

School Choice and Public School Performance: Evidence from Ontario's Tuition Tax Credit*

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Abstract

This paper measures the effects of increased competition from private schools on public school performance. It takes advantage of the clear exogenous increase in choice associated with Ontario's 2002 tuition tax credit, which eased access to private schools throughout Canada's most populous province, as well as the exogenous reduction when the policy was unexpectedly cancelled. Building on the idea that the policy would have differential competitive effects for public schools in districts with a significant private school presence versus those without, we construct a measure of the increase in competition that is specific to each school, combining the province-wide reform with local variation in private school availability. Relating this measure to school outcomes, our results indicate that public school performance improved for schools facing the greatest competitive pressures following the introduction of the policy, controlling for a host of other relevant factors; when the policy was switched off, such gains were eliminated. The estimates imply that a one standard deviation increase in private school competition generates about one-tenth of a standard deviation improvement in average public school performance. A positive relationship of similar magnitude persists when accounting for fixed unobservables using the within-school gain, and also when instrumenting for private school presence. To assess whether the positive effect is due primarily to increases in productivity, the analysis accounts for a series of alternative mechanisms. Increased sorting is unlikely to be responsible for the public school improvement as there were no significant outflows of Ontario public school students to the private system; and very slight compositional changes in observable public school student characteristics suggest that unobservable changes are likely to have been minor also. There is no evidence of any significant 'gaming' on the part of public schools, nor of differential changes in school resources that might explain performance differences. Overall, the Ontario evidence supports the view that increased competition from private schools raises public school productivity, of benefit to students remaining in the public system.

Keywords: school choice, competition, school performance, productivity, uniform voucher, voucher threat, tuition tax credit, sorting.

JEL classification: I28, C31

1 Introduction

Given widespread concern about public school performance, reforms that expand school choice have been the focus of considerable policy interest. This interest is reflected in measures such as open enrollment programs that increase choice in the public school system, or private school vouchers and tuition tax credits, designed to expand household choice between public and private schools.

According to the standard argument, increased choice will intensify competition, forcing public schools to improve quality in order to retain enrollment.¹ Yet in principle, increased choice need not invariably improve public school performance,² pointing to the need for careful empirical analysis. The central goal of this paper is to carry out such an analysis, to see whether public school performance improves when competition from private schools increases.

Ideally, one would conduct a large-scale randomized experiment to learn about the performance effects of increased competition from private schools. In the absence of such wide-scale experimentation, a number of papers have studied small-scale randomized voucher experiments, particularly focusing on the effects of choice on the academic achievement of students who were awarded vouchers. Examples include evaluations of the state-funded Milwaukee Parental Choice Program³ and the privately-funded New York School Choice Scholarship Program.⁴ Yet the limited sample sizes in these programs preclude shedding light on the broader system-wide response of public schools operating in a more competitive environment – a key potential advantage associated with greater choice.⁵

In order to shed light on the broader responses of public schools to changes in market conditions, several important observational studies have made use of cross-sectional evidence from school systems. Perhaps best known is the work by Hoxby (1994 and 2000), examining the effects of competition from private and public schools respectively on public school performance. Identifying suitable choice variation in a cross-sectional context is widely acknowledged to be challenging. Not least, as Hoxby emphasizes, simple choice measures such as local private school enrollment shares and public school district enrollment concentrations are jointly determined with public school performance, and ignoring this may lead to downward-biased estimates of any competitive effects. This type of consideration has motivated ingenious cross-sectional strategies that draw on plausibly exogenous topographical variation and county-level differences in religious affiliations in order to instrument for potentially endogenous public and private school choice measures.

¹The classic reference is Milton Friedman’s discussion of private school vouchers in Chapter 6 of *Capitalism and Freedom* (1962).

²For instance, rent-seeking public schools may choose to *reduce* productivity as competition increases when they can offset the losses from reduced enrollment by cutting costly effort.

³See Witte *et al.* (1995) and Rouse (1998).

⁴See Peterson *et al.* (2003) and Krueger and Zhu (2003).

⁵See Hoxby’s (2003) discussion of school choice being “a rising tide that lifts all boats.”

The current study uses a different source of variation to identify competitive effects from private schools, associated with the 2002 Ontario tuition tax credit. This initially eased access to private schools throughout Canada’s most populous province,⁶ exogenously increasing choice between public and private schools in a manner akin to a uniform voucher. The credit applied to the first \$7,000 of eligible annual net tuition fees paid per student; though ten percent of eligible tuition fees could be claimed in the tax year 2002, a fifty percent credit rate was scheduled to be phased-in over a five-year period, resulting in a maximum tax credit of \$3,500 when the program was fully implemented – a significant fraction of typical private school tuition.⁷ As a source of additional policy variation, the credit was eliminated two years later when the incumbent party lost power. With standardized public school performance data available from before, during and after the policy’s operation, the Ontario experience provides a valuable opportunity to shed new light on the performance effects of increased competition.

Following the unexpected increase in choice associated with the policy, it is plausible to think that there would be differential competitive effects for public schools in districts with a significant private school presence versus those without. In the former, public schools would face greater pressure on their enrollments after the policy’s introduction, while those in the latter would face little change, especially given that new private school entry was limited: when the policy was cancelled, such competitive differences should disappear. Building on this idea, the analysis constructs a reduced-form measure of increases in competition that is specific to each school, combining the clear province-wide changes in choice associated with the policy with local variation in private school presence.

The empirical analysis relates school-specific competition measures to public school outcomes using standardized achievement data from the province’s Education Quality and Accountability Office (EQAO). Results indicate that public school performance improved for schools facing the greatest competitive pressures following the introduction of the policy, controlling for a host of other relevant factors. The estimates imply that a one standard deviation increase in private school competition generates around one-tenth of a standard deviation improvement in average public school performance. A positive relationship of similar magnitude persists when using the within-school gain, accounting for fixed school unobservables; instrumental variables estimates, instrumenting for private school presence using neighborhood sociodemographics from the wider area in the manner of Evans, Oates and Schwab (1992), also yield similar results. Further, differential effects on school performance are no longer apparent once the policy was abolished.

To assess whether the estimated performance effects are explained primarily by increases in productivity, the analysis accounts for a series of alternative mechanisms. Most impor-

⁶Statistics Canada population estimates for the province of 12.94 million in 2008 would place Ontario fifth among U.S. states – behind New York and Florida (third and fourth most populous), but just ahead of Illinois and Pennsylvania.

⁷More details relating to the tax credit are provided in Section 2.

tantly, the choice policy would be expected to increase sorting. In the Ontario context, sorting is unlikely to drive the public school improvement as there is no evidence of any significant outflows of Ontario public school students to the private system; further, compositional changes in observable public school student characteristics were limited around the time of the policy, suggesting that unobservable changes were probably minor also. There is no evidence of any significant ‘gaming’ on the part of public schools located in more competitive districts, based on the proportions of test takers exempted; and the results are robust to controls for per-pupil spending, suggesting that differential changes in resources are not driving any performance differences either. By showing that the increased performance of public schools that faced more competition is unlikely to be driven by sorting, gaming, and differential resources or trend variation, the Ontario evidence is consistent with the view that increased competition raised public school productivity, likely to be beneficial on average to students staying in the public school system.

The rest of the paper is organized as follows: Section 2 provides an overview of the Ontario education system and discusses the background to and provisions of the tax credit. Data used in the analysis are described in Section 3, and descriptive evidence regarding the effects of the policy on private school enrollments, enrollment shares and private school entry is presented in Section 4. Section 5 sets out a simple conceptual framework that links changes in competition from private schools to public school performance. This helps to motivate the measurement approach used in the empirical analysis, outlined in Section 6. Section 7 sets out the main results from applying this framework, along with findings from a series of robustness checks, and Section 8 concludes.

2 The Education Policy Environment in Ontario

This section provides relevant institutional background. Following a brief overview of the Ontario education system and reforms implemented in the 1990s, we then focus on the Ontario Tuition Tax Credit, discussing the political context behind its introduction and subsequent revocation, as well as the provisions of the policy in some detail.

2.1 The Ontario education system – brief overview

In Ontario, public education from elementary through secondary school is offered free to all citizens and permanent residents. School attendance is compulsory for children between the ages of 6 and 18, and students have the right to attend public schools that have been designated to serve their respective residential addresses.⁸ A Roman Catholic school system runs parallel with the secular public school system, Catholic schools being publicly funded under a separate school system in accordance with a guaranteed right established in the

⁸To access schools outside the given school attendance area, the students can apply through an *optional attendance policy*. Acceptance at these schools is subject to space availability.

1867 British North America Act.⁹

There are approximately 700 private schools in Ontario, most represented by associations uniting schools of a common goal or view, such as the Canadian Council of Montessori Administrators (CCMA), or the Ontario Federation of Independent Schools (OFIS). In accordance with Section 16 of the Education Act, operators of private schools are required to notify the Ministry of Education on or before September 1 each year by filing a Notice of Intention to Operate a Private School.¹⁰

2.2 Ontario education reforms after 1995

Prior to the introduction of the Ontario tuition tax credit in 2002, education in the province underwent significant changes in the 1990s, most notably during the period when the Progressive Conservative (PC) Party was in power, from 1995 to 2003.¹¹ In this subsection, we highlight the reforms most relevant to our analysis.

In terms of spending, the PC government enacted major changes to school finance in the form of its ‘Student-Focused Funding’ policy. Under the new formula, the provincial government completely centralized funding control with the provincial government now setting a uniform local property tax rate and redistributing funds on an equitable basis to public and Catholic school district boards.¹² In doing so, this funding system reduced the variation in resources that might have affected public school performance differentially within the province, and by tying funding closely to enrollment, the system gave public schools clear incentives to take an active interest in any changes in enrollment.¹³

In 1995, the province established the Education Quality and Accountability Office (EQAO) to administer standardized tests in Ontario. The empirical analysis uses the EQAO’s standardized achievement test results as an outcome measure. A standards-based core curriculum was rewritten in 1998, and while this curriculum reform might have affected public school student performance, its impact is likely to have been reasonably uniform across the province.

⁹This Act aimed to ensure that rights to education of English-speaking Protestants and French-speaking Catholics would be protected. In Ontario, with the exception of one publicly-funded Protestant school, all separate schools are Roman Catholic (1,625 schools in 2002/2003).

¹⁰According to the Education Act, a private school is ‘any educational institution that is partially or entirely funded by sources other than the government, and which provides instruction at any time between the hours of 9 a.m. and 4 p.m. on any school day for five or more pupils who are of or over compulsory school age in any of the subjects of the elementary or secondary school courses of study.’

¹¹In the words of R.D. Gidney (1999), the scope and speed of these changes was ‘breathtaking.’

¹²Bill 160, passed in 1998, removed a school board’s power to adjust local property tax rates to support public school expenditure.

¹³In particular, a Foundation Grant provides every school board with a base level of funding for each student to support classroom costs, such as teachers’ salaries, classroom computers, and library services. In the 2002/2003 academic year, the Foundation Grant provided \$3,680 for each elementary student and \$4,431 for each secondary student.

2.3 The Ontario tuition tax credit

Background. In the 1990s, pressure for equality in funding for the province’s religious schools arose from multi-faith interest groups, given the fact that the only religious schools receiving funding were publicly-funded Roman Catholic schools.¹⁴ Yet during the election debate in 1999, Mike Harris, the incumbent PC premier, stated that he had no intention of introducing charter schools or vouchers in Ontario.¹⁵ Janet Ecker, then Minister of Education, expressed a similar viewpoint of “[having] no plans to provide funding to private religious schools” in a January 2000 letter to the federal government.¹⁶

At odds with this publicly stated view, the announcement of the Ontario tax credit on May 9, 2001 “took the people of Ontario by surprise.”¹⁷ The announcement to provide tax credits of up to \$3,500 per year for each eligible private school student was made by the Minister of Finance while delivering the 2001 Ontario Budget. After the announcement, the corresponding bill (Bill 45) was passed into law in June 2001 and became effective in tax year 2002.

Provisions. In terms of its provisions, the Equity in Education Tax Credit allowed parents or legal guardians to partially offset the cost of tuition for a child attending an eligible private school at either the elementary and secondary school level. The credit was calculated separately for each child and was refundable.¹⁸ The credit was claimed upon filing a personal income tax return: it reduced Ontario taxes otherwise payable or was refunded if it created a credit balance.

The tax credit rate applied to the first \$7,000 of eligible annual net tuition fees paid per student, aged six to twenty-one and the first \$3,500 for a child aged four or five.¹⁹ For tax year 2002, ten percent of eligible tuition fees could be claimed; thus parents or legal guardians who paid the tuition for an eligible child could claim a maximum of \$700 for a child going to elementary or secondary school and \$350 for a child in pre-school. The maximum fifty percent rate was scheduled to be phased-in over a five-year period, rising to a maximum tax credit of \$3,500 when the program was fully implemented.²⁰

¹⁴In particular, a loose coalition of traditional Christian and Jewish schools campaigned for public funding and increased tax deductions in Ontario in the late 1990s, launching cases that reached the Supreme Court of Canada, such as the *Alder v. Ontario* case, filed in 1996. All these lawsuits were lost by the coalition.

¹⁵The PC Party was re-elected in the 1999 Ontario provincial election.

¹⁶The quote comes from the Ontario Secondary School Teachers Federation 2001, “School Choice - Broken Promises.”

¹⁷See David T. Koyzis (12 July 2004), “Educational Equity in Ontario,” *Capital Commentary*.

¹⁸A child’s eligibility was determined by age; a child who was at least four but under twenty-one years old throughout 2002 was eligible for the whole year, and there was no family limit on the amount of credit available.

¹⁹Fees related to accommodation or boarding, child care, separate charges for meals, computers, books, clothing, travel, sports, and equipment did not qualify as tuition fees. Scholarships and bursaries received had to be netted against the tuition fees eligible for the credit unless deducted from the tuition fees paid before.

²⁰The tax credit rate was scheduled to be 20 percent of eligible tuition fees for independent schools in

For tax year 2002, the tax credit could be used at 582 private schools.²¹ At this stage, we do not know either the overall take-up rate of the tax credit in 2002 or the take-up rate disaggregated at the local level; obtaining such information would require retrieving and analyzing confidential tax data. Instead, our focus will be on the potential threat to public school enrollments arising from the increase in competition associated with the policy, a threat whose strength is likely to vary from area to area.

After the provincial election in October 2003, the new Liberal government canceled the tax credit on December 18, 2003, retroactively for the *entire* tax year 2003, effective from January 1, 2003; no tax credits were available with respect to any amounts paid for tuition after December 31, 2002.²² Yet since the change in government occurred in October 2003, it did not affect schooling decisions in 2002/2003. The tax credit policy thus affected the 2001/2002 and 2002/2003 schooling choices made by parents, with the available credit – at least on paper – being higher in the second year (a maximum of \$1,400 per child available in elementary or secondary school).

3 Data

This section describes the data used in the analysis, from four sources. Public school performance data comes from the Education Quality and Accountability Office (EQAO), an independent agency of the Ontario government that administers standardized provincial tests on an annual basis. The EQAO data set is supplemented with an enrollment data file provided by the Ontario Ministry of Education, an Ontario school data file provided by the Public Economics Data Analysis Laboratory (PEDAL) to control for school characteristics,²³ and a neighborhood demographic data file from the Canadian Census of Population 2001.²⁴

3.1 Public school performance data

The EQAO provides public school performance data drawn from provincial tests for students in Grades 3, 6, 9 and 10, administered since 1999/2000. All public school students in these grades are required to participate in the assessments, but the participation of private

2003, 30 percent in 2004, 40 percent in 2005, and 50 percent in 2006 and beyond.

²¹To qualify as an *eligible* private school, a school was required to be located in Ontario and to be registered as a private school under the Education Act. An eligible private school had to have at least five students, follow at least 75 percent of the standard curriculum for schools in Ontario, and carry out criminal reference checks on staff and others who had regular contact with its students.

²²The Progressive Conservative party lost the provincial election in 2003, replaced by the Liberal party led by Dalton McGuinty, who won the election on October 2, 2003. The Liberal Party was opposed to subsidizing private-school-goers and had actively campaigned to cancel the tax credit policy during the election.

²³The Public Economics Data Analysis Laboratory (PEDAL) at McMaster University very kindly provided access to the data used in the analysis.

²⁴The census data is assembled from the 20% restricted-access sample obtained through Statistics Canada.

school students is voluntary. The EQAO test results provide a standardized performance measure across all public schools in the province that is comparable over time.²⁵

The primary school performance data are drawn from the EQAO 2000/2001, 2001/2002, 2002/2003, and 2003/2004 tests. To measure student achievement, the EQAO adopts a four-level scale, with Level 3 being the provincial standard, and Levels 1 and 2 indicating achievement below the provincial standard. In the analysis below, the proportion of students at Levels 3 and 4 is used as the main public school performance measure.²⁶ This is EQAO's preferred method of reporting; further, schools and school boards are required to use it to ensure consistency of reporting across the province.

Figure 1 highlights the timing of the policy along with the EQAO test dates and the enrollment data collection. EQAO Grade 3 mathematics test assessments are administered annually over a period of five days in May. Given that the tax credit was passed into law in June 2001, test results for 2000/2001 are used as the pre-policy standardized measure in the analysis – again, no temporally comparable scores are available earlier than this; test results for 2001/2002 and 2002/2003 provide outcome measures for the period during which the policy was in effect; and test results for 2003/2004 provide the outcome measure for the academic year when the tax credit was canceled.²⁷

The main within-Ontario sample consists of 1,886 schools that could be linked across the four years, drawn from 28 school boards.

3.2 School data

Enrollment data. School enrollment data, used to construct the competition measure at the heart of the analysis, are collected by the Ontario Ministry of Education, providing yearly enrollment records for public and private schools in the province. The enrollment data are reported to the Ministry at the beginning of the academic year – on September 30 for the academic years prior to 2002/2003 and on October 30 for the academic years from 2002/2003 onwards.

The available data set covers enrollment information from 1990/1991 to 2003/2004. While the main empirical analysis in Section 7 employs data from 2000/2001 to 2003/2004 only, the full data series will be used to illustrate broad trends in the descriptive analysis in Section 4.

The following types of private school are excluded from the analysis: First Nations schools, learning centres, schools not following the Ontario curriculum, correctional insti-

²⁵The EQAO 2000/2001 Annual Report states that “overall levels of achievement are comparable from year to year.” The assessment contains a set of multiple choice questions, which overlap across years.

²⁶This measure follows EQAO's ‘Method 1,’ which expresses the number of students attaining each level as a percentage of *all* the students in the grade, including students who were exempted and those who took part in the assessment but did not produce enough work to receive a score.

²⁷The 2003/4 EQAO test was administered in May 2004, about 7 months after the Liberal government was elected. Public schools would thus have had enough time to adjust effort levels within a less competitive environment.

tutes, international schools and overseas schools. This is on the basis that these schools are unlikely to create direct competition for general Ontario public schools.²⁸ There are also entries in the Ministry data for private school with no enrollment at all. Out of the total sample of 1,193 listed private schools, 204 are excluded because of their type and 54 are excluded because of zero enrollment in any grade. The private school sample thus contains 934 schools in total (allowing for entry and/or exit) from 1990/1991 to 2003/2004.

Public school characteristics. Descriptive statistics for the time-varying control variables are summarized in Table 1. In addition to the achievement results, EQAO also collects several student characteristics, including whether the student is in ESL (English as a Second Language) or ELD (English Literacy Development) and whether the student is identified as gifted or exceptional.²⁹ Since the analysis compares different Grade 3 cohorts, the empirical analysis accounts for changes in student characteristics at the school level over time. During the sample period, the average proportion of ESL/ELD students is about six percent, the proportion of gifted students is about half of one percent, and the proportion of exceptional students is approximately five percent.

To control for school characteristics, we use an Ontario school data file provided by the Public Economics Data Analysis Laboratory (PEDAL). This contains information on important variables such as average teacher experience, number of teachers new to the school, total enrollment, and total funding per student. Average teacher experience is about 3.5 years, and the average school size in the sample is just over 400 (with a standard deviation of 170).

One point to note is that the total funding variable is only available for 2000/2001 and 2001/2002 from the accessible data, and therefore cannot be used in the main specification as a resource control.³⁰ In addition to the Foundation Grant tied to enrollment, all school boards can receive grants falling under one of ten special purposes including the Geographic Circumstances Grant for small schools and for remote and rural boards. To adjust for such variation in resources, total school enrollment and location indicators for rural and northern school boards are also controlled for in the empirical analysis.

²⁸First Nations schools target students of aboriginal heritage, a small percentage of students in Ontario; learning centres focus only on certain subjects but not a curriculum-round education; and some private schools do not follow the Ontario curriculum (for example, schools that following foreign education systems and curriculum targeting foreign temporary workers); and correctional institutes provide education only for students retained in these institutes. International schools and overseas schools are excluded since international schools accept enrollment mostly from overseas visa students and overseas schools that are physically located outside Canada but follow the Ontario curriculum.

²⁹In Ontario, exceptional students include students ‘who have behavioral, communication, intellectual, physical or multiple exceptionalities, and thus may have educational needs that cannot be met through regular instructional and assessment practices.’

³⁰Regressing total funding per pupil on private school enrollment share and selected student and school characteristics for these two years shows that the share coefficients for both years, before and after the introduction of the policy, are insignificant. This suggests that it is unlikely that public schools found in districts with a higher private school presence received significantly more resources to improve performance after the policy.

3.3 Neighborhood definition

Elementary school attendance area approximation. To construct relevant neighborhood characteristics, aggregation at the attendance area would provide demographics for each public school. However, there is no common set of rules in designating attendance areas within Ontario; rather, they are determined by each school board.³¹ Attendance areas change frequently, responding to local conditions that include the construction of new schools, program changes, and to align elementary and secondary boundaries. Not having boundary maps for all public schools in our sample across the policy period, we approximate the relevant attendance area using postal code data of student enrollment from the Ontario school data file. Details of the approximation are provided in Appendix A.

To control for the neighborhood demographics of the students in the same public school, the approximated attendance areas are linked to the Canadian Census of Population for 2001. Using the distribution of student counts, the neighborhood characteristics for each public school can be created from a weighted sum of the dissemination area census variables, based on the enrollment shares of each postal code.³² Table 2 provides summary statistics for the school location and census characteristics in the pre-policy year 2000. Fifteen percent of public schools in the sample are located outside cities (census metropolitan areas) and 5 percent are located in northern school boards.³³ These fixed characteristics will be used as controls in the cross-sectional specification in the empirical analysis.

Within a school attendance area, average household income is about \$73,000. On average, about 13 percent of population have a university education; 18 percent are visible minorities; 4 percent are new immigrants who landed in Canada between 1996 to 2000; one percent are newcomers who moved in Ontario in 2000 to 2001; 31 percent are Roman Catholics; 32 percent are Christians; 9 percent are Anglicans; one percent is Jewish; and 17 percent of the population have no declared religious affiliation.

Matching of private schools to public schools. Without the addresses of students attending the Ontario private schools, we match private schools to the approximated attendance area of public schools based on the location of the former, to create a measure of private school presence for each public school, given that there is no formal boundary for private schools. More details of the linkage are also provided in Appendix A. Here, we

³¹According to the Education Act, school boards are responsible for providing schools and facilities for their students and for operating and maintaining their schools as effectively and efficiently as possible to support student achievement. One of the key responsibilities of school boards is to determine the number, size, and location of schools. Each school is assigned to a particular attendance area.

³²These measures are created for each year to account for any enrollment changes across years, though it should be noted that the underlying census data are all drawn from the 2001 census year, and the variables could have changed subsequently in other years.

³³Statistics Canada defines the census metropolitan area (CMA) to be one or more adjacent municipalities centred on a large urban area. The census population count of the urban core must be at least 100,000 to form a CMA.

assume that the local competition for enrollment faced by each public school comes only from private schools located within the school attendance area.

On the one hand, this matching might underestimate the competition from private schools given that private schools outside the public school's attendance area can also compete for enrollment with the public school. On the other hand, private schools locating within the school attendance area might attract most students from outside the particular attendance area, and this matching might overestimate private school competition faced by the public school located in the same attendance area. Without the residential postal data of private school students, it is not clear which direction any bias might go in.

4 The Ontario Education Market: Descriptive Evidence

In this section, we examine Ontario school data from 1990/1991 to 2003/2004 descriptively, establishing three points. First, using aggregate enrollment data for public and private schools, we show evidence of enrollment responses corresponding to the timing of the tax credit policy. Second, private school presence varied geographically within Ontario around the time of the tax credit, with greater concentrations in the southwest of the province. This supports the notion that the policy was likely to generate differential competition effects for public schools located in different parts of Ontario. Third, we document that there were limited entry and exit responses on the part of private schools around the time of the policy, facts which will inform the main empirical analysis.

4.1 The Ontario private school market

This subsection provides a general description of the Ontario private school market using enrollment data for both public and private schools collected by the Ontario Ministry of Education.

The private school market in Ontario has been growing, especially since the mid-1990s when the Progressive Conservative party was in power. The total number of Ontario private schools has been increasing steadily, showing an average annual increase of just over 5 percent during the period 1990 to 2003. Figure 2 shows the total number of private schools in the province by year, indicating that for recent academic years, the percentage increases³⁴ are highest in the 2000/2001 and 2002/2003 academic years (each about five percent). The pattern of increases during the 1990s provides some support for the claim that interest in private school alternatives may have increased in response to the reforms implemented during the first term of the PC government (see Section 2 for more details),³⁵

³⁴Recent yearly percentage increases in the number of private school are: 5.5% in 2000/2001; 2.3% in 2001/2002; 4.9% in 2002/2003; and 1% in 2003/2004

³⁵There were two pronounced increases in the number of private schools, in the years 1996/1997 and 1998/1999, after the PC party came to power. The PC government loosened the rules for establishing private schools in Ontario in 1995, probably prompting an increase in the number of private schools in the

while the increase in 2002/2003 coincides with the introduction of the tuition tax credit.

Next, we look at aggregate time-series variation in private school enrollment in Ontario, to see if there is any aggregate enrollment impact associated with the tax credit policy. In Figure 3, we plot the net change in private school enrollment levels by school type, aggregated across grades. The private school elementary enrollment pattern displayed a marked increase in 2002/2003 and then a reduction in 2003/2004. This enrollment change is consistent with the view that the private school market was affected by the switch on/off of the tax credit policy, the incentive to choose private school vanishing after the cancellation of the tax credit in December 2003. Of note, this was positive for the elementary grades for all years except for the academic year 2003/2004, the year the tax credit policy was revoked. In Figure 3, the up/down pattern is more clearly seen for elementary rather than the secondary grades. This suggests that the tax credit policy had more effect on the decision regarding choice of schools for elementary students.³⁶

A similar pattern can be seen in the private school enrollment *share* plotted in Figure 4. The up/down share variation during the policy period is only observed in the elementary grades, but not the secondary grades. Another pattern to note is that in 2001/2002, the enrollment share remained flat compared to the previous year. Similar to the limited increase in private schools in 2001/2002 shown in Figure 2, the response may have been smaller in the first academic year 2001/2002 immediately after the tax credit policy announcement in May 2001, if parents and schools needed some time to react to the policy incentive in effect for the tax year 2002.

We further disaggregate private school elementary enrollment by grades in Figures 5. Each line in the graphs represents a particular grade (Grades 1 through 8). The plots show that the up/down pattern during the policy period is quite consistent across students of different grades.

We have separated private school enrollment by religious orientation in Figure 6. The plot suggests that the enrollment response is more significant among religiously affiliated private schools than secular private schools. Since the tax credit policy provided credit for the first \$7,000 of tuition, the policy effect is most likely to be stronger for private schools within the low- to mid- tuition range. From tuition data collected for a subsample of private schools, the average tuition fee of religious private schools is lower compared to non-religious schools.³⁷ It is likely that religious private schools receive a financial subsidy

province. However, the standardized school performance data used in the current analysis do not permit an examination of the impact on average school performance from these policy reforms: the available performance data start in 1998/1999.

³⁶One reason for this could be that there is more public school choice for students in secondary grades because older students can commute to public schools in another attendance areas more easily. In Toronto, for example, open enrollment operates at the high school level.

³⁷Private school tuition data for a subset of schools has been published annually by the *My Kids Go To School* magazine since 1999. The average tuition fees for religious private schools increased from approximately \$9,000 in 2000/2001 to about \$11,000 in 2003/2004, while that of non-religious schools is from \$11,000 to \$13,000

and/or teaching support from affiliated religious organizations, even without the government subsidy.

The *public* school enrollment response corresponding to the timing of the tax credit is explored in Figure 7. Public school enrollment shares by grade indicate that the public school enrollment shares fell from 1997/1998 until 2002/2003 (when the policy was switched off) and rose in 2003/2004.

In summary, the aggregate time-series variation in enrollment in Ontario private and public schools points to suggestive aggregate enrollment patterns that correspond to the timing of the tax credit policy. In particular, private school enrollment and enrollment shares display an up/down pattern in line with the timing of the switch on/off of the tax credit policy. Also, the enrollment response in the elementary grades schools exhibits a stronger response that is consistent with the hypothesis that the tax credit policy would have a stronger effect for elementary students who previously had less choice in the public system, perhaps because of the mobility constraints for younger students.

4.2 Tuition tax credit policy period

While the earlier analysis looks at private school data from the entire sample period, in this subsection, we focus on the period from 2000/2001 to 2003/2004, describing the geographic distribution of private schools within Ontario around the time of the policy.

Location of private school within Ontario. Figure 8 shows the geographic distribution of private school within Ontario in 2000/2001, before the introduction of the tax credit. Six major population centres are shown on the map: Ottawa, Toronto, Barrie, London, North Bay, and Thunder Bay. The plot makes clear that private schools are located primarily near and in these population centres, especially in southern Ontario.

Table 3 presents the number of private schools offering elementary grades from 2000/2001 to 2003/2004, disaggregated into the six district divisions.³⁸ A total of 654 private schools with elementary grades were registered in Ontario before the policy. A large proportion of private schools in Ontario are located within Toronto and its surrounding area (33.33 percent), as well as London and its surrounding area (32.72 percent). After the announcement of the tax credit in 2001, the central cities and the surrounding areas of Ottawa, Toronto, and Barrie all showed an increase in private school numbers; the yearly increase is about 7 percent in Ottawa, 6 percent in Toronto, and 2 percent in Barrie.

In order to more precisely compare private school presence in different divisions, accounting for variation in the underlying population of school-aged children, a student population-adjusted private school enrollment measure is shown in Table 4. For each division, the approximate space available in private schools (the elementary enrollment in private schools within the division) is divided by the total number of children age 6 to 14

³⁸These divisions are those used in the Ontario Ministry of Education website relating to private schools.

(per 1,000) located there. The figures suggest that private school presence adjusted for variation in the population of school-aged children is highest in Toronto, Barrie, and London (southern Ontario). More generally, both the overall number of private schools and the population-adjusted private school enrollment measure make clear that there is geographic variation in private school presence within the province.

Similar to the aggregate enrollment patterns documented above, the adjusted private school enrollment measure in southern Ontario shows an increase during the policy period (2001/2002 and 2002/2003) and then a fall in 2003/2004, when the policy was retracted. No such response can be identified in Northern Ontario, reinforcing the notion that the policy effect is likely to vary geographically within Ontario.

Private school entry and exit This subsection analyzes private school entry and exits after the introduction of the tax credit policy. Table 5 tabulates the number of entries and exits as well as net entry in 2001/2002, 2002/2003, and 2003/2004. In addition to the overall numbers, we have further divided private schools by the number of schools with positive Grade 3 enrollment - the grade that we focus on the main empirical analysis.

The table shows that there was limited entry immediately after the policy, with 27 schools entering in 2001/2002, 37 schools in 2002/2003, and 27 schools in 2003/2004. Most new entry occurred in Toronto and its surrounding area (52 percent of the total in 2001/2002, 46 percent in 2002/2003, and 48 percent in 2003/2004). The new entrants occur mostly in communities with some existing private school presence;³⁹ only 5 new schools in 2001/2002, 4 new schools in 2002/2003, and 2 new schools in 2003/2004 appeared in communities with no private school in 2000/2001.

It is worth noting that exits also occurred during the policy period, with 13 schools exiting in 2001/2002, 14 schools in 2002/2003, and 29 schools in 2003/2004. Particularly relevant to the current analysis is the fact that in 2001/2002, only 9 schools with Grade 3 enrollment in 2000/2001 dropped out of the market,⁴⁰ no schools with Grade 3 enrollment dropped out in 2002/2003, and 16 schools with Grade 3 enrollment dropped out in 2003/2004. Given the limited changes in private school presence, these exits are unlikely to have had much influence on neighbouring public schools.

The evidence on net entry indicates that there was a limited supply response in terms of the number of new private schools around the time of the policy. The net entry amounts to only about two to three percent of the total number of private schools in 2001/2002 and 2002/2003. After the introduction of the policy, only about half of the new entrants had Grade 3 programs, further diminishing any private sector supply response.

³⁹Here, a community denotes a city, town or village, as defined by Canada Post Corporation.

⁴⁰Grade 3 performance being the focus of the analysis in this thesis.

4.3 Measuring private school presence

To provide credible competition for a public school, at minimum there must be potential places in alternative schools which children attending the school could switch to. However, measuring potential places is difficult because it would require knowledge of the available capacity in rival schools in the area. An obvious proxy would be to use actual ‘seats’ currently available, or more indirectly, the market share of rival schools, such as local private schools in this context. In this study, private school enrollment share, defined as total private school student enrollment divided by total student enrollment at the school attendance level – the sum of public school enrollment, publicly-funded Catholic school enrollment, and private school enrollment – is used to capture private school presence in the local market in which each public school operates.⁴¹

Table 6 presents summary statistics relating to private school enrollment shares. The first panel shows enrollment shares. The only discernible increase in the private school enrollment share following the introduction of the tax credit is concentrated in the top end of the distribution (the 90th percentile and the 95th percentile): the mean level remains the same over time.

The second and the third panels show two measures of the enrollment share gain used below (the share gain relative to the pre-policy level in 2000/2001 and the yearly share gain). As shown in both panels, the increase in enrollment share gain is more pronounced in the top percentiles - similar to the level descriptives in Panel A.

4.4 Public school performance measure

Looking ahead, we provide descriptive statistics relating to our main public school performance measure — the proportion of students attaining the provincial average.⁴² Table 7 presents summary statistics based on a sample of 1,886 schools that could be linked across the sample period, with 2000/2001 being the pre-policy base year, 2001/2002 and 2002/2003 covering the policy period, and 2003/2004 being the year when the tax credit was unexpectedly ended. Panel A presents summary statistics on the score level over time; Panel B summarizes the score gain relative to the pre-policy level; and Panel C summarizes the yearly gain in scores.⁴³

Referring to Panel A, the average proportion of grade 3 students achieving the provincial standard declines very slightly during the policy period – 0.62 for 2000/2001, 0.58 for 2001/2002, 0.57 for 2002/2003 – before rising to 0.64 in the following year 2003/2004. The distributions also became slightly more dispersed during the policy period, with a

⁴¹Publicly-funded Catholic schools are linked to public schools by their locations at the Dissemination Area (DA) or Census Tract (CT) levels.

⁴²The proportion gives the number of students at a school achieving a given level as a percentage of all of the students in the grade, including students who were exempted and those who took part in the assessment but did not produce enough work to receive a score (according to EQAO’s Method 1 reporting).

⁴³All three measures will be used in the analysis of the performance effects of the tax credit below.

standard deviation of 0.19 in 2000/2001, 0.20 in 2001/2002, 0.21 in 2002/2003, becoming less dispersed again (0.19) in 2003/2004.

We use two score gain measures in the main empirical analysis: the score gain relative to the pre-policy level in 2000/2001, and the yearly score gain. The summary statistics show that the within-school average performance change (measured by the yearly score gain in Panel C) during the policy period trended up after an initial drop in 2001/2002 relative to 2000/2001, with the mean score gain being -0.04 for the first year, -0.01 for the second year (2002/2003), and 0.07 for the third year (2003/2004).

5 Conceptual Framework

This section outlines a simple model of local education markets. The model adds student ability differences to a basic school choice model in which public schools choose effort, necessary in order to analyze both productivity and sorting effects of private school vouchers within the same framework — effects that are likely to operate together in practice. This model is then used to motivate the estimation approach used in the subsequent empirical analysis.

5.1 Model

Agents. Consider local school markets in which there are three types of agent: households with school-aged children, private schools, and public schools, with one public school located in each market. Here, we are assuming that there is no competition among public schools across markets, the purpose being to draw attention to differences in public school incentives associated with local variation in private school presence.

All households have school-aged children and the children have heterogenous ability. Households are also heterogenous in their incomes. The proportion of high-income households in a market is assumed to be x , where x is an exogenous parameter. Household residential locations — taken to be exogenous — affect the distances to public and private schools, respectively, which may affect relative costs.

All households share the same concave utility function defined over school quality Q and consumption c , and written $U(c, Q)$. Households choose between public and private schools to maximize utility, which depends positively on Q and c , and negatively on the school-related expense associated with the type of school chosen; this includes any school fees and transport costs.⁴⁴ Specifically, household utility from choosing school type S (the subscript S ranges over 0 for public schools and P for private schools) can be written as: $U_S = U(c_S, Q_S)$, where household consumption and school quality depend on the school type chosen.

⁴⁴Transport costs will be relevant in the empirical application, as geographic variation in the availability of private school alternatives will help generate variation in competition.

Public schools. Suppose there is a single public school in each market, which may face competition for enrollment depending on local private school presence. Public schools are free, which gives them a competitive advantage over private schools.

In terms of the technology faced by the school, we assume that the education production function which links inputs to school outcome measures depends only on school effort e and average student ability \bar{a} in the school.⁴⁵ The school quality function of the public school in a representative school market can thus be written as $Q_0 = Q(e_0, \bar{a}_0)$. The function has positive first partial derivatives, negative second partials and a potentially non-zero cross-partial.

Under such a formulation, households care about both school effort and average student characteristics. If average student ability were high for exogenous reasons, then the public school might be able to exert low effort and still enrol many students, thereby earning better results. The enrollment decision will be discussed below, though it is clear that average ability will be endogenous.

Public schools are assumed to be single effort-making bodies, setting effort in order to maximize rents.⁴⁶ Raising effort raises public school quality directly, which increases enrollment and in turn revenue.⁴⁷ But raising effort is costly. Optimal effort e^* will balance the revenue gains against the increased cost. The public school's payoff function can be written:

$$R(e, \bar{a}) = (V - C(e))N_0(Q(e, \bar{a})), \quad (1)$$

where V is the public school funding per student, $C(\cdot)$ is the convex cost of effort, and N_0 is total public school enrollment, which depends on school quality perceived by the households. When the total market size is normalized to 1, then N_0 can also be interpreted as the public school's market share.⁴⁸

Private schools. Private schools compete for enrollment with public schools. They charge tuition fees T , and potentially select on the basis of ability. The education quality Q_P they offer is assumed to depend on T , among other factors, with $\frac{\partial Q_P}{\partial T} > 0$.

While in practice, private schools may serve a variety of goals, we assume for simplicity that they are profit-maximizing. We note that in an Ontario context, the free entry assumption does not seem compelling, though under free entry, private schools would earn zero profits in equilibrium and would be forced to operate efficiently, allowing the suppression of effort as a private school choice variable.

⁴⁵The role of resources on average school performance is abstracted from in the analysis.

⁴⁶If public schools were quality-maximizing rather than rent-seeking, there would be little reason to expect any incentive effect from increased competition.

⁴⁷There may be indirect effects on public school quality as the ability mix in the school changes.

⁴⁸The public school is assumed to have the capacity to enrol every student in the district.

The game. Having introduced the agents, the game proceeds as follows: Public schools set optimal effort accounting for the tuition fees and thus quality offered by type-specific private schools (based on the preceding discussion), and private schools set fees in order to maximize profits. Households then choose between public and private schools based on relative quality and cost.

In *equilibrium*, no household wishes to deviate from its schooling choice, every student attends some school, public schools maximize rents by setting effort optimally, and private schools maximize profits through setting tuition and thus quality appropriately.

5.2 The Policy

The conceptual exercise relevant to the empirics involves introducing a uniform private school tuition subsidy across a set of markets and seeing how local market equilibria adjust in response to the associated increase in competition, depending on local characteristics in each market – in particular, private school availability. We first consider measurement issues, before discussing the empirical implementation of the model.

Measuring competition. An intuitive measure of competition can be characterized cross-sectionally. To see this, it is worth considering the public school’s effort choice more fully. Abstracting from any effect on the mix of student abilities, optimal effort e^* satisfies the first-order condition

$$(V - C(e)) \frac{\partial N_0(Q(e))}{\partial e} - \frac{\partial C(e)}{\partial e} N_0(Q(e)) = 0. \quad (2)$$

This draws attention to the important role played by the enrollment response, $\frac{\partial N_0}{\partial e}$. If the enrollment response is high, then if the public school were to cut effort, it would face a large reduction in enrollment and suffer a significant reduction in revenues also; consequently, low effort would be unlikely to be optimal. In contrast, if the enrollment response were low, the public school could reduce costly effort without losing a large amount of revenue.

The enrollment response $\frac{\partial N_0}{\partial e}$ provides a useful measure of the competitiveness of the market that the public school operates in – the higher the enrollment response, the more competitive the market. In measuring the effects of competition on public school performance, one approach would involve measuring public school demand responsiveness directly. Reduced-form alternatives are also available, approximating market conditions using factors likely to increase public school demand responsiveness, such as private school availability. If private schools were randomly assigned to neighborhoods, one could compare the performance of public schools in neighborhoods with few private school places against those in neighborhoods with a significant number of private school places. In the latter neighborhoods, households would have more choice, and the competition faced by local public schools would be expected to be higher as a result.

There is a measurement difficulty in using cross-sectional variation in private school presence: in practice, private schools are not randomly assigned across markets. For example, there may be a large number of private schools because a subset of local households have strong tastes for private education. In such a setting, there might well be few marginal households, even though private school presence was high.⁴⁹

5.3 Empirical implementation

New private school entry was limited following the introduction of the tax credit. This could be rationalized either by private school set-up costs or by expectations that demand changes would be slight. Focusing on the former, private school set-up costs would imply that private school places cannot adjust in a perfectly elastic way across all locations. Instead, the potential adjustment in supply in a given market would be related to pre-existing private school presence there.

At one extreme, for neighborhoods with no private schools pre-tax credit and no subsequent private school entry, household options would remain the same. In turn, local public schools would face no increased pressure on enrollment: local competition would remain unchanged. In contrast, household options would expand in neighborhoods with many private schools. By making local private schools more affordable, potentially many households might reconsider their schooling choices, and the number of marginal households could increase significantly. This would in turn increase the competitive pressures on local public schools.

This discussion draws attention to the key measurement idea in this paper. In general, the tax credit should increase the competition faced by public schools, but it should do so in a non-uniform way: in particular, *the increase in competition associated with the introduction of the tax credit should be increasing in private school presence.*

The local increase in competition can be approximated by a simple function: local private school presence in combination with the province-wide policy shock. With this measure in hand, two empirical claims follow:

1. The cross-sectional impact of local private school presence on the level of competition should be increasing following the introduction of the tax credit.
2. Considering individual public schools longitudinally, the increase in competition should be greatest where local private school presence is highest.

These claims are testable, indirectly. In order to shed light on them, we link competition and school performance via an education production function that relates school quality to

⁴⁹The model makes clear that private school presence (in terms of total enrollment in private schools) is likely to be jointly determined in equilibrium with public school quality. This gives rise to endogeneity issues that will be addressed in Section 7.

a variety of school inputs.⁵⁰ The education production function can be written generally as, $\bar{T} = f(e, \bar{s}, \bar{\mathbf{X}}, \bar{\mathbf{Z}}) + \epsilon$, where \bar{T} is average public school performance, measured by test scores, and this depends on public school effort e , average student characteristics \bar{s} , a vector of observable school controls $\bar{\mathbf{X}}$, a vector of neighborhood controls $\bar{\mathbf{Z}}$, and an additive error term.

The discussion above provides reason to think that public school optimal effort may depend on the degree of local competition, at least if public schools are rent-seeking.

School effort is not directly observable, but will depend in part on factors influencing the slope $\frac{\partial N}{\partial e}$. Suppose, for simplicity, that public school j 's optimal effort e_j^* depends on observable private school availability, A_j . A parametric version of the education production function can then be written as

$$\bar{T}_j = \beta_0 + \beta_1 A_j + \beta_2 \bar{s}_j + \bar{\mathbf{X}}_j' \boldsymbol{\beta}_3 + \bar{\mathbf{Z}}_j' \boldsymbol{\beta}_4 + \epsilon_j. \quad (3)$$

where optimal effort has been substituted for using A_j . Central to the empirical analysis below is the local variation in competition associated with the introduction of the tax credit. To capture this aspect of the policy variation, we introduce additional time subscripts below.

Any increases in unobservable effort associated with the policy will tend to be manifest in changes to school performance. Thus we would expect school performance to depend on changes in competition, linked to local private school presence and the variation in choice due to the policy. Yet equation (3) also makes clear the identification challenge associated with unobservable sorting. The overall effects of increases in local competition can be thought of as combining productivity effects (working through school effort) and sorting effects, working through changes in the student body. If the overall policy effect related to A_j is positive, the productivity effect can be either positive or negative depending on the sorting response: if the public schools lose the better students (commonly known as ‘cream-skimming’ in the education literature) and suffer from negative sorting effect, then the positive policy effect implies that the school productivity effect must be positive and dominate the negative sorting effect in equilibrium to improve the average school performance; if the reverse sorting dominates in which more weaker students leave the public system, the productivity response to increased competition could be negative. In Section 7, we will use observables to shed some light on the possible extent of unobservable sorting.

6 Measurement Framework

Building on the discussion of the model, this section motivates the estimating equations that will be taken to the data. It also explains how endogeneity concerns will be addressed.

⁵⁰Quality can be thought of as some measurable output such as school average test scores, conditioning on student and school inputs.

Cross-sectional analysis. The cross-sectional estimating equation is given by

$$\bar{T}_{jt} = \beta_0 + \beta_1 A_{jt} + \mathbf{s}'_{jt}\beta_2 + \mathbf{X}'_{jt}\beta_3 + \mathbf{Z}'_{jt}\beta_4 + \epsilon_{jt}, \quad (4)$$

where \bar{T}_{jt} is public school j 's average test score at time t , A_{jt} captures local private school availability, measured using local private school enrollment, \mathbf{s}_{jt} measures a set of average student characteristics, \mathbf{X}_{jt} is a vector of observable school controls, \mathbf{Z}_{jt} is a vector of neighborhood controls, and ϵ_{jt} is an additive error term.

In the cross-sectional analysis, the key empirical issue is whether the coefficient β_1 , which identifies a combined effect of productivity and sorting on public school performance, rises following the policy. That is, does the public school performance response to private school availability increase following the introduction of the policy?

Having measured this combined effect, separating sorting from productivity is non-trivial. In the analysis below, the effect of choice on sorting will be controlled for using a set of observable student characteristics and local demographics. In terms of unobservables, the Ontario data do not permit individual students to be tracked over time, precluding any detailed analysis of sorting induced by the policy.⁵¹ Nevertheless, the empirical evidence below does not indicate significant sorting in observable student characteristics, suggesting that any sorting effect is unlikely to dominate the overall competition estimate – that is, assuming observables are a guide to unobservables.

In addition to sorting, the private school availability measure may also pick up neighborhood characteristics that affect public school performance.⁵² To distinguish higher public school performance due to the increased-choice policy from better neighborhood characteristics, we control for a host of neighborhood characteristics in the school attendance area. Controls include average income measures (proportion of population at different income quartiles); the proportion of the population with a university education; the proportion of visible minorities; the proportion of new immigrants; the proportion of intra-provincial migrant in 2000/2001; the proportion Roman Catholic; the proportion Christian; the proportion Anglican; the proportion Jewish; and the proportion of the population with no declared religious affiliation. The Roman Catholic proportion is specially chosen to control for local Catholic presence that might reflect the competition faced by public schools from the publicly-funded Catholic schools in the same attendance area. Various school input

⁵¹Individual students cannot be tracked over time, and school-average results have to be used for comparison in the EQAO data. For the assessment in Grades 3, 6 and 9, limited private school information was collected because private school participation was voluntary. For the Grade 10 OSSLT assessment, more private schools participated as the successful completion of OSSLT is a OSSD graduation requirement. However, the OSSLT test was introduced in 2001/2002 (after the announcement of the tax credit), and no pre-policy score exists.

⁵²Comparing several key average neighborhood characteristics for the public schools located in high *vs.* low private school presence in 2000/2001 shows that the most notable difference between districts with high private school presence is in terms of average household income, which is higher in districts with a higher number of private schools.

measures (teacher experience, total enrollment, city size, and schools in northern board indicator) are also included to account for any resource effects on school performance.

Score-gain specification. The school panel aspect of the data allows us to make use of time variation in the performance of a given school. To account for fixed unobservable characteristics across years, we examine the ‘value-added’ in a given school’s performance, comparing before and after the policy. As noted, to capture the local increase in competition, the measurement approach combines the policy time variation and local variation in private school presence. This can be represented using the following unobserved effects model, drawing attention to the time variation in the private school availability index:

$$\bar{T}_{jt} = \lambda_0 + \lambda_1 A_j t + \mathbf{s}'_{jt} \boldsymbol{\lambda}_2 + \mathbf{X}'_{jt} \boldsymbol{\lambda}_3 + \mathbf{Z}'_{jt} \boldsymbol{\lambda}_4 + a_i + \epsilon_{jt} \quad (5)$$

for $t = 1$ and 2 (pre- and post-policy), and where a_i represents fixed school characteristics, and the interaction term captures the time dimension, which may influence the sensitivity of public school performance to the private school presence measure. The equation in first-differences is:

$$\Delta \bar{T}_j = \lambda_1 A_j + \Delta \mathbf{s}'_j \boldsymbol{\lambda}_2 + \Delta \mathbf{X}'_j \boldsymbol{\lambda}_3 + \Delta \mathbf{Z}'_j \boldsymbol{\lambda}_4 + \Delta \epsilon_j. \quad (6)$$

A common concern when using a gain outcome measure is that the gain is likely to be affected by the base score of the school because of ‘ceiling effects.’ This implies that schools that scored highly on the 2000/2001 test were more likely to experience lower-than-average gains in 2002/2003 for mechanical reasons. To adjust for a variation in the base score, we augment equation (6), adding a dummy variable, b_j , to identify schools with a base score above the median in 2000/2001, the pre-policy year:

$$\Delta \bar{T}_j = \lambda_1 A_j + \lambda_5 b_j + \Delta \mathbf{s}'_j \boldsymbol{\lambda}_2 + \Delta \mathbf{X}'_j \boldsymbol{\lambda}_3 + \Delta \mathbf{Z}'_j \boldsymbol{\lambda}_4 + \Delta \epsilon_j. \quad (6')$$

Other outcome measures. Since public school effort is not directly observable, parents have to indirectly infer the level of effort via its average public school performance. To retain student enrollment, public schools located in more competitive districts might choose to increase their effort to improve student performance. Yet they could also attempt to ‘game’ the testing system to increase average performance by different means. For example, schools could assign more students to special education programs to access more resources.⁵³ During the assessment, public schools could also grant additional assistance

⁵³School boards receive Special Education Grants based on the proportion of students who need special education services. The actual calculation for the Special Education Grant is more complicated in the Student-Focused Funding formula. The Special Education Grant consists of two main components: the Special Education Per Pupil Amount based on the total number of students the board serves, and the Intensive Support Amount based on the proportion of students who need special education services.

or more exemptions to students.⁵⁴ Analysis of these measures can provide some insight into the administration process to see if gaming is apparent, comparing schools in high *vs.* low private school presence areas. The proportion of students without a valid score is also analyzed to check if there are any differences in the scoring pattern across schools.

Using the same framework as the cross-sectional test score analysis, these outcome measures (proportion of students granting additional assistance or exemptions and proportion of students without a valid score) can be examined to see if they vary significantly between public schools located in districts with high *vs.* low private school presence, after controlling for observable student, school, and neighborhood characteristics, as follows:

$$\bar{O}_j = \beta_0 + \beta_1 A_j + \mathbf{s}'_j \boldsymbol{\beta}_2 + \mathbf{X}'_j \boldsymbol{\beta}_3 + \mathbf{Z}'_j \boldsymbol{\beta}_4 + \epsilon_j, \quad (7)$$

where \bar{O}_j is some other outcome measure for school j .

Alternative test outcome measures. The performance analysis above focuses on the proportion of students attaining the provincial standard (Levels 3 and 4).⁵⁵ To increase the proportion of students reaching the standard, public schools could focus their efforts on the group of students whose performance was likely to be relatively close to the standard. If that is the case, students in the low-performing category (more likely to be those in Level 1) might be given less support. In order to examine if the increased-choice policy has a differential impact on the performance distribution, the proportions of students achieving different achievement levels are used as alternative outcome measures in equation 7.

Instruments for private school presence. Using the local private school enrollment share as the chosen measure of private school presence raises the concern that such a measure is likely to be endogenous, as highlighted by Hoxby (1994): if public schools became worse, so the local private school share would be expected to rise, absent any response by public schools. The standard approach in light of this difficulty has been to instrument for private school availability, (ideally) using plausibly exogenous variation in factors driving private school presence otherwise unrelated to the determinants of public school performance.

To capture those locations with greater capacity following the introduction of the tax credit, we use a set of district neighborhood instruments in order to capture the exogenous variation in private school availability at the more local level in the score-gain specification.

⁵⁴According to the EQAO guidelines, teachers and principals must make concerted efforts to enable all students to participate in all parts of the assessment in order to demonstrate the full extent of their learning. This may involve providing one or more accommodations during an assessment. The principal is responsible for making decisions about student participation in the assessment and ensuring that any accommodation, special provision or exemption is documented.

⁵⁵As described in Section 3, EQAO adopts a four-level scale, with Level 3 as the provincial standard when reporting individual student test results. Levels 1 and 2 indicate achievement below the provincial standard, while Level 4 indicates achievement above the provincial standard. In the data, Level 0 was assigned for students with insufficient information to score Level 1 or with no valid scores.

Several average census characteristics at the district census subdivision level are used to predict the private school enrollment share, including the proportion of the population with a university education, proportion of Roman Catholics in the population; proportion Jewish in the population, and proportion of the population with no declared religious affiliation. These wider variables predict the population demographics that are likely to increase the demand for private school enrollment for reasons not directly related to public school performance. The primary concern in using cross-sectional instruments to predict exogenous variation is that the instrument is likely to be correlated with the unobservables in the error term: in the score gain specification, the fixed unobservables relating to private school presence have been differenced out. Therefore, the use of the ‘level’ neighborhood variables is unlikely to suffer the same degree of correlation with the *evolution* of the error term in the score-gain specification.

Here, we are assuming that there is no differential trend between schools located in districts with high and low private school presence. Though performance gains for schools located in districts with higher private school presence might be explained by the positive trends in performance specific for these schools, empirical evidence below lends support to this identifying assumption.

7 Empirical Evidence from Ontario’s Tuition Tax Credit

This section presents the main empirical results, relating to the effects of increased competition from private schools on public school performance.

Cross-sectional analysis. Table 8 presents baseline regression results from an analysis of the determinants of Ontario public school achievement, controlling for observable student, school characteristics, and sociodemographics. The private school enrollment share coefficient is the focus of interest, the pro-competition hypothesis suggesting that the impact of private school presence would be higher following the introduction of the policy, especially in 2002/2003, when the tax credit was in full effect.

Without controlling for student, school characteristics or socio-demographics, the share measures are positive and significant in all three years with no controls (Columns 1, 3, and 5).⁵⁶ However, the better public school performance shown for schools with a higher private school presence may be due in part to the characteristics of affluent neighborhoods. Indeed, after controlling for the available student, school, and neighborhood characteristics, the ‘beginning-of-year’ share coefficient is no longer significant in 2000/2001, 2001/2002 and 2003/2004 (Columns 2, 4, and 8). For 2002/2003, the share coefficient remains positive and significant in the fully specified model (Column 6). The estimated coefficient, $\beta =$

⁵⁶The sample is clustered at the school board level and standard errors are robust to the presence of heteroskedasticity.

0.47 ($s.e. = 0.09, P < 0.01$), implies that the proportion of Grade 3 students attaining the provincial standard in a public school is predicted to increase by 0.02 – about ten percent of a standard deviation – when the private school enrollment share increases by one standard deviation.⁵⁷

This finding indicates that the performance effect for public schools located in districts with higher private school presence is stronger when the tax credit policy was in effect. Public school performance was not significantly different for schools with higher private school presence before the policy, as suggested by the insignificant share coefficient in 2000/2001, and immediately after the announcement, parents and schools may have taken time to adjust in 2001/2002. In 2003/2004, the policy was cancelled and the estimated higher public school performance for schools in neighborhoods with greater private school presence disappears.

Score-gain specification. With the EQAO school panel, we can examine the average performance gain for a given school before and after the introduction of the policy, in order to difference-out fixed factors that might be correlated with private school presence.

Given that the private school enrollment share is not necessarily a clean measure of available private school places, the first-differenced enrollment share might be a noisy indicator of the *change* in competition faced by each school.⁵⁸ As an alternative, we propose (following the strategy outlined above) to capture the change in competition using a combination of the policy variation and local *cross-sectional* variation in private school presence. To identify districts where public schools are likely to face higher private school presence, we use the ‘beginning-of-year’ private school enrollment share – the broad tenor of the findings is not sensitive to this choice.⁵⁹ Since the EQAO tests are administered in May/June of the academic year, public school can react to the ‘beginning-of-year’ private school enrollment share by adjusting their effort level for the remainder of the academic year.

Table 9 summarizes the share coefficients on the within-school score gain using the score gain specification described in equation 6.

For the full sample analysis, the baseline coefficients for the score gain specifications in columns 1, 3, and 5 show that the private school presence measure is only positive and significant in 2002/2003 with the two-year score gain measure. The share coefficient in column 3, $\beta = 0.05$ ($s.e. = 0.02, P < 0.05$), indicates that a one standard deviation increase in private school enrollment share would generate a 5-percent standard deviation

⁵⁷The effect size is calculated by comparing the predicted proportion of students attaining the provincial standard at the mean level of private school enrollment share and the predicted proportion when the private school enrollment share increases by one standard deviation from the mean level. In 2002/2003, the predicted proportion of students attaining the provincial standard at the mean private school enrollment share of 0.16 is 0.50 and the predicted proportion becomes 0.52 when private school enrollment share increases to 0.35 (adding one standard deviation of the share measure, 0.19, to the mean share value).

⁵⁸We show results using this, regardless.

⁵⁹Results with alternative private school presence measures are shown in Table 12 below.

increase in average public school performance for the within-school gain outcome measure. The estimated competition effect is smaller than that estimated from the cross-sectional analysis in Table 8. This suggests that the score gain specification controls for some fixed unobservables that are positively correlated with the private school presence measure: without direct controls for the unobservables in the cross-sectional analysis, the private school presence measure is biased upwards.

Against this, using the within-school gain as an outcome measure is likely to bias down the competition estimate for those schools that have high base scores, due to a ceiling effect. To illustrate, suppose that a school is found in a district with high private school presence and has a high score in 2002/2003. This observation would contribute to the positive competition effect estimated from the cross-sectional analysis. But if the school also had a high score in 2000/2001, then the gain between the two years would be small for purely mechanical reasons, which would tend to lower the impact of competition for the district with a high private school presence. This illustrates one concern when using the gain outcome.⁶⁰

We address this concern about ceiling effects in two ways. First, we control for the base score in 2000/2001. Columns 2, 4, and 6 in Table 9 present the results, controlling for the base score using an indicator variable for ‘base score above the median’ across the sample periods. The private school presence measure is still only positive and significant in 2002/2003. The indicator variable for the base score above the median is negative and significant, which points to the fact that schools with lower base scores have greater improvements, as one would expect. The private school enrollment share measure for the full sample, after controlling for the base score in the gain specification, is now 0.10 (*s.e.* = 0.01, $P < 0.01$). This coefficient implies that a one standard deviation increase in private school enrollment share is associated with an 10-percent of a standard deviation increase in average public school performance.

Second, we split the sample into two based on the median score level in 2000/2001. The coefficients for the split samples are shown in Table 10. Similar to the results from the full sample, the private school enrollment share is positive and significant in both high and low base score groups for the two-year score gain specification. The estimates indicate that a one standard deviation increase in private school enrollment share would generate a 10-percent of a standard deviation increase in average public school performance.⁶¹

Yearly score gain measure. In addition to examining the within-school score gain relative to the pre-policy level, we have examined the yearly score gain measure using the

⁶⁰In the school panel data, among the 159 public schools that are located in districts with private school enrollment share above the 75 percentile and public school scores above the 75 percentile in 2000/2001, 98 schools have public school scores above the 75 percentile as well as in 2002/2003.

⁶¹Similar results are also found using the *residual gain measure* in which the base score is controlled for directly as an independent variable while using the post score level as the dependent variable using the same score gain specification.

same specification in equation 6'.

Table 11 summarizes the share coefficients on the yearly score gain using the ‘beginning-of-year’ measure of private school enrollment share. The coefficients show that the private school measure is positively associated with the yearly gain after the introduction of the tax credit policy (significant for the second-year gain in 2002/2003 after accounting for the base score) and negatively correlated in 2003/2004 after the tax credit policy was canceled. This pattern again conforms with the timing of the start and cancellation of the tax credit policy, influencing the extent of competition faced by public schools.

Alternative private school presence measure. Thus far, private school presence has been measured by the ‘beginning-of-year’ private school enrollment share. To check the sensitivity of the results to this, we compare the school score gain results with three alternative private school presence measures: the pre-policy private school enrollment share in 2000/2001, the *change* in private school enrollment share relative to the pre-policy level, and the *change* in private school enrollment share relative to the previous year.

Table 12 summarizes the share coefficients on the within-school score gain from an analysis of the score gain specification, described in equation 6 using the four private school presence measures.

The results are fairly similar across the alternative private school presence measures. The change in private school enrollment share displays greater variation but as discussed before, these ‘change’ measures are likely to be more ‘noisy’ than the other measures. We conclude that the results are not overly sensitive to the use of the ‘beginning-of-year’ private school enrollment share in the within-school score gain analysis above.

7.1 Endogeneity

Following Hoxby’s (1994) insight, an important potential endogeneity bias can be addressed by instrumenting for the private school enrollment share. Households should have more incentive to enrol their children in private schools when the performance of their local public school is poor. In such cases, high private school enrollment would be correlated with low public school performance, thereby creating a negative bias in the overall performance estimates.

To isolate exogenous variation in private school presence, we have used a set of neighborhood demographics (the proportion of the population with a university education, the proportion of Christians in the population, and the proportion of Jews in the population) at the district census subdivision level associated with a given public school to instrument for the potential endogenous private school enrollment share. The idea is that, if the wider area becomes more educated given the local demographics, enrollment in the ‘local’ district should increase.⁶² The selected instruments are intended to isolate the marginal households

⁶²To serve as a valid instrument, these wider SES would have to be uncorrelated with error and to predict

most likely to be affected by the policy.⁶³

The first-stage regression coefficient estimates for private school enrollment share are presented in Table 13 in which the ‘beginning-of-year’ private school enrollment share is regressed on the differenced student, school, and neighborhood variables as well as the excluded instruments.

The set of neighborhood demographics at the wider census subdivision level are strong predictors of private school enrollment share, with significant t-statistics in the first stage. The partial F-statistics show that the instruments fare better in 2001/2002 and 2002/2003 (with p-values smaller than 0.01) than in 2003/2004 (with p-value slightly larger than 0.02).

Table 14 presents IV estimates for the Ontario public school performance gain analysis. The IV estimate for private school presence is only significant for the two-year gain specification. Comparing the result of the IV coefficient ($\beta = 0.21, s.e. = 0.10, P < 0.05$) to the OLS coefficient ($\beta = 0.12, s.e. = 0.03, P < 0.01$), the IV estimate is larger.⁶⁴ This conforms to the rationale that the instrument can remove the negative bias from the private school presence measure. Nevertheless, the main identifying power in the analysis is the time variation due to the policy, which argues for focusing on the OLS estimator over the less efficient IV approach.⁶⁵ It is worth re-emphasizing that the differencing used in the OLS estimator helps account for any correlation between the private school share and fixed unobservables.

7.2 Robustness

The main results presented earlier indicate that public schools performed better in districts with higher private school availability once the tax credit was in full effect. These findings suggest that greater competition increases public school productivity. To shed more light on this possibility, we now discuss alternative hypotheses that relate to sorting, gaming the system, and differential trends.

Sorting. The estimated coefficient on the private school enrollment share in equation (4) measures the combined effect on average public school performance from any productivity response as well as student sorting once the increased-choice policy was in place. If it were mainly high-achieving students switching to the private system, a negative sorting effect would arise, biasing down the productivity estimate. In contrast, if the sorting effect

local private school enrollment share strongly. Evidence below will lend support to this IV strategy.

⁶³As mentioned in Section 2, Christian and Jewish groups in Ontario have long been advocates of subsidized private schools for multi-faith denominations.

⁶⁴Similar results are also found when using the pre-policy enrolment share as private school availability measure.

⁶⁵To check whether the ‘level’ private school enrollment share is endogenous to the within-school score gain in the structural equation, a regression test is performed for both specifications (see Wooldridge (2002) for details). The test results suggest that there is some negative correlation between the private school enrollment share and the score gain outcome measure, but the correlation is not significant in the data. This lends support for the use of OLS estimates as the preferred specification in the current analysis.

associated with the policy were positive, as more low-achieving students chose to leave the public system, then the productivity response would be less clear because the overall choice effect could still be positive, even if the effect on public school productivity was negative.

In an attempt to identify the effect of sorting on public school performance, the score gain specification is repeated using yearly changes in private school enrollment share. As shown in the estimates in Table 15, the positive effect on public school score gain is stronger for the first-year change in private school availability ($\beta = 0.15, s.e. = 0.03, P < 0.01$) than the second-year change ($\beta = 0.10, s.e. = 0.01, P < 0.05$), at least for the two-year score gain. This pattern is more apparent when the yearly score gain is used as the dependent variable. For the second-year gain, the positive effect on the public school score gain is only significant for the first-year change in private school availability ($\beta = 0.11, s.e. = 0.03, P < 0.01$) but not significant for the second-year change (Table 16). Both of these findings indicate that the change in local private school enrollment share in the first year (2001/2002 relative to 2000/2001) has strong effects for public schools, apparent in their second year performance.

Aggregate compositional changes in observable student characteristics were limited around the time of the policy. From the data summary for the overall sample in Table 1, it is apparent that the proportion of public school students enrolling in the English as Secondary Language (ESL) program was around six percent (specifically, 5 percent in 2000/2001 and 6 percent in 2001/2002, 2002/2003, and 2003/2004). The proportion of students identified as gifted rises slightly in 2002/2003 (0.4 percent in 2000/2001, 0.5 percent in 2001/2002, 0.7 percent in 2002/2003, and 0.4 percent in 2003/2004) while those identified as exceptional drops in 2003/2004 (5 percent in 2000/2001 and 2001/2002, 6 percent in 2002/2003, and 0.4 percent in 2003/2004).

To examine if there are differential changes for average student characteristics in districts with high *vs.* low private school presence, Table 17 shows the average observable student characteristics for the two groups. Panel A presents the average student characteristics for public schools located in districts with high *vs.* low private school presence.⁶⁶ Panel B shows the difference in means of these proportions between the high and low private school presence districts.⁶⁷

There is some evidence that the proportion of gifted students increased in the public schools located in districts with high private school presence around the time of policy. One way to interpret this trend is that public schools are responding to the threat of competition from private schools by offering more choice in terms of alternative education programs within the public system to retain students. This provides evidence of additional incentives in the public system, offering more choice to students who stay in the system when competition increases. Yet even though the proportion of students in the gifted

⁶⁶Public schools are identified as located in a high private school presence districts if the private school enrollment share in 2000/2001 is above the median level.

⁶⁷One caveat is that the comparison of average student characteristics can only be made on the basis of observable characteristics.

program increased around the time of the policy, the sorting effect on average public school performance would be quite small as gifted students only represent one percent of the total public school student population.

As shown in Section 4, aggregate private school enrollment increases during the policy period but the overall elementary enrollment share of public schools only drops slightly by one percent in 2001/2002 and two percent in 2002/2003. Particularly relevant to our analysis, the public school Grade 3 enrollment share falls by one percent during the policy period. In general, sorting is unlikely to drive the public school improvement in the short run as there is no evidence of any significant outflow of Ontario public school students to the private system once the policy came in.

Other outcome measures. One way that public schools could react in more competitive districts would be to assign more resources to weaker students by providing them with special education. Panel A of Table 18 summarizes the analysis of the proportion of students in special education programs across years.⁶⁸ The coefficient on private school presence is negative and significant in 2001/2002, and becomes insignificant in 2002/2003. This suggests that the proportion of students receiving special education was not significantly higher in public schools located in districts with higher private school presence when the policy was in full effect.

To improve average public school performance, schools could also decide to engage in ‘gaming’ activities to manipulate student performance, specifically for the assessment. Panel B of Table 18 summarizes the share coefficient associated with the proportion of students granted an exemption and with no valid scores. The share coefficients indicate that public schools in more competitive districts have *lower* missing score proportions and there is no significant difference in the proportion of students granted exemptions. One reason could be that all students are accounted for using the EQAO Method 1 reporting system; students exempted or without a valid score would be assigned as attaining Level 0 when calculating the school average. Therefore, public school performance cannot be improved by pulling out the weaker students under this method. Test material is not marked in schools but rather is collected and marked centrally by a team of graders the following summer to ensure grading consistency and to reduce the potential for corruption. This again reduces any ‘gaming’ effect at the school level by making it difficult to inflate grades for weaker students. In general, there is no evidence of any significant ‘gaming’ on the part of public schools located in more competitive districts, at least based on measures that can be examined using the available data.

⁶⁸Since the special education status of the students is not identified in the EQAO dataset from 2003/2004 onwards, the analysis of the proportion of students receiving special education can only be done from 2000/2001 to 2002/2003.

Alternative test outcome measures. The analysis so far has focused on the proportion of students attaining the provincial standard (Level 3 or Level 4). Table 19 presents the share coefficients for the proportion of students attaining individual score levels (Levels 1, 2, 3 and 4) separately. There are no significant differences in the proportions attaining different levels between schools located in areas with higher versus lower private school presence before the policy was in full effect.

In 2002/2003, the coefficients are significant for all levels, and the estimates show that public schools located in districts with more private school presence significantly reduced both the proportions of students attaining Levels 1 and 2 and increased the proportions of students attaining Levels 3 and 4. Given this pattern, there is no evidence that public schools focus more intently on the marginal students (students in Level 2 whose performance is closer to the provincial standard of Levels 3 and above) rather than all students in a more competitive environment.

Differential trends. Differential performance trends for public schools located in districts with high and low private school presence might explain the positive share coefficient in 2002/2003. Figure 9 links 1,764 schools from the full sample to average public school performance in 1998/1999 and 1999/2000. With observations from further back in time, the pattern of public school performance shows that mathematics test results vary over the years and a downward trend began in 2000/2001. The trend for average school performance is similar for schools located in districts with high and low private school presence, and there is no evidence of a significant differential trend for public schools located in high *vs.* low private school presence areas.

8 Conclusion

This paper has taken advantage of a unique opportunity using North American data to learn whether public school performance is affected by increased competition from private schools. The empirical analysis focused on Ontario's Education Tuition Tax Credit, a policy that was large in scope and provided a clear exogenous variation in school choice for households throughout Canada's most populous province by making private schools more accessible (and less accessible when the policy was shut down).

We began by presenting descriptive evidence indicating that private school enrollment responded to the timing of the policy, though private school entry and exit responses were muted – certainly, supply was short of being infinitely elastic in all locations. Exploiting the measurement idea that the increased-choice policy would have differential competitive effects within Ontario for public schools in districts with a significant private school presence versus those without, the paper then developed an intuitive way of measuring changes in competition, combining exogenous province-wide policy variation with local variation in private school presence within Ontario.

The main empirical evidence indicates that the impact of competition on public school performance was positive and significant in 2002/2003, the year the tax credit was in full effect, and the effect disappears when the policy was unexpectedly cancelled. This pattern of findings is robust to controlling for a host of observable student, school, and neighborhood characteristics. It also persists when accounting for fixed unobserved differences: the competition estimate remains positive and significant when analyzing the within-school score gain; and the same is true when instrumenting for private school availability using demographic characteristics of the wider geographic region.

Given the limited proportion of students moving out of private school, and the very limited changes in average observable student characteristics between public schools located in districts with high private school presence and those located in districts with low private school presence, sorting is unlikely to be driving these results. We also found no strong effect on ‘gaming’ for public schools in districts likely to have experienced the largest increases in competition; and changes in school inputs are unlikely to be responsible for the performance effects — resource variation is controlled for in the analysis directly using measures of teacher characteristics, total funding, and school location indicators.

The findings in this study point to short-term performance benefits arising from increased private school choice. Had the policy been rolled out as planned, it is likely that the longer term performance impacts may have been stronger, given that greater private school entry would have been expected.

One caveat with the existing analysis is that it remains unclear just what public schools did in order to become more effective – higher effort is not observed directly, for example. This area warrants further study. Better data collection regarding teacher practices and parental involvement may be useful in this regard.

References

- Altonji, J., Elder, T., & Taber, C. (2005). Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools. *Journal of Political Economy*, 113(1), 151 - 184.
- Bayer, P., & McMillan, R. (2009). Choice and Competition in the Education Marketplace. *University of Toronto Working Paper*.
- Card, D., Dooley, M., & Payne, A. (2008). School Competition and Efficiency with Publicly Funded Catholic Schools. *NBER Working Paper No. 14176*.
- Clark, D. (2009). The Performance and Competitive Effects of School Autonomy. *Journal of Political Economy*, 117(4), 745 - 783.
- Cullen, J., Jacob, B., & Levitt, S. (2005). The Impact of School Choice on Student Outcomes: An Analysis of the Chicago Public Schools. *Journal of Public Economics*, 5-6, 729 - 760.

- Cullen, J., Jacob, B., & Levitt, S. (2006). The Effect of School Choice on Participants: Evidence from Randomized Lotteries. *Econometrica*, 74(5), 1191-1230.
- Evans, W., Oates, W., & Schwab, R. (1992). Measuring Peer Group Effects: A Study of Teenage Behavior. *Journal of Political Economy*, 100(5), 966 – 991.
- Figlio, D., & Page, M. (2003). *Can School Choice and School Accountability Successfully Coexist?* in Caroline M. Hoxby (ed.).
- Figlio, D., & Rouse, C. (2006). Do Accountability and Voucher Threats Improve Low-Performing Schools? *Journal of Public Economics*, 90(239-255).
- Friedman, M. (1962). *Capitalism and Freedom*. University of Chicago Press.
- Hoxby, C. (1994). Do Private Schools Provide Competition for Public Schools? *NBER Working Paper No.4978*..
- Hoxby, C. (2000). Does Competition Among Public Schools Benefit Students and Taxpayers? *American Economic Review*, 90(5), 1209 - 1238.
- Hoxby, C. (2003). *School Choice and School Productivity (Or, Could School Choice be a Rising Tide that Lifts All Boats)*. Chicago : University of Chicago Press.
- Hsiao, C. (2003). *Analysis of Panel Data* (Second éd.). Cambridge University Press.
- Jacob, B., & Levitt, S. (2003). Rotten Apples: An Investigation of the Prevalence and Predictors of Teacher Cheating. *Quarterly Journal of Economics*, 118(3), 843-877.
- Johnson, D. (2005). *Signpost of Success: Interpreting Ontario's Elementary School Test Scores*. C.D. Howe Institute.
- Krueger, A., & Zhu, P. (2003). Another Look at the New York City School Voucher Experiment. *American Behavioral Scientist*, 47(5), 658-699.
- McMillan, R. (2005). Competition, Incentives, and Public School Productivity. *Journal of Public Economics*, 89, 1131 - 1154.
- Neal, D. (2008). *The Role of Private Schools in Education Markets*. in Mark Berends, Matthew G. Springer, Dale Ballou, and Herbert J. Walberg (eds.).
- Nechyba, T. (2006). *Income and Peer Quality Sorting in Public and Private Schools* (Vol. 2). North-Holland : in Eric Hanushek and Finis Welch (eds.).
- Peterson, P., Howell, W., Wolf, P., & Campbell, D. (2003). *School Vouchers. Results from Randomized Experiments*. University of Chicago Press.
- Rouse, C. (1998). Private School Vouchers and Student Achievement: An Evaluation of the Milwaukee Parental Choice Program. *Quarterly Journal of Economics*, 113(2), 553 - 602.
- Witte, J., Sterr, T., & Thorn, C. (1995). *Fifth-Year Report: Milwaukee Parental Choice Program*. *University of Wisconsin mimeo*.
- Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Massachusetts : The MIT Press.

Table 1: Data summary (time-varying control variables in levels)

n = 1,886	2000/2001	2001/2002	2002/2003	2003/2004
Public school average performance	0.62	0.58	0.57	0.64
(proportion attaining provincial standard)	[0.19]	[0.20]	[0.21]	[0.19]
Private school enrollment share	0.16	0.16	0.16	0.16
	[0.19]	[0.19]	[0.19]	[0.19]
<i>Student characteristics</i>				
Proportion of ESL/ELD* students	0.05	0.06	0.06	0.06
	[0.09]	[0.10]	[0.11]	[0.11]
Proportion of Gifted students	0.004	0.005	0.007	0.004
	[0.02]	[0.02]	[0.02]	[0.02]
Proportion of Exceptional students	0.05	0.05	0.06	0.004
	[0.06]	[0.06]	[0.06]	[0.02]
<i>School characteristics</i>				
Average years of teacher's experience	3.46	3.51	3.58	3.97
	[2.15]	[2.18]	[2.22]	[2.44]
Total enrollment	410.87	412.88	409.99	401.51
	[164]	[171.38]	[171.49]	[168.93]
Total funding, per pupil (in \$1,000)	6.90	6.79	n.a.	n.a.
	[0.33]	[0.36]		

Notes:

Table provides mean value of the control variables, with standard deviations shown in square brackets.

* ESL stands for English as Secondary Language and ELD stands for English Literacy Development.

Table 2: Data summary (fixed control variables in levels)

<i>School characteristics</i>		
School located outside a CMA	0.15	
School located in northern Ontario	0.05	
<i>SES characteristics</i>	Local neighborhood	District-level
Average household income	73,262.86 [26,333.2]	75,134.68 [12,273.78]
Proportion of population:		
with census family income at the first quartile	0.25 [0.13]	0.24 [0.07]
with census family income at the second quartile	0.25 [0.06]	0.25 [0.04]
with census family income at the third quartile	0.25 [0.06]	0.26 [0.04]
with census family income at the fourth quartile	0.24 [0.14]	0.25 [0.08]
With university education	0.13 [0.08]	0.13 [0.06]
Visible Minorities	0.18 [0.22]	0.17 [0.17]
New immigrants between 1996-2000	0.04 [0.06]	0.04 [0.04]
Intra-provincial migrant in 2000-2001	0.01 [0.01]	0.01 [0.01]
Roman Catholic	0.31 [0.12]	0.32 [0.10]
Christian	0.32 [0.14]	0.31 [0.13]
Anglican	0.09 [0.04]	0.09 [0.03]
Jewish	0.01 [0.05]	0.01 [0.02]
No religion	0.17 [0.06]	0.16 [0.04]

Notes:

Table provides mean value of the control variables, with standard deviations shown in square brackets, for the pre-policy year 2000. Local SES characteristics are the weighted sum of census variables at the approximated public school attendance area, weighted by the enrollment shares of each postal code. These measures are created for each year to account for any enrollment changes across years, though it should be noted that underlying data are all drawn from the 2001 census year, and the variables could have changed subsequently in other years. District SES characteristics are the census variables aggregated up to the census sub-division that the public school is located in.

Table 3: Number of Ontario private schools during the policy period disaggregated geographically

	Population of children age 6 to 14	Private school count 2000/2001	Private school count 2001/2002	Private school count 2002/2003	Private school count 2003/2004
Ottawa	203,275	69	74	77	78
Toronto	428,710	218	232	252	260
Barrie	235,745	133	135	143	152
London	457,485	214	208	209	198
Thunder Bay	60,190	13	13	13	13
North Bay	33,465	7	7	7	7
Ontario	1,418,870	654	669	702	709

Note: The Ontario sample is divided into six districts: Ottawa, Toronto, Barrie, and London in Southern Ontario as well as Thunder Bay and North Bay in Northern Ontario.

Table 4: Population-adjusted Ontario private elementary enrollment measures

	2000/2001	2001/2002	2002/2003	2003/2004
Ottawa	20.44	19.67	22.16	22.01
Toronto	59.63	62.12	65.13	61.99
Barrie	39.86	41.35	43.74	42.12
London	31.41	31.82	32.81	30.75
Thunder Bay	6.92	5.97	5.52	5.48
North Bay	6.87	3.82	5.05	6.96

Notes:

The population-adjusted available private school space approximates the private school capacity per 1,000 school-aged children.

For each division, the approximate private school available space (adding up the elementary enrollment of private schools within the division) is divided by the total number of children age 6 to 14 (per 1,000) located in the division.

Table 5: Private school entry and exit in 2001/2002 to 2003/2004

	Total new entry in 2001/2002	With Grade 3 Enrollment	Total exit in 2001/2002	With Grade 3 Enrollment	Net Entry
Ottawa	5	3	0	0	5
Toronto	14	5	3	1	11
Barrie	3	1	1	1	2
London	4	4	8	6	-4
Thunder Bay	0	0	0	0	0
North Bay	1	0	1	1	0
Ontario	27	13	13	9	14
	Total new entry in 2002/2003	With Grade 3 Enrollment	Total exit in 2002/2003	With Grade 3 Enrollment	Net Entry
Ottawa	5	1	1	0	4
Toronto	17	7	4	0	13
Barrie	9	7	3	0	6
London	4	4	5	0	-1
Thunder Bay	0	0	0	0	0
North Bay	2	1	1	0	1
Ontario	37	20	14	0	23
	Total new entry in 2003/2004	With Grade 3 Enrollment	Total exit in 2003/2004	With Grade 3 Enrollment	Net Entry
Ottawa	5	1	4	2	1
Toronto	13	7	12	5	1
Barrie	7	5	2	1	5
London	2	1	11	8	-9
Thunder Bay	0	0	0	0	0
North Bay	0	0	0	0	0
Ontario	27	14	29	16	-2

Notes:

The entry, exit and net entry of private schools are listed in six districts: Ottawa, Toronto, Barrie, and London in Southern Ontario as well as Thunder Bay and North Bay in Northern Ontario.

The second columns under total entry and total exit identify schools with positive Grade 3 enrollment.

Table 6: Summary statistics for private school enrollment share measures

Panel A: Private school enrollment share level

n = 1,886	2000/2001	2001/2002	2002/2003	2003/2004
mean	0.16	0.16	0.16	0.16
standard deviation	0.19	0.19	0.19	0.19
minimum	0.00	0.00	0.00	0.00
maximum	0.90	0.87	0.90	0.90
25% percentile	0.00	0.00	0.00	0.00
50% percentile	0.10	0.09	0.10	0.09
75% percentile	0.26	0.27	0.26	0.27
90% percentile	0.44	0.46	0.44	0.44
95% percentile	0.55	0.57	0.55	0.54

Note: Private school enrollment share is defined as the total private school student enrollment divided by total student enrollment in the school attendance area (the sum of public school enrollment, publicly-funded Catholic school enrollment, and private school enrollment).

Panel B: Private school enrollment share gain relative to pre-policy level

n = 1,886	One-year gain	Two-year gain	Three-year gain
mean	0.003	0.003	-0.001
standard deviation	0.12	0.13	0.15
minimum	-0.71	-0.61	-0.76
maximum	0.65	0.81	0.74
25% percentile	-0.03	-0.04	-0.05
50% percentile	0.00	0.00	0.00
75% percentile	0.03	0.05	0.06
90% percentile	0.12	0.14	0.17
95% percentile	0.20	0.22	0.25

Note: The private school enrollment share gain is the change in the private school enrollment share relative to the pre-policy (2000/2001) enrollment share level.

Panel C: Private school enrollment share yearly-gain

n = 1,886	First-year gain	Second-year gain	Third-year gain
mean	0.003	-0.002	-0.002
standard deviation	0.12	0.12	0.12
minimum	-0.71	-0.64	-0.81
maximum	0.65	0.81	0.74
25% percentile	-0.03	-0.04	-0.04
50% percentile	0.00	0.00	0.00
75% percentile	0.03	0.03	0.04
90% percentile	0.12	0.11	0.11
95% percentile	0.20	0.19	0.2

Note: The private school enrollment share yearly-gain is the change in the private school enrollment share relative to the enrollment share level in the previous year.

Table 7: Summary statistics for public school performance measures

Panel A: Public school score

n=1,886	2000/2001	2001/2002	2002/2003	2003/2004
mean	0.62	0.58	0.57	0.64
s.d.	0.19	0.20	0.21	0.19
minimum	0.00	0.00	0.03	0.00
maximum	1.00	1.00	1.00	1.00
25% percentile	0.49	0.44	0.41	0.50
75% percentile	0.77	0.73	0.73	0.79

Note: The public school score is the proportion of test takers attaining the provincial standard (Level 3 and Level 4) in the EQAO Grade 3 mathematics test assessment.

Panel B: Public school score gain relative to pre-policy level

n=1,886	One-year gain	Two-year gain	Three-year gain
mean	-0.04	-0.05	0.02
s.d.	0.18	0.20	0.21
minimum	-0.71	-0.75	-0.80
maximum	0.75	0.71	0.73
25% percentile	-0.15	-0.19	-0.12
75% percentile	0.06	0.07	0.14

Note: The public school score gain is the change in the proportion of test-takers attaining the provincial standard (Level 3 and Level 4) in the EQAO Grade 3 mathematics test assessment relative to the pre-policy (2000/2001) performance level.

Panel C: Public school score yearly-gain

n=1,886	First-year gain	Second-year gain	Third-year gain
mean	-0.04	-0.01	0.07
s.d.	0.18	0.18	0.18
minimum	-0.71	-0.72	-0.76
maximum	0.75	0.75	0.73
25% percentile	-0.15	-0.12	-0.05
75% percentile	0.06	0.10	0.18

Note: The public school score yearly-gain is the change in the proportion of test-takers attaining the provincial standard (Level 3 and Level 4) in the EQAO Grade 3 mathematics test assessment relative to the performance level in the previous year.

Table 8: EQAO Grade 3 Ontario public school performance level analysis

Dependent variable: Proportion of Grade 3 students attaining provincial standard (logistically-transformed)								
n = 1,886	2000/2001		2001/2002		2002/2003		2003/2004	
"Beginning-of-year" share	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private school enrollment share	0.958	0.0572	0.963	-0.031	1.191	0.474	0.923	0.185
	[0.171]***	[0.136]	[0.256]***	[0.129]	[0.200]***	[0.09]***	[0.328]***	[0.208]
With Controls	No	Yes	No	Yes	No	Yes	No	Yes
<i>Student characteristics</i>								
ESL/ELD student		-0.50		-0.49		-0.27		-0.22
		[0.35]		[0.28]*		[0.19]		[0.30]
Gifted student		2.18		3.06		7.88		4.78
		[1.38]		[1.35]**		[1.16]***		[2.02]**
Exceptional student		-2.81		-2.21		-2.37		-1.35
		[0.59]***		[0.47]***		[0.73]***		[0.86]
<i>School characteristics</i>								
Average years of teacher's experience		-0.08		-0.10		-0.09		-0.09
		[0.03]**		[0.04]**		[0.03]**		[0.03]***
Experience ²		0.02		0.02		0.01		0.01
		[0.004]***		[0.01]***		[0.005]***		[0.002]***
Total enrollment (in 100)		-0.03		-0.04		-0.06		-0.05
		[0.01]***		[0.01]***		[0.01]***		[0.01]***
School located outside CMA		-0.002		0.003		0.19		0.19
		[0.09]		[0.10]		[0.10]*		[0.10]*
School located in northern Ontario		-0.04		0.02		0.29		0.38
		[0.14]		[0.09]		[0.15]*		[0.13]***
<i>Neighborhood characteristics</i>								
Proportion of population:								
with census family income at the second quartile		1.00		1.51		0.30		-0.003
		[0.66]		[0.99]		[0.74]		[0.83]
with census family income at the third quartile		0.54		1.04		1.34		1.62
		[0.32]		[0.53]*		[0.32]***		[0.42]***
with census family income at the fourth quartile		2.67		2.36		1.40		2.02
		[0.47]***		[0.66]***		[0.40]***		[0.53]***
with university education		1.51		3.29		2.77		2.35
		[0.70]**		[0.99]***		[0.95]***		[0.98]**
Visible Minorities		0.56		0.45		0.19		0.09
		[0.23]**		[0.22]*		[0.18]		[0.12]
New immigrants between 1996-2000		0.76		1.61		1.34		1.75
		[0.78]		[1.00]		[0.90]		[0.73]**
Intra-provincial migrant in 2000-2001		-10.84		-15.53		-14.83		-14.16
		[4.48]**		[7.06]**		[5.99]**		[7.69]*
Roman Catholic		-0.13		0.13		-0.28		-0.68
		[0.44]		[0.75]		[0.44]		[0.38]*
Christian		0.58		0.71		0.02		0.37
		[0.45]		[0.81]		[0.45]		[0.37]
Anglican		-0.53		0.18		-0.06		-0.91
		[0.91]		[1.11]		[0.92]		[0.91]
Jewish		0.70		0.78		-0.23		-0.66
		[0.65]		[1.03]		[0.54]		[0.49]
No religion		0.02		-0.08		-0.99		-1.32
		[0.76]		[0.87]		[0.94]		[0.67]*
Constant	0.49	-0.46	0.28	-1.16	0.16	-0.17	0.56	0.13
	[0.07]***	[0.44]	[0.07]***	[0.60]*	[0.06]***	[0.35]	[0.08]***	[0.35]
R ²	0.03	0.23	0.03	0.25	0.04	0.21	0.02	0.20

Notes:

The dependent variable is constructed from the proportion of test-takers attaining provincial standard (i.e., Level 3 and Level 4) in the EQAO Grade 3 mathematics test assessment. The logistically transformed proportion is regressed on private school enrollment share, student, school, and socio-demographic variables. The private school enrollment share is calculated by dividing private school enrollment by the sum of total enrollment in public schools, publicly-funded Catholic schools, and private schools in the approximated school attendance area using the enrollment figures at the beginning of the respective academic year. Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: EQAO Grade 3 Ontario public school performance gain analysis

Dependent variable: Score gain relative to 2000/2001 level						
n = 1,886						
	One-year gain		Two-year gain		Three-year gain	
Full sample	(1)	(2)	(3)	(4)	(5)	(6)
Private school enrollment share	0.0003 [0.021]	0.037 [0.021]*	0.050 [0.021]**	0.102 [0.015]***	-0.010 [0.038]	0.033 [0.031]
Base score indicator		-0.106 [0.009]***		-0.146 [0.012]***		-0.163 [0.010]***
<i>Differenced student characteristics</i>						
ESL/ELD student	0.002 [0.05]	-0.03 [0.04]	-0.02 [0.04]	-0.02 [0.03]	-0.003 [0.05]	-0.01 [0.05]
Gifted student	0.37 [0.17]**	0.34 [0.13]**	0.81 [0.16]***	0.82 [0.19]***	0.41 [0.27]	0.23 [0.22]
Exceptional student	-0.31 [0.06]***	-0.21 [0.05]***	-0.36 [0.07]***	-0.24 [0.06]***	-0.34 [0.11]***	-0.17 [0.10]
<i>Differenced school characteristics</i>						
Average years of teacher's experience	0.03 [0.01]**	0.03 [0.01]***	0.03 [0.01]***	0.03 [0.01]***	0.02 [0.01]	0.01 [0.01]
Experience ²	-0.003 [0.001]*	-0.002 [0.005]	-0.003 [0.001]***	-0.003 [0.001]***	-0.002 [0.001]**	-0.001 [0.001]
Total enrollment (in 100)	-0.001 [0.004]	-0.002 [0.005]	-0.004 [0.004]	-0.003 [0.005]	0.003 [0.01]	0.01 [0.01]
<i>Differenced neighborhood characteristics at school attendance area</i>						
Proportion of population:						
with census family income at the second quartile	1.13 [0.64]*	1.07 [0.63]	0.65 [0.58]	0.62 [0.52]	0.54 [0.52]	0.45 [0.44]
with census family income at the third quartile	0.16 [0.46]	0.61 [0.41]	0.02 [0.67]	0.24 [0.47]	0.22 [0.44]	0.47 [0.38]
with census family income at the fourth quartile	0.73 [0.65]	0.75 [0.52]	0.19 [0.89]	0.39 [0.71]	0.42 [0.57]	0.46 [0.43]
with university education	-0.23 [1.36]	-0.05 [1.06]	0.51 [1.37]	0.59 [1.17]	0.003 [1.15]	0.21 [0.77]
Visible Minorities	0.92 [0.59]	0.50 [0.64]	0.97 [0.35]**	0.47 [0.39]	0.19 [0.39]	-0.14 [0.39]
New immigrants between 1996-2000	-0.47 [0.74]	-0.23 [0.77]	-1.59 [1.30]	-1.80 [1.18]	-0.72 [0.81]	-0.35 [0.71]
Intra-provincial migrant in 2000-2001	-0.11 [3.09]	1.26 [3.32]	7.86 [4.02]*	7.60 [3.45]**	0.50 [4.28]	1.10 [4.06]
Roman Catholic	0.45 [0.98]	0.04 [1.18]	0.65 [0.54]	-0.34 [0.60]	0.01 [0.48]	-0.37 [0.43]
Christian	0.34 [0.73]	0.08 [0.99]	0.71 [0.41]*	-0.26 [0.60]	0.20 [0.52]	-0.17 [0.53]
Anglican	0.62 [1.33]	-0.06 [1.46]	1.55 [1.49]	0.34 [1.29]	-1.56 [1.26]	-2.39 [1.00]**
Jewish	0.29 [0.58]	-0.42 [0.84]	2.35 [0.79]***	1.10 [0.58]*	-1.59 [0.78]*	-2.09 [1.18]*
No religion	0.90 [0.64]	1.06 [0.74]	1.06 [0.70]	0.68 [0.84]	0.67 [0.75]	0.47 [0.47]
Constant	-0.04 [0.01]***	0.01 [0.01]	-0.07 [0.01]***	-0.002 [0.013]	-0.01 [0.01]	0.08 [0.02]***
R ²	0.02	0.12	0.03	0.17	0.02	0.19

Notes:

The dependent variable is the within-school score gain (relative to pre-policy 2000/2001 level). The score gain is regressed on “beginning-of-year” private school share and differenced controls for the student, school characteristics and neighborhood characteristics. A dummy variable is added to control for the base test score in 2000/2001 above median in columns (2), (4), and (6).

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10: EQAO Grade 3 Ontario public school performance gain analysis (Split sample)

Dependent variable: Score gain relative to 2000/2001 level						
n = 943						
Split sample	One-year gain		Two-year gain		Three-year gain	
	"high"	"low"	"high"	"low"	"high"	"low"
	(1)	(2)	(3)	(4)	(5)	(6)
Private school enrollment share	0.035 [0.032]	0.044 [0.023]*	0.092 [0.019]***	0.109 [0.030]***	0.030 [0.046]	0.031 [0.042]
<i>Differenced student characteristics</i>						
ESL/ELD student	0.03 [0.05]	-0.08 [0.05]	-0.03 [0.04]	-0.003 [0.05]	0.09 [0.07]	-0.11 [0.06]*
Gifted student	0.33 [0.09]***	0.65 [0.45]	0.80 [0.22]***	0.91 [0.34]**	0.22 [0.26]	0.09 [0.83]
Exceptional student	-0.27 [0.07]***	-0.14 [0.10]	-0.27 [0.10]**	-0.20 [0.09]**	-0.22 [0.09]**	-0.13 [0.15]
<i>Differenced school characteristics</i>						
Average years of teacher's experience	0.06 [0.02]***	0.01 [0.02]	0.05 [0.02]**	0.02 [0.02]	0.02 [0.02]	0.01 [0.02]
Experience ²	-0.004 [0.002]**	-0.002 [0.002]	-0.004 [0.003]	-0.003 [0.002]	-0.0003 [0.002]	-0.002 [0.001]
Total enrollment (in 100)	0.003 [0.004]	-0.003 [0.01]	-0.01 [0.01]**	0.01 [0.01]*	0.01 [0.01]	0.01 [0.01]
<i>Differenced neighborhood characteristics at school attendance area</i>						
Proportion of population:						
with census family income at the second quartile	2.17 [1.02]**	0.61 [1.00]	1.49 [0.79]*	-0.10 [0.94]	-0.60 [0.51]	1.22 [0.65]*
with census family income at the third quartile	1.67 [0.46]***	-0.25 [0.99]	1.14 [0.38]***	-0.46 [0.76]	1.02 [0.44]**	-0.43 [0.58]
with census family income at the fourth quartile	0.92 [0.67]	1.02 [0.59]*	0.88 [0.43]**	0.60 [1.11]	-0.004 [0.39]	0.42 [0.72]
with university education	0.91 [0.99]	-1.10 [1.60]	0.10 [0.96]	0.36 [1.55]	0.02 [0.76]	1.37 [1.01]
Visible Minorities	0.19 [0.68]	0.95 [0.63]	0.82 [0.55]	0.28 [0.47]	-0.21 [0.50]	0.18 [0.75]
New immigrants between 1996-2000	0.29 [1.29]	-0.90 [1.02]	-2.05 [1.15]*	-1.83 [1.00]*	-0.81 [1.25]	-0.39 [0.82]
Intra-provincial migrant in 2000-2001	5.30 [4.01]	0.08 [4.24]	10.23 [6.20]	5.76 [4.59]	-1.93 [3.83]	2.18 [6.17]
Roman Catholic	0.02 [1.61]	0.17 [1.32]	-0.89 [1.29]	-0.32 [0.70]	-0.54 [0.37]	0.15 [0.65]
Christian	-0.63 [1.92]	0.70 [0.65]	-1.83 [1.36]	0.73 [0.78]	-0.58 [0.58]	0.29 [0.68]
Anglican	-0.31 [1.84]	1.47 [2.45]	-1.66 [1.42]	1.04 [1.62]	-2.06 [1.20]*	-2.02 [1.51]
Jewish	-0.28 [1.44]	0.62 [3.88]	0.72 [1.20]	1.56 [1.20]	-1.49 [0.95]	-2.54 [1.56]
No religion	0.90 [1.85]	1.26 [0.81]	0.53 [1.24]	0.74 [0.92]	0.15 [0.60]	0.60 [0.78]
Constant	-0.10 [0.01]***	0.01 [0.01]	-0.14 [0.01]***	-0.004 [0.013]	-0.09 [0.01]***	0.09 [0.01]***
R ²	0.04	0.12	0.08	0.04	0.03	0.03

Notes:

The dependent variable is the within-school score gain (relative to pre-policy 2000/2001 level). The score gain is regressed on “beginning-of-year” private school share and differenced controls for the student, school characteristics and neighborhood characteristics. The sample is split into “high” and “low” sample based on the average score in 2000/2001. Public schools are designated as “high” if their average score in 2000/2001 is above the median.

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 11: EQAO Grade 3 Ontario public school yearly gain analysis

Dependent variable: Yearly score gain relative to the previous year						
n = 1,886	First-year gain		Second-year gain		Third-year gain	
	(1)	(2)	(3)	(4)	(5)	(6)
Private school enrollment share	0.0003 [0.021]	0.037 [0.021]*	0.035 [0.022]	0.049 [0.023]**	-0.046 [0.026]*	-0.042 [0.026]
Base score indicator		-0.106 [0.009]***		-0.038 [0.011]***		0.016 [0.008]*
<i>Differenced student characteristics</i>						
ESL/ELD student	0.002 [0.05]	-0.03 [0.04]	0.0002 [0.03]	0.01 [0.03]	0.02 [0.03]	0.02 [0.03]
Gifted student	0.37 [0.17]**	0.34 [0.13]**	0.69 [0.13]***	0.70 [0.12]***	0.76 [0.30]	0.73 [0.30]**
Exceptional student	-0.31 [0.06]***	-0.21 [0.05]***	-0.29 [0.06]***	-0.29 [0.06]***	-0.19 [0.08]*	-0.18 [0.08]**
<i>Differenced school characteristics</i>						
Average years of teacher's experience	0.03 [0.01]**	0.03 [0.01]***	0.01 [0.02]	0.01 [0.02]	-0.003 [0.02]	-0.01 [0.02]
Experience ²	-0.003 [0.001]*	-0.002 [0.005]	-0.001 [0.002]	-0.001 [0.002]	0.001 [0.002]	0.001 [0.002]
Total enrollment (in 100)	-0.001 [0.004]	-0.002 [0.005]	-0.01 [0.01]*	-0.01 [0.01]	-0.01 [0.01]	-0.01 [0.01]
<i>Differenced neighborhood characteristics at school attendance area</i>						
Proportion of population:						
with census family income at the second quartile	1.13 [0.64]*	1.07 [0.63]	0.54 [0.48]	0.50 [0.47]	-0.40 [0.43]	-0.41 [0.43]
with census family income at the third quartile	0.16 [0.46]	0.61 [0.41]	0.93 [0.46]*	0.90 [0.41]**	0.62 [0.42]	0.62 [0.43]
with census family income at the fourth quartile	0.73 [0.65]	0.75 [0.52]	0.16 [0.53]	0.18 [0.50]	-0.11 [0.55]	-0.15 [0.56]
with university education	-0.23 [1.36]	-0.05 [1.06]	1.42 [0.87]	1.41 [0.85]	0.13 [0.78]	0.16 [0.79]
Visible Minorities	0.92 [0.59]	0.50 [0.64]	0.56 [0.38]	0.50 [0.34]	-0.06 [0.44]	-0.06 [0.44]
New immigrants between 1996-2000	-0.47 [0.74]	-0.23 [0.77]	-0.87 [0.92]	-1.01 [0.93]	0.06 [1.10]	0.18 [1.10]
Intra-provincial migrant in 2000-2001	-0.11 [3.09]	1.26 [3.32]	2.67 [3.99]	2.42 [3.75]	1.30 [3.85]	1.32 [3.90]
Roman Catholic	0.45 [0.98]	0.04 [1.18]	0.81 [0.60]	0.60 [0.62]	-0.23 [0.94]	-0.18 [0.93]
Christian	0.34 [0.73]	0.08 [0.99]	0.20 [0.72]	0.004 [0.74]	-0.62 [0.83]	-0.57 [0.83]
Anglican	0.62 [1.33]	-0.06 [1.46]	1.14 [0.94]	0.89 [0.94]	0.38 [1.43]	0.41 [1.42]
Jewish	0.29 [0.58]	-0.42 [0.84]	0.44 [0.72]	0.17 [0.78]	0.24 [1.65]	0.37 [1.75]
No religion	0.90 [0.64]	1.06 [0.74]	1.00 [0.70]	0.88 [0.72]	0.25 [0.71]	0.26 [0.71]
Constant	-0.04 [0.01]***	0.01 [0.01]	-0.02 [0.01]***	-0.01 [0.01]	0.06 [0.01]***	0.07 [0.01]***
R ²	0.02	0.12	0.02	0.03	0.02	0.02

Notes:

The dependent variable is the yearly score gain (relative to previous year). The score gain is regressed on “beginning-of-year” private school share and differenced controls for the student, school characteristics and neighborhood characteristics. A dummy variable is added to control for the base test score in 2000/2001 above median in columns (2), (4), and (6).

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 12: EQAO Grade 3 Ontario public school performance gain analysis, with alternative private school presence measure

Dependent variable: Score gain relative to 2000/2001 level			
<i>n</i> = 1,886	"Beginning-of-year" share	Pre-policy share in 2000/2001	Change in share relative to pre-policy level
One-year gain			
	(1)	(2)	(3)
Private school presence	0.037 [0.021]*	0.041 [0.020]**	-0.006 [0.028]
R ²	0.12	0.12	0.12
Two-year gain			
	(5)	(6)	(7)
Private school presence	0.102 [0.015]***	0.059 [0.021]***	0.072 [0.033]**
R ²	0.17	0.17	0.17
Three-year gain			
	(9)	(10)	(11)
Private school presence	0.033 [0.031]	0.030 [0.021]	0.005 [0.030]
R ²	0.19	0.20	0.20

Notes:

The dependent variable is the within-school score gain (relative to the pre-policy level in 2000/2001). The score gain is regressed on private school share and differenced controls for the student, school characteristics and neighborhood characteristics. A dummy variable is added to control for the base test score in 2000/2001 above median. Panel 1 analyses the one-year gain; panel 2 analyses the two-year gain; and panel 3 analyses the three-year gain.

The private school presence is measured by the 'beginning-of-year' share in columns (1), (5), and (9); by the pre-policy share in columns (2), (6), and (10); and by the change in share relative to the pre-policy level in columns (3), (7), and (11).

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 13: First-stage analysis for public school performance gain

Dependent variable: Private school enrollment share			
n = 1, 886	2001/2002	2002/2003	2003/2004
	(1)	(2)	(3)
<i>Instrument</i>			
Proportion of population at CSD level:			
With university education	0.59	0.45	0.48
	[0.23]**	[0.17]**	[0.20]**
Christians	0.37	0.40	0.34
	[0.08]***	[0.08]***	[0.12]***
Jewish	1.48	1.89	1.53
	[0.51]***	[0.37]***	[0.63]**
<i>Differenced student characteristics</i>			
Proportion of ESL/ELD student	0.13	0.16	0.12
	[0.04]***	[0.05]***	[0.08]
Proportion of Gifted student	0.48	0.61	0.29
	[0.19]**	[0.41]	[0.23]
Proportion of Exceptional student	-0.02	0.03	-0.01
	[0.06]	[0.06]	[0.06]
<i>Differenced school characteristics</i>			
Average years of teacher's experience	-0.02	-0.02	0.01
	[0.01]	[0.02]	[0.01]
Experience ²	0.0003	0.002	-0.001
	[0.001]	[0.002]	[0.001]
Total enrollment (in 100)	0.003	0.01	0.02
	[0.01]	[0.01]*	[0.01]*
<i>Differenced neighborhood characteristics at school attendance area</i>			
Proportion of population:			
with census family income at the second quartile	-0.33	-0.28	0.01
	[0.72]	[0.37]	[0.33]
with census family income at the third quartile	-0.25	-0.82	-0.87
	[0.50]	[0.33]**	[0.34]**
with census family income at the fourth quartile	-1.48	-0.63	-0.30
	[0.83]*	[0.42]	[0.45]
with university education	2.56	0.08	-0.44
	[2.06]	[0.94]	[1.12]
Visible Minorities	-1.19	-0.03	-0.19
	[0.44]**	[0.26]	[0.44]
New immigrants between 1996-2000	0.33	-0.55	1.25
	[1.00]	[1.00]	[0.71]*
Intra-provincial migrant in 2000-2001	-6.59	-0.72	-4.82
	[5.11]	[3.09]	[2.59]*
Roman Catholic	-0.83	0.70	0.03
	[0.49]	[0.72]	[0.59]
Christian	-1.05	1.15	0.49
	[0.40]**	[0.40]***	[0.72]
Anglican	-1.18	-0.13	-0.18
	[1.03]	[0.70]	[0.64]
Jewish	-4.08	-4.35	-4.28
	[2.65]	[1.39]***	[1.73]**
No religion	-1.14	0.18	-1.05
	[0.50]**	[0.54]	[0.50]*
Base score control	0.04	0.03	0.02
	[0.01]***	[0.01]***	[0.01]***
Constant	-0.08	-0.08	-0.05
	[0.05]	[0.04]*	[0.06]
R ²	0.4943	0.5127	0.4932
Partial R ² for excluded instrument	0.06	0.07	0.05
F-stat for excluded instrument	8.76	11.10	3.73
p-value	0.0003	0.0001	0.0231

Notes: The dependent variable is the private school enrollment share. The “beginning-of-year” private school enrollment share is regressed on student, school, and neighborhood characteristics (independent variables in the second stage) and the excluded instrument (proportion of population with university education, proportion of Christian population, and proportion of Jewish population at the Census sub-division level). A dummy variable is added to control for the base test score in 2000/2001 above median. Robust standard errors clustered at the school board level are shown in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 14: Grade 3 public school performance gain analysis (IV approach)

Dependent variable: Score gain relative to 2000/2001 level			
n = 1, 886	One-year gain	Two-year gain	Three-year gain
	(1)	(2)	(3)
Private school enrollment share	0.182 [0.147]	0.207 [0.100]**	-0.031 [0.125]
Base score control	-0.113 [0.011]***	-0.151 [0.010]***	-0.160 [0.012]***
<i>Differenced student characteristics</i>			
Proportion of ESL/ELD student	-0.05 [0.04]	-0.04 [0.04]	-0.002 [0.05]
Proportion of Gifted student	0.26 [0.16]	0.72 [0.18]***	0.64 [0.12]***
Proportion of Exceptional student	-0.20 [0.05]***	-0.25 [0.06]***	-0.17 [0.10]*
<i>Differenced school characteristics</i>			
Average years of teacher's experience	0.03 [0.01]***	0.04 [0.01]***	0.01 [0.01]
Experience ²	-0.002 [0.001]***	-0.003 [0.001]***	-0.001 [0.001]
Total enrollment (per 100)	-0.002 [0.01]	-0.003 [0.005]	0.01 [0.01]
<i>Differenced neighborhood characteristics at school attendance area</i>			
Proportion of population:			
with census family income at the second quartile	1.14 [0.57]*	0.67 [0.57]*	0.48 [0.44]
with census family income at the third quartile	0.65 [0.39]*	0.35 [0.43]	0.38 [0.36]
with census family income at the fourth quartile	0.98 [0.52]*	0.45 [0.69]	0.44 [0.41]
with university education	-0.39 [0.91]	0.64 [1.10]	0.16 [0.78]
Visible Minorities	0.69 [0.69]	0.50 [0.38]	-0.09 [0.41]
New immigrants between 1996-2000	-0.37 [0.78]	-1.75 [1.13]	-0.24 [0.70]
Intra-provincial migrant in 2000-2001	2.34 [3.57]	7.61 [3.36]**	0.40 [3.89]
Roman Catholic	0.05 [1.17]	-0.44 [0.58]	-0.26 [0.41]
Christian	0.16 [1.05]	-0.36 [0.58]	-0.08 [0.49]
Anglican	0.10 [1.58]	0.38 [1.26]	-2.30 [1.04]**
Jewish	0.47 [1.62]	1.55 [0.83]*	-2.27 [1.77]
No religion	1.14 [0.83]	0.68 [0.83]	0.49 [0.52]
Constant	-0.01 [0.02]	-0.02 [0.02]	0.09 [0.02]***

Notes: The dependent variable is the within-school score gain (relative to pre-policy 2000/2001 level). The performance gain measure is regressed on the predicted private school enrollment share from the first stage, as well as the differenced variables of the student, school, and neighborhood characteristics. A dummy variable is added to control for the base test score in 2000/2001 above median.

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 15: EQAO Grade 3 Ontario public school performance gain analysis, with yearly change in private school enrollment share

Dependent variable: Score gain relative to 2000/2001 level						
n = 1,886	One-year gain		Two-year gain		Three-year gain	
Full sample	(1)	(2)	(3)	(4)	(5)	
Pre-policy private school enrollment share	0.044	0.095	0.097	0.042	0.045	
	[0.021]**	[0.018]***	[0.018]***	[0.029]	[0.030]	
Change in private school enrollment share relative to pre-policy level	0.014	0.122		0.025		
	[0.031]	[0.029]***		[0.041]		
Change in private school enrollment share between 00/01 and 01/02			0.145		0.040	
			[0.035]***		[0.046]	
Change in private school enrollment share between 01/02 and 02/03			0.102		0.028	
			[0.034]***		[0.041]	
Change in private school enrollment share between 02/03 and 03/04					0.014	
					[0.046]	
Base score indicator	-0.106	-0.146	-0.146	-0.163	-0.164	
	[0.009]***	[0.012]***	[0.012]***	[0.010]***	[0.010]***	
<i>Differenced student characteristics</i>						
ESL/ELD student	-0.03	-0.02	-0.01	-0.01	-0.01	
	[0.04]	[0.03]	[0.03]	[0.05]	[0.05]	
Gifted student	0.34	0.83	0.83	0.23	0.23	
	[0.13]**	[0.19]***	[0.19]***	[0.22]	[0.22]	
Exceptional student	-0.20	-0.24	-0.24	-0.17	-0.17	
	[0.05]***	[0.06]***	[0.06]***	[0.10]	[0.10]	
<i>Differenced school characteristics</i>						
Average years of teacher's experience	0.03	0.03	0.03	0.01	0.01	
	[0.01]**	[0.01]***	[0.01]***	[0.01]	[0.01]	
Experience ²	-0.002	-0.003	-0.003	-0.001	-0.001	
	[0.001]**	[0.001]***	[0.001]***	[0.001]	[0.001]	
Total enrollment (in 100)	-0.002	-0.003	-0.003	0.01	0.01	
	[0.005]	[0.001]***	[0.004]	[0.01]	[0.01]	
<i>Differenced neighborhood characteristics at school attendance area</i>						
Proportion of population:						
with census family income at the second quartile	1.09	0.61	0.58	0.44	0.44	
	[0.62]*	[0.52]	[0.52]	[0.44]	[0.44]	
with census family income at the third quartile	0.62	0.26	0.25	0.46	0.47	
	[0.43]	[0.46]	[0.46]	[0.38]	[0.38]	
with census family income at the fourth quartile	0.74	0.38	0.39	0.45	0.46	
	[0.52]	[0.71]	[0.71]	[0.43]	[0.43]	
with university education	-0.01	0.57	0.53	0.22	0.19	
	[1.06]	[1.17]	[1.19]	[0.78]	[0.76]	
Visible Minorities	0.47	0.45	0.48	-0.14	-0.13	
	[0.64]	[0.39]	[0.40]	[0.39]	[0.39]	
New immigrants between 1996-2000	-0.25	-1.74	-1.73	-0.37	-0.36	
	[0.77]	[1.23]	[1.27]	[0.71]	[0.72]	
Intra-provincial migrant in 2000-2001	1.47	7.46	7.37	1.17	1.15	
	[3.31]	[3.52]**	[3.58]**	[4.04]	[4.06]	
Roman Catholic	0.01	-0.34	-0.32	-0.37	-0.38	
	[1.19]	[0.59]	[0.61]	[0.43]	[0.45]	
Christian	0.06	-0.25	-0.24	-0.17	-0.17	
	[1.00]	[0.60]	[0.61]	[0.53]	[0.55]	
Anglican	-0.11	0.38	0.38	-2.40	-2.39	
	[1.49]	[1.29]	[1.29]	[0.99]**	[1.00]**	
Jewish	-0.38	1.10	1.10	-2.03	-2.01	
	[0.86]	[0.58]*	[0.59]*	[1.23]	[1.24]	
No religion	1.04	0.70	0.75	0.46	0.47	
	[0.73]	[0.84]	[0.88]	[0.47]	[0.47]	
Constant	0.004	-0.001	-0.001	0.08	0.08	
	[0.01]	[0.01]	[0.01]	[0.02]***	[0.02]***	
R ²	0.12	0.17	0.17	0.19	0.19	

Notes:

The dependent variable is the within-school score gain (relative to pre-policy 2000/2001 level). The score gain is regressed on private school share and differenced controls for the student, school characteristics and neighborhood characteristics. Private school availability is measured by change in private school enrollment share relative to the pre-policy level in columns (1), (2), and (4) and by yearly change in private school enrollment share in columns (3) and (5). A dummy variable is added to control for the base test score in 2000/2001 above median in columns (2), (4), and (6).

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 16: EQAO Grade 3 Ontario public school yearly gain analysis, with yearly change in private school enrollment share

Dependent variable: Yearly score gain relative to the previous year					
n = 1,886	First-year gain	Second-year gain		Third-year gain	
	(1)	(2)	(3)	(4)	(5)
Pre-policy private school enrollment share	0.044 [0.021]**	0.046 [0.027]	0.051 [0.027]*	-0.034 [0.031]	-0.042 [0.030]
Change in private school enrollment share between 00/01 and 01/02	0.014 [0.031]		0.107 [0.023]***		-0.098 [0.029]***
Change in private school enrollment share between 01/02 and 02/03			0.014 [0.038]		-0.069 [0.038]*
Change in private school enrollment share between 02/03 and 03/04					-0.021 [0.030]
Change in private school enrollment share between 00/01 and 02/03		0.058 [0.026]**			
Change in private school enrollment share between 00/01 and 03/04				-0.055 [0.026]**	
Base score indicator	-0.106 [0.009]***	-0.038 [0.011]***	-0.039 [0.010]***	-0.017 [0.009]*	-0.016 [0.009]*
<i>Differenced student characteristics</i>					
ESL/ELD student	-0.106 [0.009]***	0.01 [0.03]	0.01 [0.03]	0.02 [0.03]	0.01 [0.03]
Gifted student	0.34 [0.13]**	0.72 [0.11]***	0.72 [0.12]***	0.74 [0.30]**	0.73 [0.31]**
Exceptional student	-0.20 [0.05]***	-0.29 [0.06]***	-0.29 [0.06]***	-0.18 [0.08]**	-0.18 [0.08]**
<i>Differenced school characteristics</i>					
Average years of teacher's experience	0.03 [0.01]**	0.02 [0.02]	0.01 [0.02]	-0.01 [0.02]	-0.003 [0.02]
Experience ²	-0.002 [0.001]**	-0.001 [0.002]	-0.001 [0.002]	0.002 [0.002]	0.001 [0.002]
Total enrollment (in 100)	-0.002 [0.005]	-0.01 [0.01]	-0.01 [0.01]*	-0.01 [0.01]	-0.01 [0.01]
<i>Differenced neighborhood characteristics at school attendance area</i>					
Proportion of population:					
with census family income at the second quartile	1.09 [0.62]*	0.48 [0.48]	0.45 [0.47]	-0.43 [0.43]	-0.44 [0.42]
with census family income at the third quartile	0.62 [0.43]	0.91 [0.41]**	0.93 [0.39]**	0.60 [0.43]	0.58 [0.43]
with census family income at the fourth quartile	0.74 [0.52]	0.18 [0.50]	0.19 [0.48]	-0.19 [0.57]	-0.19 [0.55]
with university education	-0.01 [1.06]	1.38 [0.86]	1.36 [0.83]	0.19 [0.78]	0.21 [0.77]
Visible Minorities	0.47 [0.64]	0.60 [0.36]	0.51 [0.35]	-0.05 [0.45]	-0.08 [0.43]
New immigrants between 1996-2000	-0.25 [0.77]	-1.08 [0.95]	-0.93 [0.95]	0.12 [1.10]	0.20 [1.10]
Intra-provincial migrant in 2000-2001	1.47 [3.31]	2.58 [3.83]	2.40 [3.78]	1.54 [3.88]	1.25 [3.90]
Roman Catholic	0.01 [1.19]	0.68 [0.61]	0.61 [0.62]	-0.15 [0.95]	-0.12 [0.94]
Christian	0.06 [1.00]	0.06 [0.75]	-0.02 [0.76]	-0.56 [0.84]	-0.52 [0.83]
Anglican	-0.11 [1.49]	0.89 [0.96]	0.87 [0.94]	0.44 [1.42]	0.43 [1.41]
Jewish	-0.38 [0.86]	0.32 [0.79]	0.28 [0.79]	0.58 [1.85]	0.45 [1.65]
No religion	1.04 [0.73]	0.90 [0.76]	0.95 [0.75]	0.29 [0.70]	0.31 [0.71]
Constant	0.004 [0.01]	-0.003 [0.01]	-0.01 [0.01]	0.07 [0.01]***	0.07 [0.01]***
R ²	0.12	0.03	0.04	0.02	0.02

Notes:

The dependent variable is the yearly score gain. The score gain is regressed on private school share and differenced controls for the student, school characteristics and neighborhood characteristics. Private school availability is measured by change in private school enrollment share relative to the pre-policy level in columns (1), (2), and (4) and by yearly change in private school enrollment share in columns (3) and (5). A dummy variable is added to control for the base test score in 2000/2001 above median in columns (2), (4), and (6). Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 17: Grade 3 public school student compositional analysis

Panel A: Average public school student characteristics comparison

	high competition schools (n = 943)				low competition schools (n = 943)			
	2000	2001	2002	2003	2000	2001	2002	2003
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Student characteristics</i>								
Proportion of ESL/ELD student	0.05 [0.09]	0.06 [0.11]	0.06 [0.13]	0.07 [0.12]	0.05 [0.09]	0.05 [0.09]	0.05 [0.09]	0.05 [0.10]
Proportion of Gifted student	0.004 [0.02]	0.007 [0.03]	0.01 [0.03]	0.005 [0.02]	0.003 [0.02]	0.004 [0.02]	0.004 [0.01]	0.003 [0.01]
Proportion of Exceptional student	0.05 [0.05]	0.05 [0.06]	0.06 [0.06]	0.004 [0.02]	0.06 [0.06]	0.06 [0.06]	0.06 [0.06]	0.004 [0.01]

Note: Table provides mean value of the proportions, with standard deviations shown in square brackets.

Panel B: Summary statistics for proportion of gifted students, high vs. low competition

	high competition schools (n = 943)				low competition schools (n = 943)			
	2000	2001	2002	2003	2000	2001	2002	2003
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mean	0.004	0.01	0.01	0.005	0.003	0.004	0.004	0.003
s.d.	0.02	0.03	0.03	0.02	0.02	0.02	0.01	0.01
minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
maximum	0.32	0.36	0.35	0.46	0.42	0.39	0.16	0.20
25% percentile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50% percentile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75% percentile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90% percentile	0.01	0.02	0.03	0.01	0.00	0.00	0.02	0.00
95% percentile	0.03	0.04	0.06	0.03	0.02	0.02	0.03	0.02

Note: Table provides mean value of the proportions, with standard deviations shown in square brackets.

Panel B: Summary statistics for proportion of exceptional students, high vs. low competition

	high competition schools (n = 943)				low competition schools (n = 943)			
	2000	2001	2002	2003	2000	2001	2002	2003
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mean	0.05	0.05	0.06	0.004	0.06	0.06	0.06	0.004
s.d.	0.05	0.06	0.06	0.02	0.06	0.06	0.06	0.01
minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
maximum	0.60	0.43	0.41	0.56	0.44	0.43	0.39	0.12
25% percentile	0.01	0.00	0.02	0.00	0.02	0.00	0.02	0.00
50% percentile	0.04	0.04	0.05	0.00	0.04	0.04	0.05	0.00
75% percentile	0.07	0.07	0.09	0.00	0.08	0.08	0.09	0.00
90% percentile	0.12	0.13	0.13	0.01	0.14	0.13	0.15	0.02
95% percentile	0.15	0.17	0.17	0.03	0.18	0.18	0.19	0.03

Note: Table provides mean value of the proportions, with standard deviations shown in square brackets.

Table 18: Grade 3 public school administrative outcomes analysis

Panel A: Special Education support

Dependent variable	Proportion of students with special education		
	2000/2001	2001/2002	2002/2003
n = 1,886	(1)	(2)	(3)
Private school enrollment share	-0.01 [0.02]	-0.03 [0.01]***	0.01 [0.02]
R ²	0.08	0.09	0.10

Notes:

The dependent variable is the proportion of students who received Special Education support. The proportion is regressed on “beginning-of-year” private school enrollment share, student, school, and neighborhood characteristics.

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Panel B: EQAO test exemption and missing score

Dependent variable	Proportion of students exempted from math assessment			
	2000/2001	2001/2002	2002/2003	2003/2004
n = 1,886	(1)	(2)	(3)	(4)
Private school enrollment share	0.001 [0.01]	-0.01 [0.01]	-0.0001 [0.01]	-0.01 [0.01]
R ²	0.25	0.27	0.22	0.13

Dependent variable	Proportion of students without a valid score			
	2000/2001	2001/2002	2002/2003	2003/2004
n = 1,886	(5)	(6)	(7)	(8)
Private school enrollment share	-0.01 [0.01]	-0.01 [0.01]	-0.03 [0.01]***	-0.01 [0.01]
R ²	0.25	0.20	0.16	0.12

Notes:

The dependent variable is the proportion of students who was given an exemption in mathematics in columns (1) to (4), and the proportion of students who have no score for the math assessment in columns (5) to (8). The proportion is regressed on “beginning-of-year” private school enrollment share, student, school, and neighborhood characteristics.

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 19: Grade 3 public school performance analysis, by attainment level

Dependent variable: Proportion of Grade 3 students attaining:				
n = 1, 886	Level 1	Level 2	Level 3	Level 4
Private school enrollment share				
2000/2001	-0.71 [0.23]***	-0.07 [0.13]	0.03 [0.08]	0.03 [0.22]
2001/2002	-0.18 [0.38]	0.01 [0.12]	-0.09 [0.09]	-0.22 [0.19]
2002/2003	-1.00 [0.29]***	-0.31 [0.09]***	0.28 [0.06]***	0.32 [0.18]*
2003/2004	-0.05 [0.30]	-0.12 [0.23]	0.18 [0.06]	0.12 [0.23]

Notes:

The dependent variable is the proportion of test-takers attaining different levels in the EQAO Grade 3 mathematics test assessment (with Level 3 as the provincial standard, Levels 1 and 2 indicate achievement below the provincial standard, and Level 4 indicates achievement above the provincial standard). The logistically transformed proportion is regressed on “beginning-of-year” private school enrollment share, student, school, and neighborhood characteristics.

Robust standard errors clustered at the school board level are shown in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 1: Timeline for Ontario's tax credit policy, enrollment data collection, and the EQAO test dates

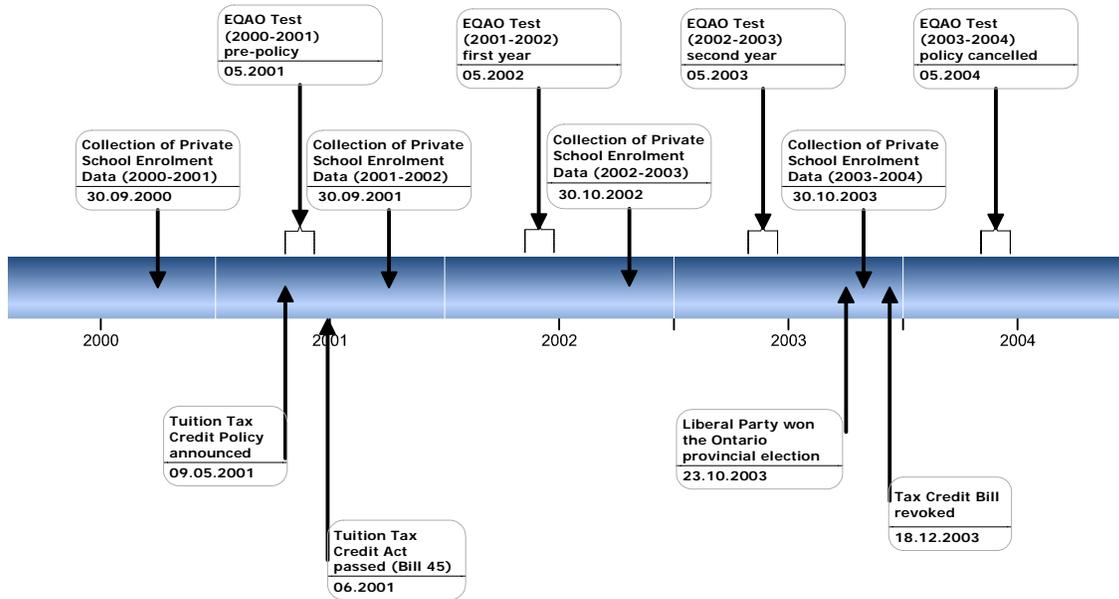
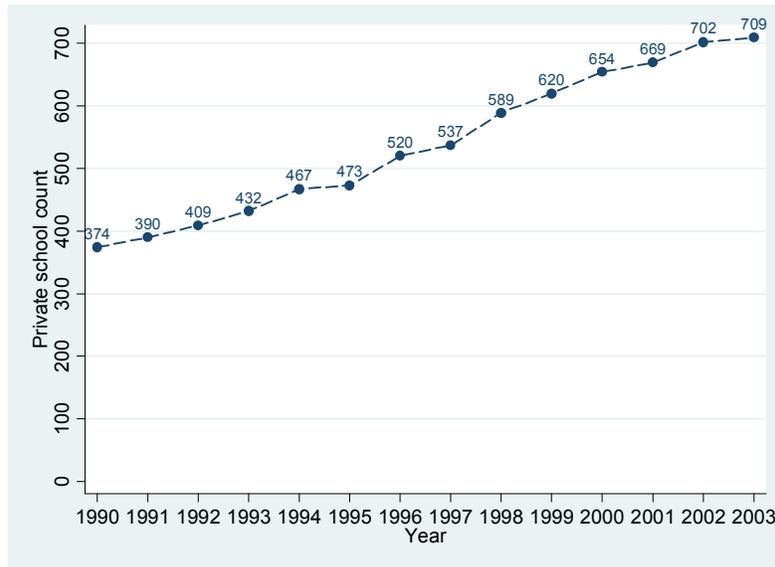
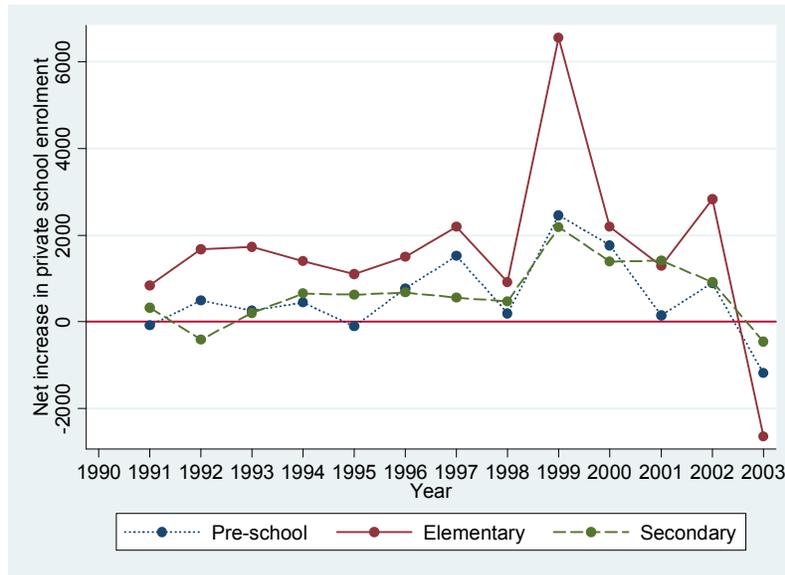


Figure 2: Ontario private school count (1990/1991 to 2003/2004)



Notes:
 First Nations schools, overseas schools, international schools, learning centres, correctional institutes, and schools not following the Ontario curriculum are excluded from the Ministry data.
 Private school enrollment data was self-reported to the Ministry at the beginning of the academic term with enrollment data as on September 30 for the academic years prior to 2002/2003 and as on October 30 for the academic years since 2002/2003.

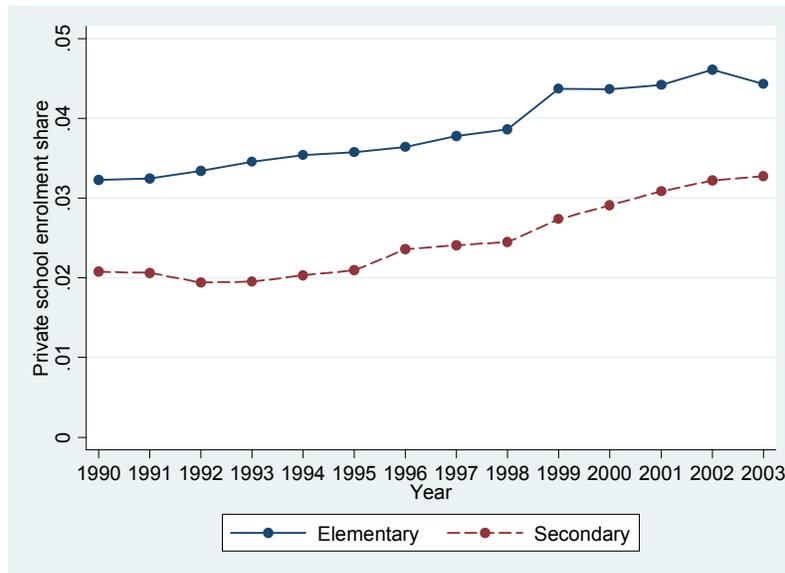
Figure 3: Net change in private school enrollment, by grade level (1990/1991 to 2003/2004)



Notes:

First Nations schools, overseas schools, international schools, learning centres, correctional institutes, and schools not following the Ontario curriculum are excluded from the Ministry data. Private school enrollment data was self-reported to the Ministry at the beginning of the academic term with enrollment data as on September 30 for the academic years prior to 2002/2003 and as on October 30 for the academic years since 2002/2003.

Figure 4: Private school enrollment share, by grade level (1990/1991 to 2003/2004)

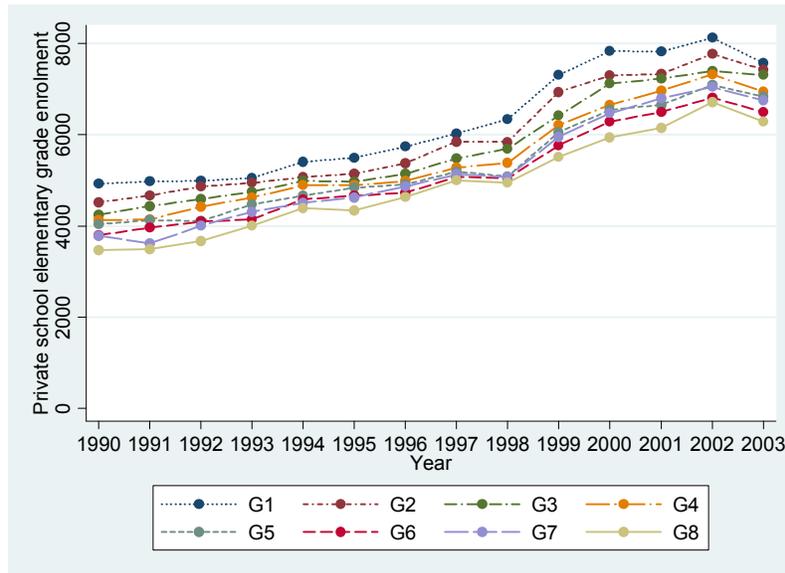


Notes:

First Nations schools, overseas schools, international schools, learning centres, correctional institutes, and schools not following the Ontario curriculum are excluded from the Ministry data. Private school enrollment data was self-reported to the Ministry at the beginning of the academic term with enrollment data as on September 30 for the academic years prior to 2002/2003 and as on October 30 for the academic years since 2002/2003.

Pre-school enrollment share is not shown as these grades are not compulsory school attendance level in Ontario and the public enrollment information does not include all children of the relevant age groups.

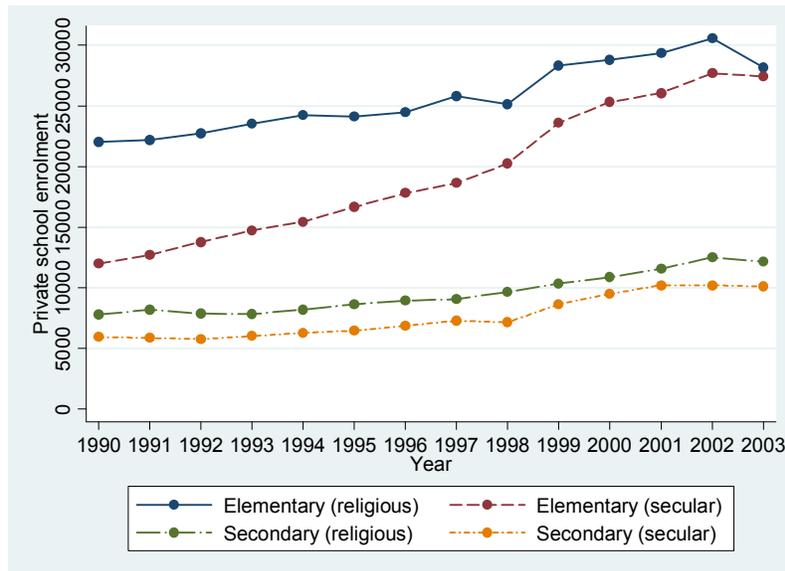
Figure 5: Private school elementary grade enrollment (1990/1991 to 2003/2004)



Notes:

First Nations schools, overseas schools, international schools, learning centres, correctional institutes, and schools not following the Ontario curriculum are excluded from the Ministry data. Private school enrollment data was self-reported to the Ministry at the beginning of the academic term with enrollment data as on September 30 for the academic years prior to 2002/2003 and as on October 30 for the academic years since 2002/2003.

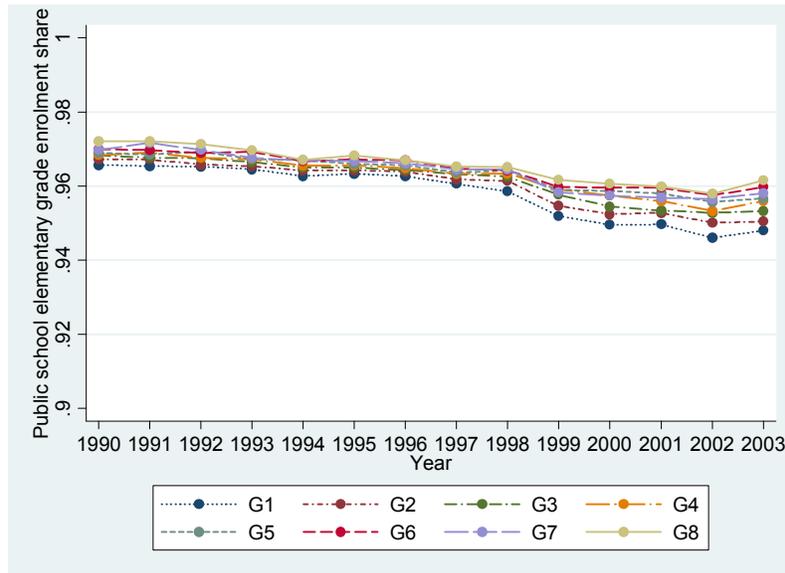
Figure 6: Private school enrollment, by religious affiliation (1990/1991 to 2003/2004)



Notes:

First Nations schools, overseas schools, international schools, learning centres, correctional institutes, and schools not following the Ontario curriculum are excluded from the Ministry data. Private school enrollment data was self-reported to the Ministry at the beginning of the academic term with enrollment data as on September 30 for the academic years prior to 2002/2003 and as on October 30 for the academic years since 2002/2003.

Figure 7: Public school enrollment share, by grade level (1990/1991 to 2003/2004)



Notes:

Public school enrollment was self-reported to the Ministry at the beginning of the academic term with enrollment data as on September 30 in the September School Report for the academic years prior to 2002/2003 and as on October 30 in the October School Report for the academic years since 2002/2003. Data include the public schools and publicly-funded Catholic schools but exclude the publicly funded hospital and provincial schools, care & treatment facilities.

Figure 8: Distribution of Ontario private schools in 2000/2001

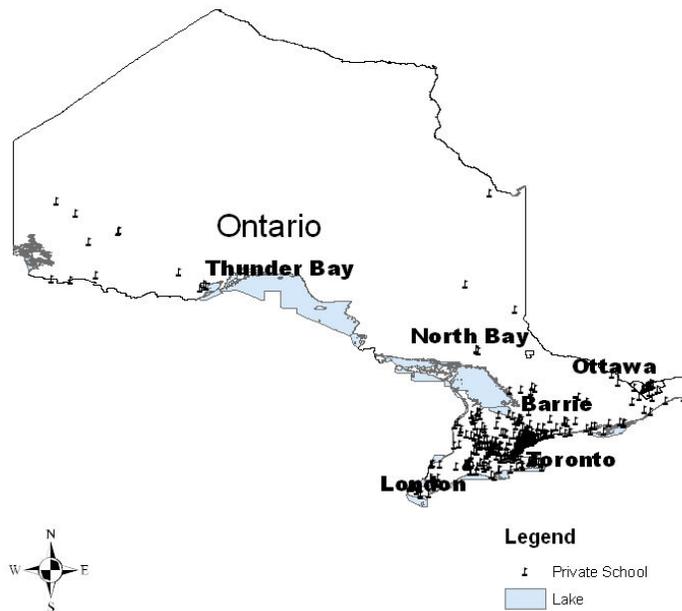
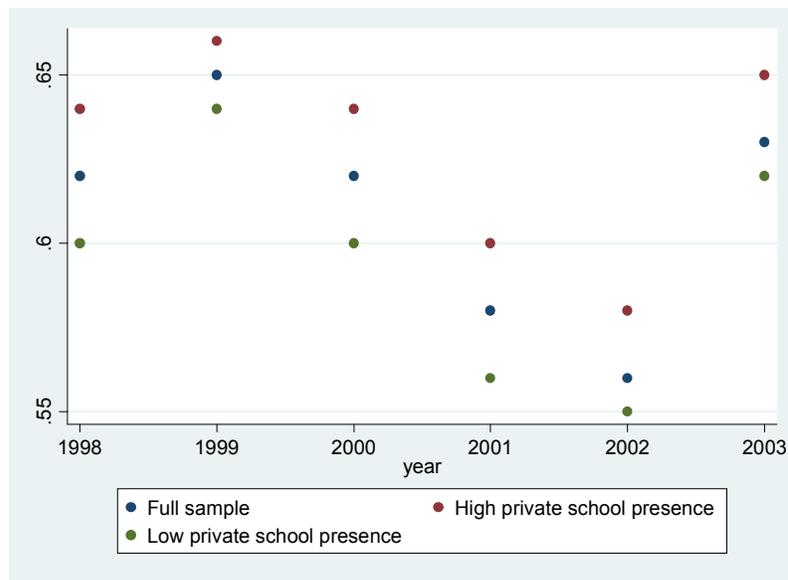


Figure 9: Average public school performance in EQAO Grade 3 mathematics assessment, 1998/1999 to 2003/2004



Notes: 1,764 schools can be linked from the main sample to public school score in 1998/1999 and 1999/2000; 880 schools are identified as located in districts with high private school presence, defined as private school enrollment share above the median level in the pre-policy period, 2000/2001.