade of lower secondary education, the activity expenditure increased from 5.12 to 5.77 thousand yen per month for the January-born children but decreased from 6.62 to 5.86 thousand yen for the July-born children. Study expense, on the other hand, increased for both the January- and July-born children, from 12.9 to 18.5 thousand yen and from 10.1 to 13.1 thousand yen, respectively. Over the two-year period, both the samples experienced an increase in private education use, namely the share of children who use cram school or tutored study at home, and days of using such services.

Descriptive statistics of prefecture-level variables are presented in Table 2. Data cover the years from 2013 to 2015, since the January-born children are schooling in the lagged academic year.[12] As Saturday class variables have somewhat skewed distribution particularly in old years, the median values (under the column title 'p50,' denoting the 50th-percentile) are also reported. Over the sample period, it is clear that the share of schools with curricular Saturday class increased, while the share of schools with non-curricular Saturday class decreased. The two distinct trends possibly reflect the increasing curricular contents to be taught in public schools, and the crowding-out of non-curricular class due to the resulting increase in curricular class given the limited Saturday class resources.

The labour union participation rates generally show a steady decline over the sample period. The largest is the JTU, accounting for about 29% of the teachers. The second-largest is actually the share of teachers in the AJTSU, but the mean values are larger for the NTFJ. This is because the share of teachers in the NTFJ has a very skewed geographical distribution, with very many prefectures with zero but high participation rates in a very few prefectures, so

[10] Extra-curricular activities that appear in our data include, for example, lessons of gymnastics, swimming, baseball, softball, soccer, tennis, kendo, judo, ballet, dancing, English conversation, abacus, calligraphy, piano and other music instruments, drawing and painting, flower arrangement, and tea ceremony.

[11] Strictly speaking, extra-curricular study does not just include studying at cram school but also tutoring lessons at home and correspondence education as well. However, such educational services are relatively rare and observationally limited in the data, so in our study we use the term "cram schooling" as almost interchangeable with private education service use.

[12] Their data in 2014 correspond to the academic (the same as fiscal) year of 2013, and their data in 2015 to the academic year of 2014.

that the mean is dragged to the right.

4. Empirical Strategy

In order to estimate the effect of Saturday class on household expenditure on child's education, we start with the following fixed effects (FE) model:

$$y_{ijt} = \beta_{OLS}^{C} \cdot SatC_{jt} + \beta_{OLS}^{N} \cdot SatN_{jt} + X_{ijt}^{HH}\gamma^{HH} + X_{jt}^{Pref}\gamma^{Pref} + \alpha_i + \alpha_t + e_{ijt} \quad (1)$$

where y_{ijt} is the outcome (such as household expenditure on different types of educational investment) for child i in prefecture j in year t, $SatC$ and $SatN$ denote the share of schools with curricular and non-curricular Saturday class in the residential prefecture, X^{HH} and X^{Pref} some household and prefectural time-variant controls, specifically, income of father, mother, and other members, dichotomous variables for whether living with father and mother, educational expenditure of prefectural government (in natural log),[13] number of children in prefecture aged 0 to 14 years (in natural log),[14] average residential land price by prefecture (yen per square meter),[15] and the inflation rate of education services in prefecture (%).[16] α_i and α_t are the child and year fixed effects, and e_{ijt} the error component. Here β_{OLS}^{C} and β_{OLS}^{N} are the parameters of interest, which represent the marginal effect of Saturday class on household expenditure, holding other factors constant.

There are, however, possible sources of endogeneity that would bias the coefficient estimates of Saturday class. First, due to data availability, we only have crude measures of the share of schools opening Saturday class by prefecture, which adds measurement error to the variables. Second, parents may in the first place choose their place of residence or become the member of the local education board

[13] Data come from the Local Educational Expenditure Survey (*Chiho Kyoikuhi Chosa*) conducted by the MEXT.
[14] Data come from the Population Forecast (*Jinko Suikei*) by the Ministry of Internal Affairs and Communications (MIC).
[15] Data come from the Prefectural Survey of Land Prices (*Todofuken-Betsu Chika Chosa*) conducted by the Ministry of Land, Infrastructure, Transport, and Tourism.
[16] The variable is calculated based on the consumer prices of "tutorial fees" collected for the construction of the Consumer Price Index by the MIC.

by themselves in order to have access to better education system, including Saturday class. These can lead to potential bias in the estimate of β_{OLS}. For these reasons, there is little hope that this model produces reliable estimates of the effect of interest.

We address this endogeneity problem with instrumental variable (IV) approach drawing on the share of teachers who partake in labour unions, namely the Japanese Teachers' Union (JTU), All Japan Teachers and Staff Union (AJTSU), and National Teachers Federation of Japan (NTFJ). These three unions cover most of the teachers who participate in union activities in Japan, and due to their upheld ideology and philosophy they are said to have different attitude towards the Saturday class policy. We let JTU, AJTSU, and NTFJ denote the share of teachers who are members of the three labour unions in each prefecture and define vectors of variables $\underline{Sat}_{jt} = (SatC_{jt}, SatN_{jt})'$ and $\underline{UNION}_{jt} = (JTU_{jt}, AJTSU_{jt}, NTFJ_{jt})'$, [17] as well as vectors of coefficients, $\underline{\beta}_{2SLS} = (\beta^{C}_{2SLS}, \beta^{N}_{2SLS})$, $\underline{\delta}^{C} = (\delta^{C}_{JTU}, \delta^{C}_{AJTSU}, \delta^{C}_{NTFJ})$, $\underline{\delta}^{N} = (\delta^{N}_{JTU}, \delta^{N}_{AJTSU}, \delta^{N}_{NTFJ})$, and $\underline{\delta} = (\underline{\delta}^{C}, \underline{\delta}^{N})'$. By also defining variables, coefficients, and random components vectors of appropriate dimensions, our strategy is to estimate the following 2SLS-FE model of the form

$$y_{ijt} = \underline{\widehat{Sat}}_{jt}\underline{\beta}_{2SLS} + X^{HH}_{ijt}\eta^{HH} + X^{Pref}_{jt}\eta^{Pref} + \mu_i + \mu_t + u_{ijt} \tag{2}$$

$$\underline{Sat}_{jt} = \underline{UNION}_{jt}\underline{\delta} + X^{HH}_{ijt}\zeta^{HH} + X^{Pref}_{jt}\zeta^{Pref} + \phi_i + \phi_t + v_{ijt} \tag{3}$$

where $\underline{\widehat{Sat}}_{jt} = (\widehat{SatC}_{jt}, \widehat{SatN}_{jt})'$ are the predicted shares of schools with curricular and non-curricular Saturday class from the linear projections of Saturday class variables onto labour union participation rates and other covariates. Since the Saturday class decisions by the local educational board are usually made in the previous year, we use a one-year lagged labour union participation rates.[18]

[17] In the main analysis, we use the three major labour unions of teachers. As a robustness check, we exclude the share of teachers partaking in the NTFJ to show that our results are indeed intact, since the NTFJ has a strongly skewed geographical distribution, and may thus be correlated with uncontrolled prefectural characteristics such as average political views of teachers in each prefecture.
[18] The January-born sample children in 2014 and 2015 were in the academic years

Of the foremost importance is whether or not the labour union status of teachers is uncorrelated with u_{ijt}, the error term in the structural equation. We first note that participation in labor union is entirely up to each and every teacher, and has nothing to do with parent's educational expenditure. Second, our specification controls for child's fixed effects, which absorbs parents' attitude toward education and work conditions. Moreover, because our sample period is rather short (2-year panel), the effect of parents' time-varying attitude should be ignorable.

One might suspect that teachers who belong to a particular labour union systematically undermine their teaching quality, and parents of children taught by such teachers are pushed to increase their private educational investment. In reality, it is typically difficult, if not impossible, for parents to observe the quality of teaching at school. Test scores, for instance, may provide its clue to parents: however, if teaching quality was poor, everyone in the class would be affected, and thus communicating with other parents would not give much idea on the teaching quality. Moreover, such teachers would in the first place have an incentive to obscure their intention to worsen their teaching quality, which would make it even more difficult for parents to observe their pedagogical quality. Even if parents were able to accurately detect teaching quality of particular teachers, parental attitude toward private educational investment is precisely controlled for by the child fixed effects. The literature suggests that labour unions increase school inputs but decrease efficiency of education production (e.g., Hoxby, 1996). However, the inputs discussed in the literature—such as the teacher salary and the teacher-student ratio—may vary in the long run but may not in the short run, as in our study. Therefore, the effect of teachers' labour unions on the household education investments should only go through changes in Saturday class.

Another concern is that some teachers may not appreciate private educational services. That is, teachers at public schools may be confident in what they teach and how they do, and may thus feel

of 2013 and 2014, so we use the teachers' union variables measured in October in 2012 and 2013, respectively. For the July-born sample children in 2014 and 2015, the labour union variables were measured in October in 2013 and 2014.

offended if many parents of their students seek additional education for their children. If this were true, teachers might discourage children to go to cram school or take private educational services, which may lead to a negative correlation between labour union variables and the structural error. However, we do not think that teachers are be so influential on the behaviour of parents, even if they could affect that of their students to some extent (e.g., children's hours of study at home may be affected by the amount of homeworks assigned by union-participating teachers). For this reason, we assume that exclusion restriction holds for outcomes decided by parents, but not for outcomes under children's control. Moreover, our review of each labour union's mission statements failed to find any item that is related to influence on parental private investments in children's education. Therefore, this channel of instrument invalidity may be of little significance.

5. Estimation Results

Table 3 reports the first-stage estimation results where the endogenous regressors, the shares of schools with curricular and non-curricular Saturday class in each prefecture, are regressed onto the labour union participation rates and other covariates. Panel A reports the estimated coefficients and standard errors of the three labour union variables where the endogenous regressor is the curricular Saturday class opening rates, while Panel B reports the estimates where the endogenous regressor is the non-curricular Saturday class. In Panel A, it is clear that the JTU participation rates are strongly negatively correlated with the share of schools with curricular Saturday class in each prefecture, which is consistent with our review on labour unions of teachers in Japan. The AJTSU participation rates generally have positive coefficient estimates. The *F*-statistic for the joint significance of the labour union variables are strong enough that the small-sample bias in the 2SLS estimation would not be a problem in our estimation.

In Panel B where the endogenous regressor is the share of schools with non-curricular Saturday class, the coefficient of the JTU participation rates are small in magnitude compared to those in Panel A

and insignificant for the January-born sample, suggesting that their influence may be smaller when the Saturday class is non-curricular and targeted at supporting the children who are in need of more studying opportunities. Notable is the strong positive correlation with the AJTSU participation rates. The joint significance *F*-statistic for the labour union participation rates seem a little small, perhaps due to the little influence of the unions other than the AJTSU on the share of schools with non-curricular Saturday class, particularly for the January-born sample. In addition, though insignificant, the changing sign of the effect of the NTFJ raises the concern of the weak instrument bias, since the NTFJ is geographically distributed in a highly skewed manner, and its distribution may be spuriously correlated with some unobserved characteristics such as average political thoughts at the prefectural level. Although the *J* statistic for overidentification cannot be rejected at any conventional level of confidence, one of our robustness check exercises (discussed later) drops the NTFJ from the instrument set and replicate the regression results. The results are remarkably unchanged both quantitatively and qualitatively, suggesting that the potential weak instrument problem may be marginal at best.

Our main results are summarized in Table 4, which presents the effect of the shares of schools with curricular and non-curricular Saturday class on household educational expenses and cram schooling decisions. The outcome variables considered in our study are household expenditures on private study and other activities, as well as whether the parents send the child to cram school (extensive margin) and, if so, how many days parents use the private educational services (intensive margin). These are chosen because the principle decision maker for these activities are usually parents and not children. The decisions primarily made by children, such as hours of study, may be affected by teachers partaking in a specific labour union by changing the amount of homework, for example. In other words, the exclusion restriction may not hold for outcomes that are either under the direct control of teachers or decided by children who are directly exposed to teachers on a daily basis. Therefore, we do not analyse them in our present study.

In Table 4, we find that for the January-born children, the share of schools with curricular Saturday class significantly increases the household expenditure on extra-curricular studying of children, whereas the share of schools with non-curricular Saturday class more dramatically decreases the household expenditure for private education services (column (1)). Since the outcome is measured in log, the exact percentage change is calculated and reported at the bottom of the table. It is found that a 1-percentage point increase in the share of schools with curricular Saturday class leads to an 11-percentage point decrease, and a 1-percentage point increase in the share of schools with non-curricular Saturday class leads to a 35-percentage point decrease, in the household expenditure on private education, which seems to be sizable effect estimates.

Our interpretation of the positive impact of curricular Saturday class and the negative impact of non-curricular Saturday class is as follows. The increase in private education expenditure in response to curricular Saturday class may stem from the fact that schools had to increase school days due to an increase in the curriculum guidelines presented by the MEXT: faced by an increase in the curriculum, some parents may have decided to send their children to cram school to help them keep up with the school study. If this interpretation is correct, the positive effect may suggest the possible complementarity between the public and private education. The decrease in household education expenditure in response to non-curricular Saturday class may suggest the potential substitutability of cram schooling and the non-curricular Saturday class, since this type of Saturday class was intended to provide students with an opportunity to review what had been taught at school. That is, some students, particularly those from a poor household, may be more likely to switch from the paid private education to the free study opportunity provided by school teachers, which is a testable hypothesis examined later. The large coefficient estimates may suggest the within-prefecture variation in Saturday class openings and education expenditure by households: Saturday class may be introduced in an area,

within prefecture, that has a larger elasticity of private expenditure with respect to Saturday class.[19]

In columns (2) to (4) where the second-stage outcome is either household expenditure on enrichment lessons, a dummy for the child going to cram school, and the number of days a week the child goes to cram school, we find small and insignificant effect of curricular and non-curricular class. The null effect on the activity expense may be because the payment for most of children's private enrichment lessons is made monthly, and a one-day increase in school days on Saturday may not substantially change the amount spent for the activity. The null effect on cram schooling variables may appear contradictory to the finding in column (1) with the positive effect of curricular, and the negative effect of non-curricular, Saturday class on private education expenditure. However, it is possible that children who were already cram schooling changed hours of study at cram school a day, holding constant the number of days of cram schooling. If this was the case, then our results for the January-born children can be consistently understood across the columns (1) through (4). The marginally significant effect estimate of the share of schools with non-curricular Saturday class on days of cram schooling is very small in magnitude, showing a 0.03 percentage point decrease of the days of cram schooling, and thus may be of little importance in practice.

On the contrary, the positive effect of curricular Saturday class and the negative effect of non-curricular class are not found for the July-born sample in column (5). The coefficient estimates are smaller in magnitude and statistically insignificant. For these different estimation results, there can be three possible reasons. One is the seasonal variation in Saturday class. As our data measure the outcome variables for the previous month of the survey, the January-born children have the data of household expenditure and cram schooling for December the previous year, while the July-born children have the data for June the same year. It is usually the case that schools are more likely to plan a field trip, or other types of

[19] This seems to be an interesting hypothesis, but due to the imprecise measure of Saturday class variables—observed at the prefecture level—in our data, we cannot investigate this possibility.

school activities, in June than in December, so it may be less likely that schools conduct Saturday class in June than in December. That is, the differential effect estimates may arise from the supply side of Saturday class.

Another reason for the differential estimates for the January- and July-born children may be that students at the lower secondary school in Japan typically have term-end final examinations in December. That is, students who need more review opportunities for the final exams and used to utilise paid study opportunities at cram school may be more likely to switch to the non-curricular Saturday class that offer free review opportunities. This demand-side effect for the January-born students seems plausible given that it is the school teachers who take care of the students in non-curricular Saturday class: they may be more helpful for the purpose of final exam preparation than are the cram school tutors.

The third explanation is based on the potential disadvantages faced by children who are relatively younger than others within a class. In Japan, a class is composed of children who are born in April of a year to March of the next year. This means that those born in January are half a year younger than those born in July, given a class year. Then, the younger children are likely disadvantaged physically, as well as academically. If parents know these relative disadvantages faced by later born children within a class, then parents with January-born children may be more responsive to the study opportunities provided for free. This may explain the differential effects estimates for the January- and July-born children.

The regression results for the other outcomes, namely household expenditure on extra-curricular activities, dummy for cram schooling, and days a week of cram schooling, seem mostly identical to the results for both the January- and July-born children. If the above reasonings for the different estimation results for the two samples were true, we can expect that the household responses to Saturday class are more elastic for the households with January-born children for a seasonal reason irrelevant to the decisions by the local education board as to the introduction of Saturday class. Also, the above three reasonings suggest that parents of January-born children

are more responsive to the change in Saturday class due to their children's relative disadvantages within the class. Therefore, we discuss the results based on the regressions for the January-born children in the rest of our present paper.

Based on our motivation, as well as our observation above, we now examine the heterogeneous effect of Saturday class by splitting the sample to the rich and poor households.[20] The sub-sample estimation results for the rich and poor households are presented in Table 5. The results for richer households, presented in Panel A, show small and insignificant effect of Saturday class variables on household educational expenditure (column (1)). On the other hand, Panel B shows larger and significant coefficient estimates. The effect of non-curricular Saturday class seems particularly large and strong. This suggests that the poor households are more likely to substitute the paid private education with the free non-curricular Saturday class. This heterogeneous impact of non-curricular Saturday class for the rich and poor households implies its potential to reduce educational inequality by relaxing the financial constraint of the poorer households.

Table 6 unpacks the Saturday class effect heterogeneity based on the purpose of cram schooling.[21] Panel A shows the results for those from the households whose parents reportedly send their children to cram school to help them supplement their study at school, while Panel B shows the results for those from the households whose parents reportedly use the private educational services to prepare their children for the preparation of high school entrance examination. It is found that those who use private education services for supplementary purpose exhibit both the complementarity and the substitutability between Saturday class and private education. On the contrary, those who use cram school for the preparation of high school entrance examination only shows the substitutability. This may suggest that these children do not need to complement their usual study at school, but they may free-ride the non-curricular Saturday

[20] The sub-samples are divided the total household income in 2012. If the household income exceeds the median, the household is classified as rich. The rest are classified as poor.
[21] The sample sizes are small for these regressions, since the sample used for the analysis only include those who reportedly use cram schooling services.

class when they want to review the contents studied at school.

Table 7 presents the results for the sub-samples split by whether the children go to a public school[22] or a private school. The estimation results for the private school children can be considered a falsification test, since the Saturday class policy change only affects public schools. The results presented in Table 7 confirms our identification, since that the effect is found for those who go to a public school (Panel A) and not for those who go to a private school (Panel B). Table 8 presents the results for the sample excluding the households in Tokyo. The idea is that Tokyo has a distinctively large number of private schools, and it may be systematically different to go to a public school in Tokyo from any other prefectures. The results show a larger effect compared to the main results in Table 4. This suggests that our finding is not driven by some special conditions in Tokyo, including rent seeking of parents and peer effects among children.

To see the robustness of the above results, we conduct additional 2SLS-FE regressions excluding the share of teachers in the NTFJ labour union from the instrument set. This is intended to check how sensitive the results are for the NTFJ, which has a skewed geographical distribution across Japan. If the NTFJ teachers are located in a few prefectures that share some peculiar prefectural characteristics such as average political thoughts in the prefecture, and these characteristics are correlated with the outcomes considered in our study, then the identifying assumption may no longer hold. The first-stage estimates are reported in Table A1 in Appendix A. The coefficient estimates for the JTU and AJTSU are largely unchanged, and so are the *F*-statistics for the joint significance of the two labour union variables. The second-stage estimates are shown in Table A2 of Appendix A, where it is found that the estimated effects of the shares of schools with curricular and non-curricular Saturday class are remarkably similar to the original estimates in Table 4. These results suggest that our findings are robust to the choice of

[22] Public schools here include the schools managed by municipality and national schools, but exclude the special schools for the handicapped.

the instrument set, or unaffected by the potential spurious correlation that the NTFJ may have as it is distributed geographically in a highly skewed manner.

To summarize the findings above, we find the positive effect of curricular Saturday class and the negative effect of non-curricular Saturday class on household private education expenditure for households with January-born children, but not for those with July-born children. Our sub-sample analyses show that, for the January-born children, the effects are stronger for the poorer ones and at the public schools. Also, those who need supplementary study at cram school show both the complementarity and the substitutability of Saturday class and cram school, but those who prepare for high school entrance exams at cram school only exhibit the substitutability. In addition, our results are not driven by some special environment in Tokyo, or omitted prefectural characteristics that may be correlated with the distribution of the NTFJ. With these findings, we consider policy implications and conclude our study in the next section.

6. Concluding Remarks

In this paper we have studied the impact of Saturday class at public school on private education expenditures by utilizing the geographical variation in the share of schools with Saturday class across prefectures. In order to address the possible endogeneity bias, we use the share of teachers belonging to different labour unions as instruments. Our 2SLS-FE estimates show that curricular Saturday class increases household educational expenditure reflecting the complementarity between the public and private education, whereas the non-curricular Saturday class has a negative impact possibly driven by its substitutability with private education aimed to supplement school education.

One policy implication from our findings may be the potential of the non-curricular Saturday class to reduce the inequality in educational opportunities based on household income. We find that the negative effect on household education expenditure is strong and significant for children from poorer households but small and insignificant for those from richer households. Given that other private

education variables do not seem affected by Saturday class, it is likely that poorer households more elastically substitute the paid private education with the free review class on Saturday at a public school. Supposing this substitutability alleviated financial constraints of poor households, non-curricular Saturday class may have the potential to narrow the gap in educational opportunity between the rich and poor.

The inequality-reducing non-curricular Saturday class is, however, facing several practical issues. First, as the school teachers open the class on Saturday, their working hours may surpass the legal limit. If someone else teaches on Saturday, then the budget to cover the cost may lead to a political debate. Second, the welfare implication has not been revealed from our study. Since Saturday class cannot be implemented costlessly, promoting non-curricular class needs to be carefully discussed as its overall impact on the entire society is not known yet. Third, the trend of Saturday class shows that non-curricular Saturday class has been declining in the past years, whereas curricular Saturday class has been on a rise. These trends may be due in part to the recent revisions of the curriculum guidelines that increased the contents to learn in each subject, which led schools to increase school days in order to cover all the things to be studied and thus crowded-out non-curricular Saturday class as a result. This trend may slow down the reduction in educational inequality, since the inequality reduction effect is found only for the non-curricular Saturday class.

Nonetheless, our study provides one useful insight. That is, as Kawaguchi (2016) discusses, the past abolition of Saturday class may have increased the educational inequality between the rich and poor. Now the policy that we examine in this study seems to be an attempt to reverse the situation, although it is entirely an open question whether the reverse policy can really reverse the inequality outcome. From our findings, the answer seems to be yes. In other words, it is not that *what's done cannot be undone;* at least in education policy debate, an increased inequality due to a past policy could be reduced by an appropriate policy intervention.

At last, although the insights from our study is valuable, our

study is not free of caveats. The most notable is the measurement of Saturday class variables. Usually, whether schools teach classes on Saturday is determined by the local education board at the municipality level, such as cities. However, our measure is at the prefecture level. This may be the reason that the estimated effects are large: although we have successfully solved the endogeneity problem at the prefectural level, it is still possible that Saturday class is more likely to take place at schools with more parents who are responsive to Saturday class policies in terms of educational expenditure. To address this issue, one needs the Saturday class data at a more disaggregated level of school administration.[23] We thus urge future studies do take this issue into consideration to examine the effect of Saturday class policies.

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Table 1. Summary statistics of major variables at the individual level.

	(1)	(2)	(3)	(4)	(5)	(6)
	N	mean	sd	N	mean	sd
	Panel A. January-born children.					
	Survey in 2014			Survey in 2015		
Expense on extra-curricular activities (1,000 Yen)	15,126	5.117	9.41	14,709	5.767	17.76
Expense on extra-curricular study (1,000 Yen)	14,967	12.92	15.79	14,631	18.50	31.36
1 if studying at cram school	15,204	0.444	0.497	14,780	0.522	0.5
1 if tutored at home	15,204	0.030	0.169	14,780	0.041	0.198
Days of cram schooling in a week	15,204	0.939	1.266	14,780	1.185	1.327
Days of cram schooling in a week, conditional	6,753	2.113	1.062	7,713	2.271	0.953
Days of tutor studying in a week	15,204	0.040	0.305	14,780	0.047	0.385
Days of tutor studying in a week, conditional	449	1.361	1.163	603	1.146	1.54
Income earned by mother (10,000 Yen)	11,480	180.1	206.1	11,474	186.3	188.9
Income earned by father (10,000 Yen)	13,187	598.7	428.3	12,806	612.8	440.2
Other income (10,000 Yen)	9,587	41.26	116.3	9,512	44.38	173.4
	Panel B. July-born children.					
	Survey in 2014			Survey in 2015		
Expense on extra-curricular activities (1,000 Yen)	15,000	6.618	12.42	14,648	5.860	12.52
Expense on extra-curricular study (1,000 Yen)	14,845	10.13	12.83	14,503	13.11	16.8
1 if studying at cram school	15,127	0.396	0.489	14,726	0.484	0.5
1 if tutored at home	15,127	0.017	0.129	14,726	0.030	0.17
Days of cram schooling in a week	15,127	0.821	1.241	14,726	1.073	1.275
Days of cram schooling in a week, conditional	5,996	2.07	1.14	7,126	2.217	0.907
Days of tutor studying in a week	15,127	0.022	0.359	14,726	0.030	0.435
Days of tutor studying in a week, conditional	258	1.295	2.438	440	1.016	2.314
Income earned by mother (1,000 Yen)	11,005	1,809	1,813	11,246	1,888	1,957
Income earned by father (1,000 Yen)	13,101	5,922	3,899	12,759	6,143	4,456
Other income (1,000 Yen)	9,793	389.6	1,426	9,496	427.4	1,751

Notes. Survey years of 2014 and 2015 provide the data at the 1st and 2nd grades of the lower secondary school, respectively. Extra-curricular activities and private study expenses are the amounts of money spent in the previous month of the survey, that is, December 2013 and 2014 for the January-born samples and June 2014 and 2015 for the July-born samples, respectively. Days of cram schooling (tutor studying) take the value zero for non-cram schooling (non-tutored) children, and such observations are excluded from the conditional days. Income variables are queried about the earning of each household member in the previous year of the survey, that is, 2013 and 2014 for both the January-born and July-born samples. Other income includes earnings by household members other than the mother and father of the child, as well as non-labour income such as equity dividend payments.

Table 2. Summary statistics of major variables at the prefecture level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	2013				2014				2015			
Variables	N	mean	p50	sd	N	mean	p50	sd	N	mean	p50	sd
Share of schools with curricular Saturday class	47	0.077	0.019	0.159	47	0.111	0.029	0.197	47	0.146	0.037	0.249
Share of schools with non-curricular Saturday class	47	0.042	0.023	0.054	47	0.024	0.012	0.039	47	0.007	0.001	0.044
Share of teachers taking part in JTU	47	0.299	0.242	0.265	47	0.293	0.232	0.262	47	0.289	0.216	0.262
Share of teachers taking part in AJTSU.	47	0.037	0	0.090	47	0.036	0	0.088	47	0.034	0.002	0.084
Share of teachers taking part in NTFJ	47	0.047	0	0.152	47	0.046	0	0.152	47	0.045	0	0.151
Number of children aged 0-14	47	348,766	245,000	333,869	47	345,447	241,000	333,260	47	339,149	230,000	330,383
Average residential land price (yen/m^2)	47	49,379	31,900	50,914	47	49,540	32,000	51,961	47	49,702	31,500	52,998
Inflation rate of education services	47	0.006	0.003	0.011	47	0.023	0.022	0.031	47	0.011	0.010	0.016
Prefectural educational expenditure (Bil. yen)	47	202.4	144.6	165.2	47	199.5	142.5	163.7	47	203.2	146.2	167.9

Notes. Variables observed at the prefecture level have the number of observations of 47, which corresponds to the number of prefectures in Japan. Share of schools with Saturday class are available only in 2012 and 2014, so the values in 2015 are extrapolated based on the past two points in time. These shares include all schools that have at least one Saturday class in the academic year. Definitions of curricular and non-curricular Saturday class are given in the body of the text. JTU, AJTSU, and NTFJ participation rates are measured in October in the previous year of each survey.

Table 3. 1st-stage estimation results of the 2SLS-FE model.

Birth month	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	January				July			
Second-stage outcome	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school
	Panel A. Effect of teachers' unions on the share of schools with curricular Saturday class.							
JTU	-0.538***	-0.554***	-0.538***	-0.538***	-0.655***	-0.654***	-0.654***	-0.654***
	(0.094)	(0.095)	(0.094)	(0.094)	(0.095)	(0.095)	(0.095)	(0.095)
AJTSU	0.395	0.372	0.398	0.398	2.492***	2.503***	2.500***	2.500***
	(0.513)	(0.510)	(0.513)	(0.513)	(0.485)	(0.481)	(0.480)	(0.480)
NTFJ	-1.074**	-1.094**	-1.069**	-1.069**	0.130	0.132	0.132	0.132
	(0.486)	(0.485)	(0.485)	(0.485)	(0.118)	(0.118)	(0.118)	(0.118)
Observations	22,434	22,600	22,692	22,692	22,626	22,922	22,986	22,986
Number of id	11,217	11,300	11,346	11,346	11,313	11,461	11,493	11,493
F(JTU & AJTSU & NTFJ)	11.41	11.67	11.46	11.46	25.64	25.80	25.83	25.83
P > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Panel B. Effect of teachers' unions on the share of schools with non-curricular Saturday class.							
JTU	0.001	0.002	0.000	0.000	0.101***	0.102***	0.103***	0.103***
	(0.014)	(0.015)	(0.014)	(0.014)	(0.029)	(0.029)	(0.029)	(0.029)
AJTSU	0.703**	0.708**	0.708**	0.708**	1.162***	1.162***	1.165***	1.165***
	(0.333)	(0.335)	(0.335)	(0.335)	(0.228)	(0.226)	(0.226)	(0.226)
NTFJ	-0.110	-0.110	-0.112	-0.112	0.291	0.295	0.296	0.296
	(0.136)	(0.137)	(0.137)	(0.137)	(0.244)	(0.247)	(0.247)	(0.247)
Observations	22,434	22,600	22,692	22,692	22,626	22,922	22,986	22,986
Number of id	11,217	11,300	11,346	11,346	11,313	11,461	11,493	11,493
F(JTU & AJTSU & NTFJ)	2.40	2.38	2.44	2.44	9.28	9.42	9.46	9.46
P > F	0.066	0.067	0.063	0.063	0.000	0.000	0.000	0.000

Notes. Reported in parentheses are the robust standard errors clustered at the child level. Statistical significance is denoted by *** if p<0.01, ** if p<0.05, and * if p<0.1. Labour union variables are measured in October in the previous year, and denote the share of teachers in each labour union in prefecture. All the regressions contain log father's income, log mother's income, log other income, dummy for living with father, dummy for living with mother, log prefectural education expenditure, log number of children aged 0 to 14 in prefecture, log average residential land price in prefecture, the inflation rate of education services in prefecture, year fixed effects, and child fixed effects.

Table 4. 2nd-stage estimation results of the 2SLS-FE model.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Birth month	January				July			
Outcome variable	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school
Curricular	10.65**	-1.702	-0.147	0.192	-1.716	3.450	-0.147	0.550
	(4.955)	(3.372)	(0.323)	(0.824)	(3.005)	(3.178)	(0.248)	(0.762)
Non-curricular	-43.65**	-6.990	-0.404	-3.046*	-14.320	2.135	-0.478	-4.391*
	(20.370)	(12.230)	(0.660)	(1.847)	(10.490)	(13.440)	(0.841)	(2.263)
Observations	22,434	22,600	22,692	22,692	22,626	22,922	22,986	22,986
Number of id	11,217	11,300	11,346	11,346	11,313	11,461	11,493	11,493
R-squared	-0.046	0.002	0.043	0.046	0.001	0.013	0.047	0.036
Overidentirication J	0.229	0.009	0.815	0.758	3.244	2.043	0.235	0.004
P > J	0.632	0.923	0.367	0.384	0.072	0.153	0.628	0.948
Exact %-point change:								
Curricular	11.24	-1.69			-1.70	3.51		
Non-curricular	-35.37	-6.75			-13.34	2.16		

Notes. Reported in parenthesis are the standard errors clustered at the child level. Statistical significance is denoted by *** if p<0.01, ** if p<0.05, and * if p<0.1. Saturday class variables measure the shares of schools that teach classes on Saturday in the prefecture. For outcomes expressed in log, we also report the exact percentage change in response to a 1% increase in the share of schools with either the curricular or non-curricular Saturday class. All the regressions include as covariates mother's income in log, father's income in log, other income in log1 if the child lives with mother, 1 if the child lives with father, prefectural expenditure for education in log, number of children under the age of 15 in log, average land price in the prefectural capital city in log, inflation rate of education services in prefecture, year fixed effects, and children fixed effects.

Table 5. 2nd stage estimation results of the 2SLS-FE model by household income level.

	(1)	(2)	(3)	(4)
Birth month	January			
Outcome variable	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school
	Panel A. Effects for children from richer households.			
Curricular	3.783	1.760	-0.289	0.064
	(5.252)	(3.740)	(0.403)	(0.960)
Non-curricular	-8.004	-13.870	-0.593	-3.683**
	(10.510)	(15.840)	(0.651)	(1.875)
Observations	13,018	13,114	13,174	13,174
Number of id	6,509	6,557	6,587	6,587
R-squared	0.005	0.000	0.038	0.051
Overidentification J statistics	3.347	1.556	0.328	0.029
P > J	0.067	0.212	0.567	0.864
Exact %-point change: Curricular	3.86	1.78		
Exact %-point change: Non-curricular	-7.69	-12.95		
	Panel B. Effects for children from poorer households.			
Curricular	14.34*	-5.593	0.353	1.124
	(8.694)	(6.555)	(0.544)	(1.390)
Non-curricular	-82.53**	-15.090	-0.287	-5.431
	(38.860)	(32.200)	(1.187)	(5.401)
Observations	9,416	9,486	9,518	9,518
Number of id	4,708	4,743	4,759	4,759
R-squared	-0.126	-0.006	0.049	0.026
Overidentification J statistics	2.512	0.523	0.348	1.243
P > J	0.113	0.470	0.556	0.265
Exact %-point change: Curricular	15.41	-5.44		
Exact %-point change: Non-curricular	-56.19	-14.01		

Notes. Reported in parentheses are the robust standard errors clustered at the child level. Statistical significance is denoted by *** if p<0.01, ** if p<0.05, and * if p<0.1. Saturday class variables measure the shares of schools that teach classes on Saturday in the prefecture. For outcomes expressed in log, we also report the exact percentage change in response to a 1% increase in the share of schools with either the curricular or non-curricular Saturday class. All the regressions include as covariates mother's income in log, father's income in log, other income in log1 if the child lives with mother, 1 if the child lives with father, prefectural expenditure for education in log, number of children under the age of 15 in log, average land price in the prefectural capital city in log, inflation rate of education services in prefecture, year fixed effects, and children fixed effects. High (low) income households are defined such that the total household income in 2012 was equal to or strictly higher (strictly lower) than the median.

Table 6. 2nd stage estimation results of the 2SLS-FE model by purpose of cram schooling.

Birth month	(1)	(2)	(3)	(4)
	January			
Outcome variable	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school
	Panel A. Effects for children going to cram school to supplement their study.			
Curricular	9.147	-0.835	-0.456	-0.670
	(7.379)	(5.335)	(0.580)	(1.301)
Non-curricular	-31.88**	-9.810	-0.737	-3.532*
	(14.180)	(16.800)	(0.691)	(1.945)
Observations	14,544	14,698	14,752	14,752
Number of id	7,272	7,349	7,376	7,376
R-squared	-0.039	0.006	0.023	0.037
Overidentification J statistics	0.043	3.160	2.045	0.879
P > J	0.835	0.076	0.153	0.348
Exact %-point change: Curricular	9.58	-0.83		
Exact %-point change: Non-curricular	-27.30	-9.34		
	Panel B. Effects for children going to cram school to prepare for high school entrance exam.			
Curricular	7.067	10.85*	-0.382	-0.464
	(8.914)	(5.781)	(0.388)	(1.335)
Non-curricular	-49.450	-41.06*	-0.013	-2.525
	(54.500)	(22.800)	(0.837)	(4.235)
Observations	6,044	6,096	6,130	6,130
Number of id	3,022	3,048	3,065	3,065
R-squared	-0.086	-0.042	0.010	0.024
Overidentification J statistics	0.566	1.117	0.093	1.828
P > J	0.452	0.291	0.760	0.176
Exact %-point change: Curricular	7.32	11.46		
Exact %-point change: Non-curricular	-39.01	-33.67		

Notes. Reported in parentheses are the robust standard errors clustered at the child level. Statistical significance is denoted by *** if p<0.01, ** if p<0.05, and * if p<0.1. Saturday class variables measure the shares of schools that teach classes on Saturday in the prefecture. For outcomes expressed in log, we also report the exact percentage change in response to a 1% increase in the share of schools with either the curricular or non-curricular Saturday class. All the regressions include as covariates mother's income in log, father's income in log, other income in log1 if the child lives with mother, 1 if the child lives with father, prefectural expenditure for education in log, number of children under the age of 15 in log, average land price in the prefectural capital city in log, inflation rate of education services in prefecture, year fixed effects, and children fixed effects.

Table 7. 2nd-stage estimation results of the 2SLS-FE model by school type.

Birth month	(1)	(2)	(3)	(4)
	January			
Outcome variable	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school
	Panel A. Effects for children enrolled in public schools.			
Curricular	11.99*	-3.586	-0.137	0.441
	(7.133)	(4.755)	(0.489)	(1.249)
Non-curricular	-59.86**	-2.993	-0.463	-4.589*
	(25.370)	(14.910)	(0.824)	(2.356)
Observations	19,692	19,850	19,930	19,930
Number of id	9,846	9,925	9,965	9,965
R-squared	-0.093	0.002	0.036	0.037
Overidentification J statistics	0.018	0.017	0.924	0.752
P > J	0.895	0.898	0.337	0.386
Exact %-point change: Curricular	12.73	-3.52		
Exact %-point change: Non-curricular	-45.04	-2.95		
	Panel B. Effects for children enrolled in private schools.			
Curricular	4.762	2.472	-0.035	-0.729
	(4.286)	(5.398)	(0.207)	(0.573)
Non-curricular	5.695	-20.260	-0.300	1.666
	(14.590)	(23.300)	(0.919)	(2.298)
Observations	2,300	2,302	2,314	2,314
Number of id	1,150	1,151	1,157	1,157
R-squared	0.028	0.007	0.035	0.032
Overidentification J statistics	0.232	0.144	0.821	0.143
P > J	0.630	0.705	0.365	0.705
Exact %-point change: Curricular	4.88	2.50		
Exact %-point change: Non-curricular	5.86	-18.34		

Notes. Reported in parentheses are the robust standard errors clustered at the child level. Statistical significance is denoted by *** if p<0.01, ** if p<0.05, and * if p<0.1. Saturday class variables measure the shares of schools that teach classes on Saturday in the prefecture. For outcomes expressed in log, we also report the exact percentage change in response to a 1% increase in the share of schools with either the curricular or non-curricular Saturday class. All the regressions include as covariates mother's income in log, father's income in log, other income in log1 if the child lives with mother, 1 if the child lives with father, prefectural expenditure for education in log, number of children under the age of 15 in log, average land price in the prefectural capital city in log, inflation rate of education services in prefecture, year fixed effects, and children fixed effects.

Table 8. 2nd-stage estimation results for the sample without Tokyo residents.

Birth month	(1)	(2)	(3)	(4)
	January			
Outcome variable	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school
Curricular	7.638	-3.289	-0.188	0.014
	(5.751)	(3.312)	(0.319)	(0.926)
Non-curricular	-84.20*	-6.704	1.627	-12.040
	(50.540)	(60.410)	(2.575)	(11.280)
Observations	20,556	20,714	20,796	20,796
Number of id	10,278	10,357	10,398	10,398
R-squared	-0.106	0.002	0.030	-0.012
Overidentification J statistics	1.405	0.305	0.598	0.008
P > J	0.236	0.581	0.439	0.930
Exact %-point change: Curricular	7.94	-3.24		
Exact %-point change: Non-curricular	-56.91	-6.48		

Notes. Reported in parenthesis are the standard errors clustered at the child level. Statistical significance is denoted by *** if p<0.01, ** if p<0.05, and * if p<0.1. All the regressions contain year dummies though not reported (2013 and 2014). Shares take a value between 0 and 1 including the boundaries, and so the coefficient estimates divided by 100 represent the marginal change in the left-hand side variable corresponding to a 1% point increase in the shares of schools with a certain type of Saturday class. The regression includes non-Tokyo residents in both 2013 and 2014.

Appendix A. Additional Regression Results.

Table A1. 1st-stage estimation results of the 2SLS-FE model without the NTFJ variable.

Birth month	(1) January	(2)	(3)	(4)	(5) July	(6)	(7)	(8)
Second-stage outcome	Log(Total expense + 0.01)	Log(Study expense + 0.01)	1 if going to cram school	Days a week to go to cram school	Log(Total expense + 0.01)	Log(Study expense + 0.01)	1 if going to cram school	Days a week to go to cram school
	Panel A. 1st stage estimates for the curricular Saturday class.							
JTU	-0.473***	-0.469***	-0.469***	-0.469***	-0.665***	-0.664***	-0.663***	-0.663***
	(0.089)	(0.089)	(0.088)	(0.088)	(0.098)	(0.098)	(0.097)	(0.097)
AJTSU	0.592	0.578	0.581	0.581	2.469***	2.461***	2.469***	2.469***
	(0.578)	(0.571)	(0.570)	(0.570)	(0.479)	(0.482)	(0.477)	(0.477)
Observations	22,480	22,434	22,692	22,692	22,784	22,626	22,986	22,986
Number of id	11,240	11,217	11,346	11,346	11,392	11,313	11,493	11,493
F(JTU & AJTSU)	15.23	14.91	14.99	14.99	37.23	37.02	37.29	37.29
P > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Panel B. 1st stage estimates for the non-curricular Saturday class.							
JTU	0.007	0.008	0.007	0.007	0.0806***	0.0808***	0.0817***	0.0817***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.029)	(0.029)	(0.029)	(0.029)
AJTSU	0.724**	0.722**	0.727**	0.727**	1.081***	1.093***	1.095***	1.095***
	(0.333)	(0.331)	(0.333)	(0.333)	(0.234)	(0.237)	(0.235)	(0.235)
Observations	22,480	22,434	22,692	22,692	22,784	22,626	22,986	22,986
Number of id	11,240	11,217	11,346	11,346	11,392	11,313	11,493	11,493
F(JTU & AJTSU)	2.37	2.37	2.38	2.38	10.79	10.71	10.88	10.88
P > F	0.09	0.09	0.09	0.09	0.00	0.00	0.00	0.00

Notes. Reported in parentheses are the robust standard errors clustered at the child level. Statistical significance is denoted by *** if p<0.01, ** if p<0.05, and * if p<0.1. Labour union variables are measured in October in the previous year, and denote the share of teachers in each labour union in prefecture. All the regressions contain log father's income, log mother's income, log other income, dummy for living with father, dummy for living with mother, log prefectural education expenditure, log number of children aged 0 to 14 in prefecture, log average residential land price in prefecture, the inflation rate of education services in prefecture, year fixed effects, and child fixed effects.

Table A2. 2nd-stage estimation results of the 2SLS-FE model.

Birth month	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	January				July			
Outcome variable	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school	Log(Study expense + 0.01)	Log(Activity expense + 0.01)	1 if going to cram school	Days a week to go to cram school
Curricular	11.32**	-1.949	-0.244	0.535	-1.410	3.042	-0.154	0.554
	(5.345)	(4.193)	(0.336)	(0.926)	(2.993)	(3.163)	(0.247)	(0.755)
Non-curricular	-44.15**	-6.811	-0.333	-3.297*	-18.470	7.643	-0.383	-4.446*
	(20.19)	(12.61)	(0.693)	(1.920)	(11.39)	(16.24)	(0.918)	(2.373)
Observations	22,434	22,600	22,692	22,692	22,626	22,922	22,986	22,986
Number of id	11,217	11,300	11,346	11,346	11,313	11,461	11,493	11,493
R-squared	-0.049	0.002	0.042	0.045	-0.002	0.011	0.047	0.035
Exact %-point change:								
Curricular	11.98	-1.93			-1.40	3.09		
Non-curricular	-35.69	-6.58			-16.86	7.94		

Notes. Reported in parenthesis are the standard errors clustered at the child level. Statistical significance is denoted by *** if p<0.01, ** if p<0.05, and * if p<0.1. Saturday class variables measure the shares of schools that teach classes on Saturday in the prefecture. For outcomes expressed in log, we also report the exact percentage change in response to a 1% increase in the share of schools with either the curricular or non-curricular Saturday class. All the regressions include as covariates mother's income in log, father's income in log, other income in log1 if the child lives with mother, 1 if the child lives with father, prefectural expenditure for education in log, number of children under the age of 15 in log, average land price in the prefectural capital city in log, inflation rate of education services in prefecture, year fixed effects, and children fixed effects.