THE EFFECTS OF SCHOOL CHOICE ON STUDENT ACHIEVEMENT, SCHOOL PRACTICES, AND SEGREGATION: EVIDENCE FROM SEOUL'S SCHOOL CHOICE PROGRAM

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ABSTRACT

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This study seeks to understand how reforms driven by market principles, such as school choice, competition, and autonomy, affect student achievement, school administrative and curricular practices, and segregation by analyzing a school choice program in Seoul, South Korea (hereafter referred to as Korea). Korea provides a unique opportunity to examine the effects of market-based reforms because of a recent policy transition from strong governmental control to a universal school choice program.

In order to guarantee equal educational opportunities, the government adopted the Equalization Policy in 1974 to equalize many aspects of private and public schooling. Due to a high level of governmental control and limited school choice, market and educational consumers have exerted limited influence over the Korean education system. However, recently, the Seoul Local Education Authority (LEA) adopted a school choice program that significantly increased market influence by allowing school choice and by converting some of its high schools into autonomous schools that have greater flexibility in school curriculum and school operations.

This study explores how these attempts have affected Seoul's student achievement, school practices, and segregation. The effect of school choice on student achievement is identified using a comparative interrupted time series analysis (CITS) and Difference-in-Differences (DD) that rely on comparisons of test-score changes between Seoul and Incheon, a neighboring city that already had a school choice policy in place. Students' scores in English and

Korean on the College Scholastic Aptitude Test (CSAT) from 1994 to 2015 were utilized for these analyses. Study results indicate that the Seoul school choice policy has no significant effects on achievement in English and Korean.

In addition, this study analyzes how market-based reforms affect school practices by examining how autonomous private high schools change their administrative and curricular practices when subjected to greater market influences. Specifically, this study uses seven-year panel data on school administration collected by the Korean Ministry of Education to examine the ways that autonomous private high schools changed their practices in expenditures, curriculum, and personnel. In order to isolate practice changes induced by the reform from those induced by other social and economic factors, we utilized a DD design that compares the changes within autonomous private high schools to the contemporaneous variation in traditional private high schools that are arguably less affected by the reform.

This study found evidence suggesting that the reform significantly increased autonomous private schools' per-pupil spending, expenditures for educational activities and after-school programs, and the number of after-school programs. In addition, results suggest that autonomous private schools allocated their instructional time away from social studies and toward Korean and math. Furthermore, this study found that autonomous private schools hired teachers with fewer years of teaching experience.

Finally, this study explores how Seoul' school choice policy affects student segregation by achievement and socioeconomic status across different types of schools and school districts. Results show that the policy significantly increased segregation across different types of schools without reducing segregation across districts.

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CHAPTER 1 INTRODUCTION

Expanding school choice for students and their families is one of the most popular policy interventions of the last two decades. Different choice policies—such as school vouchers, charter schools, or intra- and inter-district open enrollment—have been implemented within the United States and across the globe. These reforms are driven by concerns regarding low efficiency and effectiveness of public education systems (Davis, 2013). Competition induced by school choice is expected to improve schools, which in turn, leads to better academic outcomes (Chubb & Moe, 1990; Friedman, 1962).

Previous literature on school choice has focused on how school choice affects student achievement and segregation. With respect to student achievement, researchers have examined how school choice affects the achievement of those who exercise school choice and how choice-induced competition affects the productivity of traditional public schools (TPSs) and school systems (Creed, 2016). In terms of the segregating effects of school choice, researchers have investigated whether expanding school choice segregates students by their racial and socioeconomic backgrounds.

While a large body of research has examined the competitive and distributional effects of school choice, less research has paid attention to how schools change their practices in response to increased competition (e.g., Arsen & Ni, 2012; Davis, 2013; Preston, Goldring, Berends, & Cannata, 2012). Particularly, there is limited large-scale systematic evidence on this topic. Much of the research relies on perceived practices reported by teachers and administrators. It is hard to identify the causal effects of competition from these types of descriptive studies because they do

not provide data from a pre-reform period or from a reliable control group (Dee, Jabob, & Schwartz, 2013).

Furthermore, research on school choice in international contexts is notably limited (Heyneman, 2009). The ways schools respond to school choice polices in the United States may be conditioned by specific features of the U.S. school system. In order to understand how institutional characteristics mediate the relationship between school choice and student achievement, segregation, and school practices, we need to investigate this topic in societies whose education systems differ substantially from that of the United States.

This study extends previous school choice literature by examining the effects of Seoul's school choice program on student achievement, school practices, and segregation. Seoul provides a distinct opportunity to measure the effects of school choice because it recently put its school system under market influence. Market and educational consumers have exerted limited influence over the Korean education system due to strong governmental control.

A high level of standardization and equalization led by the government characterizes the Korean education system. Through standardization in many aspects of public and private schooling—such as curriculum, finance, and teacher training—the Korean government tried to provide students with the same schooling experiences regardless of their socioeconomic backgrounds (Park, Byun, & Kim, 2011). To do so, the government equalized schools' student body compositions by randomly assigning students to different public and private schools, a process known as "random student assignment." This random assignment deprived families of the right to choose a school and eliminated competition and student self-sorting across schools.

However, a recent implementation of a universal school choice policy in Seoul has brought fundamental changes to its school system. By greatly expanding school choice for

students and their families, the policy introduced competition and self-sorting in public schooling. Furthermore, it converted some private and public schools into autonomous schools, by giving them freedom to determine school operation and curriculum. These transitions—from lack of choice (due to random student assignment) to a program where all students have to choose (i.e., universal choice program), and from strong government control to the devolution of government authority to individual schools—provide researchers with a rare opportunity to investigate how they affect a school system. This dissertation project examines how these changes affect student academic achievement, school practices, and student segregation. A school choice program in Korea helps us identify commonalities in institutional responses to choice-based competition and increased autonomy, as well as how the impacts of these reforms play out in different societies and, at the same time, are conditioned by the unique contexts surrounding them.

The organization of the dissertation proceeds as follows. The second chapter describes previous studies on the effects of school choice on student achievement, school practices, and segregation. The third and fourth chapters explain the school system in Korea and the Seoul school choice policy. The fifth chapter discusses theoretical frameworks used in this study and research questions. The sixth chapter presents data source and research design. The seventh, eighth, and ninth chapters report the main results, and the tenth chapter concludes by discussing findings and implications for school choice literature and future policies.

CHAPTER 2 LITERATURE REVIEW

This section reviews literature on how school choice affects student achievement, school practices, and segregation from studies in U.S. and international contexts. For each outcome, I will summarize the findings of previous empirical studies, gaps in the literature, and methodological challenges researchers have faced in identifying the effects of school choice on each outcome. In terms of student achievement, I show that there are inconsistent findings regarding the competitive effects of school choice and identify the need for more evidence from large-scale programs. I also argue that we need to deepen our understandings of how laws, program designs, and institutional characteristics mediate the relationship between competition and student achievement. For school practices, I highlight that there have been few attempts made to understand how school choice competition affects school practices and note that there is a lack of systematic evidence. Finally, regarding the segregating effects of school choice, I show that researchers have investigated the characteristics of school-choice participants and their school preferences in order to explore this topic. I conclude that the findings of U.S. studies are hard to generalize because most U.S. school choice programs target low-income families. Additionally, I argue that we do not have enough evidence from international studies.

Effects of School Choice on Student Achievement

With respect to the effects of school choice on student achievement, previous empirical studies approached this topic in two ways. First, they look at how school choice affects achievement for students who exercise school choice by comparing these students' test scores

with those who attend their assigned public schools. Second, they focus on how choice-induced competition affects students attending TPSs or for all students within a given school system. This section reviews evidence from research on the second topic because the second approach is more relevant to this study, which also looks at changes for all students in the given system. In addition, this section reviews methodological challenges researchers have faced in the causal estimation of the competitive effects of school choice.

The competitive effects of school choice on TPS student achievement have been most extensively investigated in the contexts of U.S. charter schools. The focus of these studies is on examining whether competition from charter schools improves educational outcomes for students attending TPSs. Competition has been measured using different proxies such as the number of choice schools in a given area (e.g., Bifulco & Ladd, 2006; Booker, Gilpatric, Gronberg, Jansen, 2008; Zimmer & Buddin, 2009), the existence of at least one charter school within a certain distance from a TPS (e.g. Jackson, 2012), the geographic proximity to schools of choice (e.g., Davis, 2013), and the share of total district enrollment in choice schools (e.g., Imberman, 2011).

There are two main challenges that threaten the causal identification of competitive effects of school choice: the endogeneity of school location and student sorting (Ni, 2009). If, for example, private schools or privately-operated schools are more likely to be located in areas with a high percentage of low-performing public schools, a negative association between increased competition and TPSs'performance would be found. Likewise, if charter schools or private schools draw low-achieving students from TPSs, even though their existence does not change their productivity, TPSs' performance would increase. Therefore, not addressing endogeneity of

charter school location and student sorting may lead to biased estimation of competitive effects of school choice.

In order to eliminate potential biases induced from endogeneity of school location and student sorting, researchers have adopted different approaches (Betts & Tang, 2011). With respect to endogeneity of school location, researchers have utilized a panel data set and eliminated unobserved heterogeneity using school-fixed effects. Researchers also employed an instrument variable, which predicts the presence of charter schools but does not affect the achievement of TPSs in order to address the issue of endogenous location. With respect to student sorting, researchers utilized student-level panel data and examined whether achievement gains occur following increased competition. The panel nature of data allows researchers to control for achievement variation induced from unobserved student characteristics by including lagged dependent variables or a student-fixed effect.

Most U.S. studies using student-level data have found either small positive effects of competition on TPS student achievement (e.g., Booker et al., 2008; Sass, 2006; Winters, 2012) or null effects of it (e.g., Bifulco & Ladd, 2006; Davis, 2013; Zimmer & Buddin, 2009). Among studies using student-level data, only Imberman (2011) found negative competitive effects. U.S studies analyzing school-level data also have presented inconsistent results, as some found positive effects of competition (e.g., Bohte, 2004), while others found negative effects (e.g., Ni, 2009) or null effects of competition (e.g., Bettinger, 2005).

A small number of studies have investigated this topic using data from other countries. For example, Clark (2009) evaluated a U.K. reform that allows high schools to become autonomous schools (i.e., Grant-Maintained (GM) schools). Clark did not find evidence that GM schools have any significant impacts on the achievement of neighborhood public schools. Using

data from Nepal, Thapa (2013) examined the impact of private school competition on public school performance. That study found evidence suggesting that private school competition benefits their public counterparts.

While these studies explore competitive effects of school choice on TPSs, other studies examine whether competition improves the overall productivity of a given school system. These studies differ from ones on competitive effects on TPSs in that they look at achievement patterns for all students within a given school system rather than looking at only TPS student achievement. Because these studies examine achievement for all students, they avoid the issue of student sorting. However, they still face the issue that schools endogenously choose where to locate. In order to handle this endogeneity issue, researchers again have employed a fixed effect model using a panel data set (e.g., Böhlmark & Lindhl, 2015; Hsieh & Urquiola, 2006) or an IV model (e.g., Hoxby, 2000; Gibbons Silva, & Machin, 2008).

Most empirical evidence on this topic comes from studies conducted in countries other than the United States including Chile (e.g., Hsieh & Urquiola, 2006), the Netherlands (e.g., Dijkgraaf, Gradus, & Jong, 2013), the U.K. (e.g., Clark, 2009; Gibbons et al., 2008), Canada (Card, Dooley, & Payne, 2010), and Sweden (e.g., Böhlmark & Lindhl, 2015). These studies examine whether greater competition is associated with the greater productivity of a school system measured by student test scores. These studies have utilized different sources of competition, such as shares of private schools (e.g., Hsieh & Urquiola, 2006) or independent schools (e.g., Böhlmark & Lindhl, 2015), proportions of Catholics (e.g., Card et al., 2010), or market concentration of schools (e.g., Dijkgraaf et al., 2013). Like U.S. studies, international studies also present inconsistent findings: some studies found significant effects of competition

(e.g., Card et al., 2010; Böhlmark & Lindhl, 2015; Dijkgraaf et al, 2013; Gibbons et al., 2008) while others did not find any significant effects (e.g., Hsieh & Urquiola, 2006).

Domestic studies have paid less attention to the effects of competition on the overall product of a given school system (Creed, 2016). I found two studies that have explored this topic. Hoxby (2000) investigated whether Tiebout choice competition enhances academic quality for all public school students. Hoxby found positive effects of competition. Rothstein (2007) replicated Hoxby's study but did not find any significant effects of competition. According to Rothstein, results are sensitive to the way the competition variables are constructed.

As such, previous studies examined how school choice competition affects the productivity of TPSs or a given system. These studies report inconsistent results, which may reflect differences in policies across different places. However, less is known about how competitive effects might differ depending on local contexts, such as the specific design of a school-choice program or relevant laws (Gill & Booker, 2015). Additionally, most evidence is from small choice programs; thus, there is lack of evidence from large-scale school choice programs.

Competitive Effects of School Choice on School Practices

Research into competitive effects of school choice beyond student achievement is much more limited. Prior empirical research on the competitive effects on school choice on TPSs treats schools as black boxes and looks at the relationship between increased competition and school productivity (Arsen & Ni, 2012). However, this type of research does not tell us through which mechanism school choice improves school productivity, nor does it provide information on how

school choice affects schooling beyond student achievement. Only when we look at changes occurring inside schools, do we better understand how school choice shapes schooling. However, to date, only a few studies look at how school choice competition affects school practices such as resource allocation (Arsen & Ni, 2012, Lubienski, 2005), retention of students and teachers (Cannata, 2011), principals' leadership (Parry, 1997), teaching methodologies (Parry, 1997), and demands for teachers (Hoxby, 2000).

In Michigan, Arsen and Ni (2012) investigated whether competition induced by charter schools has significant impacts on TPSs' resource use. The authors did not find any significant effects of competition. Similarly, drawing upon data from several states, Cannata (2011) examined whether principals in traditional, magnet, and private schools perceive that competition significantly influences their financial resources or recruitment of teachers and students. Cannata did not find any significant impacts of school choice competition on perceived changes. Unlike the results of these two studies, Lubienski (2005) found that districts in Michigan increased their budgets for marketing campaigns in response to increased competitive pressures.

Some studies examine this topic using a nationally representative data set. For example, Hoxby (2002) analyzed the Schools and Staffing Survey (SASS) and found that competition induced by traditional forms of choice (i.e., Tiebout choice, choice of private schools) increases demands for teachers with degrees from selective colleges and with math and science skills. Also, she found that school choice competition increases demands for teachers who make extra efforts on their work and assume more responsibility. Likewise, based on the analysis of the Early Childhood Longitudinal Study–Kindergarten Class (ECLS-K), Davis (2013) also examined whether there is any association between charter school competition and school practices such as

standards, parental outreach, or teacher efforts. In most practices, he did not find significant effects of competition.

Like U.S. studies, most school choice literature in an international context focuses on illuminating the relationship between competition and educational outcomes or segregation; only a few look at how schools respond to choice-induced competition. In New Zealand, Ladd and Fiske (2003) investigated how perceived levels of competitive pressures affect educational processes such as instructional content and style and teachers' relationships with principles, fellow teachers, and parents. The results of the study highlight the negative impacts of competition on these areas. In Chile, Parry (1997) examined whether there are any significant differences between public schools and publicly financed private schools in their school practices and leadership. Publicly financed private schools face greater levels of competition as their student enrollments determine their budgets. She did not find any significant difference between these two types of schools in terms of bringing in innovation in teaching methodologies. However, she found that public school principals offer more innovative courses and receive higher leadership scores from evaluators.

Previous empirical studies explored how school-choice competition affects school practices in areas such as use of school resources, teacher hiring, and teaching methods. Most studies did not find evidence suggesting that competition significantly affects school practices. Only a few of them found significant effects of competition, but in a direction that school choice advocates predicted. For example, Parry (1997) found many innovative practices in public schools. Also, Lubienski (2005) found that districts increased spending in marketing but not in an area that is directly related to student achievement. Among studies reviewed so far, only

Hoxby's (2002) study found significant positive effects of competition in that it shows competition increases demands for high-quality teachers.

Most studies on the effects of competition on school practices are limited in presenting causal estimates of competitive effects. For example, some studies use teachers or administrators' self-perceived practices, which may or may not be different from objective measures of practices (e.g., Cannata, 2011; Davis, 2013; Ladd & Fiske, 2003). Also, other studies do not include data from the pre-reform period, which makes it difficult for us to draw causal inference from their results (e.g., Davis, 2013; Lubienski, 2005). Furthermore, only few studies examined this topic, so we still have limited evidence to draw a conclusion. In sum, a small number of studies provide limited empirical evidence regarding how schools are responding to competitive pressure shaped by school choice policies, and future research is necessary in this field.

Effects of School Choice on Segregation

In order to examine segregating effects of school choice, previous research has analyzed i) the relationship between the characteristics of choice participants and their program participation and ii) heterogeneity in school preference across different groups of families. The first topic, the characteristics of choice participants in comparison to non-participants, has been most extensively studied in the context of voucher programs. The second topic, heterogeneity in school preference, has been most exhaustively studied in the context of charter schools. This section reviews prior research on the segregating effects of school choice.

Characteristics of choice participants. The characteristics of choice participants in comparison to non-participants can determine the level of segregation. For example, when students of high income are more likely to leave their assigned neighborhood schools using available choice options, then their departure may increase the isolation of low-income students. Likewise, when a high percentage of white students leave their local schools, their transfer might lead to the concentration of minority students.

The characteristics of choice participants have been investigated in different choice policy settings such as charter schools (e.g., Dee & Fu, 2004; Ni, 2012), voucher programs (e.g., Campbell, West, & Peterson, 2005; Cowen, 2010; Figlio, Hart, & Metzger, 2010; Fleming, Cowen, Witte, & Wolf, 2013; Howell, 2004; Howell & Peterson, 2006; Peterson, Howell, & Greene, 1999; Witte, 2000; Wolf, Gutmann, Eissa, & Puma, 2005), and open enrollment (e.g., Fossey, 1994; Lavery & Carlson, 2014). This topic has been most exhaustively investigated in voucher programs. A limited number of studies examined this topic in the contexts of charter schools or open enrollment.

Prior studies present inconsistent findings regarding who participates in these choice programs. For example, studies found that the majority of voucher participants were from low-income families (e.g., Campbell et al., 2005; Fleming et al., 2013; Peterson et al., 1999; Witte, 2000). In contrast, open enrollment studies showed that wealthier families more actively take advantage of choice opportunities (e.g., Armor & Peiser, 1998; Holme & Richards, 2009; Lavery & Carlson, 2015). Great variation existing in program designs and unique local circumstances might have led to inconsistent results regarding the characteristics of participants.

The most consistent finding across studies is that choice participants are *relatively* advantaged among their target populations. For example, even though voucher students in most

programs were predominately from low-income minority families, they were relatively advantaged in terms of parents' education (Campbell et al., 2005; Fleming et al., 2013; Peterson et al., 1999; Witte, 2000). Research on other choice programs also presents similar results: choice users are more advantaged compared to their peers in terms of their parents' education levels (Bifulco, Ladd, & Ross, 2009) or their families' economic status (Ni, 2012). In interdistrict open enrollment, where school choice is widely available for different socioeconomic or racial groups, families with a higher level of income or education are more likely to exercise choice (e.g., Armor & Peiser, 1998; Holme & Richards, 2009; Lavery & Carlson, 2015).

Additionally, a small number of studies looked at whether certain district characteristics significantly explain their student choice participation. The results of these studies indicate that families are more likely to opt out of their districts or their schools when they have higher proportions of low-income or minority students (e.g., Bifulco et al., 2009; Howell & Peterson, 2006; Ni, 2012). In sum, results of previous studies indicate that relatively advantaged students among the target population are more likely to utilize school choice especially when these students attend schools with a higher percentage of disadvantaged students. These results indicate that school choice may further segregate schools by race and class.

Heterogeneity in school preferences. Another way school choice affects segregation is through differences in school preferences across different groups of families (Carlson, 2014). For example, if families prefer schools with a higher representation of their own race, school choice may stratify schools along racial lines. Some studies examined whether there is heterogeneity in school preferences across different groups of families in order to identify how school choice affects segregation. Most of these preference studies have been conducted in charter school

settings (e.g., Bifulco et al., 2009; Booker, Zimmer, & Buddin, 2005; Figlio et al., 2010; Garcia, 2008; Weiher & Tedin, 2002; Zimmer et al., 2009). A limited number of studies examined this topic in open enrollment programs (e.g., Armor & Peiser, 1998; Holme & Richards, 2009).

Previous charter school studies examined whether students switched to charter schools that are more racially segregated or integrated compared to their previous schools. Most studies found that Black students transferred to charter schools with a higher percentage of black students (e.g., Booker et al., 2005; Garcia, 2008; Weiher & Tedin, 2002). The exceptions are Chicago, Milwaukee, and Little Rock, and in all three instances, Black students transferred into charter schools with lower percentages of their own race. Also, the majority of studies found that White students transferred to charter schools with a higher percentage of White students (e.g., Bifulco & Ladd, 2007; Bifulco et al., 2009; Garcia, 2008; Weiher & Tedin, 2002). The results of these studies suggest that school choice increases segregation by student racial backgrounds, as students tend to transfer to charter schools with a higher percentage of their own race compared to their previous public schools.

A limited number of studies examined heterogeneity in school preferences in the context of open enrollment (Armor & Peiser, 1998; Harris & Larsen, 2014; Holme & Richards, 2009). Most studies explored whether there are any significant differences in the characteristics of districts that send students (i.e., sending districts) from those of districts that receive students (i.e., receiving districts). However, unlike charter school studies, these studies did not specifically analyze how the characteristics of participants interact with their district preferences.

So far, I reviewed studies that examined heterogeneity in school preference across different socioeconomic and racial groups. The majority of studies on this topic were conducted in the context of charter schools, and their main focus is on preference for racial compositions

across different racial groups. The most consistent finding across these studies is that advantaged students prefer schools with a high percentage of students with advantaged backgrounds. Fewer studies have analyzed preferences based on other dimensions such as academic quality. Exceptions are open-enrollment studies whose results indicate that families prefer districts that have high SES and academic achievement.

Studies in international contexts. Many countries adopted educational polices to expand students' and their families' school choice. However, few of them have been intensively studied, especially in terms of their effects on school segregation with the exception of Chile. A voucher program in Chile has been studied most extensively, and a large body of research explored who participated in the voucher program. The results of these studies indicate that the program stratified public and private schools along socioeconomic lines because families with high socioeconomic backgrounds more often used vouchers to opt out of their neighborhood public schools (Alves et al., 2015; Carnoy, 1998; Chumacero, Gómez, & Paredes, 2011; Hsieh & Urquiola, 2006; McEwan & Carnoy, 2000). Researchers also found that families in voucher schools had higher income and higher education levels compared to their counterparts in public schools.

Studies conducted in other countries have presented similar findings. For example, Aves et al. (2015) examined who is more likely to choose a school located outside their neighborhood in a public school open enrollment system in Rio de Janeiro, Brazil. The authors found that student achievement levels are positively associated with the likelihood of students attending schools located outside of their neighborhood. They also found that high-achieving students are more likely to opt out of their neighborhood schools regardless of their socioeconomic status. In

Ontario, Canada, Leonard (2015) also found that students of high ability are more likely to transfer out of assigned schools.

While these studies look at segregation by students' socioeconomic status and achievement levels, other studies examine segregation by students' racial backgrounds. In the evaluation of a New Zealand universal school choice program, Ladd and Fisk (2010) found that school choice led to the exodus of European students from schools with a high percentage of ethnic minority students, which increased the concentration of Maori and Pacific Islander students in these schools. Karsten, Ledoux Roeleveld, Felix, and Elshof (2003) found a similar result in the Netherlands. They investigated whether parents' school preferences led to ethnic segregation and found that Dutch parents were significantly more interested in sending their children to schools that had similar ethnic compositions with their own.

So far, I have reviewed empirical studies on the segregating effects of school choice in domestic and international contexts. There are two main approaches that these studies have taken to examine how school choice affects student segregation. The first approach, the characteristics of choice participants, has been most extensively studied in the context of voucher programs. Evidence from voucher studies indicates that the majority of voucher participants are from low-income minority families, and among them, those who have a mother with a higher level of education are more likely to apply for vouchers. The findings from voucher programs are limited as it is hard to generalize the results to a broader segment of a population because voucher programs are targeted to homogeneous groups in terms of income and geography (Figlio et al., 2010). Other choice programs such as charter schools and open enrollment include participants with diverse socioeconomic and racial backgrounds, but few studies examine this topic in the contexts of these prevalent forms of choice polices. Thus, for the majority of choice participants,

it is still unclear which types of students and families leave their neighborhood schools and how their transfers affect segregation, especially on the schools they left behind. This area requires further research.

The second topic, heterogeneity in school preference, has been exhaustively studied in the context of charter schools. Most preference studies focus on illuminating whether class- or race-based preferences exist across different socioeconomic or racial groups. The most salient evidence from previous studies is that students prefer schools with a high percentage of students with similar racial or socioeconomic backgrounds.

Overall, evidence is limited with respect to segregation induced by preferences based on academic and non-academic dimensions of schools such as student achievement, teacher quality, school climates, or extracurricular activities. The distributional effects of school choice will be determined by how much parents take these school factors into account relative to racial or socioeconomic composition of a school's student body (Bifulco & Ladd, 2009). Thus, researchers need to look at how preferences for academic and non-academic dimensions of schools vary across families of different types.

Finally, for both topics, previous studies have paid less attention to stratification by student characteristics such as motivation, expectation for their academic accomplishment, or attitudes toward learning. Whether school choice leads to stratification by academic mindsets is an important issue to address. If school choice is made within a certain racial or socioeconomic boundary, it may not significantly change the level of racial or socioeconomic segregation. But it is still possible that school choice leads to segregation by another dimension such as students' levels of motivation or achievement. Despite this possibility, few studies investigate this topic,

and less is known about whether student participation varies systematically by their academic characteristics.

So far, I reviewed previous empirical research on the effects of school choice on student achievement, school practices, and school segregation. Regarding competitive effects of school choice, U.S studies have examined how competition affects TPS students. Some studies found null effects of school-choice competition while others found small significant impacts of it. Most U.S. school choice programs are limited in scope; thus, it is not surprising that most studies report small effects of competition. Furthermore, only few U.S. studies examine impacts of school choice for all students in a given education system.

Regarding the segregating effects of school choice, prior U.S. studies have reported evidence suggesting that school choice increases racial and class stratification. However, most choice programs in the U.S. are targeted to low-income students, so it is hard to generalize the findings of U.S. studies to a broad segment of a population. Additionally, only a limited number of studies examined these topics in international contexts. Finally, few studies have examined how school choice influences school practices.

This study contributes to school choice literature by utilizing the expansion of school choice in Seoul. Seoul's school choice policy provides researchers with a unique opportunity to investigate the effects of school choice because market principles, such as autonomy, competition, and school choice, were newly introduced with the implementation of the policy. In the Korean school system, they barely exist due to the High School Equalization Policy and random student assignment. In Seoul, sudden exposure to market principles provides an opportunity to examine how they affect school practices, segregation, and achievement, presenting a sharp contrast with the previous school system under strong governmental control.

The school system in Korea consists of six years of elementary school, three years of middle school, and three years of high school. The school year starts at the beginning of March and ends in February. High levels of equalization, standardization, and government control shape the Korean school system. These characteristics date back to the 1974 law that eliminated school choice through random student assignment and, at the same time, minimized differences across schools, by applying a high level of standardization in school finance, curriculum, and teacher policies. Behind the implementation of this rather radical law was the government's effort to ameliorate exam pressures for prestigious high schools among middle school students (Sorensen, 1994).

Prior to 1974, when students were allowed to choose their schools, fierce competition existed among middle-school students for prestigious high schools. The admission criteria based on academic achievement increased students' dependency on the use of tutors and extracurricular cram schools (Sorensen, 1994). Furthermore, because these schools selected students based on academic achievement, they cream skimmed high-achieving students, which increased student stratification by ability and, presumably, by socioeconomic status. In this situation, concerns about educational inequality came to dominate education discussions in Korea.

These concerns regarding inequality and excessive exam pressures prompted the 1974 passing of the High School Equalization Policy (HSEP) in Pusan and Seoul, the two largest metropolitan areas in Korea. Additionally, the HSEP was increasingly adopted in other major metropolitan areas (Kim, Lee, & Lee, 2008). The HSEP banned entrance exams from most high schools and opened up secondary education to the wider public. Under the HSEP, the government heavily subsidized and regulated private and public schools by adopting uniform and centralized policies for curriculum, finance, and teachers. The compositions of schools' student

bodies were also equalized through within-district random student assignment (Kang, 2007; Park et al., 2011). As such, students were prohibited from choosing a school in the regions that adopted the HSEP. Choosing a school through residential relocation was not possible either, because transferring students were also randomly assigned to new schools within new districts (Kang, 2007).

It is important to note that the HSEP applies to private schools as well as public schools. In exchange for a substantial amount of financial subsidies, the government currently controls private schools' budgets and curriculums. For example, private school teachers' salaries are required to follow a schedule set by the government. Private schools also charge the same tuition as public schools. Furthermore, private schools are required to teach a national curriculum, and are also subject to random student assignments. What sets public and private schools apart is the fact that only private schools have autonomy in decisions regarding personnel, including teacher hiring. Unlike public schools, private schools select their own teachers. However, their teachers are still required to meet the qualifications set by laws. Once hired, most private-school teachers work at the same school until they retire. For public schools, provincial education offices (PEO) directly hire teachers and rotate them every five years across different schools in order to equalize teacher quality.

Overall, policies focused on guaranteeing equal education opportunities made private secondary schools quasi-public in Korea. They do not face competition for student enrollments as their seats are filled through random student assignment, which may mean that they may not have incentives to tailor their programs to the needs and preferences of their students. Furthermore, they do not have the means to differentiate their programs, as there exists a high level of government control over school curriculum. Under policies focused on enhancing

equality, private schools are not distinguishable from public schools except in their autonomy regarding staffing decisions.

Even though the HSEP has been successful in guaranteeing equal education opportunities, it has been criticized for lowering the effectiveness and efficiency of the school systems. Indeed, several components of the HSEP have the potential to lower school productivity. For example, random student assignment means private and public schools' seats are filled, regardless of the quality of education they provide. In addition, teacher pay schemes, which are based on years of teaching experience, are not linked to performance. Furthermore, a high level of curriculum standardization does not allow individual schools to adjust curriculum according to their students' specific needs. Thus, these components of the HSEP may have lowered the effectiveness of school systems, which may have led to families' increased dependency on private tutoring (Park et al, 2011). A large percentage of Korean students are enrolled in private for-profit cram schools (*hakwon* in Korean), and the prevalent dependency on private tutoring has been an issue for several decades.

To confront these issues arising from enforcing standardized and uniform education, some education authorities at the municipal level started modifying the random student assignment method of the HSEP in 1996, by allowing school choice in order to partially accommodate parents' and students' school preferences in their student assignments. In contrast, Seoul adhered to the random assignment method of the HSEP until the 2009 school year.

CHAPTER 4 SCHOOL CHOICE IN SEOUL

Seoul, the capital of Korea, is the largest city in the nation with ten million residents in 2015. In 2015, Seoul had 347 academic and vocational high schools and 321,914 students attending these schools (see Table 4.2). Seoul had maintained the HSEP and the within-district student random assignment for more than thirty years until it adopted a school choice policy in 2010. Schools in Seoul experienced dramatic changes with an introduction of school choice.

The school choice policy has two main components: expansion of school choice and introduction of autonomous schools (Choi & Hwang, 2017). Under the new policy, middle school graduates are required to apply to any high school in the city regardless of school type or their residence. Moreover, the new policy introduced autonomous public and private schools, most of which were converted from traditional public and private schools. This section explores specific features of the policy and discusses how these features may have exerted different levels of competitive pressure across different types of schools.

Expansion of School Choice and Application Procedures

Before the introduction of the school choice policy, families exercised very limited school choice by applying to special-purpose schools, such as science or foreign language schools, or to schools located in common catchment areas.[1] The new policy greatly expanded

[1] From1996, incoming high-school students in Seoul were allowed to submit applications to the schools located in the common catchment areas. Due to decreasing residential populations, schools located in downtown Seoul had difficulties filling their seats. In order to address this problem, the Seoul LEA allowed students to apply to the schools located in these areas regardless of their residence. There are 36 schools located in these areas, which account for about 15 percent of the total academic schools.

school choice by requiring every incoming high school student to apply to schools of their choice. Under the new policy, assignment procedures start with the selection of students based on their middle school GPA by the Local Educational Authority (LEA). Selected students then can apply to an autonomous private school or a special-purpose school. In order to apply to autonomous private schools, a student's middle school GPA should be above the median, which opens up the possibility for these schools to cream-skim high-achieving students. When schools are oversubscribed, these two types of schools (i.e., autonomous private and special-purpose) use their own criteria to select students.

Those who did not win admission during the first stage of application, along with the rest of the students who did not apply to autonomous private or special-purpose schools, then apply to any two traditional schools of their choice regardless of school type. In addition, if students wish, they can apply to one autonomous public school. In this stage, 20 percent of seats in each school are filled via lottery. In the next stage, students who have not been assigned to any school during the second stage again apply to two schools among traditional public, traditional private, or public autonomous schools within their own school district. Then, another lottery is conducted to fill half of the remaining slots (40% of the total seats) in each school. In the final stage, the remaining students are randomly assigned to the open seats within their own or adjoining districts. Table 4.1 summarizes the application procedures. Even though some aspects of the previous random assignment method are retained in the final stage, the school choice policy is still a dramatic departure from the previous random assignment in that it allows students to apply to schools regardless of their residential location.

Table 4.1. School Assignment procedure in Seoul

	First Stage	Second Stage	Third Stage	Forth Stage
District	anywhere in Seoul	anywhere in Seoul	own school district	own or adjoining school district
School types	special purpose school, autonomous private school	traditional private and public school, autonomous public school	traditional private and public school, autonomous public school	traditional private and public school, autonomous public school
Assignment method	school's own criteria	lottery among applicants	lottery among applicants	lottery among remaining students
% of seats assigned	100% of respective schools	20% of respective schools	40% of respective schools	40% of respective schools

(Source: Choi & Hwang, 2017)

Introduction of Autonomous Schools

Not only does the school choice policy greatly expand school choice, but it also introduces autonomous schools, most of which were converted from traditional private schools. While the expansion of school choice was adopted by the Seoul LEA, the law that introduces autonomous schools was enforced by the central government. Compared to other regional educational offices, the Seoul LEA most actively promoted the establishment of autonomous private schools. During the first year of the choice policy, there were seven autonomous public schools out of 90 public schools and 13 autonomous private schools out of 142 private schools. In 2011, these numbers increased to 17 and 27, respectively (see 4.2). A superintendent have the authority to approve a school's application for conversion into an autonomous private school. The Seoul LEA's superintendent made autonomous private schools widely distributed across

Seoul by strategically approving a few schools to be converted into autonomous schools per district, which is evident in Figure 1.1.

Table 4.2. Distribution of high schools in Seoul

	Number of Schools						
	2009	2010	2011	2012	2013	2014	2015
Public schools	84	78	71	72	73	73	74
Private schools	131	120	107	108	110	110	110
Autonomous public schools	0	7	17	19	19	19	18
Autonomous private schools	0	14	27	26	25	25	25
Special purpose schools	16	18	19	19	20	20	20
Number of schools or students	231	237	241	244	247	247	247

Table 4.3. Distribution of students in Seoul

	Percentage of Enrollment						
	2009	2010	2011	2012	2013	2014	2015
Public schools	35.06	31.41	29.72	29.48	29.86	29.53	29.12
Private schools	60.85	52.58	48.72	49.35	49.72	50	49.94
Autonomous public schools	0	2.24	5.81	6.31	6.06	5.97	5.86
Autonomous private schools	0	9.3	10.99	10.08	9.4	9.52	10.1
Special purpose schools	4.09	4.46	4.77	4.78	4.96	4.97	4.98
Number of schools or students	305,531	317,798	298,002	290,891	283,355	270,706	259,196

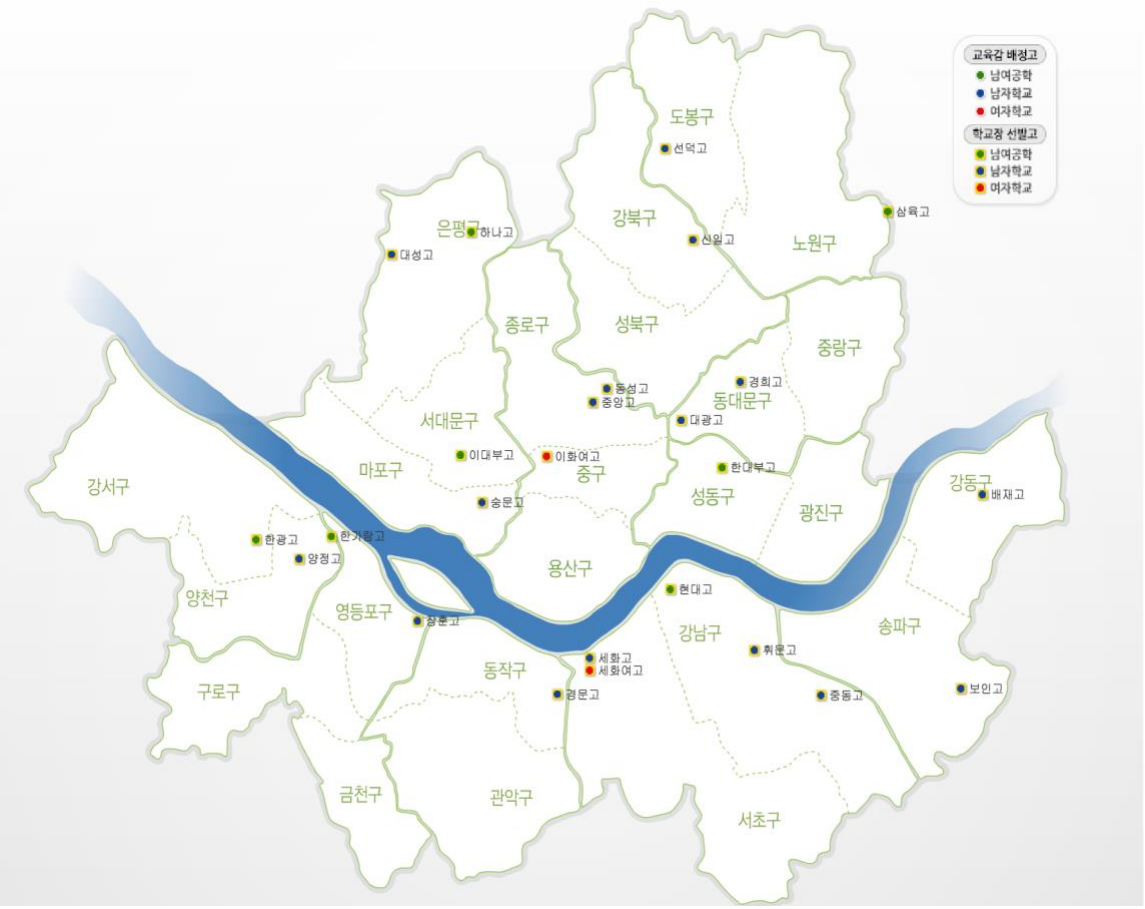


Figure 1.1. Location of private autonomous schools in Seoul in 2016

*Red, green and black dots indicate the location of autonomous private schools.

Autonomous private schools are different from traditional public or private schools in several ways. For example, in exchange for financial independence from the government, autonomous private schools are given greater autonomy in school operation and curriculum. They can create their own curriculum as long as they meet 50 percent of the required lesson hours, as stipulated by a national curriculum for core subjects. In addition, their teacher salary does not need to follow the schedule set by the government. Also, they can charge tuition up to three times larger than that of public schools. Furthermore, autonomous private schools are allowed to selectively admit students, as long as they do not set a separate admission test and

admit 20 percent of their students from low-income families (the Seoul LEA provides a scholarship for these students).

Autonomous public schools are guaranteed the same level of autonomy as autonomous private schools. However, they differ from autonomous private schools in that their creation was initiated by the LEA's effort to improve the productivity of low-performing schools, especially those located in disadvantaged areas, through increased financial support and autonomy. These schools enjoy a great degree of autonomy but to a lesser extent compared to autonomous private schools. For example, because they are publicly financed, they do not have autonomy over their teacher salary or tuition. Furthermore, they are allowed to recruit teachers but only among teachers who are already hired by the Seoul LEA.

Seoul's school choice policy does not increase autonomy for traditional public and private schools; they are still subject to the regulations of the HSEP in many dimensions of school management and curriculum. Table 4.3 displays information about the dimension of school operations, in which autonomous schools have autonomy compared to traditional public and private schools.

Table 4.4. Different levels of autonomy existing across different types of schools

	Pre-choice			Post-choice		
	Public schools	Private schools	Traditional public schools	Traditional private school	Autonomous public schools	Autonomous private schools
Autonomy in teacher hiring	no	yes	no	yes	yes	yes
Autonomy in curriculum	no	no	no	no	yes	yes
Autonomy in student selection	no	no	no	no	no	yes
Autonomy in tuition schedule	no	no	no	no	no	yes
Financial independence	no	no	no	no	no	yes
Autonomy in teacher salary schedule	no	no	no	no	no	yes

Competitive Pressure Exerted on Different Types of Schools

The varying levels of financial support and autonomy across different types of schools suggest that they may face different levels of competition under the new policy. First of all, the policy may have generated the greatest competition for autonomous private schools because their budgets depend on student enrollments. In comparison, traditional public, traditional private schools, and autonomous public schools may have faced a lesser degree of competition because they are publicly financed and their student enrollments do not determine their budgets. In particular, traditional public and private schools' empty seats are filled through random student assignment at the last stage of student assignment, which makes them feel less competitive pressure to attract students compared to autonomous private schools. As of the beginning of 2015, autonomous public schools are subject to the final stage of random assignment.

Under the new policy, because autonomous private schools' budgets depend on the number of students enrolled in their schools, they may be more susceptible to market pressures

and consumer demands. Thus, I expect that practice and policy changes in autonomous private schools are most likely to show how market-based pressure and consumers' requests shape schooling. Also, the greater autonomy granted to them makes it easier for these schools to bring these changes.

For the other types of schools, the policy may have generated competition specifically for high-achieving students. The policy makes it possible for autonomous private schools to cream skim high-achievers in the first stage of application. If a high percentage of high-achieving students choose autonomous private schools, then the principals and teachers in traditional schools may be left with a higher percentage of low-achieving students. This may make school management difficult and lower their effectiveness in improving student achievement. In order to avoid this situation, traditional public, traditional private, and autonomous public schools may try to attract high-achieving students but to a lesser extent compared to autonomous private schools.

In the next section, I discuss how these features of the policy may have affected student achievement, school practices, and student segregation based on relevant theories and based on consideration of how local contexts may play a role in shaping these outcomes.

CHAPTER 5 THEORETICAL FRAMEWORK & RESEARCH QUESTIONS

Of central interest to this paper are the relationships between school choice and student academic achievement, school practices, and segregation in the unique school choice context of Korea. In this section, I explore relevant sociology and economics literature to develop a conceptual framework and hypotheses for how school choice in Seoul affects these outcomes. It is important to note that, even though I examine achievement, segregation, and school practices as distinct outcomes, there is interplay among these outcomes, as segregation and school practices also affect achievement.

How School Choice Affects School Productivity and School Practices

In this section, I discuss the mechanisms through which Seoul's school choice policy may have affected school productivity and student achievement.

Extant literature on school choice has argued that choice-induced *competition* may improve school productivity by pushing schools to better organize and improve their practices (Chubb & Moe, 1990; Hoxby, 2002, 2003; Nathan, 1996). This is especially the case for autonomous private schools because they are subjected to the greatest level of competition under the new policy. In order to perform better than others, autonomous private schools may adopt innovative practices. These innovative practices may spread across different types of schools as other types of schools also try to improve their practices under increased market pressure. As a result, the overall productivity of the school system may increase. At the same time, competition encourages a variety of options (Friedman, 1962), which allows parents to choose educational

programs that most address their child's needs and interests. This leads to a better match of services to needs, which may lead to increased achievement. Competition can incentivize schools to make improvements, especially to the dimensions valued by students and families. If education consumers put a high value on academic quality, school leaders may channel their resources into activities that are more directly related to raising student achievement (Hoxby, 2003; Rouse & Barrow, 2009).

Another way that school choice in Seoul affects school productivity is through increased autonomy. As noted above, with the introduction of school choice, some private and public schools were granted autonomy from governmental regulations. Advocates of shifting power and authority to individual schools view standardization and bureaucratic control as obstacles to efficiency, effectiveness, and responsiveness (Lockwood, 2002; Oates, 1972). According to them, local-level decision makers (e.g., teachers and principals) better understand the needs and preferences of their constituencies and make appropriate decisions for them. These advocates also believe that, when decisions are made locally, it is easier to monitor decision-making processes and make them less susceptible to bureaucratic corruption (Bardhan & Mookherjee, 2005). Autonomy is also expected to allow schools to organize themselves in order to improve technical efficiency and address local accountability demands rather than adopting institutionalized norms and definitions of effective schooling (Huerta & Zuckerman, 2009).

Finally, another way school choice can affect school productivity is through changes in schools' student body compositions. If school choice significantly alters the composition of student bodies in traditional and autonomous high schools, and student achievement is affected by their peer compositions, student achievement may change even if school choice has little impact on school productivity and practices. Seoul's school choice policy was designed so only

students whose middle school GPA ranked above the median can apply to autonomous private high schools. If high-achieving students choose to attend autonomous private schools, and if peers affect one's achievement, students in autonomous private schools are positively affected by their high-achieving peers. In contrast, the loss of high-achieving students may negatively affect students who remain in traditional schools or autonomous public schools. In this case, even though the policy rarely affects school productivity, it increases student achievement in the context of autonomous private schools, while simultaneously decreasing student achievement in other types of schools.

So far, I discussed through which mechanism Seoul's school choice policy may have affected school performance and practices. It is important to note that the mechanisms discussed above may play out differently depending on institutional features or specific local contexts. In terms of autonomy, for example, when teachers and administrators do not have relevant knowledge or decision-making capacity, autonomy may not necessarily lead to increased educational outcomes (Smith, 1985). The existing level of competition and public school competitiveness in a given context can also mediate the competitive effects of school choice (Rouse & Barrow, 2009). The existing level of competition matters because, when schools already face high competition, a new program may not generate much additional competitive pressure. Additionally, if schools are already effective and efficient, there is less room for improvement. Families may also be much less likely to use school choice when they are satisfied with their assigned school district. In these cases, the program may not introduce much competition and will have little impact on school productivity.

How School Choice Affects School Segregation

Some theories predict how school choice affects segregation. For example, *out-group avoidance theory* posits that school choice increases segregation because more advantaged families (e.g., white families or families with college-educated parents) tend to take advantage of choice opportunities to distance themselves from low socioeconomic or minority families (Bifulco et al., 2009). This theory is consistent with the results of voucher studies; research has shown that, among low-income families, families with a higher level of education are more likely to participate in voucher programs. In contrast to out-group avoidance theory, *liberation theory* predicts that school choice decreases school segregation because school choice allows families living in segregated neighborhoods to attend schools located outside their residential areas (Archbald, 2003). According to Bifulco et al (2009), this outcome is likely to occur when school choice programs are implemented in areas with a high level of segregation, which suggests that how school choice affects segregation depends a status quo of segregation.

In Seoul, the existing level of school segregation before the implementation of the choice policy was relatively low. This was mainly due to random student assignments occurring within districts that are socially mixed (Kang, 2007). The size of a school district is usually equivalent to the size of a municipality (Kang, 2007), which comprises diverse communities in terms of socioeconomic levels. Because students were randomly assigned within a socially mixed district, schools are socially integrated as well. Thus, liberation theory may not accurately describe how the Seoul school choice policy segregates students.

Rather, due to a high level of integration, what out-group avoidance theory predicts may have occurred in Seoul. That is, some high SES or high-achieving students may have exercised school choice to distance themselves from students from disadvantaged backgrounds. This

scenario is likely to occur due to Seoul's school choice policy design. The policy was designed in a way that guarantees every student has an equal chance to apply and be admitted to all types of schools except autonomous private schools. Autonomous private schools' application requirements (i.e., students' middle school GPA is above the median) coupled with high tuition fees limit low-income and low-achieving students' access to them. These features of the policy may have encouraged high achieving students to apply to autonomous private schools in order to segregate themselves from low-income or low-achieving students. Their departure may lead to the high concentrations of low-achieving and low SES students in traditional public, private, and autonomous public schools.

Research Questions

This study examines how the Seoul school choice policy has affected student achievement, school practices, and segregation. It is important to note that this study analyzes achievement changes for all students in Seoul rather than just looking at achievement changes for students attending traditional public schools. This is because, as discussed above, the choice policy may have substantially changed student compositions across different types of schools. According to Hsieh and Urquiola (2006), when school choice also introduces sorting, there is no instrument to isolate the effects of sorting from the effects of expanding school choice. Thus, following Hsieh and Urquiola's approach, this study examines whether the choice policy has improved the average achievement of all students in Seoul. Measuring the average change is expected to net out achievement variation induced from changes in student composition (Hsieh & Urquiola, 2006).

Additionally, this study examines the effect of Seoul's school-choice policy on school practices by comparing how autonomous private schools change their practices in comparison to traditional private schools. Because autonomous private schools' budgets depend on their student enrollments, autonomous private schools may have changed their practices in ways that increase technical efficiency and school productivity using their autonomy in order to attract students and their families. This means that changes occurring in autonomous private schools are likely to show how market-based pressures shape school practices. Thus, we examined how market-based pressures affect school practices by examining how autonomous private schools have changed their practices from the past. Finally, distributional effects of the Seoul school choice policy are examined by looking at how the reform has changed student sorting by socioeconomic status and achievement level across different types of schools and school districts

Specifically, I ask: i) did Seoul's school choice policy increase overall academic achievement levels in Seoul? ii) How did the Seoul school choice policy affect autonomous private schools' expenditures, personnel policies and practices, and curriculum in comparison to traditional private schools? iii) How did the school choice policy change student sorting by socioeconomic status and achievement level across different school districts and school types?

CHAPTER 6 DATA AND ESTIMATION STRATEGIES

Data

CSAT data. In order to examine how the school choice policy has affected student achievement, I utilize CSAT Korean and English scores from 1994 to 2015. The CSAT is used for college admission in Korea. It aims to measure knowledge and skills that are assumed to be important for academic success in college. Students take the CSAT exam in November at the end of their final school year in high school. The CSAT data for this study was obtained through the Ministry of Education (MOE). The data includes CSAT scores for every student who took the test from 1994 to 2015 across the nation. Individual student scores are provided with limited information about students, such as gender and school districts. The data from 1996 to 2008 does not provide their school identifiers for confidentiality reasons. However, data from 2009 to 2015 does have school identifiers because the judiciary ruled that the MOE should reveal that information beginning in 2010. CSAT scores were nationally standardized at a mean of 100 with a standard deviation of 20 each year.

The school choice policy was officially announced on August 30, 2009 and was enacted in the 2010 school year. Thus, data from 1996 to 2009 includes the CSAT scores of students who attended high school before the introduction of school choice. On the other hand, the CSAT scores from 2010 show the achievement of students who attended high school after the implementation of the school choice program (see Figure 6.1 for a timeline). The data also includes students who graduated in the previous years and retook the exam. However, this study excludes these students because their dates of high school attendance are unverified. The data

also includes students attending vocational school. These students were not affected by the policy change because vocational schools allowed students to apply to schools of their choice even before the introduction of the policy. It is impossible to identify who attended vocational school because the MOE data does not include students' school information. Thus, even though vocational-school students were not affected by the policy, this study includes vocational-school students' scores in its analysis.

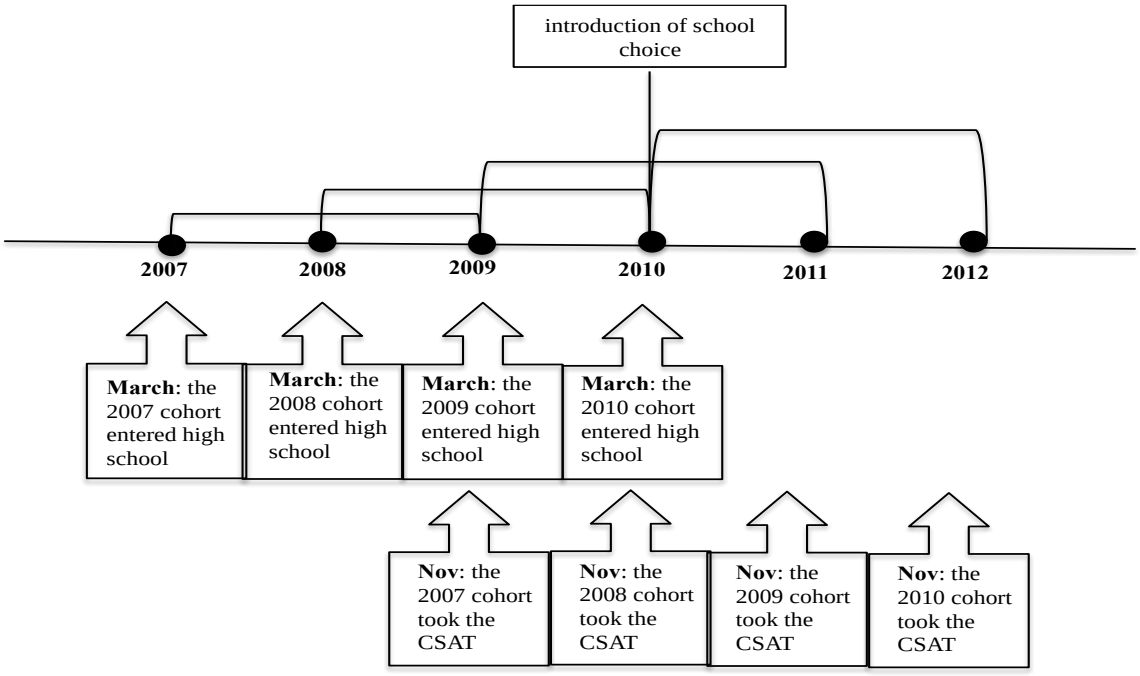


Figure 6.1. CSAT timeline for high school students who entered and graduated before and after the introduction of the school choice policy

However, because only a small percentage of vocational school students take the CSAT, I expect that including these students will not significantly affect the results of the analysis. I also dropped the observations from 2002 because the distribution of average CSAT achievements across years showed an implausible outlier for 2002, which might reflect coding errors for that year. Additionally, I dropped data from 2008 because it only reports students' competency levels without providing their actual scores.

Using student scores, I calculated average achievements for a treatment group (i.e., Seoul) and a control group (i.e., Incheon) for English and Korean. I use only these two subjects because, for other subjects (such as mathematics, social studies, and science), students select and take a subset of a test as opposed to the whole test. Korean and English are thus the only subjects in which all students take the same test.

EDSS school administration data. In order to examine how the school choice policy has affected school practices, I analyze school panel data on school administration from 2009 to 2015. The data was obtained through the EduData Service System (EDSS). Using a stratified sampling strategy, the EDSS selects 70 percent of schools across the nation and provides their administrative data and students' CSAT scores. The data has a very rich set of school information, such as school finance, teacher characteristics, and curriculum.

My analytical sample consists of school-by-year observations of traditional and autonomous private schools between 2009 and 2015 because the MOE decided to open the data to the public starting in 2009. The school choice policy was enacted at the beginning of the 2010 school year, which means I have data on one time point prior to the date the school choice policy took effect, as well as data for six time points after.

Variables

Table 6.1 presents selected key variables. The dependent variables include CSAT Korean and English scores, various measures for school practices, and segregation and isolation indices. My analysis is based on comparisons between: (a) schools in Seoul and those in another region, as well as between (b) autonomous private schools and traditional private schools across years.

As such, of particular interest to this study are variables (i.e., independent variables) that allow for the identification of regions where schools are located, years in which data was collected, and school types.

Measures of school practices. Based on the hypotheses presented above, I examine how competition changed schools' practices and polices in the following categories: (a) expenditures, (b) curriculum, and (c) personnel policies and practices. For resource allocation, I examine total expenditures per pupil and the allocation of these expenditures, including instructional activities, after-school curriculum, and staff salaries. I also look at conventional measures of school resource use, such as pupil-teacher ratios and class sizes.

In personnel policies and practices, I look at the percentage of teachers with advanced certifications, those with fixed-term contracts, and those hired on an hourly basis. Additionally, I consider the average years of teaching, how many hours teachers spend on administrative work per week, and differentiation rates in incentive pay.

I also examine the allocation of instruction time for core academic subjects such as English, Korean, math, and social studies. For these subjects, I look at the number of instructional hours per week. I also consider the number of school days per year and the number of after-school programs.

Measures for school segregation. Following Ladd et al. (2009), I use the isolation index to measure the degree to which disadvantaged students are segregated from other students. For the purposes of this study, disadvantaged students are defined as students who are eligible for free or reduced lunch (FRL). The isolation index measures the extent to which disadvantaged students are concentrated in schools with other students like themselves, thereby indicating the extent to which disadvantaged students are isolated from more advantaged students.

$$\text{Isolation index (I):}\quad I = \Sigma i\,(DIi / DIseoul) * (DIi / Ni)) \tag{3}$$

where DIi is the number of disadvantaged students in school i, Ni is the total number of students in the school, and DIseoul is the number of disadvantaged students in Seoul.

Table 6.1. List of key variables

Variable	Source
Academic outcomes	
CSAT Korean scores	CSAT data
CSAT English scores	CSAT data
Measures of segregation	
Isolation index	EDSS data
Resource allocation	
Per pupil total expenditures	EDSS data
Expenditure in instructional activities	EDSS data
Expenditure in after-school curriculum	EDSS data
Expenditure in staff salary	EDSS data
Pupil-teacher ratio	EDSS data
Class sizes	EDSS data
Personnel policies and practices	
Percentage of teachers with fixed-term contracts	EDSS data
Teachers with advanced certificates	EDSS data
Teachers working on an hourly basis	EDSS data
Average years of teaching experience	EDSS data
Average hours spent on administrative work per week	EDSS data
Differential rate in incentive payment	EDSS data
Curriculum	
Instructional hours for English	EDSS data
Instructional hours for Math	EDSS data
Instructional hours for Korean	EDSS data
Instructional hours for social studies	EDSS data
The number school days per year	EDSS data
The number of after-school programs	EDSS data

Estimation Strategy

Effects of school choice on academic achievement. Following Dee and Jacob (2011), this study utilizes a CITS design to measure the effect of the Seoul school choice policy on academic achievement. When examining data collected over the course of years, researchers face the possibility that other confounding variables in history might have affected a given treatment group. If I were to find a significant difference in student achievement after 2010 in Seoul, for instance, I would need some way to ensure that this change occurred as a result of the school choice policy, and not other social, economic, and political changes during that time.

To circumvent this issue, CITS compares the deviation from a prior trend in a treatment group with the deviation for a comparison group that is assumed to be less affected by a policy intervention (Dee & Jacob, 2011). One of the biggest challenges in using a CITS design is to identify a plausible comparison group that is unaffected by the policy (Dee et al., 2013). This study relies on the fact that the school choice policy was newly introduced in Seoul, while it has been in place for more than two decades in a control group, Incheon city.

Specifically, in order to investigate how Seoul's school choice policy affects student achievement, this study compares student achievement in Seoul with that of students from Incheon. Seoul borders Gyeonggi province and Incheon, both of which were initially considered as control groups. A basic assumption behind this approach is that, because Incheon and Gyeonggi are physically and economically connected to Seoul, students in these areas would have been affected by most of the same political, economic, and social changes as the students living in Seoul, but they would not have been affected by Seoul's new choice policy.

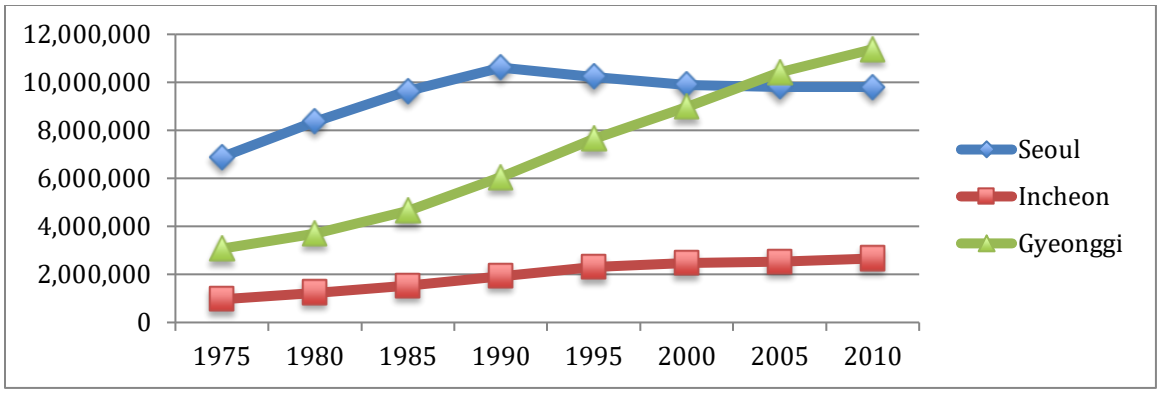


Figure 6.2. Population growth

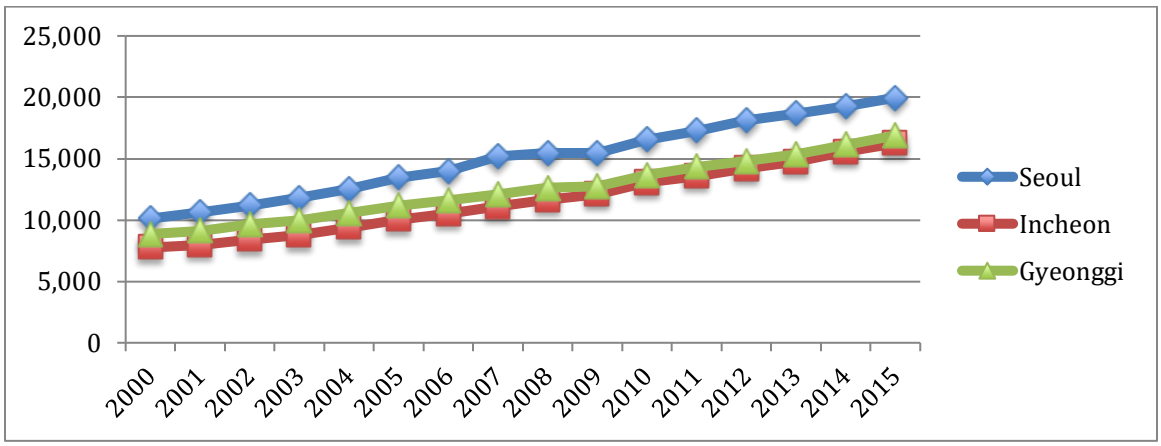


Figure 6.3. Average annual income per person (currency unit 1, 000 won)

However, I rejected Gyeonggi province as a control group because it has a regionally distinct trend in population growth as seen in Figure 6.2. In contrast, population growth in Seoul and Incheon has been relatively stable since the 1990s. In addition, Figure 6.3 shows that income per person in Seoul also developed similarly with that of Incheon. Another reason I dropped Gyeonggi is due to the fact that it did not adopt the HSEP in most of its regions. In contrast, following Seoul, Incheon enacted the HSEP in 1975 and has maintained this policy ever since.

Incheon is the third largest city in Korea bordering Seoul. As of 2016, there are 87 academic high schools in Incheon (see Table 6.2). Traditional public and private schools account for about 60 % and 21% of them, respectively. The rest are special purpose schools (11%), autonomous public (6%), and autonomous private schools (2%). Incheon also used a within-

district random method for school assignment until it adopted a universal school choice program in 1996.

Table 6.2. Number of high schools by school type in Incheon

	2009	2010	2011	2012	2013	2014	2015
Public schools	48	50	53	50	51	51	51
Private schools	18	18	18	18	18	18	18
Autonomous public schools	0	1	1	4	5	5	5
Autonomous private schools	0	0	1	1	1	1	2
Special purpose schools	6	7	7	8	9	9	9

Incheon implemented school choice in 1996 and has maintained it since then. However, Incheon's school choice policy differs from that of Seoul's in that Incheon introduced limited and controlled forms of school choice because schools' budgets are not linked to student enrollments. Furthermore, the school choice policy did not change the existing level of autonomy in its schools.

In contrast, Seoul, which is similar to Incheon in many important regards, did not allow parental school choice until 2010, when it implemented a universal school choice policy. Seoul introduced competition forcefully by making autonomous private schools' budgets depend on their student enrollments. The Seoul choice policy also offers autonomous private schools a great deal of autonomy, which allows them to respond to choice-induced competition more effectively.

It is important to note that Incheon also recently introduced two autonomous private schools and five autonomous public schools (See Table 6.3). However, because autonomous private schools account for only 2% of the total number of academic high schools, they might have limited impacts on the school system. I expect that achievement changes induced by the establishment of autonomous schools will be controlled by comparing these two cities because

similar percentages of autonomous public schools were introduced in both cities (8% in Seoul and 6% in Incheon).

In sum, the key similarity between Seoul and Incheon pre 2010 is that competition and autonomy were limited because public and private schools were publicly financed were thus under strong governmental control. The key difference between Seoul and Incheon post 2010 is that only Seoul significantly increased market-based pressures by introducing autonomous private schools and making student enrollments determine budgets. This allows me to treat Incheon as a plausible comparison group and to identify the potential effects of the policy change in Seoul.

Following the logic of the CITS research design, I estimate the following linear regression model that analyzes the Seoul versus Incheon contrast:

$$Y_{tc}=\beta_0+\beta_1(YEAR)_t+\beta_2(SEOUL)_c+\beta_3(CHOICE)_{tc}+\beta_4(YEAR \times SEOUL)_{tc}+\beta_5(CHOICE \times YEAR)_{tc}+\beta_6(CHOICE \times SEOUL)_{tc}+\beta_7(CHOICE \times YEAR \times SEOUL)_{tc}+\varepsilon_{ts} \quad (1),$$

where Y_{tc} represents the performance for Seoul and Incheon in the year t. Three different performance measures are used: average CSAT English and Korean scores across Seoul and Incheon, the share of students who achieved in the 90th percentile or above nationally, and the proportion of students who achieved in the 10th percentile or below nationally. $YEAR_t$ is a trend variable centered at zero in the final year before the school choice reform (2009). $SEOUL_c$ is a dichotomous variable representing Seoul (Seoul=1) versus non-Seoul (Seoul=0). $CHOICE_{tc}$ is another dichotomous variable indicating the pre- and post-intervention periods (1=post-intervention).

β_0 is the mean performance of the comparison group at the baseline year (year=0 and Incheon=1). β_1 is the pre-choice time-trend for Incheon. β_2 is the mean difference between

Incheon and Seoul at baseline. $\beta_1+\beta_4$ is the time trend for Seoul during the pre-choice period. β_3 is the mean shift for Incheon after the implementation of the policy. β_5 is the trend for Incheon in the post-choice period. β_6 is the mean shift for Seoul after the implementation of the policy. β_7 is the trend for Seoul in the post-reform period.

My analysis thus has two time series components. One of them represents the mean and growth in achievement scores prior to the introduction of the choice policy in 2010, and the other corresponds to the means and growth in achievement scores after the introduction of the choice policy in 2010. The regression coefficient β_6 of the *CHOICE x SEOUL* interaction captures a differential mean shift associated with the choice policy in Seoul. The three-way interaction term β_7 estimates a differential shift in the time trend after the choice-program implementation in Seoul. I selected years from 1995 to 2009 as the pre-intervention period because Seoul students attended school before the implementation of the choice policy during these years. I consider years after 2010 as the post-intervention period. Following Dee et al. (2013), the total effects of Seoul's school choice policy in this model as of 2015 can be represented as the mean shift associated with the policy in Seoul plus the effects of 6 years under the school choice policy for Seoul: $\beta_6+ 6 \times \beta_7$.

I use the cities Seoul and Incheon as a unit of analysis because the CSAT data prior to 2009 provides student scores without their school identifiers. One of the main concerns of using Seoul and Incheon as a unit of analysis is that, due to a small sample size, this model may not have enough statistical power to detect significant effects of the policy (N=38). In order to address this concern, I run a separate analysis using 2009-16 CSAT data, with schools as a unit of analysis. The 2009-16 CSAT panel data includes school identifiers; which allows me to use schools as a unit of analysis and employ a school-fixed effects model. However, because only

one data point is available before the introduction of school choice, CITS cannot be utilized for this analysis. Instead, I employ a difference-in-differences (DD) model that does not condition on pre-reform trends.

I estimate the following DD model that uses schools in Incheon that did not experience the reform as a control group.

$$Y_{it} = \beta_0 + \beta_1 POST_t + \beta_2 POST_t \cdot SEOUL_i + \mu_i + \varepsilon_{it.} \quad (2),$$

where Y is measures of academic performance for Seoul and Incheon in school i in year t. A time-dummy variable, POST, captures school performance trends that Seoul and Incheon had in common between and after the reform. The coefficient of interest, β_2, shows how the reform affects the performances of Seoul schools relative to those of Incheon. μ_i refers to unobserved school fixed effects that account for all the unobserved school characteristics stable over time. School-fixed effects account for changes in outcomes that are induced by unobserved differences in school characteristics. ε_{it} is the idiosyncratic error term that changes across time for each school. Robust standard errors are clustered at the city level.

The key assumption of these models is that outcome trends in Incheon schools provide a valid counterfactual for what would have happened in Seoul schools if the school choice policy had not been implemented. This assumption can be violated if there are regional specific changes in other determinants of outcomes or if student compositions varied contemporaneously with the start of the policy (Dee et al., 2013). In order to address this concern, this study provides trends in measures for other policy domains and student compositions for Seoul and Incheon. I find that there are no regional specific trends in these measures.

Effects of school choice on school practices. This study examines how increased market pressure coupled with autonomy change school practices by analyzing how autonomous private

high schools change their practices after the reform. In order to isolate practice variation induced by the reform from variation induced by other social, economic, and policy changes, this study takes advantage of the fact that the reform introduced different levels of competition and autonomy across different types of schools. Specifically, in order to estimate the causal effects of the reform on school practices in autonomous private schools, this study compares the deviation from prior practices among autonomous private schools with the comparable deviation for traditional private schools that are arguably less affected by the policy using a Difference-in-Differences (DD) design.

I estimate the following linear regression model in order to measure the effects of school choice on school practices by comparing practice changes in autonomous private high schools with those of traditional private high schools,

$$Y_{st}=\beta_0+\beta_1 CHOICE_t +\beta_2(CHOICE_t \times AUTOPRIVATE_s) +\theta_i+\mu_s +\varepsilon_{st} \quad (3),$$

where Y_{st} is a measure of practice for school *s* in year *t*. School practices are examined in three categories: expenditure, curriculum, and personnel practices. Expenditure includes total expenditures per pupil and budget allocation on instructional activities, after-school curriculum, and staff salaries. Additionally, conventional measures of school resources—such as pupil–teacher ratios and class sizes—are used as outcomes. The following are examined in personnel policies and practices: the percentage of teachers with advanced certifications, those with fixed-term contracts, teachers hired on an hourly basis, average years of teaching, hours teachers spend on administrative work per week, and differentiation rates in incentive pay. Finally, for curriculum, I examine the allocation of instruction time for English, Korean, math, and social studies. The number of school days per year and the number of after-school programs are also used as outcomes. $AUTOPRIVATE_{s,}$ is a dichotomous variable representing autonomous private

schools (AUTOPRIVATE =1). $CHOICE_t$ is another dichotomous variable indicating the pre- and post-intervention periods, so that this variable takes on a value of 1 from 2010 and 0 for the previous year. The regression coefficient β_2 captures a differential mean shift associated with the choice policy for autonomous private high schools. μ_s represents school fixed effects. ε_{st} is an idiosyncratic error term.

Effects of the school choice policy on school segregation. In order to investigate how the Seoul school choice policy has affected school segregation, this study examines how the school choice policy affected student sorting by socioeconomic status and achievement level. I also look at segregation trends over time and examine whether there are significant differences in the measures of segregation before and after the implementation of the school choice policy in Seoul.

CHAPTER 7 THE EFFECTS OF SCHOOL CHOICE ON STUDENT ACHIEVEMENT

This section examines whether Seoul's school choice policy increases overall academic achievement levels in Seoul by comparing Seoul's student achievement trends to Incheon's student achievement trends from 1995 to 2015.

Main Results

Table 7.1 provides descriptive statistics for Seoul and Incheon. The table reports the average CSAT scores, the proportion of students who achieved in the 90th percentile or above nationally, and the proportion of students who achieved in the 10th percentile or below nationally for English and Korean during the pre-reform (1995-2009) and post-reform years (2010-2015) for Seoul and Incheon. The average achievement difference between Seoul and Incheon is 2.37 for English and 1.82 for Korean in the pre-reform period and 3.03 and 0.56 in the post-reform period. There existed small achievement gaps between these two regions, and only slight changes occurred in these gaps in the post-reform period. The same trend exists for the other outcomes such as the percentage of students who achieved in the 90th percentile or above or the 10th percentile or below.

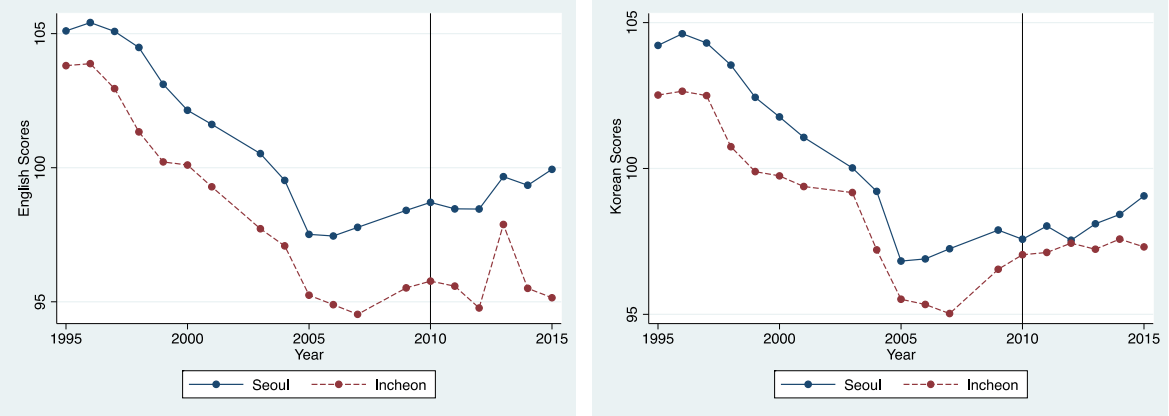
Table 7.1. Descriptive statistics of outcomes

	Seoul		Incheon	
	2005-2009	2010-2015	2005-2009	2010-2015
Mean in English	101.27	99.10	98.90	95.78
Mean in Korean	100.66	98.13	98.84	97.30
Share achieving top 10% in English	12.60	11.09	7.53	5.89
Share achieving top 10% in Korean	11.49	10.12	8.28	7.25
Share achieving bottom 10% in English	9.90	12.18	11.05	12.80
Share achieving bottom 10% in Korean	10.31	12.92	11.36	11.77

The outcomes are plotted year-by-year in Figure 7.1, Figure 7.2, and Figure 7.3, respectively. Figure 7.1 displays trends in English and Korean for Seoul and Incheon, separately. The figure shows that pre-school choice trends are similar between Seoul and Incheon though not exactly parallel. The achievement of Seoul and Incheon decreased for both subjects until 2005. However, after 2005, Seoul experienced a shift in English and Korean achievement, and the graphs showed upward trends. In contrast, achievement in Incheon declined slightly further until 2007. From 2007, the achievement of Incheon started to increase as well. Even though trends after 2005 are slightly divergent from their previous trends, scores still developed quite similarly in the pre- and post-reform periods and achievement gaps between the two regions remained small.

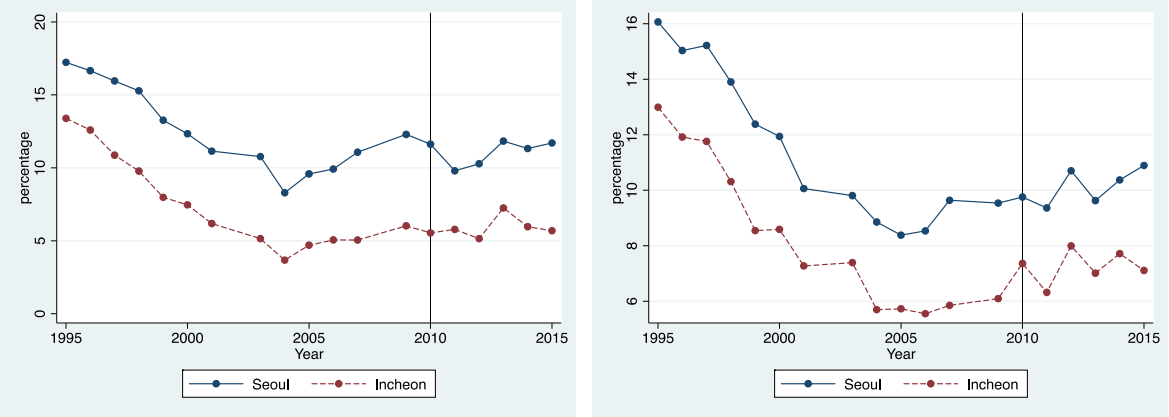
Figure 7.2 and Figure 7.3 graph the proportions of low (10^{th} percentile or below nationally) and high achievers (90^{th} percentile or above nationally) for Seoul and Incheon. The figures show that these measures also developed similarly between Seoul and Incheon for English and Korean. Seoul had a higher percentage of high achieving students during pre- and post- reform periods. The proportions of low-achieving students also developed similarly

between Seoul and Incheon during these periods. The proportion of low-achieving students increased in both Seoul and Incheon during the last two decades.



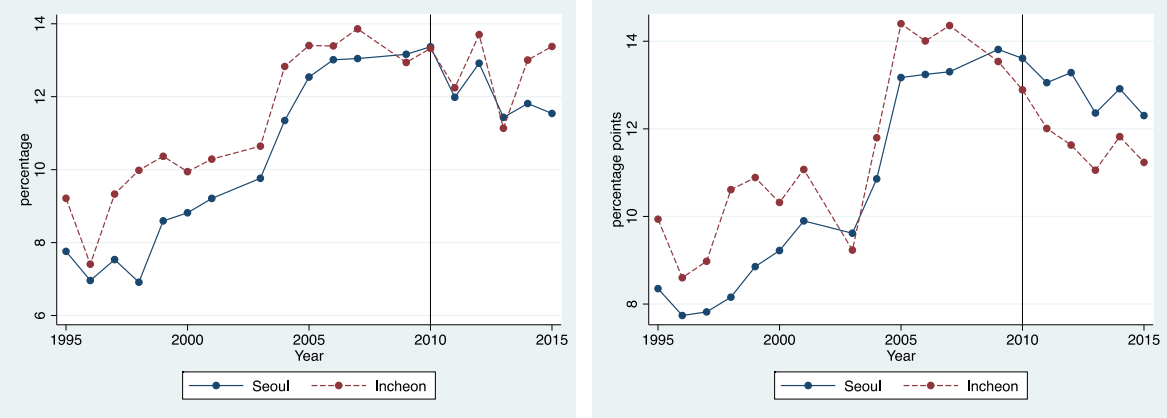
(a) English (b) Korean

Figure 7.1. Average English and Korean achievement



(a) English (b) Korean

Figure 7.2. Share of students who achieved in the 90th percentile or above nationally



(a) English (b) Korean

Figure 7.3. Share of students who achieved in the 10th percentile or below nationally

Table 7.2 presents the result of the CITS model that compares Seoul performance changes during pre- and post-reform periods with the corresponding changes of Incheon. Standard errors clustered at the city level are shown in parenthesis. The results show statistical tests and effect size estimates for mean (CHOICE*SEOUL) and slope (CHOICE*SEOUL*TIME). The results presented in the table correspond to the trends shown in Figure 7.1, Figure 7.2, and Figure 7.3. First, the magnitudes of coefficients indicating mean and slope differences between Seoul and Incheon in the pre- and post-reform periods are quite small compared to the scale of test scores (which is set up to have a mean of 100 and a standard deviation of 20). Also, none of the coefficients indicating mean and slope differences are significantly different from zero for both subjects. The results suggest that the Seoul school choice policy did not significantly affect English and Korean achievement. The estimated Seoul school choice effects as of 2015 (β_6+ 6 x β_7) are 0.475 for English and 0.048 for Korean.

Table 7.2. Estimated CITS Seoul's school choice effects

	Mean		Percentage of top 10% students		Percentage of bottom 10% students	
VARIABLES	English	Korean	English	Korean	English	Korean
time	-0.819***	-0.649***	-0.681***	-0.613***	0.455***	0.435***
	(0.0703)	(0.0621)	(0.112)	(0.0736)	(0.0602)	(0.0629)
Seoul	3.015***	1.522**	5.856***	3.162***	-0.342	-0.327
	(0.789)	(0.697)	(1.254)	(0.826)	(0.675)	(0.706)
choice	2.594**	2.731***	2.740	3.015**	-1.393	-1.661*
	(1.071)	(0.946)	(1.702)	(1.121)	(0.916)	(0.958)
time*Seoul	0.0936	-0.0429	0.114	-0.00606	0.117	0.105
	(0.0994)	(0.0879)	(0.158)	(0.104)	(0.0851)	(0.0890)
choice*time	0.807***	0.712***	0.778*	0.668**	-0.455**	-0.704***
	(0.245)	(0.216)	(0.389)	(0.257)	(0.210)	(0.219)
choice*Seoul	-0.719	-1.356	-0.974	-0.866	0.832	1.322
	(1.514)	(1.338)	(2.406)	(1.586)	(1.296)	(1.355)
choice*time*Seoul	0.199	0.234	-0.0238	0.169	-0.434	-0.0613
	(0.346)	(0.306)	(0.551)	(0.363)	(0.296)	(0.310)
Observations	38	38	38	38	38	38
R-squared	0.926	0.912	0.853	0.888	0.875	0.845

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7.3 presents our DD estimates of the effects of Seoul's school choice on CSAT English and Korean. These scores are estimated as a function of time, an indicator for Seoul, and their interactions. The CSAT scores from 2009 to 2015 were utilized for this analysis. None of the coefficients for the effects of the reform are significantly different from zero, which suggests that Seoul's school choice has no significant effect on student achievement. This result is consistent with findings from the CITS models. The estimated effects of Seoul's school choice policy as of 2015 are 0.531 for English and 0.19 for Korean, which are similar to those of CITS estimates (0.475 for English and 0.048 for Korean).

Table 7.3. Estimated DD Seoul's school choice effects

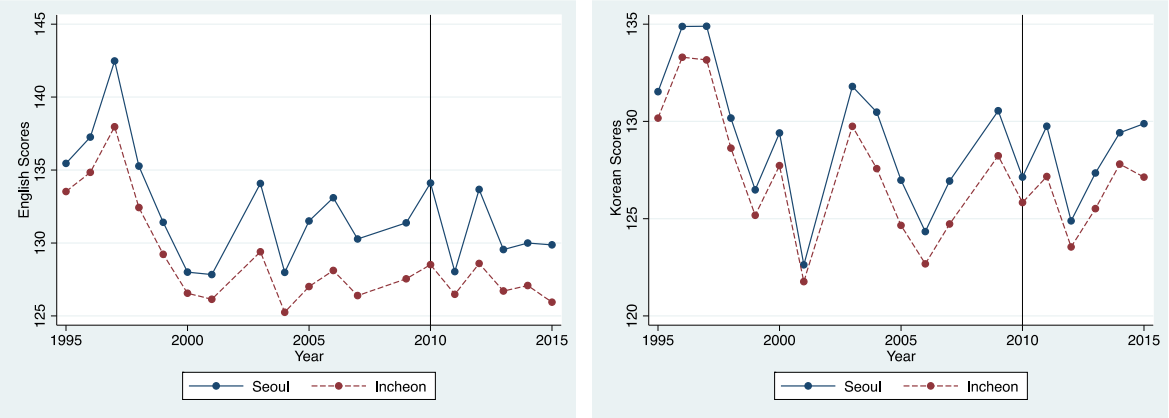
	Mean	
VARIABLES	English	Korean
Seoul*post	0.531	0.190
	(0.507)	(0.730)
Post	-1.003**	-0.115
	(0.417)	(0.658)
Observations	2,104	2,104
R-squared	0.004	0.000
Number of schoolid	307	307

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Robustness Check

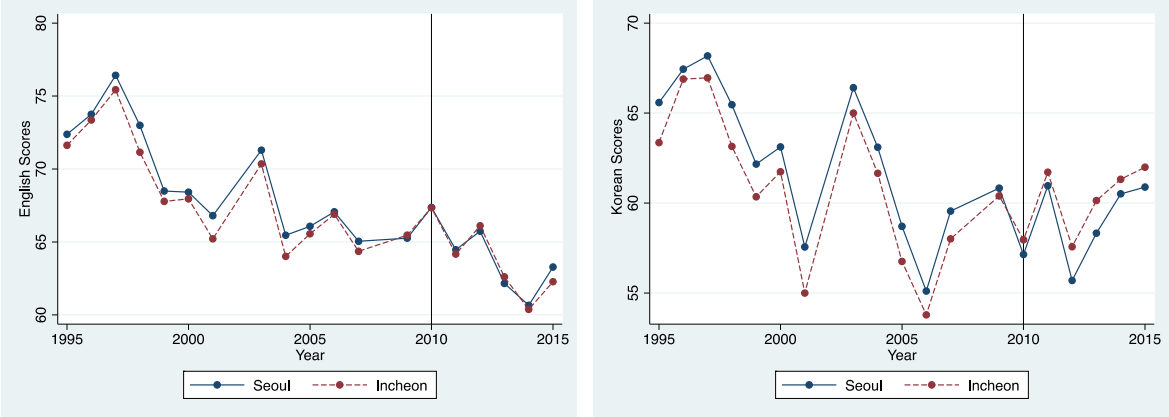
Effect heterogeneity. If the Seoul choice program has led to the concentration of high-achieving students in autonomous private schools and the concentration of low achieving students in traditional public and private schools, school choice might have positive impacts for students attending autonomous private schools and negative impacts for students enrolled in traditional schools. In this case, achievement gains of autonomous-school students may cancel out the achievement losses of traditional-school students, and we might not be able to see any significant changes for overall student achievement. In order to check whether the effects of school choice differ depending on students' academic levels, I run Equation (1) separately for students who achieved in the 90th percentile or above and students who achieved in the 10th percentile or below within each city. Figure 7.4 and Figure 7.5 show trends in average achievement for these subgroups of students in Seoul and Incheon. Even though these trends fluctuated more, in comparison to the trends of average achievement for the whole student population, they still indicate that achievement changes were almost equivalent for Seoul and

Incheon in the pre- and post-reform years. The average achievement shows slight downward trends for both cities for both subjects over the whole period. CITS regression estimates are shown in Table 7.4. For both groups, none of coefficients for mean change (CHOICE*SEOUL) and slope change (CHOICE *SEOUL*TIME) after the implementation of school choice for English and Korean are significantly different from zero, which suggests that school choice might not have significant impacts on student achievement regardless of students' academic levels.



(a) English (b) Korean

Figure 7.4. Trends in English and Korean achievement for students who achieved 90 percentile in the CSAT within Seoul and Incheon



(a) English (b) Korean

Figure 7.5. Trends in English and Korean achievement for students who achieved 10 percentile in the CSAT within Seoul and Incheon

Table 7.4. Estimated CITS Seoul school choice effects, by subgroup

	90th or above percentile students		10the percentile students	
VARIABLES	English	Korean	English	Korean
time	-0.723***	-0.517**	-0.723***	-0.661***
	(0.211)	(0.211)	(0.151)	(0.210)
Seoul	4.288*	2.342	0.417	1.256
	(2.363)	(2.362)	(1.693)	(2.359)
choice	3.953	1.202	4.449*	1.531
	(3.208)	(3.206)	(2.298)	(3.201)
time*Seoul	0.157	0.0770	-0.0543	-0.0428
	(0.298)	(0.298)	(0.213)	(0.297)
choice*time	0.353	0.814	-0.426	1.276*
	(0.734)	(0.734)	(0.526)	(0.733)
choice*Seoul	0.0121	-0.916	-0.766	-2.298
	(4.537)	(4.534)	(3.250)	(4.527)
choice*time*Seoul	-0.342	0.0595	0.192	-0.000975
	(1.038)	(1.037)	(0.744)	(1.036)
Observations	38	38	38	38
R-squared	0.549	0.351	0.777	0.497

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Using a different year for program implementation. In the models employed in this study, it is assumed that the Seoul school choice was in effect from 2010 because the program officially started with the beginning of the 2010 school year. However, discussion surrounding the introduction of the program could have affected school practices. Furthermore, the implementation of the program was officially announced in 2009. Thus, it is reasonable to think that the program could have affected school practices and student achievement from 2009. Table 7.5 presents results from a model that considers the Seoul school choice as being first in effect in 2009. Results are similar to those of the previous model, which views 2010 as a starting point, for English and Korean. In sum, setting up the introduction of school choice one year earlier did

not change the results: the impact estimates are not statistically significant, which suggests that the school choice reform has no significant impact on student achievement.

Table 7.5 Estimated CITS Seoul school choice effects from 2009 to 2015

	Mean	
VARIABLES	English	Korean
time	-0.941***	-0.770***
	(0.0566)	(0.0443)
Seoul	2.974***	1.640***
	(0.589)	(0.461)
choice	2.628***	2.755***
	(0.708)	(0.554)
time*Seoul	0.100	-0.0335
	(0.0801)	(0.0627)
choice*time	0.957***	0.879***
	(0.140)	(0.110)
choice*Seoul	-0.630	-0.992
	(1.001)	(0.784)
choice*time*Seoul	0.129	0.0982
	(0.198)	(0.155)
Observations	38	38
R-squared	0.965	0.967

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

It is also possible to presume that potential effects of the policy may be observed in the CSAT scores administered in as early as 2012 when the first cohort of the choice policy (who entered high school in 2010) took the exam after they spent three years in high schools (2010-2012). This is because the Seoul school choice policy was first implemented for students entering high school in 2010. In this case, defining pre- and post-treatment periods by 2010, rather than 2013, could underestimate the true effects of the school choice policy. Table 7.6 and Table 7.7 present results from a model that consider the Seoul school choice as being first in effect in 2013. The results of this model are consistent with those of previous models that use

2010 and 2009 as a program-starting year. Regression coefficients showing policy effects are not significantly different from zero, which means that the policy have no significant impacts on student English and Korean achievement.

Table 7.6. Estimated CITS Seoul school choice effects from 2012 to 2015

	Mean	
VARIABLES	English	Korean
time	-0.707***	-0.525***
	(0.0728)	(0.0673)
Seoul	3.057***	1.121
	(0.847)	(0.783)
choice	2.611	2.457
	(1.609)	(1.485)
time*Seoul	0.0883	-0.0786
	(0.103)	(0.0951)
choice*time	0.584	0.521
	(0.550)	(0.508)
choice*Seoul	-0.867	-1.457
	(2.275)	(2.101)
choice*time*Seoul	0.447	0.570
	(0.778)	(0.718)
Observations	38	38
R-squared	0.886	0.852

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7.7. Estimated DD Seoul school choice effects from 2012 to 2015

VARIABLES	English	Korean
Seoul*post	-0.450	-0.570
	(0.553)	(0.630)
Post	0.00683	0.0915
	(0.429)	(0.510)
Observations	2,104	2,104
R-squared	0.003	0.003
Number of schoolid	307	307

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Policy changes in other domains. Estimation based on CITS and DD will be biased if there were other regional-specific policy changes in Incheon that coincided with the introduction of school choice in Seoul. A high level of centralization existing in the Korean school system reduces this possibility. For example, there remains the central government's influence over school curriculum and finance, two important dimensions of schooling even though the Korean education system has moved toward the decentralization of decision-making authority to lower levels of the government with the enactment of the Local Education Autonomy Act of 1991. Provincial Education Authorities (PEA) are still required to formulate an education budget based on the Ministry of the Interior Act of the central government because a substantial proportion of school budgets in PEAs come from the central government (Jeong, Lee, & Cho, 2017). Furthermore, schools are required to teach a national curriculum in Korea (Park et al., 2011).

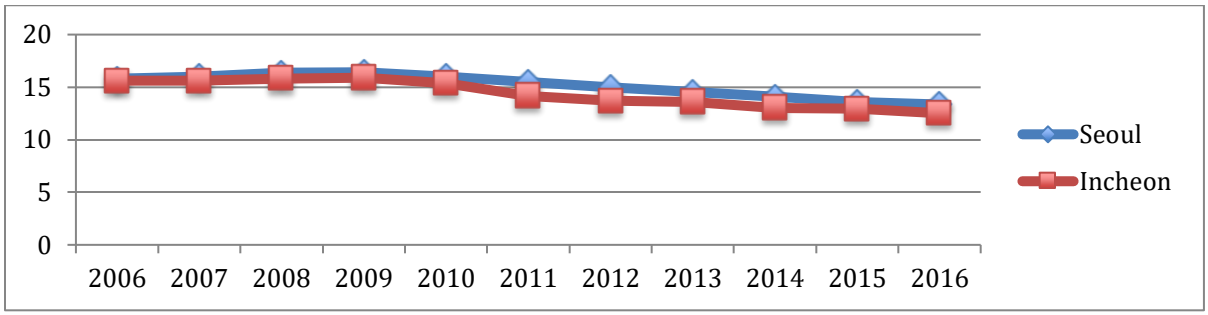
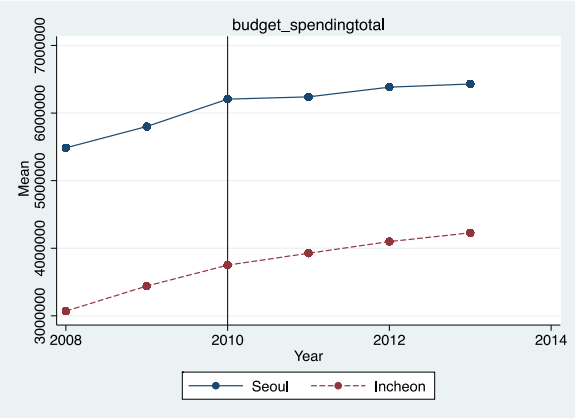
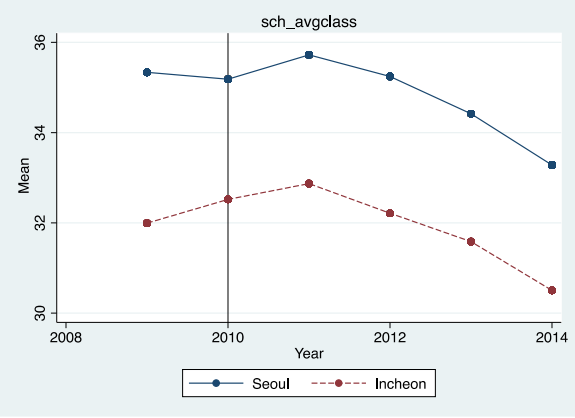


Figure 7.6. Student-teacher ratios from 2006 to 2016

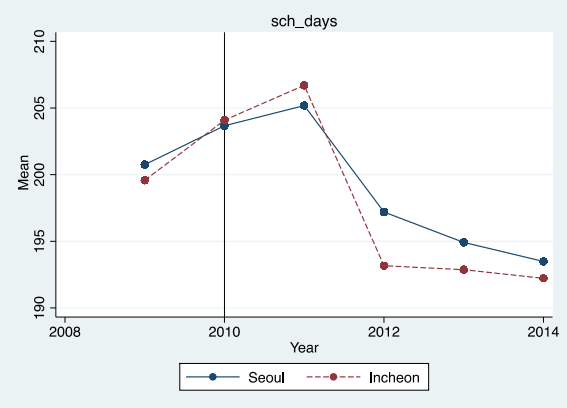
Figure 7.6 displays trends in student-teacher ratios, a traditional measure of school resources, in Seoul and Incheon from 2006 to 2016. The figure shows that student-teacher ratios in these two regions are almost identical during the last 10 years. Figure 7.7 shows trends in a variety of measures for school resources, practices, and teacher characteristics such as school total expenditure, average class size, number of school days, percentage of tenured teachers, average teaching hour, and average years of teaching experience form 2009 to 2014 (from 2008 for school total expenditures). These graphs show that trends developed similarly between Seoul and Incheon in these measures across these years and there are no regional specific policy changes in these domains.



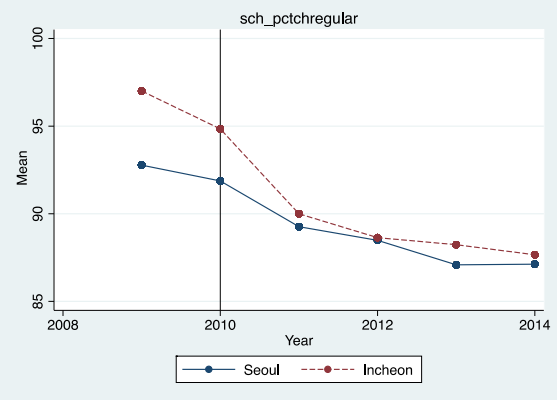
(a) School total expenditure



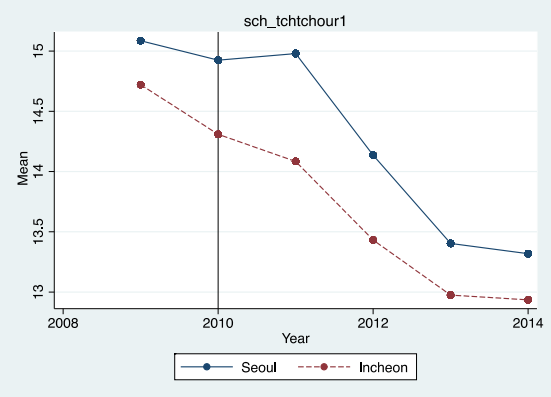
(b) Average class size



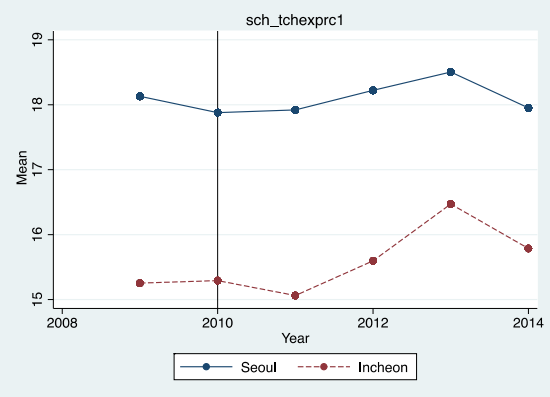
(c) Number of school days



(d) Percentage of tenured teachers



(e) Average teaching hour



(f) Average years of teaching

Figure 7.7. Trends in school resources, practices, and teacher characteristics

Trends in student compositions. Another threat to the causal estimation of a CITS approach arises from regional specific trends in student compositions. In order to identify trends in student compositions in Seoul and Incheon, I analyzed the TIMSS data from 1995 to 2011.[2] Figure 7.8 displays trends in the proportion of students with college-educated parents during this period separately for Seoul and Incheon. The figure suggests that both cities may have experienced similar trends in their student compositions.

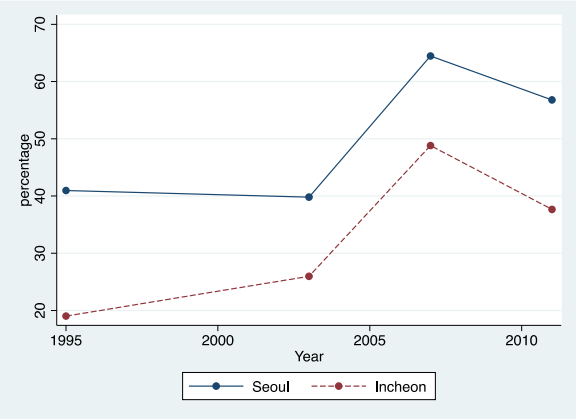


Figure 7.8. Trends in the percentage of students with college-educated parents

These trends on school practices and student composition indicate that there may not have been any regionally distinct policy or student composition changes affecting Incheon's or Seoul's student achievement when the Seoul school choice policy was enforced. This confirms the robustness of the findings of this study.

This section estimates the effects of the policy based on CITS and DD models that leverage the fact that school choice was newly introduced only in Seoul while it has been in place for several decades in Incheon. Results indicate that the reform has no significant impact on student English and Korean achievement. These findings are robust to specific student

[2] The TIMSS study collects data for every four year. I do not include the 1999 data because a city level indicator is not included in the data set.

populations such as those who achieved in the 90th percentile or above and students who achieved in the bottom 10th percentile or below within the city.

CHAPTER 8 EFFECTS OF SCHOOL CHOICE ON SCHOOL PRACTICES

This section examines how market-based competition changes school practices by analyzing how autonomous private schools change their practices in comparison to traditional private schools. The new policy put autonomous private schools under greater market-based pressure by making their budgets depend on their student enrollments. Also, the greater autonomy granted to them makes it easier for them to bring necessary changes in their policies and practices in response to increased competitive pressures. Because their budgets depend on their student enrollments, autonomous private schools may have changed their practices and policies in a way that addresses consumers' demands and preferences to attract them to their schools. Thus, analyzing changes occurring in autonomous private schools may give us insight into how market-based competition shapes school practices.

This section explores how autonomous private schools change their practice and policies in three different domains: expenditures, curriculum, and personnel decisions. In order to isolate practice changes induced by the reform from those induced by other social and economic factors, this study utilizes a DD design that compares the changes within autonomous private schools to the contemporaneous variation in traditional private schools that are arguably less affected by the reform.

Examination of the Integrity of the DD Strategy

The integrity of the DD identification strategy depends on the assumption that parallel trends existed between autonomous private high schools and traditional private high schools before the reform. Given that only one data point in the pre-reform period (i.e., 2009) is

available, it is impossible to show trends for this period. However, the 1974 Equalization Policy makes it possible for me to assume that common trends existed between these two types of schools before the implementation of the school choice policy. Therefore, I will show that schools were under the regime of the Equalization Policy by drawing upon the 2009 data.

Table 8.1. Description of variables

	Pre-reform		Post-reform	
	Traditional	Autonomous	Traditional	Autonomous
Expenditures				
Total expenditures (per student)	5702.25	6073.60	6993.94	8004.67
Education activity expenditures (per student)	109.32	81.02	273.24	374.84
After-school curriculum expenditures (per student)	230.24	239.45	240.93	348.85
Staff salary expenditures (per staff)	49720.17	49890.75	56308.45	55127.53
Average class size	35.70	37.05	34.62	34.18
Pupil teacher ratios	17.46	17.88	15.89	15.24
Curriculum				
Number of school days per year	205.53	205.19	198.61	199.57
After School curriculum	50.50	55.78	59.72	72.73
English time/total academic time	16.73	16.39	17.62	17.33
Korean time/total academic time	16.50	16.03	16.44	16.78
Math time/total academic time	14.58	15.19	15.82	17.96
Social studies time/total academic time	6.32	6.26	5.94	5.00
Personnel Policies				
% teachers with advanced certification	70.51	66.36	68.75	62.89
Average years of teaching	17.46	18.01	17.57	16.60
% teachers with a fixed-term contract	10.41	11.76	14.50	13.14
% teachers hired on a hourly basis	1.72	5.02	2.53	5.91
Differentiation rates in incentives	60.54	62.22	53.81	56.57
Hours spent for administrative work	5.80	3.67	3.27	1.96
parents' participation				
N(schools-years)	74	18	444	108

(unit of currency: 1000 won=$ 1)

Table 8.1 displays the means of individual practices and policies in the pre- and post-reform periods. During the pre-reform period, the table shows small differences between these two types of schools in expenditures, curriculum, and personnel policies and practices. First of all, there exists little variation between these two types of schools in school expenditures. For example, total expenditure is 5,760,250 won and 6,073,600 won for traditional and autonomous private schools, respectively. Traditional private schools (109, 320 won) spent slightly more money for education activities than their autonomous counterparts (81, 020 won). Average salary per staff is almost identical between traditional (49,720,170 won) and autonomous private schools (49,890,750). Also, I found small differences in average class size and pupil teacher ratio; teacher-student ratio is 17.46 in traditional private schools and 17.88 in autonomous private schools. Average class size is 35.77 for traditional private schools 37.05 for autonomous private schools.

Table 8.1 shows that these two types of schools provide a similar curriculum. On average, traditional and autonomous private schools run school for 205.53 and 205.19 days per year, respectively. Differences existing between these two types of schools in the proportions of English, Korean, math, and social studies instructional hours are less than 0.5 percent. The number of after school programs is slightly higher in autonomous private schools (55.78) than traditional private schools (50.5), but the difference is small.

Even though schools were under the strong control of the HSEP, private schools still had autonomy in personnel decisions including teacher hiring before the introduction of the school choice policy. Private schools' autonomy in this area does not seem to lead to large discrepancies between these two types of schools' teacher characteristics. For example, the difference in differentiation rates in incentives is less than 2 percent: 60.54 for traditional private schools and

62.22 for autonomous private schools. The average years of teaching experience is also almost identical between autonomous (18.01 years) and traditional private schools (17.46 years). Additionally, about 10.41 percent of traditional private school teachers and 11.76 percent of autonomous private school teachers were hired with a fixed-term contract.

However, there are slight differences between these two types of schools in some measures of teacher practices and policies. For example, traditional private school teachers (5.9 hours) spent about 2 hours more per week doing administrative work than autonomous private schools (3.67 hours). About 70 percent of traditional private school teachers have advanced certification compared to about 66 percent of teachers in autonomous private schools. The percentage of teachers hired on an hourly basis is also slightly higher in autonomous private schools (5.02 %) than in traditional private schools (1.71 %).

In order to examine whether there are statistically significant differences in expenditures and curriculum during the pre-reform period, I regressed a traditional private school indicator on variables measuring policies and practices in these areas during the pre-reform period (i.e., year 2009). I excluded personnel practices from this analysis because, as explained above, private schools have autonomy in this area even before the implementation policy. Results for each domain are displayed in Tables 8.2, 8.3, respectively. Only a few of the characteristics are statistically significant. Autonomous private schools have a significantly higher average class size, but the difference is only 1.35. The rest of the coefficients for school expenditures and curriculum are statistically insignificant. The results of these analyses indicate that traditional and autonomous private schools are balanced with respect to their practices in expenditures and curriculum. These results provide evidence suggesting that these schools were under the regime of the Equalization Policy and it is highly likely that trends in their practices moved in parallel

before the implementation of the school choice policy, an important assumption of the DD identification strategy.

Table 8. 2. Balance tests for expenditures between traditional and autonomous private schools

VARIABLES	Total expenditures	Education activity expenditures	After-school curriculum expenditures	Staff salary expenditures (per staff)	Average class size	Pupil teacher ratios
Autonomous private school	371.3*	-28.30	9.209	170.6	1.349**	0.418
	(212.6)	(28.90)	(27.22)	(1,365)	(0.611)	(0.318)
Observations	92	91	91	92	91	91
R-squared	0.033	0.011	0.001	0.000	0.052	0.019

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8. 3. Balance tests for curriculum between traditional and autonomous private schools

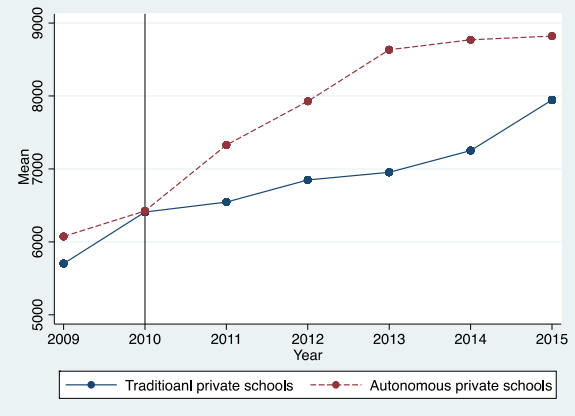
VARIABLES	Number of school days per year	# after school program	% English time	% Korean time	% Math time	% Social studies time
Autonomous private school	-0.346	5.278	-0.334	-0.469	0.615	-0.0644
	(0.360)	(10.38)	(0.460)	(0.407)	(0.400)	(0.517)
Observations	92	92	92	92	92	91
R-squared	0.010	0.003	0.006	0.015	0.026	0.000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

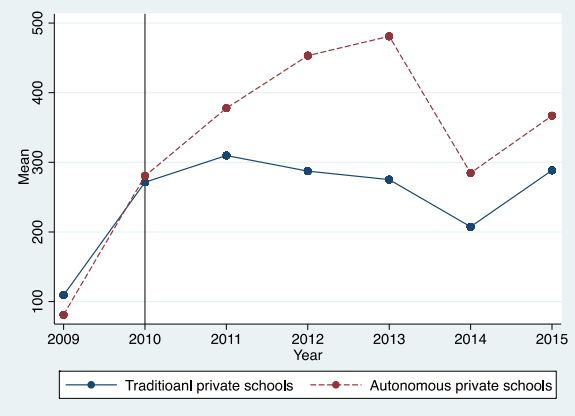
After the reform took effect, however, differences between these two types of schools became larger in curriculum and school expenditures. In contrast, differences in personnel policies and practices between these two types of schools remain at similar levels even after the reform took effect. Figures 8.1, 8.2, and 8.3 below show year-by-year mean trends in these measures in autonomous and traditional private schools, separately.

School Expenditures

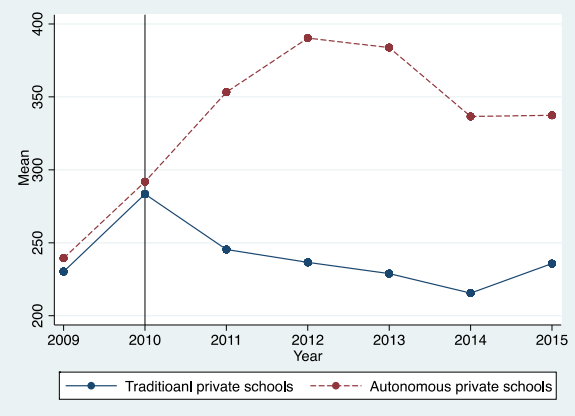
Figure 8.1 illustrates trends in expenditures in autonomous private and traditional private schools respectively. Figure 8.1a shows that, prior to the policy change, school expenditures remain closely aligned until 2010. However, after the school choice reform was implemented, total per-pupil expenditures rose more quickly in autonomous private schools compared to traditional private schools even though the government substantially reduced financial subsidies for these schools. Figures 8.2b and 8.2c show trends in expenditures for educational activities and after-school programs, respectively. These graphs show that autonomous private schools' spending increased in these categories compared to traditional private schools. Also, average class sizes (Figure 8.2e) and teacher-pupil ratios (Figure 8.2f) dropped more quickly in autonomous private schools compared to traditional private schools. In contrast, expenditures for teacher and staff salaries increased more in traditional private schools relative to autonomous private schools (Figure 8.2d).



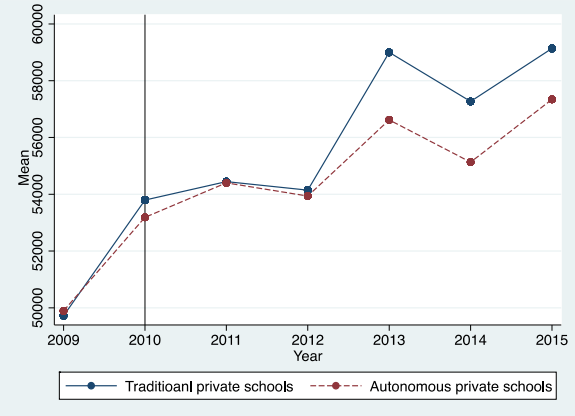
(a) Total per-pupil expenditures



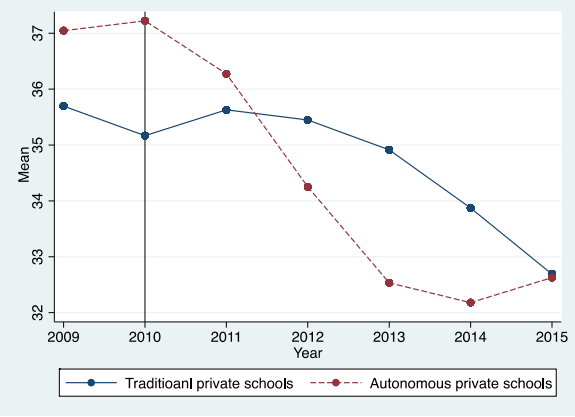
(b) Per-pupil spending for instructional activities



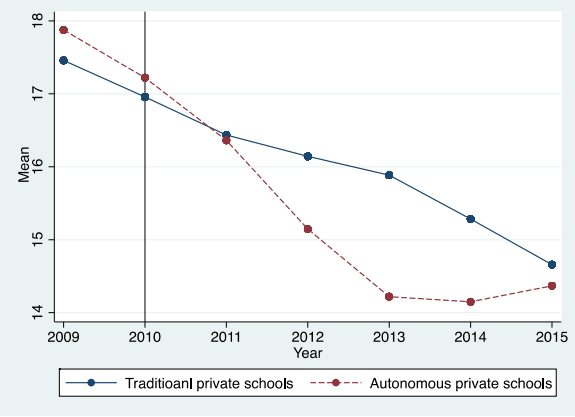
(c) Per-pupil spending for after-school programs



(d) Expenditures for staff salaries



(e) Average class size



(f) Teacher pupil ratios

Figure 8.1. Trends in expenditures from 2009 to 2016 (A unit of measures for expenditures is Korean 1,000 Won)

Table 8. 4. Estimated DD Seoul school choice effects for expenditures

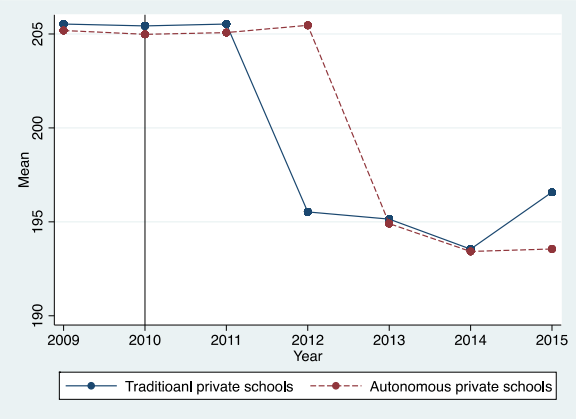
expenditures	Total expenditures (per student)	Education activity expenditures (per student)	After-school curriculum expenditures (per student)	Staff salary expenditures (per staff)	Average class size	Pupil teacher ratios
Post	1,294***	164.4***	10.88	6,635***	-1.076***	-1.587***
	(107.2)	(15.17)	(10.51)	(434.7)	(0.314)	(0.139)
Auto*Post	635.6***	129.1***	98.53***	-1,423	-1.803**	-1.045***
	(162.0)	(32.15)	(19.91)	(1,303)	(0.724)	(0.386)
Observations	640	642	642	640	643	643
R-squared	0.230	0.345	0.050	0.235	0.067	0.248
Number of school ID	92	92	92	92	92	92

Robust standard errors in parentheses
*** p<0.01, ** p<0.05

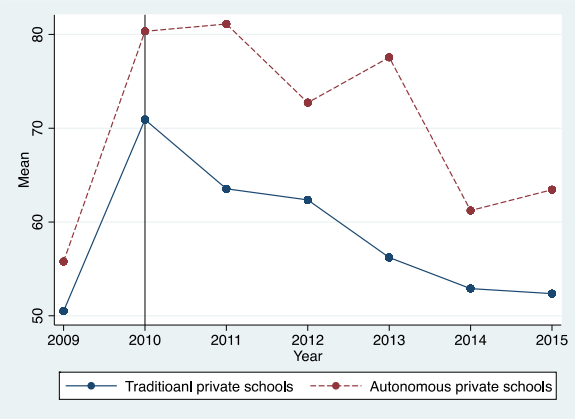
Table 8.5 presents regression estimates for school expenditures. All models include school fixed effects. The coefficients for Post*Auto show changes in expenditures for autonomous private schools after the policy implementation compared to those of traditional private schools. The results indicate that autonomous private schools significantly increased total budget expenditures, spending for instructional activities and for after school programs relative to traditional private schools after the implementation of the school choice policy. For example, Seoul's school choice policy increased autonomous private schools' average total expenditure per student by 13 percent in the post-reform period while it raised only five percent of traditional private schools' average expenditure per pupil. Also, after the reform, autonomous private schools' average per-pupil spending for education activities and after-school programs rose by 36 percent and 42 percent, respectively. During the same period, traditional private schools' average per-pupil spending for education activities dropped by 26 percent. Also, their per-pupil spending for after-school programs only increased by five percent.

In contrast, we do not find evidence suggesting that autonomous private schools significantly changed their spending for staff salaries compared to traditional private schools. The coefficient for change in teacher salary is less than zero, which suggests that autonomous private schools spent less for teacher salaries compared to traditional private schools after the reform, but it is not statistically significant. Also, the policy does not seem to significantly change autonomous private high schools' teacher-student ratios and average class sizes compared to those of traditional private high schools; though the regression coefficients for them are statistically significant, the effect sizes are small.

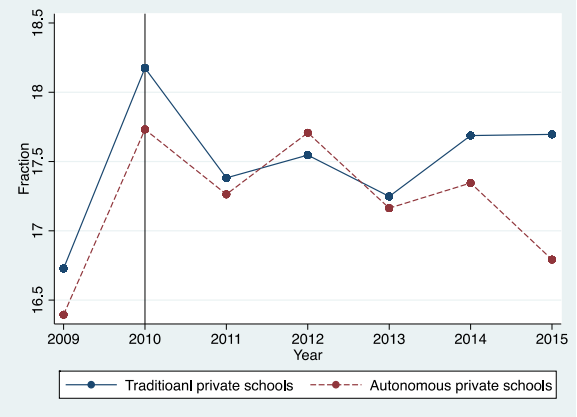
School Curriculum



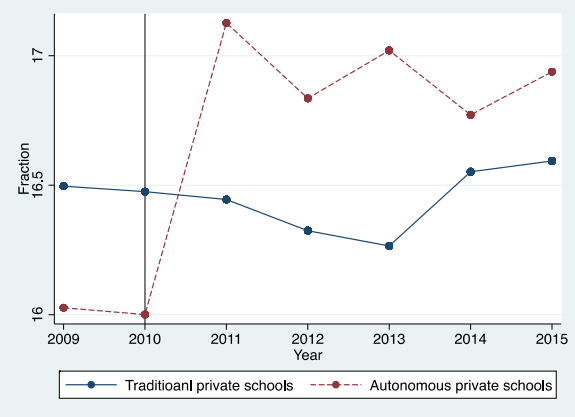
(a) Number of school days



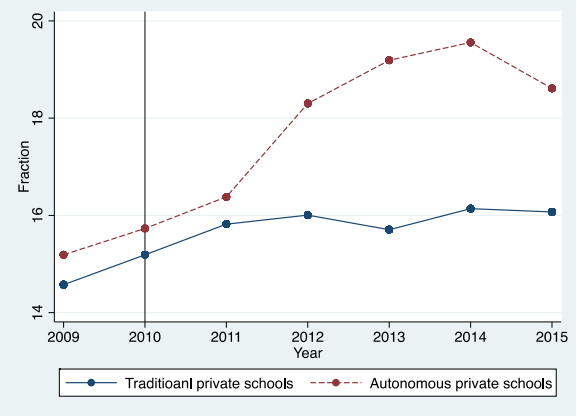
(b) Number of after-school programs



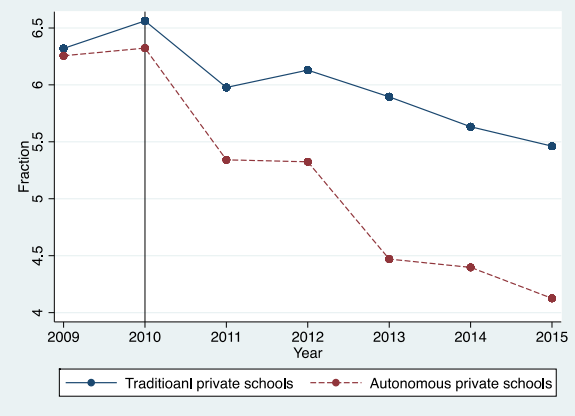
(c) % English hours



(d) % Korean hours



(e) % Math hours



(f) % social studies hours

Figure 8.2. Trends in school curriculum from 2009 to 2016

Figure 8.2 illustrates trends in school curriculum for autonomous private schools and traditional private schools from 2009 to 2016. Figures 8.2a and 8.2b show trends in the number of school days and the number of after-school programs, respectively. Figure 8.2c, 8.2d, 8.2e, and 8.2f show trends in the proportion of instructional time allocated for English, Korean, Math, and social studies, respectively. Graphs show that trends in the number of school days and instructional time allocated for English developed similarly between autonomous private and traditional private schools. However, the number of after-school programs and instructional time allocated to math and Korean rose more rapidly in autonomous private schools compared to traditional private schools. In contrast, the share of time allocated for social studies decreased more quickly in autonomous private schools compared to their traditional counterparts.

Table 8. 5. Estimated DD Seoul school choice effects for curriculum

curriculum	Number of school days per year	After School curriculum	English time/total academic time	Korean time/total academic time	Math time/total academic time	Social studies time/total academic time
Post	-6.926***	9.216**	0.894***	-0.0535	1.246***	-0.370*
	(0.337)	(4.308)	(0.189)	(0.147)	(0.156)	(0.201)
Auto*Post	1.309	7.737	0.0456	0.808**	1.526***	-0.888**
	(1.265)	(12.22)	(0.437)	(0.337)	(0.409)	(0.343)
Observations	643	644	644	644	644	640
R-squared	0.069	0.018	0.053	0.012	0.160	0.031
Number of schoolid	92	92	92	92	92	92

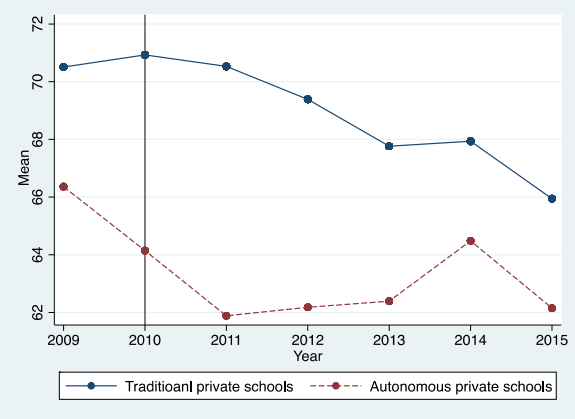
Robust standard errors in parentheses
*** p<0.01, ** p<0.05

Table 8.6 presents the results of the model that compares curriculum changes in autonomous private schools with the corresponding changes in traditional private schools during the post-reform period. All models include school fixed effects. The results presented in the table

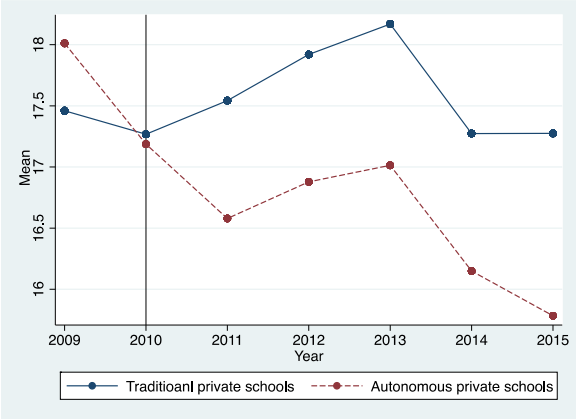
correspond to the trends shown in Figure 8.2; autonomous private schools' instructional time significantly increased for math and Korean and significantly decreased for social studies. The results also show that the reform increased autonomous private schools' proportion of instructional time allocated for math increased by two percent: before the reform the total instructional time allocated to math instruction accounts for about 16 percent of the total instructional time, which increased to 18 percent after the reform.

These results suggest that autonomous private schools reduced their instructional time for social studies and instead increased hours for math after the reform. For the rest of the variables, I do not find evidence showing that autonomous private schools significantly changed their practices after the reform compared to traditional private schools. Even though the number of after-school programs increased in autonomous private schools relative to traditional, its coefficient is not statistically significant.

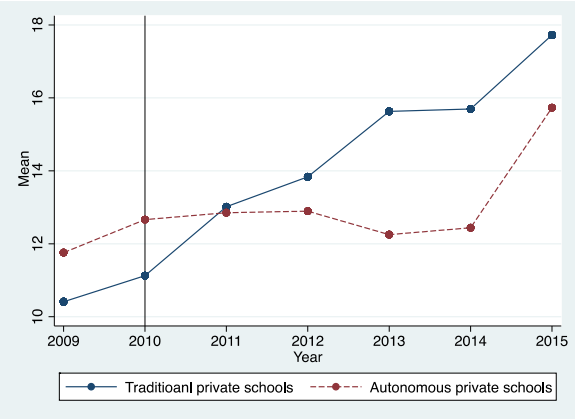
Personnel Policies and Practices



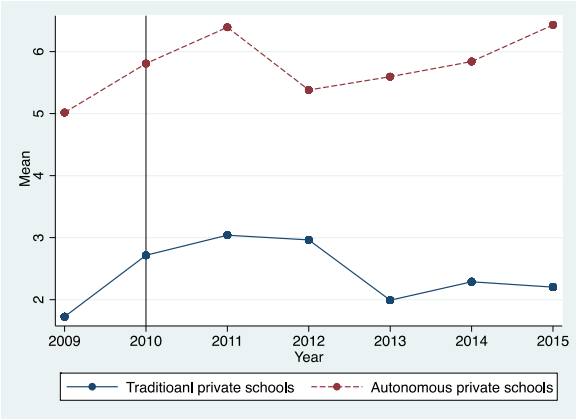
(a) % teachers with advanced certification



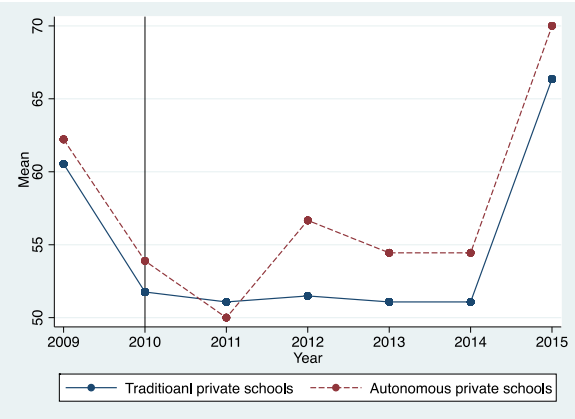
(b) Average years of teaching



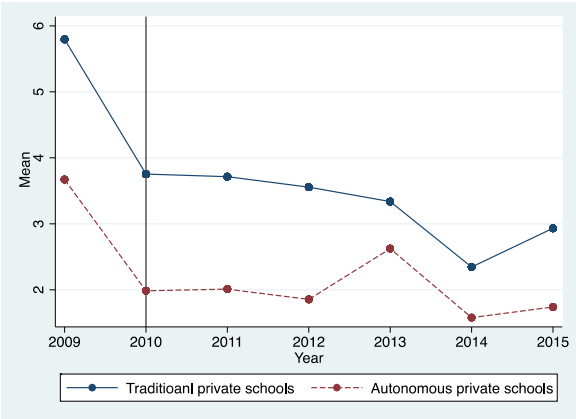
(c) % teachers with fixed term contracts



(d) % teachers hired on a hourly basis



(e) Incentive differentiation rates



(f) Hours spent for administrative work

Figure 8.3. Trends in personnel policies and practices from 2009 to 2016

Figure 8.3 displays trends in personnel decisions and practices that include the percentage of teachers with advanced certification, the average years of teaching, the percentage of teachers with fixed term contracts, the percentage of teachers hired on a hourly basis, differentiation rates in incentives, and teachers' average hours spent on administrative work for autonomous private schools and traditional private schools between 2009 and 2016. In most measures, trends developed similarly between autonomous private and traditional private schools. The only exception is average years of teaching. Before the implementation of the policy, there was a small difference in the average of teaching experiences between these two types of schools (Figure 8.3b). However, after the policy was introduced, it dropped more rapidly in autonomous private schools compared to traditional private schools.

Regression estimates for personnel policies and practices are presented in Table 8.7. All models include school fixed effects, and standard errors are clustered at the school level. Most coefficients indicating mean changes in autonomous private schools after the policy implementation (Post*Auto) are not statistically significant. The only exception is years of teaching; the average teaching year significantly decreased in autonomous private schools relative to traditional private schools after the reform, which suggests that autonomous private schools started to hire teachers with lesser experience after the reform. This may be why their average teacher salary increased more slowly compared to that of traditional private schools. Overall, the reform did not significantly change autonomous private schools' personnel decisions relative to traditional private schools with the exception of their teachers' average teaching years.

Table 8.6. Estimated DD Seoul school choice effects for personnel

personnel	% teachers with advanced certification	average teaching years	% teachers with a fixed-term contract	% teachers hired on a hourly basis	Differentiation rates in incentives	Hours spent for administrative work
Post	-1.448*	0.115	4.106***	0.823***	-6.734***	-2.523***
	(0.754)	(0.172)	(0.536)	(0.301)	(0.535)	(0.449)
Auto*Post	-0.859	-1.528***	-2.726	0.0680	1.086	0.816
	(1.614)	(0.357)	(1.501)	(1.188)	(1.597)	(0.997)
Observations	622	644	643	643	644	644
R-squared	0.016	0.043	0.103	0.014	0.092	0.068
Number of schoolid	92	92	92	92	92	92

Robust standard errors in parentheses
*** p<0.01, ** p<0.05

In sum, findings indicate that the reform significantly increased autonomous private schools' per-pupil spending, expenditures for educational activities and after-school programs as well as the overall number of after-school programs. In addition, results suggest that autonomous private schools allocated their instructional time away from social studies and toward Korean and math. Furthermore, autonomous private schools appear to hire teachers with fewer years of teaching experience after the reform compared to their traditional private schools, which might be a reason why their average expenditures for staff and teachers' average teaching experience dropped after the reform.

CHAPTER 9 EFFECTS OF SCHOOL CHOICE ON STUDENT SEGREGATION

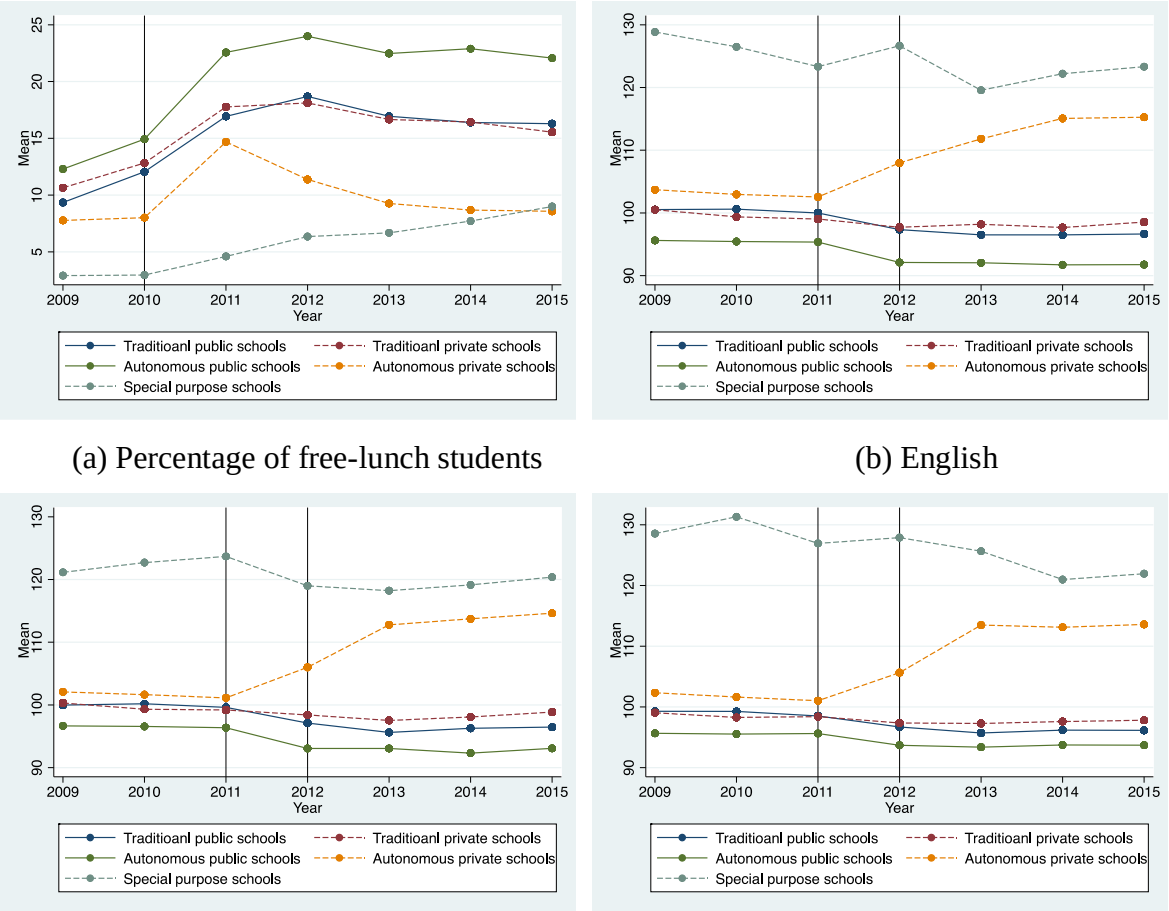
The purpose of this chapter is to look at how Seoul's school choice affects student segregation. Before the reform students were randomly assigned to different schools within their school districts; thus, there was a high level of school integration within each district. However, there still existed segregation and achievement gaps across school districts. Especially, there were large achievement gaps between the Gangnam district, the wealthiest district in Seoul, the other districts. Also, students were allowed to apply to special-purpose schools, which might have generated some degree of student sorting by socioeconomic status and achievement into the system even before the policy implementation. This chapter explores how Seoul's school choice policy affects the existing level of segregation by analyzing how the policy has affected student sorting by socioeconomic status and academic achievement across different school districts and different school types. Sorting by socioeconomic status is measured by the percentage of free-lunch students. In order to analyze sorting by academic achievement level, this study utilizes CSAT scores.

Table 9.1 describes CSAT scores and the percentage of free-lunch students for traditional public and private high schools, autonomous public and private schools, and special purpose schools from 2009 to 2015. Figure 9.1 plots this information in graph form. While the percentage of free-lunch students is reflective of 10^{th} -12^{th} grader student data, CSAT scores are only reflective of 12^{th} graders because only 12^{th} graders take the test. The 2009 CSAT data includes the scores of the cohort that entered high school in 2007 (i.e., the 2007 cohort) and graduated high school before the introduction of school choice. On the other hand, the 2010 and 2011 CSAT data sets consist of student groups that entered high school in 2008 and 2009 (i.e., the

2008 and 2009 cohorts). These cohorts were admitted to their high schools before the implementation of the school choice program, but they attended high school under the high school choice policy. The CSAT data for 2012 and afterwards includes the outcomes of the cohorts of students who entered high school after the implementation of the school choice policy (see Figure 6.4.). Therefore, I expect to see the impacts of the policy on segregation in the percentage of free-lunch students from 2010. On the other hand, CSAT data is expected to demonstrate this impact from 2012, when the first cohort of the choice policy took the exam.

Table 9. 1. Average CSAT scores and % of free-lunch students by school type

		Traditional Public	Traditional Private	Autonomous public	Autonomous private	Special purpose
2009	CSAT English	100.53	100.50	95.61	103.70	128.85
	CSAT Korean	99.97	100.31	96.65	102.07	121.14
	CSAT Math	99.28	99.03	95.65	102.33	128.56
	% FRL students	9.35	10.64	12.30	7.77	2.91
2010	CSAT English	100.61	99.38	95.43	102.95	126.48
	CSAT Korean	100.18	99.31	96.56	101.64	122.69
	CSAT Math	99.26	98.27	95.54	101.63	131.33
	% FRL students	12.06	12.83	14.93	8.01	2.96
2011	CSAT English	99.99	99.03	95.36	102.54	123.33
	CSAT Korean	99.61	99.19	96.36	101.12	123.68
	CSAT Math	98.52	98.40	95.62	101.02	126.94
	% FRL students	16.93	17.77	22.56	14.69	4.60
2012	CSAT English	97.33	97.71	92.10	107.98	126.66
	CSAT Korean	97.11	98.40	93.06	106.00	118.99
	CSAT Math	96.70	97.36	93.68	105.64	127.89
	% FRL students	18.69	18.12	23.99	11.38	6.35
2013	CSAT English	96.49	98.19	92.04	111.81	119.56
	CSAT Korean	95.61	97.53	93.05	112.77	118.22
	CSAT Math	95.72	97.28	93.38	113.49	125.66
	% FRL students	16.94	16.66	22.48	9.26	6.68
2014	CSAT English	96.50	97.67	91.73	115.07	122.20
	CSAT Korean	96.27	98.08	92.32	113.73	119.14
	CSAT Math	96.18	97.59	93.74	113.12	120.98
	% FRL students	16.40	16.44	22.89	8.68	7.71
2015	CSAT English	96.64	98.54	91.76	115.26	123.31
	CSAT Korean	96.46	98.86	93.07	114.63	120.38
	CSAT Math	96.14	97.80	93.70	113.60	121.94
	% FRL students	16.29	15.55	22.07	8.57	9.00
	# schools	46	75	15	18	7



(a) Percentage of free-lunch students (b) English

(c) Korean (d) Math

Figure 9.1. Trends in CSAT scores and the percentage of free-lunch students by school type

Figure 9.1a displays the percentage of free-lunch students (FL) in traditional public and private high schools, autonomous public and private schools, and special purpose schools. The graph shows upward trends in the percentage of FL students from 2010 for all types of schools. This is mainly because the Seoul LEA changed the way it supports FL students. The new law allows students to report their eligibility for lunch support to their local district government to directly receive money. This makes it possible for them to receive the money without revealing their socioeconomic status to teachers and classmates. This presumably explains the increase in the percentage of FL students for all types of schools from the beginning of 2010 and onward. In

2009, before the implementation of school choice, there were relatively small gaps in the proportion of FL students across different types of schools with the exception of special purpose schools. Even before the implementation of the school choice policy, students were allowed to submit an application to special purpose schools and these schools selected students based on prior academic achievement. Traditionally, academically high-performing students have been drawn to these schools. This may explain special purpose schools' low percentage of FL students.

The graph also shows that the percentage of FL students is slightly overrepresented in autonomous public schools and slightly underrepresented in autonomous private schools. However, prior to the introduction of the new policy, the difference between these two types of schools was only about four percent. The gap started to increase from 2010 after incoming students were sorted by their school choice (with the exception of special-purpose schools). As of 2015, FL students accounted for 8.57 percent of autonomous private school students, which is far below the 22.07 percent share of autonomous public school students. This means that autonomous private schools overall disproportionately serve a smaller percentage of free-lunch students and vice versa for autonomous public schools after the reform.

Trends in CSAT scores also indicate that the existing level of segregation across different types of schools increased after the introduction of the policy. Figure 9.1b c d show trends in CSAT English, Korean, and math scores from 2009 to 2015. In the post-reform period, special purpose schools' average CSAT score was significantly higher than that of the other types of schools for English, Korean, and math. As explained above, high-achieving students applied and were admitted to special purpose schools. This may explain special purpose schools' high performance. In contrast, there were small achievement gaps among the other types of schools

(Figures 9.1b, 9.1c, 9.1d). These gaps remained constant until 2011 and became much larger in 2012, when the first cohort that entered high school under the choice policy took the CSAT. This pattern persists in all subjects.

These scores could reflect not only students' academic levels and socioeconomic backgrounds, but also these schools' effectiveness. During the first two years of the school choice policy, however, the average achievement rate of the different school types rarely changed. CSAT scores in these years come from the cohorts who entered high school under the random assignment but attended school under the school choice policy. Thus, CSAT scores in 2010 and 2011 do not reflect the effects of student sorting. Only after the first cohort of the choice policy took the CSAT exam could significant improvement in autonomous private schools' achievement be observed. This suggests that higher achieving (and probably high SES) students self-sorted into autonomous private schools with a start of the school choice policy in 2010, which may explain autonomous private schools' high CSAT scores from 2012. This observation is consistent with the finding that autonomous private schools serve disproportionately a lower percentage of free-lunch students after the reform.

Table 9.2. Differences in the percentage of free-lunch students by school type

	2009	2010	2011	2012	2013	2014	2015
Traditional private	0.152	-0.937	-1.552	-2.674**	-2.546**	-2.110*	-3.041**
	(1.143)	(1.170)	(2.352)	(1.278)	(1.189)	(1.216)	(1.202)
Autonomous private	-1.495	-3.799**	-3.225	-6.740***	-8.166***	-7.965***	-8.098***
	(1.510)	(1.549)	(3.113)	(1.691)	(1.572)	(1.609)	(1.589)
Autonomous public	0.957	-0.429	2.544	1.077	2.202	2.984	1.802
	(1.713)	(1.756)	(3.528)	(1.918)	(1.784)	(1.825)	(1.803)
Special Purpose	-7.225***	-10.40***	-15.21***	-14.33***	-12.97***	-10.99***	-10.37***
	(2.227)	(2.282)	(4.585)	(2.493)	(2.318)	(2.372)	(2.343)
District fixed effects (11 school districts)	√	√	√	√	√	√	√
Observations	160	160	160	161	161	161	161
R-squared	0.374	0.483	0.279	0.605	0.595	0.587	0.552

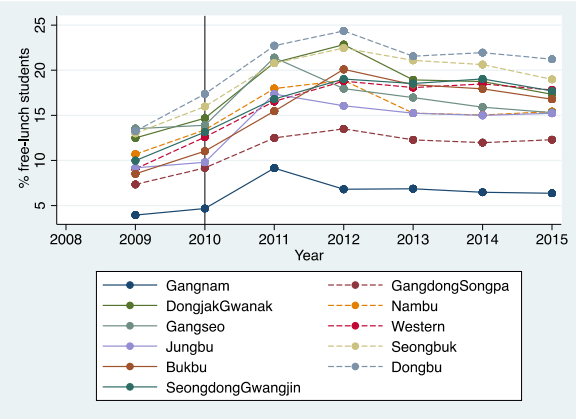
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0

I ran a series of regressions to examine whether or not there are statistically significant differences across different types of schools in the percentage of free-lunch students during the pre- and post-reform periods. Traditional public schools were used as a reference group. District-fixed effects were included because random student assignment occurred within each school district. Table 9.2 reports the results of these regression analyses. Findings suggest that there were no statistically significant differences in the percentage of free-lunch students between traditional public schools and the other types of schools before the start of school choice (i.e. year 2009), with an exception of special purpose schools. Analyses of the post-reform period indicate that free-lunch students are substantially underrepresented in autonomous and traditional private schools relative to traditional public school enrollments. In contrast, these students were overrepresented in autonomous public schools during these years, but differences between autonomous public schools and traditional public schools are not statistically significantly

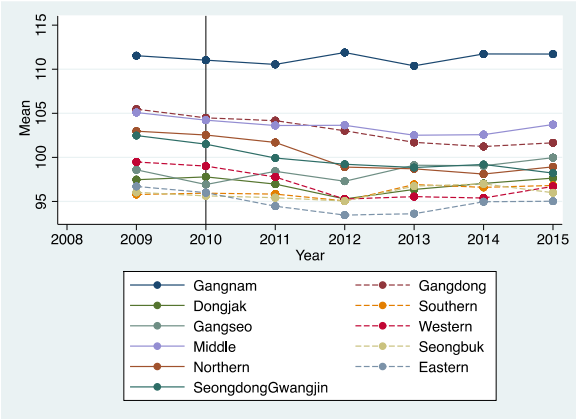
different. These observations together suggest that Seoul's school choice led to increased school segregation by achievement and SES status especially between autonomous private schools and the other types of schools.

Even though school choice increased segregation by academic achievement level and socioeconomic status across different types of schools, it may have reduced gaps existing across school districts. Because the random student assignment occurred within districts, there existed achievement gaps and segregation across districts. This is especially the case between the Gangnam school district and the other districts. I examine whether the policy contributed to reducing interdistrict segregation by analyzing how the Gangnam district's achievement and student composition has changed after the reform.

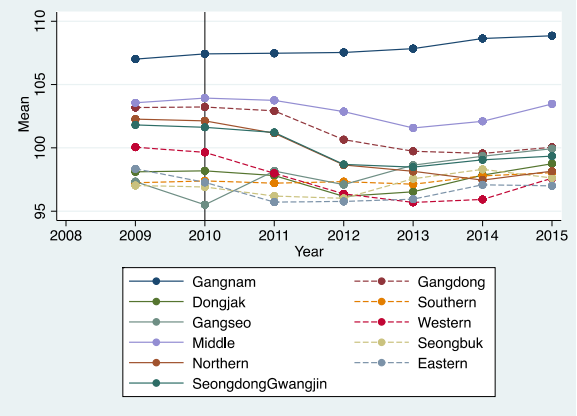
Figure 9.2 a b c shows trends in CSAT English, Korean, and Math scores for eleven school districts in Seoul. The figure shows that, before the implementation of school choice in 2009, there existed large achievement gaps between Gangnam and the other districts. Gangnam also had the lowest percentage of free-lunch students (See Figure 9.2 a), which suggests that their student composition may explain their higher academic achievement. Before the start of the school choice policy, parents could not send their children to schools in the Gangnam district unless they could afford a house in the area.



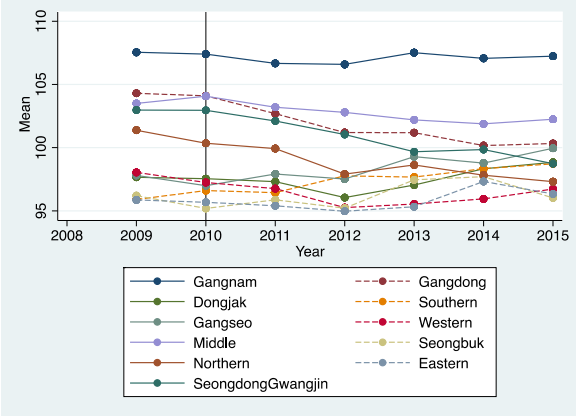
(a) Percentage of free-lunch students



(b) English



(b) Korean



(c) Math

Figure 9.2. Trends in average CSAT scores and the percentage of free-lunch students across school districts

Because the school choice policy made it possible for students to apply to school regardless of their residential location, and because schools are not allowed to selectively admit students (with the exception of autonomous private schools and special-purpose schools), we can presume that the policy may have contributed to reducing segregation between the Gangnam district and the other districts. However, trends in Figure 9.2 show that the achievement of Gangnam remains high and their share of free-lunch students remains low after the school choice

reform, which suggests that Seoul's school choice policy does not reduce segregation existing between the Gangnam district and the other districts.

Tables 9.3, 9.4, 9.5, 9.6 present results of regression analyses that examined whether there are significant differences between the Gangnam district and the other districts in CSAT achievement and the percentage of free-lunch students. Consistent with the observations in Figure 9.2, the results show significant gaps exist between the Gangnam district and the other districts before and after the implementation of the policy. In sum, findings suggest that the policy induced segregation across different types of schools without lowering the level of segregation existing between the Gangnam district and the other districts. This may be because the HSEP that equalized schools in terms of resources, teacher quality, and curriculum, made it so that the quality of schooling in traditional public and private schools was not significantly different across schools regardless of their location before the implementation of the policy. In this situation, parents may have not been incentivized to send their children to schools outside their local district even when they have the right to do so. Those who look for the different quality of education or a better peer group may have sent their children to autonomous private schools, which may explain why the policy did not reduce the level of segregation between Gangnam and the other districts while increasing the level of segregation across different types of schools.

	2009	2010	2011	2012	2013	2014	2015
Gangdong							
Songpa	-6.064*	-6.540**	-6.382**	-8.865***	-8.676***	-10.50***	-10.06***
	(3.116)	(2.977)	(2.778)	(3.319)	(3.274)	(3.409)	(3.476)
Dongjak							
Gwanak	-14.06***	-13.23***	-13.58***	-16.61***	-14.02***	-14.69***	-14.07***
	(3.116)	(3.050)	(2.846)	(3.400)	(3.355)	(3.493)	(3.561)
Nambu	-15.74***	-15.09***	-14.71***	-16.82***	-13.46***	-15.13***	-14.90***
	(2.867)	(2.761)	(2.539)	(3.033)	(2.992)	(3.115)	(3.176)
Gangseo	-12.94***	-14.10***	-12.13***	-14.60***	-11.27***	-12.69***	-11.75***
	(2.742)	(2.683)	(2.539)	(2.991)	(2.952)	(3.073)	(3.133)
Seobu	-12.05***	-12.01***	-12.78***	-16.61***	-14.83***	-16.34***	-15.00***
	(2.867)	(2.806)	(2.539)	(3.033)	(2.992)	(3.115)	(3.176)
Jungbu	-6.442**	-6.798**	-6.928***	-8.245***	-7.866***	-9.157***	-7.995**
	(2.742)	(2.683)	(2.504)	(2.991)	(2.952)	(3.073)	(3.133)
Seongbuk	-15.50***	-15.39***	-15.12***	-16.84***	-13.64***	-14.74***	-15.72***
	(3.420)	(3.347)	(3.015)	(3.602)	(3.554)	(3.700)	(3.773)
Bukbu	-8.564***	-8.490***	-8.850***	-12.99***	-11.68***	-13.62***	-12.79***
	(2.867)	(2.806)	(2.619)	(3.128)	(3.087)	(3.214)	(3.277)
Dongbu	-14.83***	-15.03***	-16.08***	-18.43***	-16.77***	-16.76***	-16.69***
	(3.202)	(3.133)	(2.924)	(3.493)	(3.447)	(3.589)	(3.659)
SeongdongG							
wangjin	-9.055**	-9.521**	-10.62***	-12.67***	-11.53***	-12.54***	-13.50***
	(3.736)	(3.657)	(3.413)	(4.076)	(4.022)	(4.188)	(4.270)
N	156	158	161	162	162	162	162
R-squared	0.271	0.273	0.293	0.280	0.218	0.223	0.213

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9.3. Differences in CSAT Korean scores between Gangnam and the other school districts

	2009	2010	2011	2012	2013	2014	2015
Gangdong							-8.803***
Songpa	-3.825	-4.192	-4.548*	-6.886**	-8.101**	-9.073***	
	(2.742)	(2.864)	(2.702)	(2.889)	(3.216)	(3.036)	(3.222)
Dongjak							-10.10***
Gwanak	-8.902***	-9.236***	-9.655***	-11.37***	-11.30***	-10.79***	
	(2.742)	(2.934)	(2.768)	(2.959)	(3.295)	(3.110)	(3.301)
Nambu	-9.767***	-10.03***	-10.26***	-10.20***	-10.70***	-10.85***	-10.81***
	(2.523)	(2.656)	(2.469)	(2.640)	(2.939)	(2.774)	(2.945)
Gangseo	-9.678***	-11.91***	-9.297***	-10.43***	-9.202***	-9.294***	-8.921***
	(2.413)	(2.581)	(2.469)	(2.604)	(2.899)	(2.737)	(2.905)
Seobu	-6.959***	-7.776***	-9.477***	-11.16***	-12.14***	-12.71***	-11.24***
	(2.523)	(2.700)	(2.469)	(2.640)	(2.939)	(2.774)	(2.945)
Jungbu	-3.450	-3.489	-3.715	-4.669*	-6.262**	-6.541**	-5.382*
	(2.413)	(2.581)	(2.436)	(2.604)	(2.899)	(2.737)	(2.905)
Seongbuk	-9.983***	-10.51***	-11.27***	-11.52***	-10.27***	-10.33***	-11.23***
	(3.009)	(3.219)	(2.933)	(3.135)	(3.491)	(3.295)	(3.498)
Bukbu	-4.745*	-5.294*	-6.311**	-8.882***	-9.688***	-11.18***	-10.70***
	(2.523)	(2.700)	(2.547)	(2.723)	(3.032)	(2.862)	(3.038)
Dongbu	-8.663***	-10.14***	-11.75***	-11.76***	-11.89***	-11.55***	-11.85***
	(2.817)	(3.014)	(2.844)	(3.041)	(3.386)	(3.196)	(3.392)
SeongdongGwangjin	-5.199	-5.799	-6.248*	-8.842**	-9.355**	-9.581**	-9.502***
	(3.288)	(3.518)	(3.319)	(3.548)	(3.951)	(3.729)	(3.958)
N	156	158	161	162	162	162	162
R-squared	0.176	0.193	0.201	0.187	0.147	0.168	0.148

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9.4. Differences in CSAT Math scores between Gangnam and the other school districts

	2009	2010	2011	2012	2013	2014	2015
Gangdong							
Songpa	-3.242	-3.303	-3.973	-5.389*	-6.328*	-6.896**	-6.909**
	(2.839)	(2.929)	(2.639)	(3.021)	(3.304)	(3.032)	(3.151)
Dongjak							
Gwanak	-9.884***	-9.856***	-9.356***	-10.53***	-10.47***	-8.736***	-8.396**
	(2.839)	(3.001)	(2.703)	(3.095)	(3.384)	(3.106)	(3.228)
Nambu	-11.64***	-10.79***	-10.22***	-8.815***	-9.844***	-8.724***	-8.516***
	(2.613)	(2.717)	(2.411)	(2.760)	(3.019)	(2.770)	(2.879)
Gangseo	-9.734***	-10.41***	-8.751***	-9.063***	-8.226***	-8.282***	-7.282**
	(2.498)	(2.641)	(2.411)	(2.723)	(2.978)	(2.733)	(2.840)
Seobu	-9.497***	-10.16***	-9.907***	-11.33***	-11.97***	-11.12***	-10.51***
	(2.613)	(2.762)	(2.411)	(2.760)	(3.019)	(2.770)	(2.879)
Jungbu	-4.045	-3.335	-3.469	-3.789	-5.321*	-5.179*	-4.991*
	(2.498)	(2.641)	(2.378)	(2.723)	(2.978)	(2.733)	(2.840)
Seongbuk	-11.34***	-12.21***	-10.79***	-11.37***	-10.06***	-9.356***	-11.21***
	(3.116)	(3.293)	(2.864)	(3.279)	(3.586)	(3.291)	(3.420)
Bukbu	-6.161**	-7.053**	-6.735***	-8.679***	-8.886***	-9.241***	-9.927***
	(2.613)	(2.762)	(2.487)	(2.848)	(3.114)	(2.858)	(2.970)
Dongbu	-11.68***	-11.72***	-11.26***	-11.61***	-12.19***	-9.737***	-10.90***
	(2.917)	(3.084)	(2.777)	(3.180)	(3.477)	(3.191)	(3.317)
Seongdong							
Gwangjin	-4.567	-4.447	-4.554	-5.544	-7.840*	-7.213*	-8.502**
	(3.404)	(3.599)	(3.241)	(3.711)	(4.058)	(3.724)	(3.870)
N	156	158	161	162	162	162	162
R-squared	0.219	0.211	0.209	0.173	0.139	0.130	0.131

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9.5. Differences in the percentage of free lunch students between Gangnam and the other school districts

	2009	2010	2011	2012	2013	2014	2015
Gangdong							5.932***
Songpa	3.398*	4.501**	3.347	6.690***	5.414**	5.498**	
	(1.990)	(2.058)	(3.851)	(2.452)	(2.333)	(2.342)	(2.260)
Dongjak							10.96***
Gwanak	8.550***	10.01***	11.69***	16.03***	12.06***	12.28***	
	(2.039)	(2.108)	(3.945)	(2.512)	(2.390)	(2.399)	(2.315)
							9.047***
Nambu	6.746***	8.713***	8.817**	12.06***	8.380***	8.565***	
	(1.819)	(1.881)	(3.519)	(2.240)	(2.132)	(2.140)	(2.065)
							8.938***
Gangseo	10.92***	9.227***	12.24***	11.15***	10.11***	9.426***	
	(1.794)	(1.855)	(3.471)	(2.210)	(2.103)	(2.111)	(2.037)
							11.44***
Seobu	5.118***	7.920***	7.390**	11.98***	11.21***	12.01***	
	(1.819)	(1.909)	(3.572)	(2.240)	(2.132)	(2.140)	(2.065)
							8.863***
Jungbu	5.233***	5.130***	8.203**	9.251***	8.378***	8.531***	
	(1.794)	(1.855)	(3.471)	(2.210)	(2.103)	(2.111)	(2.037)
							12.31***
Seongbuk	8.856***	11.07***	11.77***	15.38***	14.02***	13.89***	
	(2.160)	(2.234)	(4.180)	(2.661)	(2.533)	(2.542)	(2.453)
							10.42***
Bukbu	4.570**	6.360***	6.309*	13.29***	11.53***	11.46***	
	(1.876)	(1.940)	(3.630)	(2.311)	(2.200)	(2.208)	(2.131)
							14.86***
Dongbu	9.303***	12.70***	13.57***	17.55***	14.68***	15.48***	
	(2.095)	(2.166)	(4.053)	(2.581)	(2.456)	(2.465)	(2.379)
Seongdon							
gGwangji							11.34***
n	6.038**	8.479***	7.658	12.21***	11.66***	12.56***	
	(2.445)	(2.528)	(4.730)	(3.012)	(2.866)	(2.877)	(2.776)
N	162	161	161	162	162	162	162
R-squared	0.255	0.278	0.129	0.345	0.298	0.310	0.285

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

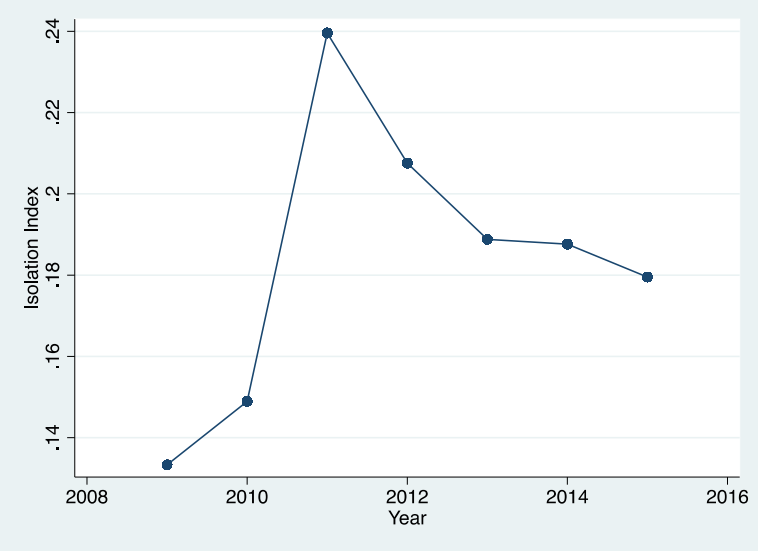


Figure 9.3. Trends in Isolation index from 2009 to 2016

Figure 9.3 illustrates the level and trend over time in Isolation index that measures the extent to which free-lunch students across Seoul attended school with students like themselves. Consistent with the previous graphs and analyses, the figure shows that, after the implementation of the school choice policy, the segregation of FL students increased. Before the implementation of the school choice policy in 2009, free-lunch students in Seoul attended schools with about 13 percent of free-lunch students. However, this measure increased dramatically in 2011, the second year of the school choice policy in which it reached its peak. Even though it started to decrease in 2012, it remains higher than that of the pre-reform period.

In sum, my data shows that segregation increased after the implementation of the policy even though the reform did not alter segregation across districts during the pre-reform period. This study found evidence suggesting that segregation increased because autonomous private schools became to serve disproportionately a higher proportion of high-achieving and high-income students and autonomous public schools became to serve disproportionately a higher proportion of low-achieving and low-income students.

CHAPTER 10 CONCLUSION

Main Findings

This study examined how market-based reforms affect student achievement, school practices, and student segregation by analyzing administrative and achievement data from Korea. Seoul, Korea, recently launched a universal school choice policy and thus provides an interesting case study of how market-based reforms change student achievement, school practices, and student segregation. The Seoul school choice policy marked a dramatic increase of market influence over the school system by allowing families to choose a school and by converting private high schools into autonomous schools. Particularly, the policy put autonomous private schools under greater market pressures by allowing student enrollments to determine their budgets.

First, I did not find evidence suggesting that Seoul's school choice policy significantly changed achievement in English and Korean CSAT scores. What accounts for this lack of significant changes in student achievement? For traditional public and traditional private schools, school curriculum and operations are still under the control of the HSEP; thus, they might not have been able to bring substantial changes to their school practices. For autonomous public schools, there may have been less competitive pressures and fewer incentives to improve student achievement because their student enrollments do not determine their budgets, even though they were given greater autonomy under the new policy.

However, unlike these types of schools, autonomous private schools have greater flexibility in determining school curriculum and operation. In addition, the policy put them under greater competitive pressures because their student enrollments determine their budgets.

Nevertheless, I did not find evidence showing these schools increased student achievement significantly under the new policy. The admission rules of the policy might explain this lack of significant impact. The policy makes it possible for autonomous private high schools to provide high-achieving peer groups to students and families because only students who have middle school GPAs above the median are allowed to apply to this type of school. Parents who put a high value on having high-achieving peer groups may have been attracted to autonomous private high schools regardless of the quality of educational programs they provide. If this was the case, schools may have focused more on attracting high-achieving students rather than improving their instruction or practices, and the policy may not have necessarily led to increased school productivity or student achievement (Hsieh & Urquiola, 2006).

Additionally, this study examined how autonomous private schools changed their practices after they became subjected to greater competition and autonomy under the new policy. The results of this study indicate that autonomous private schools substantially increased their per-pupil expenditures. In particular, their spending on educational activities and after-school programs significantly increased after the reform. This study also found evidence suggesting that autonomous private schools substantially reduced their instructional hours for Social Studies and increased hours for math and Korean. The average years of teaching experience also significantly reduced in autonomous private schools compared to traditional private schools after the reform. Even though it is not statistically significant, this study also found a substantial increase in the number of after-school programs in autonomous private schools. In order to understand why these changes occurred in schools subjected to greater market-based pressures and consumers' demands, it is critical to understand what education consumers demand from their children's schooling in Korea.

In Korea, graduates from prestigious universities receive desirable jobs and achieve a higher position in the social hierarchy. In this situation, being admitted to these prestigious universities is one of the most important goals of parents and students. Achievement in the CSAT is a key component in determining one's admission to such universities. Specifically, high achievement in Korean, English, and Math is most important, because these subjects make up the largest part of the test. Therefore, it is highly likely that parents demand schools to prepare their children for these subjects on the CSAT. In response to these parents' interest, autonomous private schools may have increased their instructional hours for Korean and math. Subsequently, they may have reduced hours for social studies. However, students and parents' emphasis on a college entrance examination may be unique in Korea, which suggests that the market response of focusing on math and Korean may be specific to the Korean context.

It seems like that these autonomous private schools channel their resources into activities that are more directly related to student achievement, such as instructional activities and after-school programs. They substantially increased the number of after-school programs through which they might be able to better address students' needs and interests. They also seem to hire teachers with lesser years of experience, which might explain why their teachers' average teaching years and expenditures for salary decreased after the reform. These changes indicate that, as Hoxby (2003) posited, privatization may improve school productivity by pushing schools to channel their resources into academic activities more directly related to increasing student achievement, such as instructional activities and after-school programs, from those less related to achievement, such as years of teaching experience.

It is important to recognize how unique features of the policy might shape these observed changes in practice. For example, the policy allowed autonomous private schools to selectively

admit students, restrict eligibility to students with above median GPAs, raise tuition to three times larger than that of traditional schools, and deviate from a national curriculum, so long as they satisfied 50 percent of the lesson hours required by the national curriculum. Due to restricted eligibility and high tuition rates, autonomous private schools mainly serve high-achieving and high-income families. The changes in practice observed in this study may be due to autonomous private schools' efforts to address these particular groups' needs and interests. If they mainly serve students from low-income families, different changes in practice might have been observed under the new policy. Furthermore, these schools are still required to meet 50 percent of the lesson hours stipulated by the national curriculum for core subjects. Without this policy feature, autonomous schools could have further reduced their instructional hours for social studies.

Finally, this study does not find evidence suggesting that school choice reduced a level of segregation and achievement gaps that previously existed across districts in the pre-reform period. On the contrary, the findings of this study suggest that, after the reform, schools have become socioeconomically imbalanced as autonomous private schools are disproportionately serving a higher proportion of high-achieving and high-income students, and their public counterparts are disproportionately serving a higher proportion of low-achieving and low-income students.

Effects of Seoul's School Choice on Educational Goals and Policy Implication

Proponents of school choice argue that expanding school choice increases the productivity of schools, and consequently, student achievement. However, this study did not find

evidence suggesting that Seoul student achievement significantly increased after the reform. However, this study found evidence that the policy brought substantial changes in autonomous private schools' practices. Also, it increased the level of segregation existing across different types of schools.

Changes in practices in autonomous private schools and an increased level of segregation after reform reveal that Seoul's school choice policy may pose challenges to the democratic goals of schooling in terms of citizenship training and equal treatment. Autonomous private schools' increased expenditures indicate that they may provide schooling that is qualitatively different from that of other types of schools; this change can undermine the democratic value of equal treatment. It is important to note that disparities in expenditures do not necessarily mean a reduction in democratic goals. Different students have different educational needs and therefore different costs to educate. Therefore, in education systems that attempt to equalize outcomes across students with differing educational needs, we would expect expenditures to vary. However, the Seoul choice policy led to increased expenditures for autonomous private high schools. Their students obviously have advantaged backgrounds given their selective admission rules and high tuition rates. Therefore, disparities in expenditures would suggest a potential equity issue in this case. Additionally, autonomous private schools reduced instructional hours for social studies, which suggests that market-based reforms can negatively affect schools' capacities to provide students with citizenship training.

When school choice increases segregation, it negatively affects one of the important goals upon which a public education system has been built: promoting social cohesion. Schools provide an opportunity for students to interact with peers from different socioeconomic backgrounds and have a common educational experience. In Seoul's school choice policy,

because a high percentage of high-SES and high-achieving students exercised school choice to attend schools with peers of similar racial and socioeconomic status, school choice further segregated schools and, as a consequence, might have negative impacts on social integration.

Furthermore, an increased level of segregation can negatively affect the democratic goal of schooling in terms of guaranteeing equal educational opportunities. High-income and high-achieving students actively took advantage of choice opportunities and self-sorted into autonomous private schools. Their transfers led to the isolation of disadvantaged students in other types of schools. If the quality of one's peers affects one's achievement, then the concentration of disadvantaged students may have negatively affected the academic performance of students who attend other types of schools, which means a departure from equal treatment.

According to Levin (2014), school choice polices cannot embrace all education goals and some goals cannot be achieved without sacrificing others. The results of this study show these inherent tensions between educational goals. Equity can best be achieved when the government controls education and equalizes school funding and curriculum. However, providing the same education without considering a wide range of students' academic levels and values can lower the efficiency and effectiveness of the school system. In contrast, efforts to improve the productivity of a school system through increased competition and school choice options can differentiate students' schooling experiences and increase school segregation, which, in turn, can negatively affect equity and social cohesion. Efforts to increase the efficiency and effectiveness of schools through expanding school choice should thus be made in conjunction with the recognition of potential harms to other educational goals.

Implications for the School Choice Literature

This study addressed several gaps in school-choice literature. First, by analyzing a school choice program in Seoul, this study deepened understandings on how institutional characteristics, school choice designs, and social and cultural factors shape the effects of expanding school choice. In particular, Korea provides valuable evidence because its school choice policy was implemented in a context of limited competition, autonomy, and student sorting.

Additionally, this study addresses the current lack of evidence from large school choice programs in school choice literature. Most empirical studies on school choice have been conducted in the United States. However, there are few large school choice programs in the United States; thus, most empirical evidence on the topic comes from small-scale choice programs. By analyzing Seoul's citywide choice program, in which every student has to choose schools, this study provides large-scale systematic evidence to the field.

Furthermore, this study contributes to school choice literature by identifying the causal effects of school choice on school practices. Previous studies have focused on how expanding school choice affects education outcomes, such as academic achievement, without paying attention to how school choice-induced competition changes school practices. Only recently have a few studies attempted to understand how increased competition affects school practices in regards to school resources, teacher hiring, and teaching methods. However, most studies do not present the causal estimation of competitive effects. This study addressed this gap by identifying the causal effects of school choice on school expenditures by utilizing the DD strategy.

Finally, this study expands school choice literature by examining the effects of school choice on school segregation in a system with a low level of school segregation. Proponents of

school choice believe that expanding school choice promotes integration across different racial and socioeconomic groups by breaking the link between their neighborhoods and school assignment (Viteritti, 1999). However, opponents raised concerns that school choice may further segregate schools along racial and socioeconomic lines (Cobb & Glass, 1999; Frankenberg, Siegel-Hawley, & Wang, 2010). Previous studies provide limited evidence on this controversy, as most choice programs have been implemented in communities with a high-level of school segregation.

In contrast, in Seoul, the LEA controlled student compositions of public and private schools before the introduction of school choice, which limited families' efforts to attend schools with students of similar characteristics and created a high level of integration in the school system. The results of this study suggest that, under these specific contexts, school choice can be exercised in a way that actually increases segregation. However, in a highly segregated school system where advantaged families already exercised their school choice by sending their children to private schools or through their residential location decisions, school choice may not necessarily lead to increased segregation by families with advantaged backgrounds. The results of this study indicate that implementing a school choice policy does not necessarily increase or exacerbate school segregation because the characteristics of an underlying institution and the specific designs of the policy play an important role in determining who will actively take advantage of school choice opportunities.

Limitations

The primary limitation in this study is that this study solely relies on Incheon for a comparison group. Other regions do not satisfy the CITS and DD conditions, as they have baseline population and student composition trends differing from those of Seoul, so it is not possible to test whether our findings are robust when a different comparison group is used. Analysis based on alternative comparison groups would increase robustness of the findings. Additionally, this study only looks at short-term effects of the policy. However, what schools can change over a long period of time is different from what they can change over a short period of time. Thus, long-term effects of the policy may be different.

Another potential bias arises from using the CSAT scores as an outcome. The CSAT is the high-stakes exam that determines students' college entrance in Korea. At the same time, however, it has limitations because only students who want to go to college take the exam. Thus, the results of this study cannot apply to those who did not take the CSAT. In other words, the results do not show how the policy affects those who do not want to go to college. Additionally, this study includes vocational school students even though they were not affected by the policy change. Different trends between Seoul and Incheon in the characteristics of vocational school students who took the CSAT might have biased the results.

The other limitation of this study is that only a single pre-reform data on school administration is available. Multiple-data points during the pre-reform period would make it possible to assess whether there were similar trends between autonomous private and traditional private high schools.

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