

A Tale of Two Cities:

Learning from Provincial Achievement Test Results in Calgary and Edmonton

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Summary:

This report measures differences between schools in Calgary and Edmonton.

Provincial Achievement Test (PAT) results in mathematics in Grade 3, 6 and 9, analyzed over the period from 2000/2001 to 2011/2012 show that schools in Calgary have a higher percentage of excellent students and a slightly higher percentage of acceptable students. These superficial comparisons would seem to indicate that schools in Calgary are, in a sense, better than schools in Edmonton. This conclusion is incorrect.

Students in Calgary schools come from households that have economic and social advantages (higher SES [Social and Economic Status]) compared to students in Edmonton. At the simplest level, families in Calgary are better educated than families in Edmonton.

Schools in Edmonton substantially outperform schools in Calgary on Provincial Achievement Tests (PATs) between 2000/2001 and 2011/2012 after taking into account the social and economic advantages enjoyed by students in Calgary.

The performance gap in favour of Edmonton schools grows over the time period studied. The performance gap is larger in Grade 9 than in Grade 3. The performance gap in favour of schools located in Edmonton is larger in mathematics than in language.

The performance gaps in favour of schools in Edmonton over similar schools in Calgary are found in all types of school authorities: private, separate, public and charter.

Within the city of Calgary it is clear that the very large number of private schools in Calgary do not, as a group, outperform the Calgary public school system after adjusting for the much higher SES characteristics of private school students. The better PAT results at private schools in Calgary are fully accounted for by stronger SES characteristics of their students.

Separate schools in Calgary perform at the same level as the Calgary public schools.

Public and separate schools in Edmonton both perform at a much higher level than their public and separate counterparts in Calgary. The gaps are large. The gaps increase with grade level.

The interpretation of the outcomes at charter schools in both cities is complicated. There are very few charter schools in Edmonton. Very few observations are an immediate caution to placing too much weight on the results. Charter schools in both cities produce a larger percentage of excellent and acceptable (including excellent) results on PATs. This is true whether or not the PAT success measure controls for the background of students. However, without knowing much more about the charter schools and their admission policies, it cannot be concluded that charter schools are more successful. To state the obvious, if charter schools admit mostly students with high academic ability whatever the observable SES characteristics of these students, then charter school students will perform better on PATs. Further investigation of charter school admission policies is needed.

The report does not explain why public and separate schools in Edmonton schools clearly perform better than similar Calgary schools after the adjustment for social and economic factors. However it is possible to provide a narrative consistent with this fact.

It is well documented that the public school board in Edmonton, when Alberta schools were opened to choice and private schools received significant public funding, responded with active encouragement of school choice; the creation of many programs of choice; and the decentralization of school management. One goal of the Edmonton public board was to preempt the opening of charter and private schools. In Edmonton, very few charter schools opened and very few private schools opened. Calgary is a city where a much larger percentage of students attend private schools and charter schools. In this sense, there is more school choice exercised in Calgary. There was a choice to exit the public and separate school authorities.

The results of this study show that schools in the public school board in Edmonton produce better results than their counterpart in Calgary. They also show that schools in the Edmonton separate board produced better results as well. It seems very plausible that satisfied parents in Edmonton did not see a need to press for the opening of charter schools nor do they see the need to send children to private schools.

It is consistent with this evidence to tell a story that the adoption of better management methods by the Edmonton public school system and the encouragement of school choice within the public board, the board that the majority of students in Edmonton attended, forced all schools in Edmonton to perform at a higher level.

Concerns have been expressed that public school choice, as initiated in Edmonton, would lead to a school system where public schools become less diverse over time. It is clear that private schools and separate schools in Calgary draw students disproportionately from higher SES households. In that sense school choice led to less diversity within Calgary schools, while since private and charter schools did not open in Edmonton, that path to less diversity within the school system was closed.

Within the public and separate systems in 2000/2001 and 2005/2006, a smaller percentage of households in Edmonton than in Calgary chose to attend the closest available schools with the same configuration and school authority. This is some evidence in favour of the exercise of more choice within the public and separate systems in Edmonton. The available and limited measures of within-school diversity seem to show similar patterns of diversity across the two cities. It is not possible to conclude that school choice in Edmonton led to less within-school diversity of income and education at Edmonton public and separate schools relative to Calgary public and separate schools.

1. Introduction

The goal of this project is compare schools in Calgary and Edmonton between 2000/2001 and 2011/2012. One comparison is across the outcomes from Alberta's Provincial Achievement Tests (PATs). The second comparison is across the social and economic characteristics of schools. A third briefer comparison is around travel choices to school.

Schools located in Edmonton that draw students from the same social and economic background as schools in Calgary perform at a much higher level on the PATs. PAT results in Calgary are slightly better than PAT results in Edmonton if you ignore the social and economic advantages of students who live in Calgary. The performance gap in favour of Edmonton schools, the gap that takes into account the social and economic advantages of students in Calgary, widens as the grade level increases from Grade 3 to Grade 9. The performance gap is wider in mathematics than in language.

The school systems in the two cities evolved along different lines. A much larger private and charter school sector in Calgary draws its students from parents with higher social and economic (SES) characteristics. The broader exercise of school choice in Calgary, choice that includes a relatively large number of private schools and charter schools, changes the social structure of the school system as a whole.

Private schools in Calgary, when their PAT results are compared to public schools in Calgary where students come from a similar background, do not have better PAT results.

The report shows that although the charter and private school system in Edmonton is small, there is much school choice exercised within the Edmonton public school board. The available measure indicates that more choice is exercised in Edmonton than in Calgary, while the available data suggest that wider school choice within Edmonton public schools has not had a very large or obvious effect on social

and economic diversity within these schools or across these schools. The patterns of social and economic diversity in public schools and separate schools in Edmonton and Calgary are similar. Ungerleider (2011) makes a claim that more school choice leads to economic segregation across schools. This does not seem to have happened in the Edmonton public school board, while there is considerable economic segregation with Calgary private and charter schools. There is more work to be done in the analysis of diversity within and across schools.

There were extensive changes to the Alberta school system in the mid-1990s. It is clear that the Edmonton public school board met these changes with significant reforms.

Dosdall (2001) lists the provincial-level changes in Alberta. Leading the list was full funding for charter schools and partial taxpayer funding for private schools. The ability of local school boards to access the property tax base was removed. Dosdall labels these provincial changes as moving to a de facto system of school vouchers where educational funding money from the province followed the student into the student's school authority.

Dosdall, as superintendent of the Edmonton public board, led its response to these changes. Dosdall (2001) reported that in 4 of 6 cases, parental requests for charter schools were met by the Edmonton board creating the charter program desired by parents within the public board. Jenkinson (1996) and Steel (1999) report that previously-private Christian schools became alternative programs within the Edmonton public school board in the late 1990s.

Bosetti (2007) reports that while the public school board in Calgary enrolled a smaller percentage of students in Calgary as the charter school system grew, the Edmonton public school system was rapidly creating alternative programs. Bosetti (2000) reports 26 programs of choice in 96 Edmonton schools. Taylor and Mackay (2008) report that the Edmonton public school board was operating 33 different programs of choice in 2005.

The Edmonton public school board continued with its long history of open boundaries in the period of the provincial educational reform. Parents were not required to send children to their designated school by geographic location. Archer (2005) reports parents could pick any school for their children. Taylor and Mackay (2008) report that in the 2005/2006 school year in Edmonton public schools 52% of elementary students; 56% of junior students; and 51% of senior students did not attending their designated school. Dossdall (2001) reports quite similar numbers. Parents in Edmonton clearly exercised choice within the public school system during the period studied by this report

Ouchi and Segal (2003) as well as Ouchi, Rirodan, Lingle and Porter (2009) stress a different aspect of the reforms initiated within the Edmonton public school system. They argue that, uniquely within school boards in Canada (and indeed to a large degree within North America) Edmonton public schools experienced a significant reform in management. Strembitsky (1997), superintendent of the Edmonton public board for 22 years, discusses these reforms. At the Edmonton public board, funds followed students to individual schools. More funds followed students who required a higher degree of educational support. Principals were given more freedom to manage their own budgets. These management changes did attract some attention, see Archer (2005) and Robson and Hepburn (2010). Both authors make claims that school systems elsewhere in North American should be emulating Edmonton public board management initiatives. However it remained difficult to appropriately assess the effectiveness of schools in Edmonton and more particularly schools in the Edmonton public school board. This report rectifies that problem.

There is a very interesting comment reported in Wells and MacQueen (2006). They wrote:

For all Edmonton's autonomy and choice, it is not clear there is a direct link to improved outcomes, says Peter Cowley, director of school performance studies for Canada's right-wing Fraser Institute, which tracks academic indicators, and supports an increased role for private schools – to the dismay of public teachers' unions across the country. Edmonton schools habitually score near the top in international rankings, but no better than other Alberta schools, even in areas with centrally driven hierarchies, he says.

The results in this report directly contradict the statement above. They show that Edmonton schools and Edmonton public schools in particular, where social and economic characteristics of students are comparable, generate systematically better results than similar schools located in Calgary. This is a result obtained using Grade 3, 6 and 9 PAT results from 2000/2001 to 2011/2012. The gap in favour in Edmonton-located schools appears to be larger the higher the grade of assessment: that is, the gap is wider in Grade 9 than in Grade 3. The gap in favour of Edmonton schools widens between 2000/2001 and 2011/2012. The gap in favour of Edmonton schools includes public, separate, private and even charter schools located in Edmonton. The research does not fully explain why these performance gaps exist or have increased over time. You cannot draw a direct link between better results and more choice in Edmonton schools or better results and decentralized management in Edmonton schools. Any link to be made is indirect and made as a narrative.

That narrative would be as follows. The Edmonton public board already had a more decentralized management system than other school boards. The province of Alberta opened up school choice and a voucher-like system in and around 1995. The public school board in Edmonton responded vigorously with programs of choice to retain parents within the public board. Very few charter or private schools opened in Edmonton. Many private schools and charter schools opened in Calgary. Parents voted with their feet in both urban areas. There is a presumption that parents that remained in the Edmonton public system because they were satisfied with the education their children received. The narrative would then point out that the other schools in Edmonton, separate, private and charter, in order to retain their students, would have to provide an equivalent high-quality education to their students. When the Calgary public board did not act to keep students within its schools, the other schools in Calgary were not forced to meet the higher standards of the Edmonton public board, merely the lower outcomes at the Calgary board. In this narrative, the performance of the lead board mattered for the outcome in the city as a whole. In Edmonton, the rising tide lifted all boats.

The remainder of this report proceeds as follows. Section 2 identifies the groups of schools studied. Section 3 documents the changes in the structure of schooling in Calgary and Edmonton. Section 4 looks at results on PATs in Calgary and Edmonton without any adjustment for the SES characteristics of students in the two urban areas. Section 5 then documents how SES characteristics in Edmonton are different than in Calgary. Section 6, arguably the most important section of the report, shows that PAT results in Edmonton are better than PAT results in Calgary when we compare the schools where students share the same social and economic characteristics. This is true whether we look at either the city or CMA level.

The second part of Section 5 breaks down the comparison of results in the City of Calgary and the City of Edmonton by authority type. It becomes clear that better PAT results are found in all types of school authorities in Edmonton when they are compared to the schools in Calgary teaching a group of students with the same social and economic characteristics in the same type of authority.

Section 7 is a preliminary attempt to measure social and economic diversity across and within schools in the cities of Calgary and Edmonton. Section 8 is a preliminary attempt to measure choice through pattern of travel data from home to school. There is more work to be done on both issues. This work could be done if we had more detailed data not made available for this report.¹ These sections are included in the report partly to encourage further analysis. There is a brief conclusion and an appendix. There is a series of tables and figures at the end of the report.

The central and clear message of this report is that, when we compare schools where students share the same social and economic characteristics, schools located in Edmonton produced better Provincial Achievement Test results than schools in Calgary from 2000/2001 to 2011/2012.

¹ Some of the data used in this report came out of Freedom of Information requests made to Alberta Education. These data did not include any individual student information. Such information is available within the government and could be analyzed.

2. Defining the schools in Edmonton and Calgary

Schools located in or near the Edmonton Census Metropolitan Area (CMA) and the Calgary Metropolitan Area are identified. The process is repeated for the schools located within the cities proper. The process is not as straightforward as you might expect.

A list of school addresses containing all schools in Alberta operating between 1995/1996 and 2011/2012 was obtained from Alberta Education. Schools open and much less frequently, close. There are 37,193 school-year observations for schools where elementary, junior high and high school grades were taught. Each school must be placed within or outside consistent geographic areas representing the city of Edmonton, the city of Calgary, the Edmonton CMA and the Calgary CMA over this period.

The smallest geographic unit of the 1996 census is an Enumeration Area (EA) with an average population of 568. The smallest unit of the 2001 and 2006 census is a Dissemination Area (DA) with average populations of about 600. Each DA or EA is placed by Statistics Canada within the Calgary or Edmonton CMA or in the cities proper as of a census year. The DA and EA is the basic unit of geographic analysis for both social and economic characteristics of students as well as for calculating the distances between student home and student school.² However the geographic boundaries of the geographic units and the place names attached to those units vary slightly over the period studied. A method is created to place schools in consistent geographic units.

In each census year, Statistics Canada provides a geography that is a set of community names, postal codes and associated EAs and DAs. More than one EA or DA is linked to a postal code. These files contained some errors. Some EAs or DAs are associated with a postal code within one of the CMAs are not in fact part of the either CMA. These files are corrected.

² The data include an exact school address. The postal code from that address is used to place a school in an EA/DA. The student EA/DA is constructed by Alberta Education from the student's postal code but the data do not include the student's postal code.

A second problem is that two of the geographic units are not completely stable over the period studied. The CMA boundaries are stable. City boundaries change slightly. For the City of Edmonton, the community names that are treated as part of the City of Edmonton in all 3 census years are Maple Ridge, Lancaster Park and Winterburn. For the City of Calgary, the community of DeWinton, an area, immediately south of Calgary is treated as part of the City of Calgary in all 3 census years.

In this way every school in Alberta is placed in the City of Edmonton, the City of Calgary, the Edmonton CMA or Calgary CMA or outside these 4 geographic units. All schools in school authorities listed from Edmonton and Calgary fall within the relevant urban boundaries.

Figure 1 and Figure 2 place the schools included in this study on maps of the Edmonton and Calgary regions respectively. A closed circle is a school with only elementary grades. An open circle is a school with any other grade configuration. The 2012 Statistics Canada CMA is marked by the shaded area in both figures. Both maps contain a few schools just outside the CMA boundaries. These schools have community addresses using the names of communities within the CMA or are schools operated by a school board directly associated with that CMA.

3. The structure of schools within Edmonton and Calgary

Table 1 presents information on the structure of the school system in Calgary and Edmonton. Data are presented for two academic years, 1995/1996, the first year of the study and 2011/2012, the last year of the study. There are two aspects of structure: What type of authority operates schools? What is the grade configuration of schools?

There are 5 different school authorities in Alberta: Public, Separate, Charter, Private and Francophone. Public schools dominate the system, both in number of schools and the percentage of

students taught. There are changes by type of school authorities that differ across the two cities and over the period of the study.

In the Edmonton CMA in 1995/1996, public schools (69% of schools) teach 71% of students. In the Calgary CMA in 1995/1996, public schools (67% of schools) teach 72% of students. By 2011/2012 the share of students taught in conventional public schools declines in the Edmonton CMA from 71% to 69% and in Calgary from 72% to 66%. Public school students fell as a percent of all students in both jurisdictions. Where did they go?

In Edmonton, there is a 1 percentage point increase in the student share of the separate school system. In Calgary, the separate system maintains a share of 24 percent of students. In Calgary the public Francophone system expands from 0% to 1% students over the period studied. In Edmonton the public Francophone system expands from 1% to 2% students. These are quite similar changes in the two urban areas. Both indicate some increase in options for parents of public school students, options without additional fees.

The two urban areas differ substantially in the role of charter schools and private schools. In Edmonton, the percentage of students attending charter schools rises from 0 to 1 over the period. In 1995/1996 there are 2 Edmonton charter schools with a total of 131 students. There are only 4 charter schools with a total of 1087 students in 2011/2012, less than 1% of all students in the Edmonton CMA. In Calgary, the number of charter schools increases from 0 to 12 over the same period and, by the end of the study period, the charter school system in Calgary includes 5,859 students or 4 percent of students. The charter school system is much larger in Calgary.³

³ This report does not investigate why charter school growth has been so rapid in Calgary. This is another area of research where matched individual school-grade-student data would be of great benefit. Then the point in time when students switch schools could be identified. The leaving school and the receiving school could be identified.

At both the beginning and end of the period, 3 percent of Edmonton students attend a private school. Calgary begins the period studied with 4 percent of students in private schools and ends with 6 percent of students in private schools.

Thus the total percentage of students attending private and charter school in Calgary is 10 percent in 2011/2012, In Edmonton only 4 percent of students attend private or charter schools in 2011/2012. This is a very substantial difference between the two cities.

The lower portion of Table 1 shows, both by number of schools and number of students, the grade configurations of schools in the two CMAs. There are three noteworthy items. A significant number of schools contain all grades and such schools educate a substantial percent of all students. The large expansion in Calgary schools over the study period is in schools that contain elementary and junior grades and in schools that contain all grades. The number of students in K-8 schools more than doubled; the number of students in all-grade schools tripled. These changes are part of massive growth in the Calgary system relative to the Edmonton system. Over the period studied, the total number of students in Calgary grew by 20% while the total number of students in Edmonton grew by only 4%.

4. Achievement Results in Calgary and Edmonton

Figures 3, 4 and 5 illustrate the results on the 6 Provincial Achievement Tests (PAT) used in this study. Results are available from 2000/2001 to 2011/2012. Although there are many tests that could be used to compare outcomes, the largest and arguably most important tests are in language and

mathematics.⁴ These are the two tests where there is an almost consistent set of results over all years in all three grades.⁵

There are two measures of student success; a student achieves at the excellent level or at the student achieves at the acceptable level. At each school the percent of all students who achieve at the excellent level or at the acceptable level is calculated.⁶ Students miss tests for a variety of reasons, illness as well as a formal exemption process. The Figures present the percentage of all students in each category for the Calgary and Edmonton CMAs in each year of the 12 years where there are PAT results. The latter number, by construction, is always larger than the former since all who perform at the excellent level also perform at the acceptable level.

A quick glance at Figures 3 through 5 shows that about 20 percent of students achieve at the excellent level in the two urban areas and about 80 percent of students achieve at the acceptable level. The lighter bars are results in Edmonton, the darker bars results in Calgary. The left-hand side of the graphs on each page is the percentage of students at the excellent level, the right-hand side the percentage at the acceptable level.

The percentage of students achieving at the excellent level varies considerably across the years. On the Grade 3 language exam, the percent of all students with excellent scores in Calgary and Edmonton varies from a low of 16% to a high of 23%. Other PATs show similar fluctuations in the percent of students at the excellent level. There are smaller, but still important, annual fluctuations in the percent of students scoring at the acceptable level. There are three possibilities that could explain these fluctuations.

⁴ I choose not to include the PATs administered in French. I focus on exams with results in all years of the study.

⁵ In 2009/2010, two different mathematics tests were administered. About half the schools in Grades 3, 6 and 9 wrote each version. No results were reported for one of the two versions. In all other years all schools wrote both the language and mathematics tests.

⁶ Using all students in the denominators of the calculation of these percentages means a school cannot raise its results by exempting students who would not achieve at the acceptable level.

One possibility is that the quality of the student group tested actually changes by a large amount from year to year. This is unlikely for such a large group of students. The second possibility is that the quality of teaching by many teachers over many years to this group of many students assessed also suddenly varies a large amount from year to year. This also seems unlikely.

The sensible and third explanation of the year-to-year variation in either success rate is that the PAT test itself varies in either difficulty or there is variation in marking a PAT of similar difficulty. Both could clearly occur. The annual fluctuations in overall results are of little interest in assessing the relative performance of schools across the cities. The relevant comparisons must focus, both in the graphs and in the later statistical analysis, on results within a year between the two urban areas.

Figures 3, 4 and 5 leave the impression that the percentage of all students scoring at the excellent level is slightly higher in Calgary than in Edmonton. The differences are not large, but they are there. The gap between the two cities in the percent of all students scoring at the acceptable level is much smaller.

If we took the evidence from Figures 3, 4 and 5 at face value, we would conclude that, in terms of student achievement, results in Calgary and Edmonton are quite similar using the percent of students scoring above acceptable. We would then conclude that in terms of students achieving at the excellent level, schools located in Calgary produce generally better results. This conclusion is incorrect. Student results on standardized tests reflect two factors, the quality of the learning experienced by the student and the resources brought to the student's studies from their home background. My previous work has quantified the relative importance of these two factors.⁷ When we take into account the fact that Calgary students, on average, come with substantial advantages in their home backgrounds, a quite

⁷ Johnson (2005) provides a fairly complete introduction to this type of analysis.

different picture of the relative quality of schools in Calgary and Edmonton emerges. The background of students must be measured in order to separate the two factors.

5. The social and economic characteristics of students in Calgary and Edmonton

There are no direct data on individual social and economic characteristics of students attending schools in Alberta.⁸ The data describing the characteristics of children attending each school are created by linking the location of student homes to the smallest geographic units in the census, the EAs and DAs discussed earlier. Data from 1996, 2001 and 2006 censuses are used. Table 2 presents a direct comparison of the social and economic characteristics of neighbourhoods sending children to schools in both the CMAs and the cities of Calgary and Edmonton. The school value of a social or economic characteristic at that school is a weighted average of the social and economic characteristics of EAs or DAs sending students to those schools. The weights are school enrolments in those geographic units.

The measures for the CMA and cities are weighted averages of values at each school, weighted by total school enrolments.⁹ For convenience, I use the term students or parents when referring to these characteristics of schools even though they are actually the characteristics of persons or households dwelling in the neighbourhoods from which the students are drawn.¹⁰ There are clear differences between the two urban areas: Schools in Calgary, whether city or CMA, serve children of higher average social and economic status (SES) than schools in the City of Edmonton or the Edmonton CMA.

⁸ In some provinces, part of the assessment process includes questions about student characteristics, for example the number of years that the student has attended their current school, whether the student receives ESL assistance, or whether a student is a Special Education student. There are some releases of school level values of such variables, for example, the percentage of students receiving special education (not gifted) at a school.

⁹ Johnson (2007, 2010, 2013) presents further details on how this is done in Alberta.

¹⁰ In other work, Johnson (2008), I show that direct data on students and census data on neighbourhoods from which students are drawn create virtually identical characteristics at the school level. The match in British Columbia can be made for the percentage of students who are aboriginal and the percentage of students who speak a second language. The close correspondence increases our confidence in creating these school descriptions.

Table 2 presents the data from the 1995/1996 (matching exactly the 1996 census) and 2005/2006 (matching exactly the 2006 census) school years.¹¹ Two comparisons are possible – changes over time in the same urban area and differences between urban areas at the same point in time.

The first three rows simply show the number of schools, the number of students and average school size. The data presented in Table 2 exclude schools where only high school grades are taught, that is, Grades 10, 11 and 12. The data include all students in all schools that produce PAT results in Grade 3, 6 and 9.

The table compares each CMA to the matching city. The City of Calgary incorporates a much larger proportion of the student population in its CMA. The CMA of Edmonton has some large towns and suburbs that are excluded from the City of Edmonton proper. This observation is confirmed by returning to Figures 1 and 2. In both Calgary and Edmonton, the schools within the city boundaries proper tend to have collections of students with SES values that predict lower PAT results relative to the full CMA. A wide variety of social and economic characteristics of students help predict school PAT results.

Social characteristics:

Edmonton schools teach more aboriginal students than Calgary schools. Edmonton city schools have a higher percentage of aboriginals than Edmonton CMA schools. The Calgary-Edmonton gap across the two CMAs is 2.2 percentage points of aboriginals in 2005/2006 relative to 1.4 percentage points in

¹¹ It would be possible to construct, using the 2006 census, the same variables for the 2011/2012 school year. This makes the assumption that the characteristics of neighbourhoods do not change very much between the 2006 census and the 2011/2012 school year. For the purposes of Table 2, it is satisfactory to compare Calgary and Edmonton between 1996 and 2006 census. The results from National Household Survey in 2011 are not directly comparable to the 2006 census. They were not fully available as this project began. Further work needs to be done in understanding how, if it possible, the National Household Survey with its lower response rate and less fine geographic data can be used to accurately describe school-level social and economic characteristics.

1995/1996. In 2005/2006, the census reports that Edmonton city schools contain 5% aboriginal students versus only 2.3% aboriginal students in the city of Calgary.

Edmonton schools, both city and CMA, service many more lone parents than Calgary schools. This is a gap that also increases over time.

There are relatively small differences between the two cities when it comes to persons speaking a non-official language, whether measured as language spoken at home or as measured by the student's mother tongue. The City of Edmonton has the lowest percentage of students with an official language spoken as their mother tongue or language at home in both years.

Immigration:

A substantial percentage of the citizens of both urban areas are born outside Canada. In both years the Calgary urban area, CMA and city, has a higher proportion of recent immigrants than either definition of the Edmonton urban area. Recent immigrants are measured in two ways, those who have arrived in the last 5 years or those who arrived in the year prior to the census. These gaps widen in 2005/2006 as Calgary grew much more than Edmonton, partly through international migration. As measured in the 2006 census, 4.6% of the Calgary CMA's population arrived from outside Canada in the last 5 years and 1.4% of its population arrived from outside Canada in the last year.

Mobility and housing

The next three rows look at measures of mobility and housing as SES variables. The census measures the percent of households that have moved in the last year. This is partly an index of stress on children as they are more likely to switch schools when their family has just moved. Mobility increases over time in both urban areas using this measure. Calgary appears to be a more mobile society than Edmonton, particularly in the last year of the data presented, the data drawn from the 2006 census. It is

then somewhat surprising that a higher percentage of people in Calgary live in single-family homes and a higher proportion of people own their own residences. These differences may simply reflect differences in education, employment and income that favour Calgary over Edmonton.

Education

It is clear that the level of education of parents has a very substantial influence on the educational outcomes of children. There are complications in using the census to measure the educational level of adults associated with schools. The three censuses have slightly different measures of education.

The 1995/1996 census counts persons in each geographic area by level of highest education achieved for all persons over the age of 15. One category is persons with a completed university degree. The 2001 census then counts persons with a completed university degree but only if a person is over 20 years of age. The 2006 census then counts persons with completed university degrees aged 15 to 24, aged 25 to 64 and 65 and over with completed university degrees. These changes in the grouping of ages and categories of highest level of education make construction of a consistent series more difficult.

The variable used is the count of persons with at least one completed university degree as a percent of the total population over the age of 15. The validity of this variable depends on the assumption that very few persons aged 15,16,17,18 or 19 have had time to complete a university degree.

The population of Calgary, as measured by the percentage of persons over 15 with a completed university degree, is much better educated than the population of Edmonton. In 2005/2006, in Calgary city, 25% of the population has a completed university degree, in Edmonton, only 18.8% of the

population has a university degree. This is a much wider gap than in 1995/1996. Similar gaps in educational achievement are observed between the two CMAs.

Labour market and income variables

There are a variety of labour market indicators. The employment rate is the percent of persons over 15 in employment, full or part-time. The employment rate is higher in Calgary than in Edmonton. The unemployment rate, the percentage of the labour force without jobs, is lower in Calgary than in Edmonton. Both rates are calculated in each census year using adults from households with children present. Both rates show economic advantages to living in Calgary.

The last two rows of the table present measures of average individual income and average household income from the census for students at schools in Calgary and Edmonton. You can only compare the urban areas within the two census years. In each year the dollar units of income are dollars from the year prior to the relevant census. Thus in 1995/1996, incomes are measured in 1995 dollars from the 1996 census. In 2005/2006, incomes are measured in 2005 dollars. The key message is that incomes are higher in Calgary than in Edmonton and that the income gap between Edmonton and Calgary increases over time. In the 1996 census year, individual incomes are 14% higher in Calgary; in the 2006 census year individual incomes in Calgary are 24% higher. Household incomes in the Calgary CMA are 13% higher than in the Edmonton CMA as measured in the 2006 census.

6. The superior performance of schools in Edmonton

In Section 4, Figures 3, 4 and 5 showed that performance, measured by the percent of students acceptable, on the PATs was fairly similar in Calgary and Edmonton. Using the percentage of students performing at the excellent level as the measure of performance, students in Calgary usually performed

at a slightly higher level than students in Edmonton. This section is entitled “The superior performance of schools in Edmonton.” Why?

The statement is best understood if you think of two groups of schools, one group located in Edmonton and the other in Calgary. The two groups of students are attending comparable schools in the different cities. Comparable schools share the same SES characteristics, think of an extreme case where the SES characteristics are identical. Then the schools in Edmonton with the students having matching SES characteristics as the schools in Calgary perform, on average, at a higher level than the schools in Calgary. These comparisons are actually carried out using a statistical modelling exercise.

Regression models of both outcome measures are estimated for each of the 6 PATs in Figures 2, 3 and 4.¹² The unit of observation is a school. One school outcome is the percent of all students who are excellent; the other outcome is the percent of all students who are acceptable. Recall that the latter group includes the students who are excellent. The model uses the average social and economic background of students at each school to make a prediction of each PAT outcome measure at each school. A separate model is estimated for each assessment studied using schools from both urban areas and both levels of the urban areas, both CMAs and cities. The association of SES variables and achievement results is allowed to vary by type of assessment. The model takes into account annual variation in the difficulty of the relevant PAT by having a dummy variable in each regression model for each year.

It is not surprising that the social and economic background of students plays a large role in predicting student success. However the regressions that predict school-level variation predict between 31 and 46 percent of the variation in student success across schools. To some readers explanatory power values of less than 50 percent will seem low. These readers see academic success as measured by

¹² The coefficients on the variables in the regression models used to construct Tables 3 and 4 are reported in the appendix tables.

a standardized assessment very closely related to student background. Such a reader would expect regressions of achievement success variables on social and economic variables to much higher explanatory power. However the results indicate that only part of student success is family background. The components of social and economic background that predict academic success are similar, but not identical across the assessments.

The association of a large percentage of aboriginal students and lower results in mathematics is strong. These effects persist through all grades and both assessments. The association is weaker for language results.

The effect of immigration, whether long-term or recent, is more complex. This is expected. Immigrants are often selected as strong candidates to enter Canada and self-selected as wanting to leave their own country to better their lives. These two effects will be expected to improve academic results. But immigrants often do not speak English as their native tongue. This would be predicted to lower academic results. Negative effects are largest for the most recent immigrants in language-based PATs. There is little additional association of the language measures, either home language or mother tongue, with PAT results. This is likely because the regression equation already includes the effects of immigration by length since the time of immigration.

School communities where people move more often, do not live in detached homes and pay rent rather than owning their own home are generally predicted to do worse on PATs. These effects are quite consistent across the different PATs.

School communities where a larger percentage of persons are unemployed are generally predicted to do worse on PATs. The association of unemployment with lower PAT scores weakens as the PAT grade rises.

Finally, the percent of persons over 15 with a completed university degree is the strongest and most significant predictor of success on PATs using either outcome. An increase in 1 percentage point of adults in the school community with a completed university degree predicts an increase in the percent of students at a school who achieve excellent or acceptable by anywhere between one-half and one full percentage point depending on the assessment. The association of parents with completed degrees and strong PAT results is very precisely estimated. Consider an example: using the schools located within the Calgary and Edmonton city limits, the percentage of students at a school achieving excellent on the PAT0300 is predicted to rise between 0.51 and 0.71 percentage points 19 times out of 20 when the percentage of adults associated with the school who have completed a university degree rises by 1 percentage point. Using the midpoint of this estimate, the 2005/2006 gap of 6.2 percentage points in the percent of persons with a completed university degree in favour of the city of Calgary predicts that Calgary schools would have $0.61 \text{ times } 6.2 = 3.8$ percentage points more students at the excellent level than the schools in Edmonton.

Comparing the PAT results in Calgary and Edmonton

The Calgary-Edmonton comparisons are presented in two complex tables of coefficients, one for the language PATs and the other for the mathematics PATs. Table 3 and Table 4 share the same format: Table 3 contains language results; Table 4 mathematics results. Each table covers all 12 years of results in 3 grades. There are, under each pair of urban areas in each year for each PAT, two coefficients. A coefficient is a measure of the difference between the percentage of students who achieve either excellent (the left hand side of the table) or acceptable (the right hand side of the table) in Edmonton and Calgary. The difference is expressed as an average Edmonton result minus an average Calgary result (averaged over a year of observations across schools) so that a positive value indicates a better result in Edmonton. The units are average percentage points of students in schools. There are 8 coefficients in

each row. Each row refers to a specific PAT in a given year. An Edmonton-Calgary coefficient that is statistically different from zero at the 5% level is marked with an asterisk.¹³ Reminder: a positive coefficient indicates a better result, on average, in schools in the pairwise Edmonton geographic unit over the corresponding Calgary unit. The Edmonton advantage (disadvantage when the coefficient is negative) is measured by the sign, size and statistical significance of these coefficients.

The first relevant comparison is between adjacent pairs of coefficients. The left-hand coefficient in each pair is the difference between Edmonton and Calgary results without controls for the differing SES background of students in the two urban areas. This is the difference in the measured outcome between the two urban areas ignoring any differences in student background. These coefficients are estimates of the differences between the bar heights in Figures 3, 4 and 5 using average results across schools.¹⁴

If the values in the initial left-hand column labelled `No SES Controls` are negative, this indicates the percentage of students scoring excellent on that PAT is lower in Edmonton than in Calgary in that year. For example, in 2000/2001 the percent of students that scored excellent in the Edmonton CMA on the Grade 3 language PAT is 2.99 percentage points lower than in the Calgary CMA. This difference between CMAs in that year was statistically different from zero as indicated by the *. This coefficient is then estimated for the Grade 6 language PAT (-0.49) and the Grade 9 language PAT (-4.18) in 2000/2001. The gap in favour of Calgary schools in Grade 6 is not statistically significant, while the gap in Grade 9 results is statistically significant. The table then repeats for all 12 years of achievement data across both CMA-pairs and city-pairs. Outcomes are measured using both the percent of students who

¹³ To include standard errors would have made the table much more difficult to read. The usual standard error on the year-urban area effect is about 1. Thus a 1 unit coefficient would not be statistically significant, but a 3-unit coefficient is almost certainly statistically significant. Coefficients greater than two are also statistically different from zero. These estimates weight schools equally.

¹⁴ These are coefficients on year indicator variables multiplied by the relevant geographic indicator variables. The year indicator variables are also included in the regressions to control for the differences in average percent of students achieving acceptable or excellent between years. Standard errors are robust.

are excellent and the percent of students who are acceptable. It is important to consider both outcomes.

The column values in columns 1 and 3 of Table 3 (No SES Controls) are typically negative. When the outcome measure is the percentage of student scoring excellent, they are often statistically significant, that is statistically different from zero. This is clearly the case in making the comparison between Calgary city and Edmonton city. These coefficients, when negative, are the statistical evidence that when SES differences are ignored, that there is a smaller percentage of excellent achievement results in Edmonton than in Calgary.

As already noted in Figures 3, 4 and 5, the Edmonton-Calgary gap between the percent of students acceptable is a much smaller value. In the coefficients displayed in the 5th column that measure these differences at the CMA level, the values are small and not statistically different from zero. In the 7th column capturing the differences in the percentage of students acceptable between Edmonton city and Calgary city, there are many more negative and some statistically significant coefficients. For example, the percentage of students scoring acceptable on the PAT0300 language assessment is 4.25 percentage points lower in Edmonton city than in Calgary city in 2000/2001 and 3.30 percentage points in 2011/2012. The performance gaps that ignore the differences between the two cities in social and economic structure (SES) are of much less interest than the gaps between Calgary and Edmonton results that control for the SES differences. Section 5 presented the measures that show that students in Calgary arrive at school with social and economic advantages over their counterparts in Edmonton.

The gaps that control for SES differences are the right-hand coefficients in each pair of urban areas under the label "With SES Controls." The simplest way to think about these coefficient values is that you have two large groups of schools with identical student SES characteristics, one located in one

of the Calgary urban units and the other in the corresponding Edmonton urban unit. Thus the only difference between these schools is their location by urban area. All other SES values are the same, that is, the comparison schools have the same percentage of lone parents, aboriginals and persons with completed university degrees and any other SES variables of interest. The coefficients measure the gap in results for schools with the same SES characteristics when one group of schools is located in Edmonton and the other in Calgary. A positive value of the estimated coefficient indicates a stronger average performance by schools located in Edmonton, that is, a value of 4 indicates that 4 percentage points more students in Edmonton schools achieve at the excellent or acceptable where the school has students from the same SES as the school in Calgary. The average Edmonton-Calgary gap is estimated for each year, each PAT and the two PAT outcome measures.

The important observation is that every one of the coefficients in the columns labelled “With SES Controls” is positive. The vast majority of these coefficients are significantly different from zero. These large, and often vary large, positive coefficients are the basis for the claim in this section’s title: “The superior performance of Edmonton schools.”

The first statistically significant coefficient is the value 4.11 associated with the comparison of Grade 6 language results in 2000/2001. This is found in the second column two rows below the label “With SES Controls.” The interpretation of the value 4.11 is that 4.11 more students in a group of 100 students achieve an excellent result in the Edmonton CMA than in the Calgary CMA on the Grade 6 language PAT in 2000/2001 when these students come from the same SES background. If you continue to look at the coefficient values in column 2 over all the language PATs in all the years, you have a clear picture that schools with the same SES characteristics in the Edmonton CMA produce more students at the excellent level than similar SES schools in Calgary on the language assessments in Grade 3, 6 and 9. The gap widens as the grade level increases, that is, the superior performance of Edmonton schools is

generally larger in Grade 6 and Grade 9 than in Grade 3. The remaining columns of coefficients under the label “With SES Controls” have the same type of interpretation.

The large number of positive and significant coefficients in the second, fourth, sixth and eighth columns support the statement that schools located in the geography associated with Edmonton, either city or CMA, have stronger results in language PATs than schools located in the same geography associated with Calgary.

Table 4 repeats the same analysis for the mathematics PATs. Schools located in Edmonton are even more dominant in mathematics over schools in Calgary after controlling for SES background of students. The mathematics gaps in favour of Edmonton schools widen significantly in Grade 6 and Grade 9 relative to the gap in Grade 3.

Another pattern of coefficients in Table 3 and Table 4 invites a more subtle comparison. The increase in the percentage of all students achieving excellence in a geographic unit on a PAT can be compared to the increase in the percentage of all students achieving acceptable in the same unit. To be specific, compare the value 4.20 percentage points to 3.29 percentage points referring to CMAs in the first row of mathematics results in Table 4. If we take these as exact values (they are not- both coefficients are estimated with some error), then this would say that the 4.20 percentage point increase in excellent students in Edmonton and the 3.29 percentage points increase in acceptable students implies that there was a $4.20 - 3.29 = 0.91$ percentage point decrease in the percent of students scoring between excellent and acceptable. Remember that is still a larger percentage of students scoring above acceptable.¹⁵ In this particular row of results, the increase in the percentage of students scoring excellent is achieved partly by decreasing the percentage of students between excellent and acceptable without decreasing the overall percent of students above acceptable. This is a good outcome.

¹⁵ To be clear, since the values 4.20 and 3.29 are both estimated with a standard error of about 1, these coefficients are in fact very similar. The discussion here should be thought of as an example.

In an outcome that would be more difficult to support, it could be that an increase in the percentage of students performing at the excellent level is obtained in decreasing the proportion of students at the acceptable (including excellent) level. Then the increase in excellent students in Edmonton would have been achieved partly by decreasing the percentage of acceptable students. This pattern of coefficients never occurs.

In the best outcome, the best school system would produce, from students with the same SES background, a larger percentage of excellent students and a larger percentage of students between excellent and acceptable and a thus a very large increase in the percentage of students who are above acceptable. The coefficient measuring the increase in the percentage of students at the acceptable level in Edmonton relative to Calgary would then exceed the percentage increase in the percent of excellent students in Edmonton relative to Calgary. Corresponding coefficients in the right-hand columns of Tables 3 and 4 would be larger than those in the left hand side. The coefficient in column 6 would be larger than the coefficient in column 2 and the coefficient in column 8 would be larger than the coefficient in column 4.

This best outcome is the usual configuration of coefficient values in the usual case in Table 3 and Table 4. There are very few year-assessment combinations where Edmonton schools achieve a higher percentage of students in the excellent category by reducing the percentage of students between acceptable and excellent. In the most common case, the acceptable category increases by more than the excellent category implying that there is an increase in the percentage of students scoring excellent and an increase in the percentage of student scoring between excellent and acceptable. Thus results in Edmonton, adjusted for the SES background of students are much better than in Calgary.

The overall picture is one where it is clear that PAT results are better, adjusted for the background of students, in the Edmonton CMA relative to the Calgary CMA and in Edmonton city

relative to Calgary city. The next tables present a similar analysis where the schools within the cities of Calgary and Edmonton are compared, controlling for student background, across the type of school authority operating the groups of school. These comparisons are very interesting.

Table 5 presents results on the language assessments using the full period from 2000/2001 to 2011/2012. The tables must be read carefully. All coefficients measure the gap, measured as a percentage of all students, between the relevant group of schools in that authority type and city and the group of public schools in the city of Calgary.¹⁶

The first pair of coefficients estimates gaps in achievement results in Grade 3 language between students in the private schools in the city of Calgary and students in public schools in the city of Calgary. The two numbers to consider are 10.18 and 4.67 in the upper left corner. The 10.18 is statistically different from zero as denoted by the *. This means that, ignoring SES factors (as denoted by NO SES Controls), private schools in the city of Calgary achieve an average of 10.18 percentage points more students per school in the excellent category than Calgary public schools. The value of 4.94 two cells below the 10.18 indicates private schools have 4.94 percentage points more students than Calgary public schools in the acceptable category. This entry is also found in a row denoted NO SES Controls. You might then conclude that private schools in Calgary provide a better education than Calgary public schools. However, there are very large differences in the SES structure of private schools in Calgary compared to the public schools in Calgary.¹⁷

Private schools draw their students disproportionately from higher SES families. When the SES differentials are taken into account using the same methodology used to construct Tables 3 and 4 and

¹⁶ Table 3 and 4 presented coefficients that estimated a gap between results at Calgary schools and Edmonton schools. A positive (negative) coefficient was a gap in favour of Edmonton (Calgary). Here the coefficient measures the gap between results at a authority-city group of schools and Calgary public schools. A positive value is a better performance relative to public schools in Calgary.

¹⁷ These differences are presented in Section 7.

already explained, there is no statistically significant difference between the results in Grade 3 language at Calgary private schools and Calgary public schools. The coefficient 4.67 is not statistically different from zero at a 5% level of significance (it is almost statistically significant). The coefficient -.64 is clearly close to zero – the private school sector does not produce a higher percentage of students at the acceptable level in Grade 3 once the SES advantages of students attending private schools are taken into account. The same patterns are repeated in results from Grade 6 and Grade 9. Any private school advantage over Calgary public schools in PAT outcomes disappears when SES factors are taken into account. Calgary private schools are not better than Calgary public schools as a group. We will return to the interpretation of this result later.

The next column measures results at charter schools in Calgary. The coefficients again measure the performance gap between charter schools and Calgary public schools. It is very clear that with or without SES controls, the charter school sector produces a higher percentage of excellent results and a higher percentage of acceptable and excellent results.

Do we conclude from this evidence that charter schools are better than Calgary public schools? We have to be very cautious. The composition of students within charter schools is a result of parent choices and school admission policies. Imagine that the SES control variable is the observed level of parental education (simplify here to one SES factor for the purposes of discussion). Suppose at the same level of parental education, the parents who are motivated to help their children with homework all send their children to charter schools and parents who would not help their children with homework sent their children to public school. The charter school children would do better than the public school children even though the level of parental education, the SES factor is the same. The available data, which does not ask if parents help their children with homework, cannot be used to ask if this story is true.

It is equally possible that charter schools only accept children whose parents promise to help them with their homework. If it is possible for the charter school to enforce such a rule, then charter school students would also do much better than public school students where parents had the same level of education but did not help with homework.

Finally, and perhaps most plausibly, it is also possible that charter schools accept only students with strong academic aptitude. In this setting, better academic results at the same level of parental education are simply a function of such admission policies. The better results are much less interesting.¹⁸ To be certain that charter schools are “better” we would have to know much more about their admission policies.¹⁹

The last set of coefficients on the left-hand side of Table 5 under “Separate” measure gaps in performance at city of Calgary separate schools relative to city of Calgary public schools. All of the estimated gaps are small, with or without the SES controls. There is an interesting pattern in Grade 3 and Grade 6 where there are small positive gaps associated with the percentage of students in the excellent category and small negative gaps in the percentage of students in the acceptable category. This configuration of coefficients suggests that there could be some choices made about the allocation of effort in a school system. Is effort expended moving students into the excellent category from between excellent and acceptable and does that effort increase the percentage of students in the

¹⁸ The best known case in Ontario is St. Michael’s Choir School in Toronto where academic ability as well as choral ability plays a significant role in admission to a school where students always enormously outperform the SES characteristics of their parents. However you cannot use this result to conclude that choral singing leads to better academic results.

¹⁹ In the ideal world, to test if charter schools are actually better, students would have to be randomly allocated into charter schools and into private schools and then assessed for several years.

You could make the argument that the lack of better results at private schools reflects private schools having an admission policy that accepts students who are the poorer students from the set of highly educated parents. For example, the -4.22 percentage points statistically significant reduction in the percent acceptable relative to the Calgary public board in Grade 6 language found in Table 6 could be the result of private schools, as a group, admitting the weaker students from families with the same level of education. It could be that higher SES parents with children denied places in charter school move these academically weaker children to private schools. The reader can decide for himself if this is a plausible explanation.

unacceptable category? It is noticeable that no such coefficient pattern appears when the results in the city of Edmonton are studied with a view to measuring if results vary by type of authority.

In all four types of Edmonton school authorities, the usual pattern is an advantage over both the Calgary public school board and the corresponding type of school authority in Calgary. Both the percentage of students who are excellent and the percentage of students who are acceptable is larger in Edmonton relative to schools with the same SES characteristics in the Calgary public board and relative to the same type of school authority in Calgary. Given the extensive analysis in Tables 3 and 4, this is not a surprise. Remember, these tables showed a dominance of results in all schools in Edmonton over all schools in Calgary in all years. Tables 5 through 8 simply show how the better Edmonton results are spread across all types of school authorities within the groups of years used to estimate these coefficients. It was important to initially show that the better results in Edmonton occurred in every year and on average, across all types of schools.

Consider, as examples, the coefficients relating to Grade 3 language results under the heading Edmonton and Public in Table 5. In the cells relating to excellent results, the coefficient value that is not adjusted for SES controls is -2.28, a value statistically different from zero.²⁰ Edmonton public schools produce a smaller percentage of excellent students than Calgary public schools over the 12 year period. However when SES differences are considered, Edmonton public schools produce 2.67 percentage points more excellent students and 2.28 percentage points more acceptable students (the latter value is not quite statistically different from zero). The gaps in favour of Edmonton public schools when schools with comparable SES characteristics are compared widen considerably in Grade 6 and Grade 9 for both the percentage of students scoring excellent and the percentage of students scoring acceptable. As of Grade 9, the Edmonton public schools produce 5.57 percentage points more excellent students and 8.56

²⁰ The estimates of these coefficients are more precise when there are a large number of observations. There are 1829 school years of Grade 3 results in the Edmonton public school board from 2000/2001 to 2011/2012.

percentage points more acceptable students when students come from the same SES background than at schools operated by the public school board in the city of Calgary.

In studying Table 5, we need to consider the following argument that might, in principle, account for part of the gaps between Calgary public schools and Edmonton public schools. Consider, as an example, that there are only public and charter schools in Calgary and Edmonton.²¹ Suppose in Calgary four percent of students attend charter schools and in Edmonton 1 percent of students attend charter schools. Now suppose all of the charter school students both come from high SES backgrounds and are acceptable performers. Then if we compare a high SES school in Edmonton to a high SES school in Calgary, the high SES school in Edmonton that has not lost its acceptable students to the charter school will look better. Calculations indicate changes in percentage points of students excellent (acceptable) with these effects must always be less than the 3 percentage points of 'extra' students in charter schools.²² Then in comparing Calgary and Edmonton public schools after SES adjustment should show gaps of less than the 3 percentage points extra students in charter schools. The gaps between the performance of Edmonton public schools, Edmonton separate and indeed Edmonton private schools and Calgary public schools are generally larger than the 3 percentage point gap in the number of students in charter schools in Calgary, particularly in upper grades and particularly, as shown later, in mathematics. However it would be very useful to undertake much more study of the admission policies of charter schools and the consequences of those policies for the composition of the schools from which students exit.

The coefficients describing the results for Edmonton separate schools compared to Calgary public schools are found in the last column of Table 5. For Grade 6 and 9, these coefficients make a very

²¹ This assumption works because, adjusted for SES, results are similar in Calgary public, separate and private schools.

²² There are always some non-excellent (unacceptable) students in the public schools. The change in the percentage of excellent (acceptable) students at the public school that is losing the excellent (acceptable) students cannot be the full 3 percentage points.

favourable comparison, both to Calgary public schools and in some cases to Edmonton public schools. In Grade 9 language, for example, Edmonton separate schools produce 12.94 percentage points more students at the acceptable level when students come from the same SES background than the same students in the Calgary public system. That same value is 8.56 percentage points for Edmonton public schools.²³ In other cases, the advantage of the Edmonton separate system over the Calgary public system looks more similar to that of the Edmonton public system over the Calgary public system.

Edmonton has relatively few private and charter schools. Edmonton private schools do show some performance gaps over Calgary public schools even taking into account SES controls in Grade 9 and Grade 3 (acceptable) but not in Grade 6. There are even fewer charter schools in Edmonton than there are private schools. In Grade 3 and 6, the 24 observations would be accounted for by only 2 schools. In Grade 9, the 12 observations are accounted for by one school. That being said, even with very few schools, the SES adjusted gaps in performance at the Edmonton charter schools over the Calgary public schools are even wider than the same gaps for charter schools in Calgary.

The conclusion from Table 5 is that schools run by all types of authorities in Edmonton contribute to better language results from 2000/2001 to 2011/2012, after the adjustment for SES characteristics of students, than the results at the same school authorities in the city of Calgary.

Table 6 repeats the analysis of Table 5 using the years between 2006/2007 and 2010/2011 and the three language tests. The advantages of schools located in Edmonton over schools located in Calgary are virtually identical to those in Table 5.²⁴

²³ In statistical terms, the standard errors are large enough that the two estimates overlap in a sense.

²⁴ Since the entire sample period will represent the average across the first half and the second half of the period, showing that results for the second half of the sample are the same as for the full sample implies results for the first half of the period are the same as for the full period as well. A separate table for the first half of the period studied would be redundant.

Table 7 and 8 repeat the analysis, for the 12-year period and for the second half of the 12-year period using the mathematics PATs. The pattern of results on mathematics is essentially identical to that of language. Again all coefficients measure differences between the group of schools in that type of authority in that city relative to schools within the city of Calgary operated by the public school board. Adjusted for SES characteristics, private schools and separate schools in Calgary are no better than Calgary's public schools. Charter schools in both Calgary and Edmonton have better results. Most importantly, Edmonton's public schools and Edmonton's separate schools, once results are adjusted for the SES characteristics of their students, are much stronger than Calgary's public and separate schools. Table 8 presents the analysis of mathematics results using only the second half of the sample. Restricting the period studied to the second half of the available data makes little difference.

The results of the analysis are clear. Once there is an appropriate adjustment for SES characteristics, schools located in the CMA or city of Edmonton perform at a higher level than schools located in the CMA or city of Calgary (Table 3 and 4). Looking in detail at the two cities, it is clear that performance is better in both Edmonton public schools and Edmonton separate schools (table 5 through 8).

In the next two sections, we begin to compare schools in these two cities on two further dimensions: social and economic diversity across and within schools and travel patterns to schools. These measures of diversity are used to ask how students in these two cities are sorted across schools. Some parts of this analysis are limited by the data available. Part of the purpose of presenting this material is to encourage further analysis of this type of data, using the more detailed data that are available within the school system.

7. Social and economic diversity across schools in Edmonton and Calgary

To this point only the average values of social and economic characteristics at schools and the urban areas have been presented. The last part of this report begins to measure and study the diversity of SES characteristics across schools within a school system or within schools. The spread of SES variables around their average values is measured for two variables: education and income.

Spread or dispersion of a variable is often measured using the standard deviation. The standard deviation of a normally distributed variable is a value, measured in the units of the variable, where 70% of the observations are within one standard deviation of the average of the variable and 95% of observations are within two standard deviations of the mean. The larger the standard deviation, the more spread out is the distribution of the variable. A second measure of spread, the coefficient of variation divides the standard deviation by the mean of the variable. This controls for differences in means of variables. In this analysis we use the coefficient of variation as the relevant measure of diversity. The mean values of the SES measures vary between the cities, vary over time and at the level of the school, vary enormously from school to school. This suggests use of the coefficient of variation as our measure of diversity. The larger the coefficient of variation, the more diverse is the variable of interest.

There are two ways to look at diversity. One is student diversity within a specific school, that is, does a school contain a wide variety of students around its own average of an SES variable? At each school the coefficient of variation is calculated. The average value, across all schools in a group, is a measure of within-school SES diversity that can be compared across cities and over time. A larger value of this number is a larger average amount of diversity, on average, within schools in that group.

A second measure of diversity asks: Are the schools across the system widely different in the average values of the SES characteristics across schools? Here we are asking if all the schools in the

system are close to the average value of the SES variable in the system. If this coefficient of variation is larger, then there are more schools away from the average value of the SES variable of the system and the schools are not grouped tightly at the system mean. The schools within a system are more specialized by SES category. Diversity is measured across parental education and household income.

Parental education is measured by the percent of persons associated with a school that have a completed university degree. We discussed the details of this important SES measure earlier. Table 9 presents measures of diversity in parental education for three academic years in three census years where the characteristics of students at schools are directly measured by the census in that year.

Figures 6 and 7 repeat the first column of data from Table 9 in visual form.

Table 9 looks only at schools within the cities of Calgary and Edmonton. The decision to focus on the cities rather than CMAs matches the subsequent analysis of travel patterns. School switching and school choice, which might affect diversity at schools, seems more plausible within cities than school switching across the much wider geographic regions that define the CMAs in Figures 1 and 2.

The first column of Table 9 shows Edmonton, both across schools and within schools, operates a more diverse school system. As already noted, the average level of parental education is higher in Calgary. Using Figure 6 to look across schools, there is a wider variety of average parental education across schools in Edmonton. In Calgary, there are a few schools that have very high levels of parental education and then there is a very large mass of schools grouped around the mean. In Edmonton, the tail of higher-education schools is prolonged. In Table 10, the coefficient of variation across schools is 0.35 in Calgary and 0.45 in Edmonton in 2005/2006. The other years show similar differences. There is no obvious change in diversity across schools in the two cities in this decade.

Within schools, Table 9 shows the value of the coefficient of variation averaged over schools. This value is slightly larger in Edmonton than in Calgary in all three years. For example, in 2005/2006, the

average coefficient of variation within schools in Edmonton is 0.16, in Calgary is 0.13. The higher value in Edmonton indicates that, on average, Edmonton schools have more within school diversity in parental education. Figure 7 matches the numbers – the values of the coefficients of variation achieve higher values in the large tail of Edmonton schools to the right.

The remainder of Table 9 presents the same information about the coefficient of variation using only schools where elementary and junior grades are taught. These are the schools where PATs are written in Grade 3, 6 and 9. This deliberately excludes all schools where high school grades are taught. The goal is to exclude high school students from the analysis who may be much more mobile and may be choosing schools for a wider variety of reasons. Carrying out the analysis in this manner also excludes the schools where all grades are taught. Some private schools and some charter schools fall into the category of schools offering all grades. There are some years where there are very few charter or private schools. Because average diversity would thus be measured across very few schools and with a very small number of schools, with the result that the concept of diversity across schools may not very meaningful. Thus the most interesting comparisons will be at public and separate schools where there are many more schools.

The patterns are fairly clear and not surprising. Since the public and separate schools are most of the schools in both cities – the dispersion pattern is similar to those already presented for all schools in Table 9 and Figures 6 and 7. Both public and separate schools in Edmonton are more diverse than their counterparts in Calgary in all years. Public schools are slightly more diverse than separate schools. Within Edmonton there is no obvious evidence that there is more or less dispersion over time in the 10 years studied.

Within the category of private schools, although the number of private schools in Edmonton is quite limited, they appear to be more diverse than private schools in Calgary. The within-school

coefficients of variation are larger. There are no charter schools in Calgary in 1995/1996 and very few charter schools in either city that do not teach high school grades. The other key fact in Table 9 is that private schools in Calgary clearly remove the more educated portion of the population of Calgary from the rest of the system. The average percentage of persons with completed university degrees in Calgary private schools is 10 percentage points higher than in the public schools in both 2000/2001 and 2005/2006. This gap is wider than the same gap in 1995/1996. If we combine the information with the relatively non-diverse private schools, it must be the case that private schools in Calgary remove more educated families from the Calgary public and separate systems.

The second measure of diversity used is household income. Direct use of this data is neither possible nor desirable. As already noted, income is measured in dollars of the year preceding the census, that is, in the 1996 census, the level of income in 1995 is measured and similarly for the other two censuses. There are two reasons that the reported level of incomes cannot be compared between 1995, 2000 and 2005. First, incomes would have to be adjusted for inflation. Second, there has been considerable increase in real incomes in Canada and particularly in Alberta over the period.

Another small challenge, not mentioned earlier, is that in all three censuses there are some EAs and DAS where the average level of household income is not reported. In 1996, in the province, 890 of 4233 EAs are missing income data. However in the Calgary and Edmonton areas, the proportion of EAs missing income data is much lower. In the Edmonton CMA only 58 of 773 EAs are missing income data and in the Calgary CMA, only 73 of 961 income measures are missing. These proportions decline further in 2001 and 2006. It is also the case that as a proportion of the total population, the number of EAs missing income data is quite low. For example, although almost 20% of EAs in the province are missing income data in the 1996 census, the EAs that are missing the income data account for only 5% of the population. Income data are not reported at the EA/DA level when populations are small and there are

potential privacy issues. Within Calgary and Edmonton, over 98% of the population is included in the directly-measured income data.

EAs and DAs that are missing income data have this data replaced by an imputed value. Other variables for the EA that are not missing are used to predict a level of average income in the missing EA. The prediction uses least squares. Education levels and house prices are the key variables in making the income prediction. After this replacement of missing variables, the measures of household income are transformed to make them comparable across the three censuses and across the two cities.

The transformation places the average level of household income within the DA in a percentile of the average household income in each city. Thus the DA with a value of 90 in the City of Calgary has an average household income that is in the 90th percentile of household incomes in the city. Then, as is done with the other variables, a measure of the average percentile of household income as well as the coefficient of variation of the percentile of income within each school, weighted by the school's population of students from that EA or DA, is calculated. The dispersion of average percentiles of income is calculated across schools.

Table 10 shows, for three years, information on the dispersion of income percentiles as school-level SES measures. In the same way as in Table 9 the first columns show data for all schools. Subsequent columns show similar data by type of school authority in the schools where only Grades 3, 6 and 9 are offered. Schools which offer high school grades are excluded from the analysis in the last three columns.

One striking aspect is that there is an apparent change in the average percentile of households who are providing children to the school system as a whole. In the data from the 1995/1996 and 2000/2001 census the average percentile of households associated with the school system is about 60 percent. In these census years school attendees live in geographic areas with above-average household

incomes. There is dramatic change as of the 2006 census. In both urban areas the average income percentile of school attendees drops to 50 percent. The interpretation of this data: households with school attendees become relatively poorer within both their geographic regions. This is another reason to focus on the coefficient of determination as the measure of dispersion. The dispersion comparisons must be made around the households that are sending children to schools and not all households. The two bottom panels of Figure 8 illustrate the shift to the left in the mean percentile of household income in the school system.

There is little difference in the average value of the coefficient of variation in income within schools for all schools in the two cities in a given year. The number is very slightly higher in Calgary – indicating Calgary schools are actually more diverse in income. The graphs of this variable in Figure 9 do not look dramatically different between the cities.

Across-school diversity for all schools looks slightly higher in Calgary than in Edmonton in 2005/2006 and 2000/2001, but the difference is small.

The remainder of the data in Table 10 again looks separately at charter schools, private schools, public schools and separate schools. The substantial gap between average income in Calgary private schools and average income in Calgary public schools widens over time. By 2005/2006, the 17 private schools in Calgary that do not teach high school grades have an average income percentile of 68.6 percent, much higher than the average percentile of 52.2 percent in the public system. The distribution of income around the mean in these private schools is relatively low and the dispersion of income across private schools is relatively low. Private schools in Calgary are both high income and not very diverse, either across schools or within schools, and must be removing the higher-income component from the remainder of the school system. The 5 private schools in Edmonton that do not teach high school grades are similar to schools in the public or separate system in terms of the average level of income

and the diversity of income. The smaller private school system in Edmonton does not appear to draw off the higher income students from the remainder of the system.

Neither city has many charter schools that exclude high school grades. In 2005/2006 there are 4 such schools in Calgary and 2 in Edmonton. In both cities, the charters have a higher average income percentile than the public or separate schools. The two charter schools in Edmonton actually have less income diversity and a much higher mean level of income than the two charter schools in Calgary.

Charter schools in Calgary in 2000/2001 have somewhat higher average incomes than public or separate schools. By 2005/2006 charter school in Calgary look more similar in income characteristics to public and separate schools. The two Edmonton charter schools seem to be higher income and less diverse than the rest of the system.

8. Some evidence from student travel patterns to schools in Calgary and Edmonton

This section presents some exploratory results of the analysis of travel patterns to schools. There are severe limitations placed on this analysis by the available data. Schools are located using the school's postal code and placed within an EA/DA. Students live in an EA/DA. Each EA/DA has a latitude and longitude. It is possible to calculate a weighted average (weighted by number of students) of the straight-line distance between school and student home.²⁵ Latitudes and longitudes of all the EAs or DAs of distances traveled to school. The student location data covers the academic years between 1995/1996 and 2011/2012.

Table 11 presents average travel distances to schools and, using the same measures of dispersion already introduced, the dispersion of travel distances both across schools and within schools.

²⁵ Another possible measure of travel would be to use Google Maps or similar software to calculate road travel times between the two location pairs. This would be an improvement on the methodology used here. It would also be much better to have actual school addresses and student addresses.

The first columns present the data from all schools in the cities of Calgary and Edmonton. The remaining columns present travel distances where schools offering high school grades are excluded.

There are some issues with the quality of the data for the purposes of the analysis of travel choices. Table 1 shows 91,576 students in all schools in the City of Edmonton in 1995/1996. Table 11 reports travel distances for 80,843 students in the City of Edmonton in 1995/1996. The corresponding numbers for the 2011/2012 academic year are 92,251 and 87,279. The excluded students are students who attend a school in the City of Edmonton and live outside the City of Edmonton as well as students who live outside the City of Edmonton yet attend a school within the City of Edmonton. There are similar situations in Calgary. It remains unclear why these pairings appear in the data. Some student addresses may be for a parent working outside the city while the students actually live in the city. Some may be for students taking correspondence courses, online courses or registered as home schooled students. Since these alternatives cannot be sorted, any student-school pair where one of the pair is located outside the city is dropped from the analysis of the travel choices. If these students are left in the analysis, some extremely long trips to school (up to 80 or more kilometers) occur. These long trips are outliers in the data. These very long trips substantially change the average distance travelled as well as the measures of the dispersion of travel at individual schools. With an understanding of the limitations of the available data, what can be learned from Table 11 about travel choices made in the two cities?

It is fairly clear that average travel distances to schools in Calgary are larger than in Edmonton. This is not very interesting of itself; the two cities may have quite different transportation networks and quite different histories of urban development. It is more interesting to ask how travel distances have changed over the 4 academic years of data presented in Table 11. Average distances travelled to schools in both cities have declined. Distances appear to have declined relatively more in Calgary than in

Edmonton. The interpretation of that decline is difficult. We know that the number of students and schools in the Calgary district grew very rapidly. It is entirely possible that the decline in average travel in Calgary is related to moving students into new schools as they are built in newer neighbourhoods.

A coefficient of variation on travel distances is calculated. Here the differences in the measures of dispersion between Calgary and Edmonton are very small using the data from all schools.

The similarity between the cities for all schools masks some interesting variation when schools are broken down across charter, private, public and separate authorities. The most obvious and completely unsurprising feature of the data is a longer average travel distance to charter and private schools. There is actually less dispersion in the travel distances to these schools, that is, all of these schools have large average travel distances and within these schools, most students travel a long distance to attend. The effect of long distances travelled to charter schools on neighbourhood schools exited by those same students is an area for further research.

There are some differences in the dispersion of travel around the mean between the two cities in the public and separate systems. Edmonton schools exhibit less dispersion in travel. However if we use these data to suggest that Edmonton parents exercise less choice than parents in Calgary, the analysis in Table 12, the last table in this report, contradicts that inference and shows, for at least part of the sample period, Edmonton parents exercising more choice within the public and separate school systems.

To construct Table 12, the following question was posed: When I consider a student at a public (separate) school where high school grades are not taught, is that student attending the closest public (separate) school with the same grade configuration.²⁶ The answer to that question is either Yes or No.

²⁶ Grade configurations are found in Table 1.

This is not the question we would actually like to ask but it is the question that can be asked within the data available.

The better question to ask is, given the grade and home address of the child, does this child attend the closest school, public or separate, that offers that grade? If they do not attend the closest school offering that grade, how far are they willing to travel to attend a different school that offers the same grade? We could also ask when a parent opts to change to a private or charter authority, how much further did they choose to travel to leave the public or separate school authority?

Table 12 presents calculations of the percentage of all students, public school and separate school students who attend the closest school (as defined above) in 2000/2001, 2005/2006 and 2011/2012 in the two cities. In most cases (there is one exception – public schools in Edmonton in 2011/2012), parents in Edmonton in the past certainly appear to have exercised more choice than parents in Calgary. Parents in Edmonton have been less likely than parents in Calgary to choose the closest school of the same authority and configuration of grades. Separate school parents in both cities are more likely to be at the closest school – probably because the separate system is smaller and less dense. In Edmonton there is a considerable increase over time in the choice to attend the closest public school from 33 percent in 2000/2001 to 46.4 percent in 2011/2012. This is not the case in Calgary. In 2000/2001 44.8% of parents in Calgary attended the closest public school. This number dipped to 40.2% in 2005/2006 and then rose again to 45.7% in 2011/2012. Some of this fluctuation could easily be associated with the large expansion of the public system in Calgary; that is, as new schools were built, it may have become easier to attend the closest school.

The data presented in Table 12 cannot really be used to show that Edmonton parents are more inclined to exercise choice. It is suggestive of a history of the exercise of choice, but is certainly not decisive evidence that choice is more frequently exercised in Edmonton than in Calgary. Table 12 is

included in this report partly to show that it would be possible to learn a great deal more about parental school choices with more complete data that clearly exists.

The administrative data within the school system could be used to link student-grade-school observations with addresses of student and school. The study of individual mobility choices within grades would create an index of how far parents are willing to travel to attend specific schools. The study of individual mobility choices could be used to identify schools which parents choose to leave when the parent has not changed the location of their residence. An example of such an analysis is found in Friesen et. al (2012) This type of analysis would help us understand parental choices of schools at a much deeper level.

8. Conclusions

This report has analyzes differences between schools in Calgary and Edmonton. Students in Calgary schools come from households with economic and social advantages when compared to students in Edmonton. Schools in Edmonton outperform schools in Calgary on Provincial Achievement Tests between 2000/2001 and 2011/2012 when the social and economic advantages of students in Calgary are taken into account.

The performance gap in favour of Edmonton schools widens over time and is usually larger in Grade 9 than in Grade 3.

The performance gap is found in all types of Edmonton city schools: private, public and separate. It is found in all years. The report does not explain why Edmonton schools perform better than Calgary schools after adjustment for social and economic factors.

Edmonton is perceived as a city where school choice within public schools is and has been encouraged. There is some evidence that a smaller proportion of Edmonton parents send their children to the closest available school. More complete data where individual student address, grade and school would allow a more complete investigation of student travel patterns. This is work that remains to be done. Such work would help us understand parent school choices better.

The Edmonton public school board has been documented in other literature as a school board where decentralized school management is more extensive.

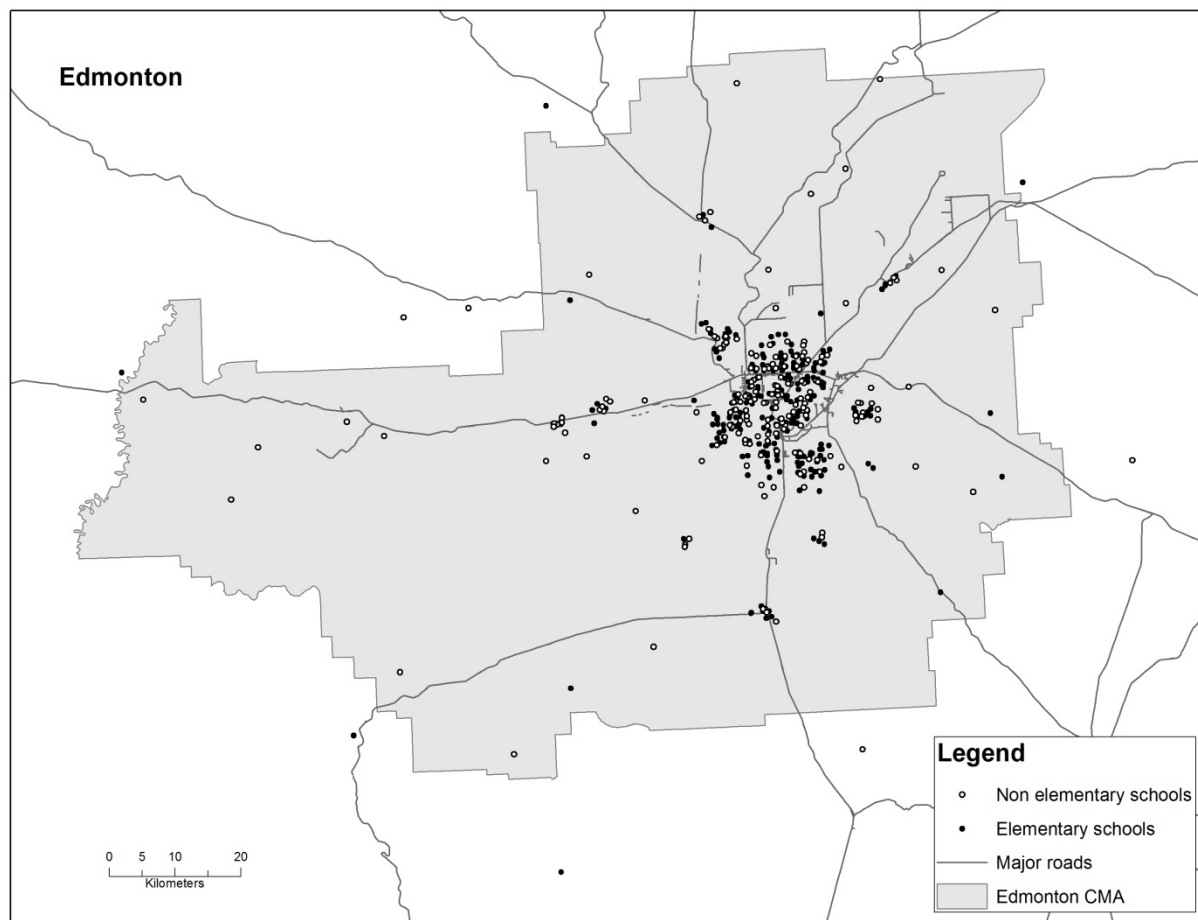
Calgary is a city where a much larger percentage of students attend private schools and charter schools. Calgary parents have exercised the choice to leave the public and separate school authorities. It is also clear that in Calgary relatively highly-educated and affluent households have moved to charter and private schools. There is a need for further study of the implications of this difference between the school system in Edmonton and Calgary. What is clear is that Edmonton schools, when compared to schools in Calgary where students have similar social and economic characteristics, produce better results.

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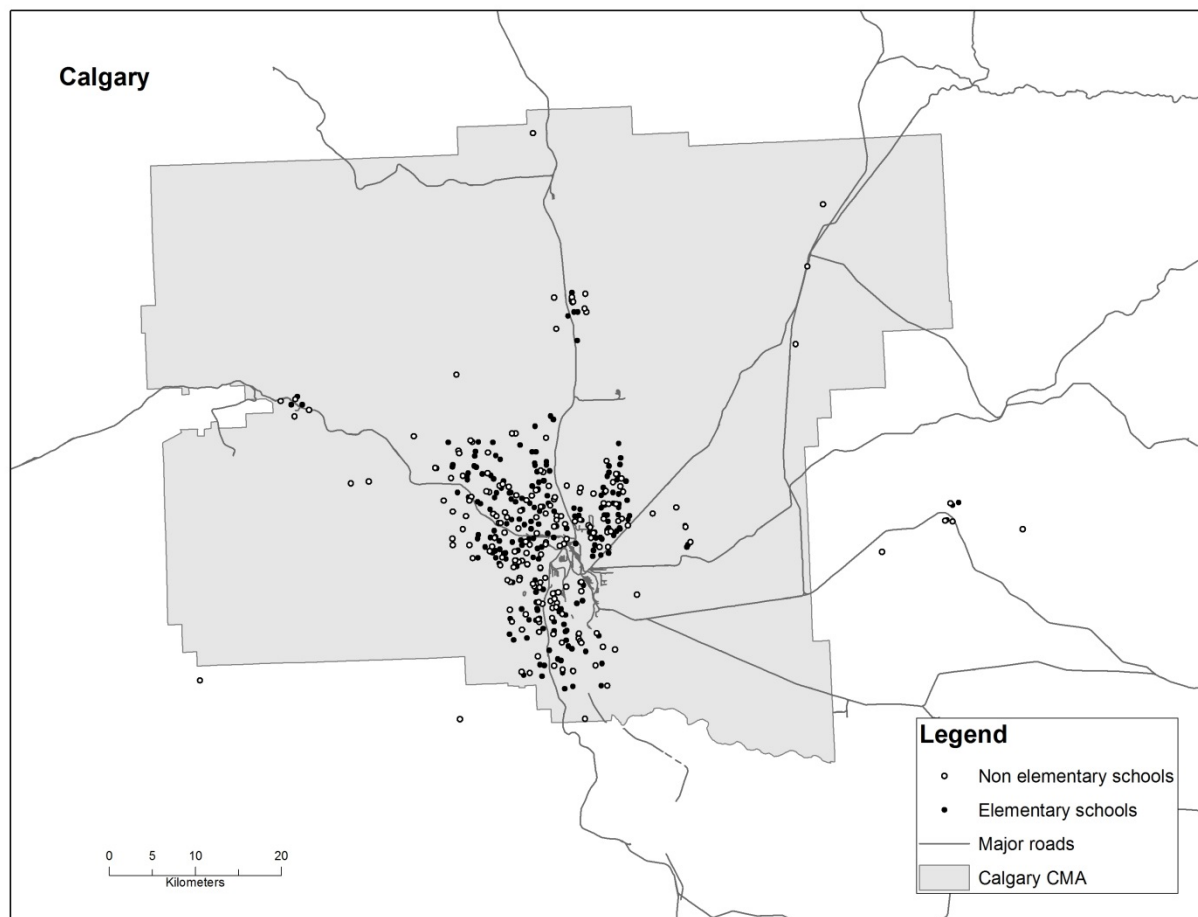
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Figure 1: School Locations in the Edmonton CMA



Source: Created by the author from lists of all schools and school addresses in Alberta provided by Alberta Education

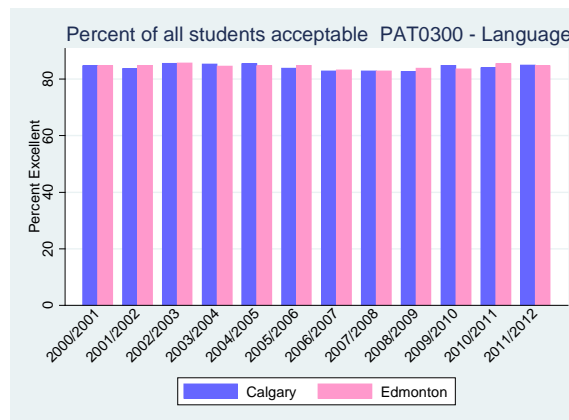
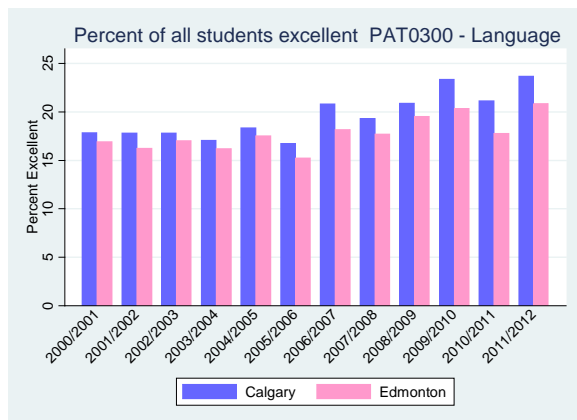
Figure 2: School locations in the Calgary CMA



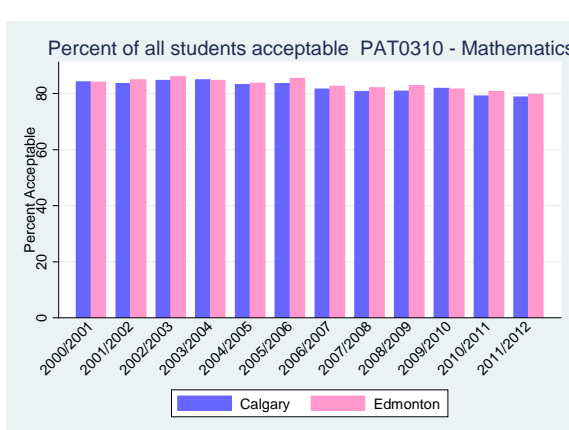
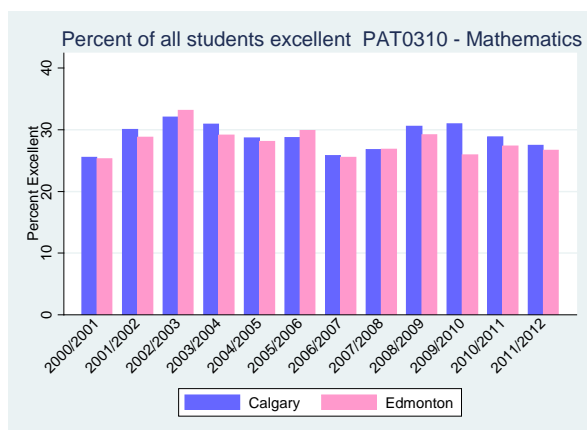
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Figure 3: Provincial Achievement Test Results in Grade 3

Language



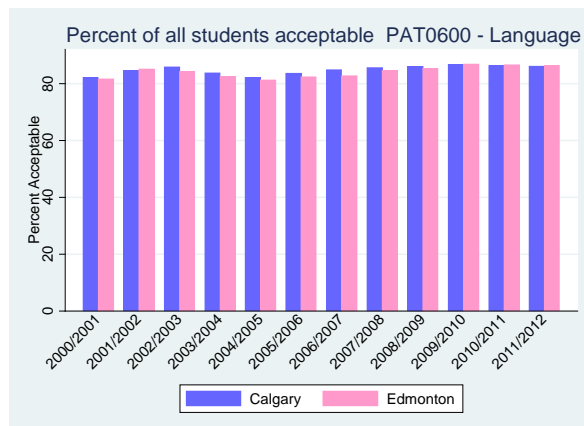
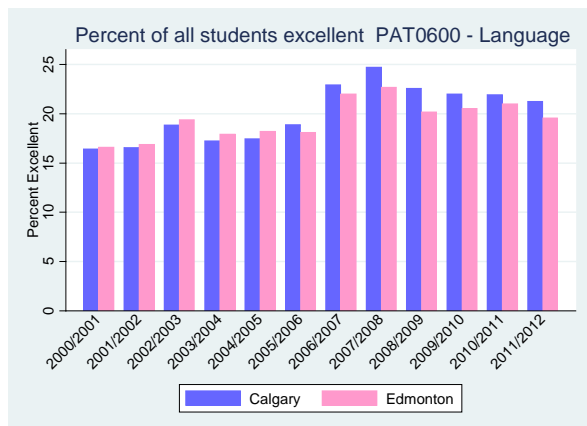
Mathematics



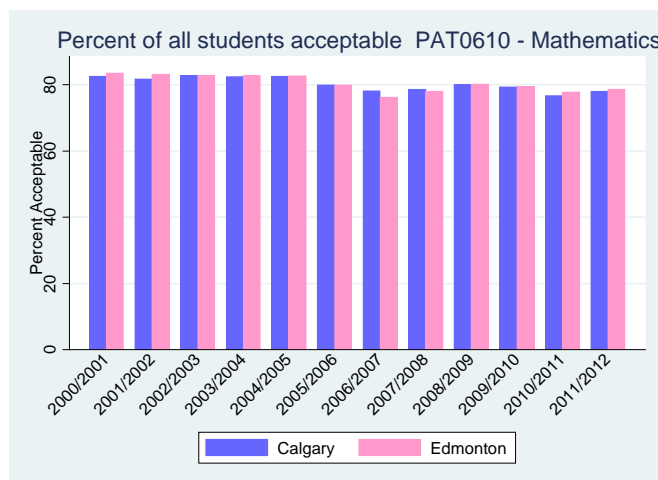
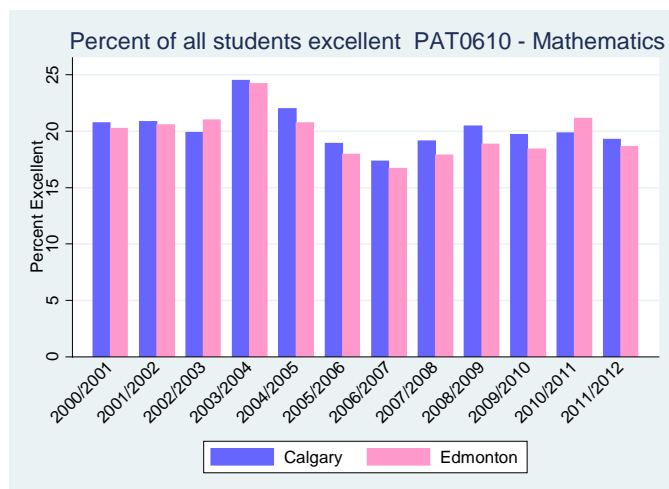
Source: Created by the author using PAT results as posted on Alberta Education website and school locations as described in the text.

Figure 4: Provincial Achievement Test Results in Grade 6

Language



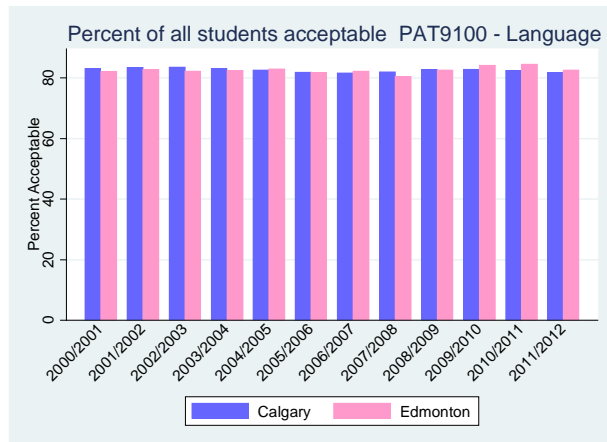
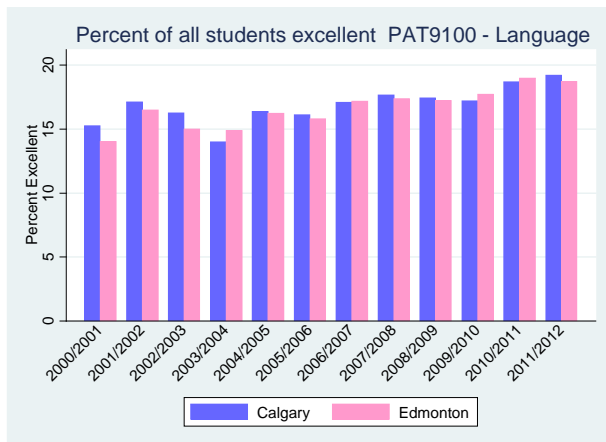
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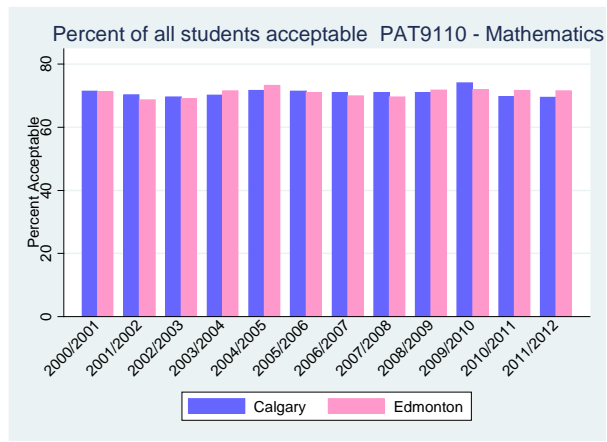
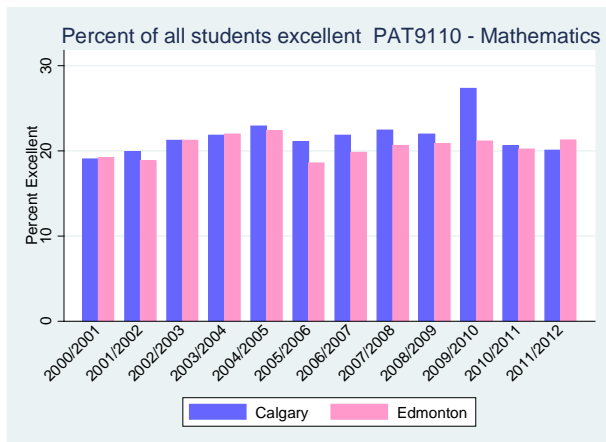
Source: Created by the author using PAT results as posted on Alberta Education website and school locations as described in the text.

Figure 5: Provincial Achievement Test Results in Grade 9

Language

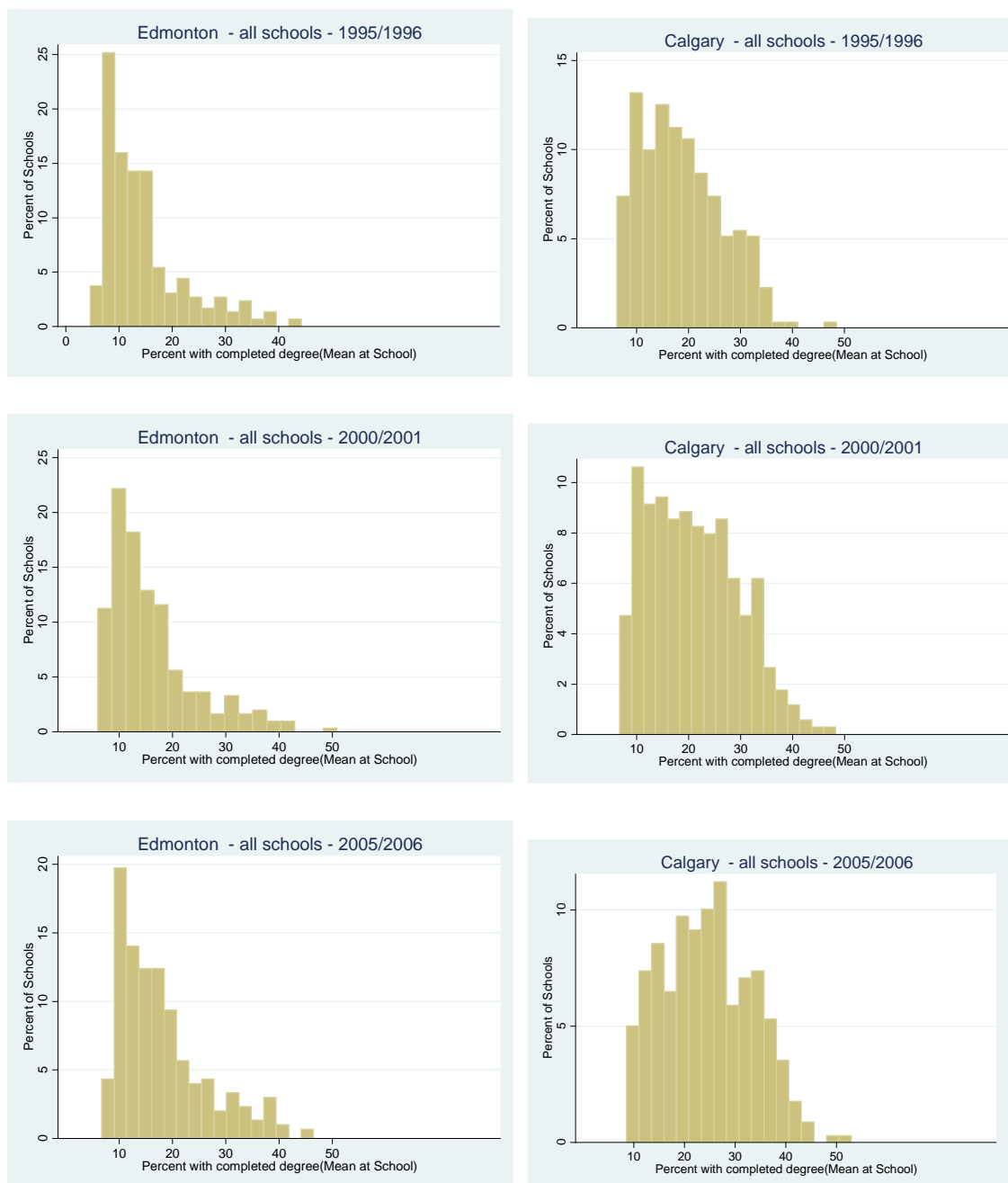


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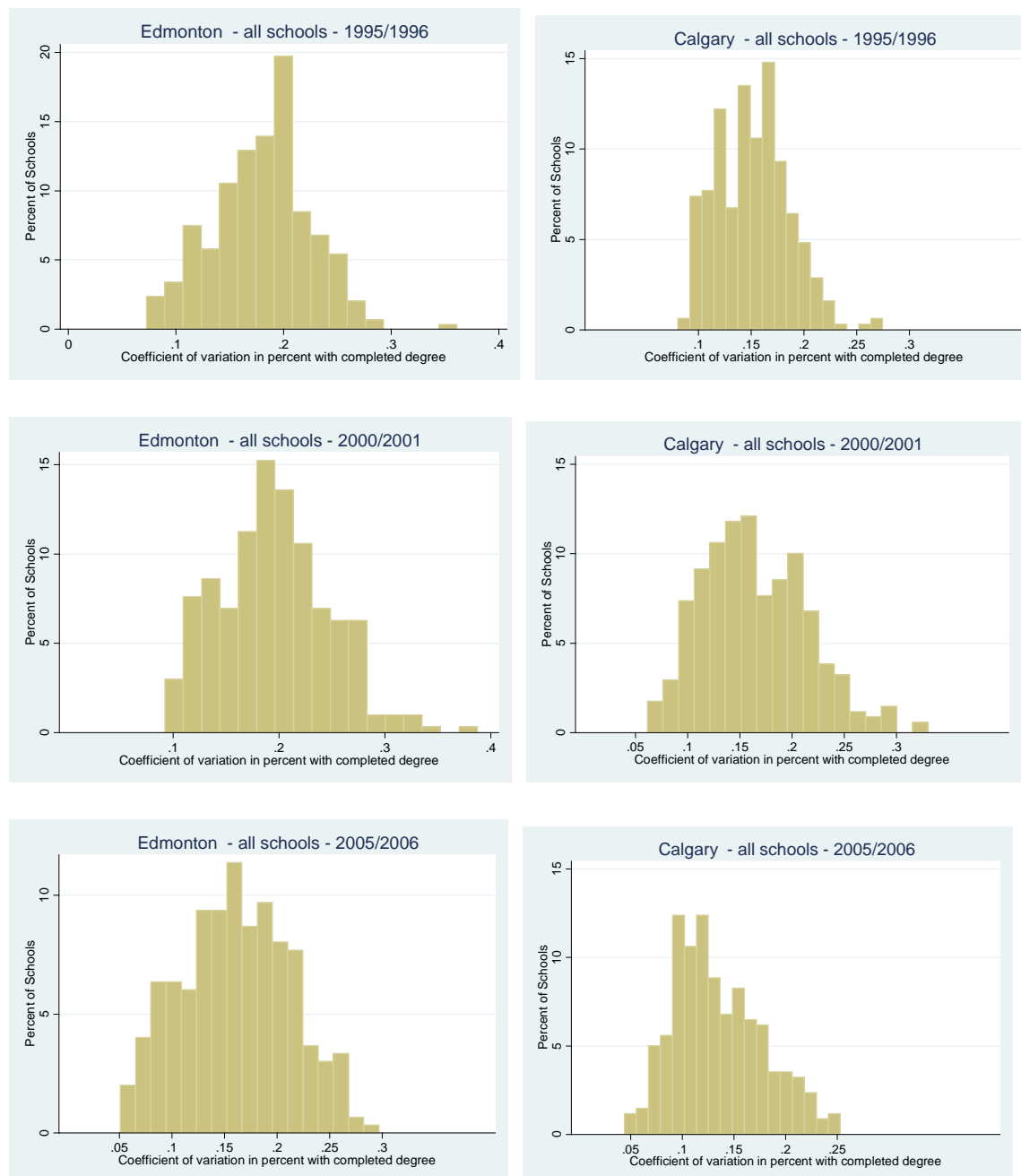
Source: Created by the author using PAT results as posted on Alberta Education website and school locations as described in the text.

Figure 6: The distribution of parental education across schools in Calgary and Edmonton



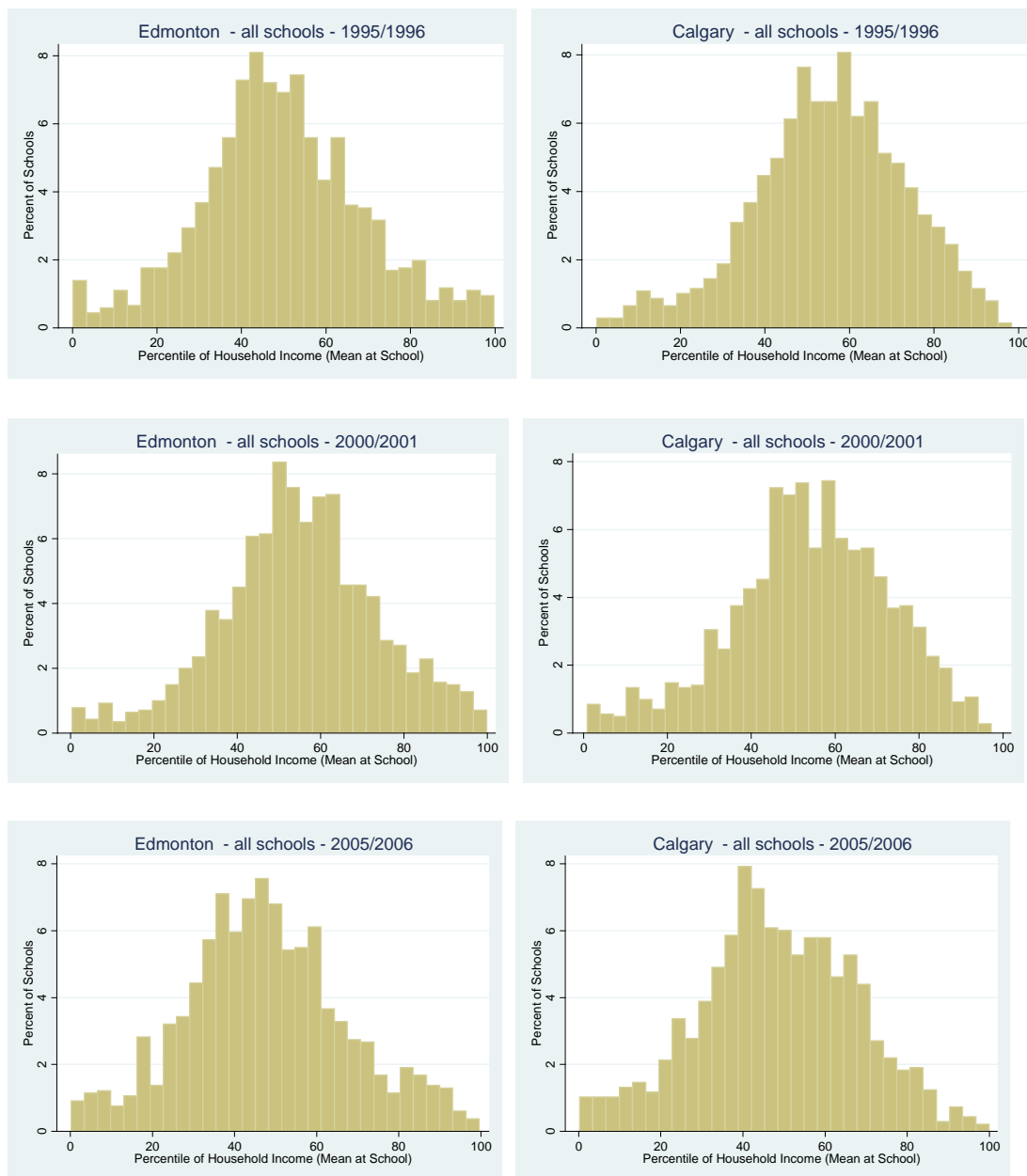
Source: Created by the author using student locations provided by Alberta Education through a Freedom of Information request and 1996, 2001 and 2006 census data as described in the text.

Figure 7: The distribution of parental education within schools in Calgary and Edmonton



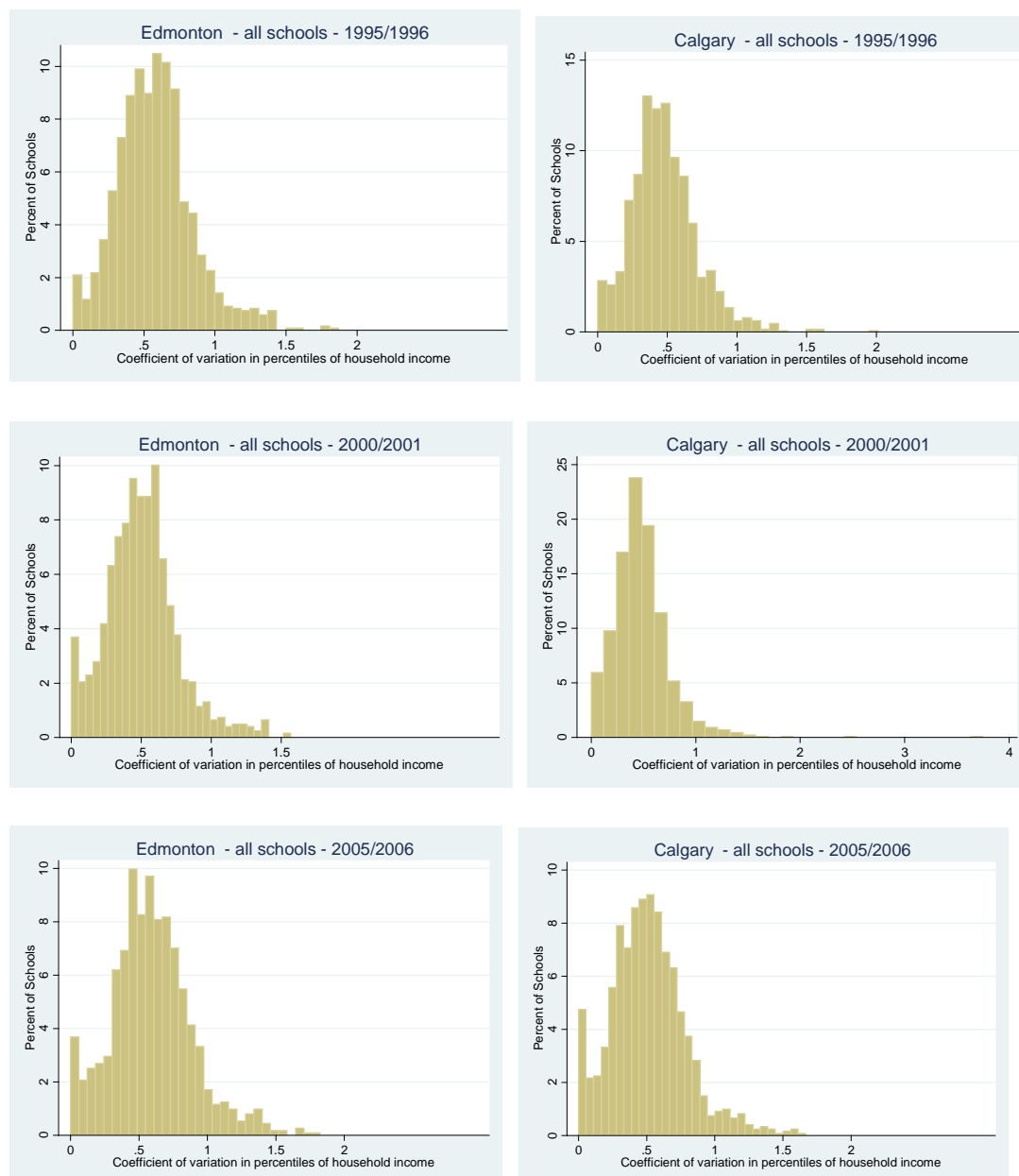
Source: Created by the author using student locations provided by Alberta Education through a Freedom of Information request and 1996, 2001 and 2006 census data as described in the text.

Figure 8: The distribution of household income across schools in Calgary and Edmonton



Source: Created by the author using student locations provided by Alberta Education through a Freedom of Information request and 1996, 2001 and 2006 census data as described in the text.

Figure 9: The distribution of household income within schools in Calgary and Edmonton



Source: Created by the author using student locations provided by Alberta Education through a Freedom of Information request and 1996, 2001 and 2006 census data as described in the text.

Table 1: Changes in the Structure of Schools in Calgary and Edmonton 1995/1996 to 2011/2012

Variable	Edmonton				Calgary			
	1995/1996		2011/2012		1995/1996		2011/2012	
	CMA	City	CMA	City	CMA	City	CMA	City
Authority Types Number of Schools								
Public	306	196	314	190	236	200	265	208
Separate	104	77	113	80	77	75	96	87
Charter	2	1	4	2	0	0	12	12
Private	26	16	22	16	38	36	39	38
Francophone	6	4	11	7	0	0	8	6
Authority Types Number of Students (percent)								
Public	98,814 (71)	62,825 (69)	100,306 (69)	61,982 (67)	90,963 (72)	81,472 (71)	100,183 (66)	83,146 (63)
Separate	35,009 (25)	25,103 (27)	37,419 (26)	25,107 (27)	30,069 (24)	28,880 (25)	36,410 (24)	32,641 (25)
Charter	131 (0)	55 (0)	1,087 (1)	784 (1)	0 (0)	0 (0)	5,859 (4)	5,859 (4)
Private	4089 (3)	2685 (3)	4,337 (3)	2,607 (3)	5,392 (4)	5190 (4)	8,444 (6)	8,188 (6)
Francophone	1020 (1)	908 (1)	2,340 (2)	1,771 (2)	0 (0)	0 (0)	1,790 (1)	1,496 (1)
Total	139,063	91,576	145,489	92,251	126,424	115,542	152,686	131,330
Organization of Schools by Grade Configuration - Number of Schools								
Elementary Only	250	186	247	178	201	193	205	190
Elementary and Junior	92	40	96	40	64	41	113	82
Junior Only	49	38	50	40	43	42	30	29
Junior and High School	23	11	32	10	20	17	26	18
High School Only	6	4	4	2	2	2	2	1
All Grades	24	15	35	25	20	16	44	31
Organization of Schools by Grade: Number of Students								
Elementary Only	70,018	50,389	66,979	46,207	67,105	63,368	65,517	58,653
Elementary and Junior	31,569	14,454	35,081	17,165	20,999	17,826	46,051	39,181
Junior Only	20,493	16,399	20,036	15,430	20,807	20,467	14,380	13,808
Junior and High School	8,671	4,442	9,697	2,942	11,215	9,084	14,015	10,062
High School Only	3,859	3,342	2,713	2,448	1,844	1,844	772	99
All Grades	5,453	2,550	10,983	8,059	3,914	2,453	11,951	9,527
Total	139,063	91,576	145,489	92,251	126,424	115,542	152,686	131,330

Source: Constructed by the author from information obtained from Alberta Education through Freedom of Information requests. The data in this table uses only schools large enough to report enrolment by geographic area. Very small schools are excluded.

Table 2: A Comparison of the Social and Economic Structure of Calgary and Edmonton

	1995/1996				2005/2006			
	Calgary CMA	Calgary City	Edmonton CMA	Edmonton City	Calgary CMA	Calgary City	Edmonton CMA	Edmonton City
Number of Schools	349	309	438	290	397	334	457	298
Number of Students	124,168	113,566	136,016	88,106	139,406	121,833	142,315	91,621
Average School Size	356	367	310	304	351	365	311	307
Percent Aboriginal	1.99	1.9	3.42	3.8	2.4	2.3	4.6	5.0
Percent Lone Parents	17.2	17.3	19.9	22.0	26.2	26.8	28.8	31.0
Percent Official Language at Home	90.3	89.8	91.1	87.8	87.3	86.4	90.7	87.0
Percent Official Language as Mother Tongue	82.2	81.3	81.3	76.6	76.9	75.3	79.8	73.8
Percent Born outside Canada	19.3	20.3	17.3	21.4	22.2	24.0	17.2	22.0
Percent immigrated in last 5 years	3.6	3.8	2.8	3.8	4.6	5.0	2.5	3.4
Percent immigrated in last year	0.93	1.0	0.56	0.71	1.1	1.4	0.7	1.0
Percent moved in the last year	19.5	19.5	16.7	17.9	19.1	19.0	17.7	18.3
Percent in detached homes	74.1	74.1	71.1	66.6	75.7	75.6	72.5	67.2
Percent owners of their dwellings	82.2	77.9	81.1	70.8	85.0	85.0	81.0	77.0
Percent with university degree	17.8	18.6	13.8	15.0	23.7	25.0	17.0	18.8
Employment rate (%)	78.0	78.0	76.0	73.8	79.2	79.7	78.8	77.2
Unemployment rate (%)	4.7	4.7	6.4	7.0	3.0	3.1	3.2	3.5
Average individual income	30,685	30,969	26,706	26,233	51,662	52,804	41,619	40,083
Average household income	65,080	65,984	55,592	54,366	108,920	111,157	89,003	85,332

Source: Constructed by the author as described in the text

Table 3: Comparing Language Results: PAT0300 (G3), PAT0600 (G6), PAT9100 (G9)

Academic Year	Percentage of Students Excellent				Percentage of Students Acceptable			
	CMA Pairs		City Pairs		CMA Pairs		City Pairs	
	No SES Controls	With SES Controls	No SES Controls	With SES Controls	No SES Controls	With SES Controls	No SES Controls	With SES Controls
2000/01-G3	-2.99*	1.21	-3.95*	1.11	-1.01	2.59*	-4.25*	1.70
2000/01-G6	-0.49	4.11*	-1.39	3.96*	-1.33	3.05*	-4.38*	2.89*
2000/01-G9	-4.18*	2.05	-6.04*	0.56	-4.01*	4.71*	-7.52*	7.96*
2001/02-G3	-1.77	2.24*	-2.63*	2.19*	.35	3.91*	-3.23*	2.41*
2001/02-G6	-0.29	4.29*	-0.97	4.33*	0.30	4.65*	-2.41	4.68*
2001/02-G9	-2.75	3.65*	-3.89*	2.72	-2.95	5.77*	-6.52*	8.30*
2002/03-G3	-1.52	2.45*	-2.50*	2.38*	.35	3.86*	-2.07	3.70*
2002/03-G6	0.92	5.10*	-0.38	4.53*	-0.94	3.20*	-3.62*	3.29*
2002/03-G9	-4.18*	2.15	-5.07*	1.65	-2.97	5.74*	-6.66*	7.97*
2003/04-G3	-.40	3.60*	-.73	4.07*	-.35	3.26*	-2.80*	2.89*
2003/04-G6	0.78	5.10*	0.36	5.31*	-0.81	3.54*	-3.42*	3.54*
2003/04-G9	-2.24	4.11*	-3.16*	3.41*	-3.12	5.80*	-7.26*	7.64*
2004/05-G3	-.75	3.14*	-1.78	3.00*	-.41	3.10*	-2.21*	3.55*
2004/05-G6	0.97	5.11*	0.62	5.55*	-0.02	4.25*	-2.40	4.69*
2004/05-G9	-1.90	4.15*	-1.33	4.58*	-1.52	6.83*	-4.94*	9.32*
2005/06-G3	-1.66	2.71*	-2.43*	3.37*	1.0	4.16*	-1.21	5.13*
2005/06-G6	-1.09	4.28*	-1.31	5.63*	-1.84	2.56*	-3.59*	4.84*
2005/06-G9	-3.47*	3.90*	-3.17*	5.05*	-3.96*	4.54*	-6.02*	10.17*
2006/07-G3	-2.71*	1.74	-3.43*	2.62*	1.45	4.68*	-0.26	6.40*
2006/07-G6	-0.78	4.48*	-1.09	5.81*	-2.06	2.30*	-3.78*	4.63*
2006/07-G9	-2.09	4.85*	-2.34	5.80*	-1.87	6.52*	-5.62*	10.69*
2007/08-G3	-2.46*	1.97*	-3.10*	2.87*	0.77	4.01*	-1.60	4.91*
2007/08-G6	-1.61	3.73*	-2.37	4.48*	0.49	4.76*	-1.11	6.95*
2007/08-G9	-2.57	3.93*	-2.77	4.76*	-2.86	4.91*	-5.69*	9.51*
2008/09-G3	-1.71	2.85*	-3.25*	3.16*	0.99	4.49*	-.85	6.53*
2008/09-G6	-2.79*	2.77*	-3.20*	4.33*	0.21	5.04*	-1.55	7.82*
2008/09-G9	-3.39*	3.89*	-4.22*	4.72*	-4.26*	4.62*	-7.18*	10.80*
2009/10-G3	-3.80*	.40	-5.60*	.30	-0.62	2.39*	-3.35*	3.16*
2009/10-G6	-1.30	3.71*	-2.81*	4.17*	1.16	5.29*	-0.68	7.66*
2009/10-G9	-1.79	5.26*	-2.31	5.88*	-2.05	6.22*	-5.07*	11.29*
2010/11-G3	-3.77*	.40	-4.85*	1.07	1.87	4.92*	-.24	6.47*
2010/11-G6	-0.90	4.10*	-1.92	5.04*	0.78	5.01*	-0.84	7.79*
2010/11-G9	-1.79	4.96*	-2.48	5.43*	-1.15	6.56*	-3.42	12.80*
2011/12-G3	-3.47*	.82	-4.31*	1.75	-.83	2.41*	-3.30*	3.60*
2011/12-G6	-1.84	3.06*	-2.70	4.05*	1.50	5.66*	-0.43	7.97*
2011/12-G9	-3.61*	3.06*	-4.43*	3.22*	-1.67	6.00*	-4.75*	11.07*

Notes: * Indicates statistical significance at 5% Source: Constructed by the author as described in the text

Table 4: Comparing Mathematics Results: PAT0310 (G3), PAT0610 (G6), PAT9110 (G9)

Academic Year	Percentage of Students Excellent				Percentage of Students Acceptable			
	CMA Pairs		City Pairs		CMA Pairs		City Pairs	
	No SES Controls	With SES Controls	No SES Controls	With SES Controls	No SES Controls	With SES Controls	No SES Controls	With SES Controls
2000/01-G3	-1.32	4.20*	-2.62	3.62*	-1.22	3.29*	-3.78*	3.39*
2000/01-G6	-0.56	4.13*	-1.22	3.56*	-1.08	6.84*	-0.71	8.18*
2000/01-G9	-3.11*	5.41*	-2.32	6.30*	-6.22*	6.27*	-7.20*	10.93*
2001/02-G3	-1.76	3.48*	-2.92	2.91*	0.91	5.36*	-1.08	5.74*
2001/02-G6	-0.62	4.02*	-1.29	3.42*	1.24	6.97*	-0.44	8.28*
2001/02-G9	-3.83*	4.81*	-2.58	5.87*	-5.74*	6.68*	-7.03*	10.28*
2002/03-G3	-0.07	5.09*	-1.26	4.63*	1.02	5.42*	-0.94	6.05*
2002/03-G6	2.04	6.26*	1.56	5.85*	1.57	7.24*	0.46	8.97*
2002/03-G9	-3.01	5.46*	-1.79	6.72*	-4.82*	7.37*	-6.57*	10.52*
2003/04-G3	-1.79	3.36*	-2.79	2.92*	0.10	4.61*	-2.03	4.89*
2003/04-G6	0.44	4.81*	0.27	4.58*	0.27	6.60*	-1.18	7.46*
2003/04-G9	-2.48	5.78*	-2.95	5.17*	-2.27	10.11*	-3.59	13.70*
2004/05-G3	0.00	5.05*	-0.63	5.06*	1.17	5.63*	0.11	7.13*
2004/05-G6	-0.28	3.86*	-.75	5.85*	-0.76	6.71*	-0.31	8.42*
2004/05-G9	-2.11	5.91*	-0.72	6.63*	-0.02	11.77*	-1.46	14.81*
2005/06-G3	1.67	7.47*	0.26	7.49*	1.64	5.77*	-0.51	7.16*
2005/06-G6	-0.93	4.88*	-0.70	4.58*	-0.71	5.84*	-0.86	9.45*
2005/06-G9	-3.34*	5.50*	-3.65	6.54*	-3.16	8.74*	-6.99*	12.53*
2006/07-G3	-0.35	5.20*	-1.15	5.89*	2.16	6.19*	0.70	8.34*
2006/07-G6	-0.24	5.17*	-0.73	3.43*	-0.73	4.91*	-2.00	8.23*
2006/07-G9	-2.87	6.57*	-1.43	9.10*	-2.88	9.70*	-5.23	14.30*
2007/08-G3	-1.07	4.44*	-1.65	5.19*	2.57	6.63*	0.75	8.19*
2007/08-G6	-0.33	5.14*	-0.72	6.17*	-0.73	6.97*	-0.17	9.63*
2007/08-G9	-4.36*	4.21*	-2.57	6.40*	-4.20	7.10*	-5.59	11.66*
2008/09-G3	-1.77	4.05*	-2.95*	4.64*	2.62	7.03*	1.60	10.08*
2008/09-G6	-1.12	4.54*	-1.31	5.83*	-1.32	8.02*	0.37	11.47*
2008/09-G9	-4.11*	5.65*	-2.85	8.22*	-4.45	8.52*	-6.04	15.00*
2009/10-G3	-4.45*	1.19	-6.91*	0.87	1.62	6.05*	-1.23	7.00*
2009/10-G6	-1.28	3.57	-2.64	5.69*	-2.64	7.09*	-0.73	10.11*
2009/10-G9	-8.37*	2.98	-6.02	6.53*	-5.77	8.69*	-6.32	15.07*
2010/11-G3	-2.36	2.92*	-4.19*	2.71*	1.81	5.79*	0.21	8.02*
2010/11-G6	1.10	6.33*	0.64	4.25*	0.64	7.72*	0.25	10.77*
2010/11-G9	-2.97	6.04*	-2.92	6.82*	-0.83	10.73*	-3.32	15.43*
2011/12-G3	-2.53*	2.79*	-3.07*	3.86*	0.59	4.68*	-1.13	6.77*
2011/12-G6	-0.61	4.46*	-1.62	7.23*	-1.63	7.49*	-0.21	9.98*
2011/12-G9	-1.79	7.31*	-1.42	8.44*	-0.94	10.85*	-2.90	16.15*

Notes: * Indicates statistical significance at 5% Source: Constructed by the author as described in the text

Table 5: City Differences in Language PAT Results by Authority Type; 2000/2001 to 2011/2012

City		Calgary			Edmonton			
Number of School-Years Grade 3		Private	Charter	Separate	Public	Private	Charter	Separate
		295	62	885	1829	97	24	746
Percent Excellent	NO SES Controls	10.18 (1.28)*	18.14 (2.26)*	1.50 (.49)*	-2.28 (.42)*	4.02 (1.58)*	21.70 (3.34)*	4.06 (1.58)*
	With SES Controls	4.67 (2.60)	18.01 (4.50)*	1.81 (.74)*	2.67 (.81)*	4.91 (3.06)	21.07 (8.48)*	5.00 (.85)
Percent Acceptable	NO SES Controls	4.94 (2.46)*	9.63 (4.14)*	-1.55 (1.41)	-3.60 (1.32)*	8.77 (1.97)*	14.57 (.82)*	.41 (1.34)
	With SES Controls	-.64 (2.17)	8.54 (1.97)*	-1.98 (.82)*	2.23 (1.15)	9.18 (2.36)*	12.16 (.787)*	-1.98 (.82)*
Number of School-Years Grade 6		Calgary			Edmonton			
		Private	Charter	Separate	Public	Private	Charter	Separate
		319	69	908	1832	96	24	748
Percent Excellent	NO SES Controls	8.31 (3.43)*	12.21 (4.65)*	1.23 (1.47)*	-.40 (1.35)	2.12 (5.59)	30.66 (4.04)*	.32 (1.54)
	With SES Controls	1.19 (2.67)	9.56 (1.69)*	1.44 (.77)	4.80 (.94)*	3.58 (4.23)	29.7 (4.1)*	6.64 (1.05)*
Percent Acceptable	NO SES Controls	2.52 (3.00)	8.85 (4.72)	-.24 (1.64)	-3.17 (1.43)*	.05 (3.64)	14.57 (.99)*	.33 (1.77)
	With SES Controls	-4.22 (2.56)	5.92 (2.16)*	-1.29 (1.10)	3.92 (1.34)*	1.98 (3.12)	12.87 (.89)*	7.27 (1.31)*
City		Calgary			Edmonton			
Number of School-Year Grade 9		Private	Charter	Separate	Public	Private	Charter	Separate
		300	61	410	699	87	12	301
Percent Excellent	NO SES Controls	11.62 (3.79)*	10.25 (5.47)	.23 (1.77)	-.63 (2.05)	-.98 (5.10)	14.61 (1.24)*	-.39 (2.26)
	With SES Controls	4.49 (2.82)	9.28 (2.29)*	1.29 (1.09)	5.57 (1.68)*	2.33 (4.00)	14.34 (1.22)*	6.99 (1.71)*
Percent Acceptable	NO SES Controls	6.16 (3.29)	11.97 (4.05)*	.79 (2.57)	-6.24 (2.97)*	3.84 (4.40)	18.71 (1.72)*	-1.47 (3.38)
	With SES Controls	-.63 (2.75)	10.50 (1.52)*	.84 (1.61)	8.56 (2.47)*	12.45 (4.68)*	19.60 (1.81)*	12.94 (2.39)*

Notes: The coefficients measure the difference in the percentage of all students achieving excellent (acceptable) between schools in the city and authority and schools in the Calgary Public school authority. Positive values indicate that schools in this city-authority pair have stronger PAT results than school in Calgary Public. The values in parentheses are standard errors. * denotes a value that is different from zero at a 5% level of significance.

Table 6 : City Differences in Language PAT Results by Authority Type; 2006/2007 to 2011/2012

City		Calgary			Edmonton			
Number of School-years Grade 3		Private	Charter	Separate	Public	Private	Charter	Separate
		140	41	459	903	50	12	373
Percent Excellent	NO SES Controls	10.35 (3.86)*	24.80 (5.13)*	1.19 (1.47)	-3.10 (1.33)*	3.34 (3.85)	24.17 (7.82)*	-1.39 (1.45)
	With SES Controls	5.48 (3.19)	24.44 (5.27)*	1.84 (.97)*	2.38 (1.04)*	3.75 (2.95)	24.89 (7.41)*	5.03 (1.14)*
Percent Acceptable	NO SES Controls	3.81 (3.40)	12.96 (2.33)*	-2.97 (1.67)	-3.23 (1.50)*	10.35 (1.78)*	16.02 (1.48)*	.05 (1.48)
	With SES Controls	-1.49 (3.10)	11.26 (1.41)*	-2.81 (1.04)*	2.74 (1.39)*	9.40 (2.80)*	15.14 (1.35)*	6.14 (1.36)*
Number of School-years Grade 6		Calgary			Edmonton			
		Private	Charter	Separate	Public	Private	Charter	Separate
		155	40	470	905	51	12	374
Percent Excellent	NO SES Controls	7.04 (3.80)	14.05 (4.63)*	.54 (1.70)	-1.63 (1.55)	1.08 (5.64)	32.48 (4.07)	-1.07 (1.74)
	With SES Controls	-.05 (2.97)	10.83 (2.30)*	1.05 (1.03)	4.50 (1.16)*	1.71 (4.72)	33.08 (3.69)*	6.26 (1.25)*
Percent Acceptable	NO SES Controls	-.26 (3.68)	10.21 (2.39)*	-2.57 (1.76)	-3.27 (1.52)*	.34 (3.23)	14.46 (1.02)*	.40 (1.79)
	With SES Controls	-6.66 (3.23)*	6.43 (1.12)*	-3.40 (1.24)*	3.21 (1.47)*	-.23 (3.50)	13.73 (1.22)*	6.79 (1.42)*
City		Calgary			Edmonton			
Number of School-years Grade 9		Private	Charter	Separate	Public	Private	Charter	Separate
		147	36	218	351	46	6	157
Percent Excellent	NO SES Controls	10.78 (4.31)*	13.29 (5.28)*	-.53 (1.91)	-.51 (2.25)	-3.88 (4.72)	12.11 (1.34)*	-.09 (2.55)
	With SES Controls	3.95 (3.00)	11.39 (2.43)*	.71 (1.25)	6.71 (1.97)*	.85 (3.96)	14.90 (1.60)*	8.37 (2.18)*
Percent Acceptable	NO SES Controls	3.88 (4.03)	15.19 (2.22)	-.36 (2.81)	-6.29 (3.17)*	3.52 (4.14)	18.95 (1.63)*	-1.83 (3.86)
	With SES Controls	-1.98 (3.60)	12.87 (4.76)*	.40 (1.98)	9.03 (2.49)*	12.47 (4.76)*	22.66 (2.32)*	13.32 (3.02)*

Notes: The coefficients measure the difference in the percentage of all students achieving excellent (acceptable) between schools in the city and authority and schools in the Calgary Public school authority. Positive values indicate that schools in this city-authority pair have stronger PAT results than school in Calgary Public. The values in parentheses are standard errors. * denotes a value that is different from zero at a 5% level of significance.

Table 7: City Differences in Mathematics PAT Results by Authority Type; 2000/2001 to 2011/2012

City		Calgary			Edmonton			
Number of School-Years Grade 3		Private	Charter	Separate	Public	Private	Charter	Separate
		280	57	835	1741	97	23	720
Percent Excellent	NO SES Controls	12.32 (3.55)*	11.60 (4.70)*	2.46 (1.67)*	-.26 (1.46)	3.07 (4.58)	28.29 (10.28)*	-.85 (1.59)
	With SES Controls	5.72 (2.87)*	11.17 (2.57)*	2.75 (.95)*	5.59 (1.06)*	3.48 (4.04)	26.80 (10.63)*	5.97 (101)*
Percent Acceptable	NO SES Controls	4.75 (3.03)	10.94 (4.29)*	-.29 (1.51)	-.97 (1.42)	9.17 (2.32)*	17.10 (.96)*	.63 (1.52)
	With SES Controls	-1.10 (2.72)	9.74 (1.85)*	-.70 (.85)	5.89 (1.21)*	9.91 (2.05)*	15.28 (.89)*	7.26 (1.16)*
Number of School-Years Grade 6		Calgary			Edmonton			
		Private	Charter	Separate	Public	Private	Charter	Separate
		297	64	859	1750	95	23	717
Percent Excellent	NO SES Controls	6.53 (3.43)	10.24 (5.74)	1.28 (1.51)	.65 (1.38)	1.90 (4.12)	21.97 (1.18)*	.28 (1.49)
	With SES Controls	-.06 (2.67)	7.41 (3.81)*	1.31 (.85)	5.48 (1.01)*	2.20 (3.13)	20.69 (.68)*	6.01 (1.03)
Percent Acceptable	NO SES Controls	2.39 (3.80)	12.13 (5.39)*	2.02 (1.84)	-.12 (1.67)	5.18 (3.86)	20.57 (1.58)*	1.74 (2.03)
	With SES Controls	-5.24 (3.32)	8.90 (2.20)*	1.04 (1.69)	8.48 (1.53)*	6.90 (3.53)*	18.85 (1.05)*	10.47 (1.40)*
City		Calgary			Edmonton			
Number of Schools Grade 9		Private	Charter	Separate	Public	Private	Charter	Separate
		284	58	367	670	93	12	282
Percent Excellent	NO SES Controls	7.11 (4.02)	8.92 (5.12)	-1.18 (2.17)	-.39 (2.54)	-.69 (5.42)	20.22 (1.61)*	-2.86 (2.41)*
	With SES Controls	.14 (2.83)	7.14 (4.27)	.29 (1.38)	7.90 (2.03)*	4.52 (3.92)	19.72 (1.52)*	6.52 (1.99)*
Percent Acceptable	NO SES Controls	8.96 (4.55)	16.94 (4.69)*	1.08 (3.28)	-3.59 (3.38)	3.57 (6.00)	25.13 (2.14)*	-1.75 (4.14)
	With SES Controls	.65 (3.62)	14.98 (3.39)*	2.03 (1.79)	13.63 (2.61)*	14.77 (6.39)*	26.14 (1.96)*	15.97 (2.57)*

Notes: The coefficients measure the difference in the percentage of all students achieving excellent (acceptable) between schools in the city and authority and schools in the Calgary Public school authority. Positive values indicate that schools in this city-authority pair have stronger PAT results than school in Calgary Public. The values in parentheses are standard errors. * denotes a value that is different from zero at a 5% level of significance.

Table 8 : City Differences in Mathematics PAT Results by Authority Type; 2006/2007 to 2011/2012

City		Calgary			Edmonton			
Number of School-years Grade 3		Private	Charter	Separate	Public	Private	Charter	Separate
		123	36	410	815	49	11	346
Percent Excellent	NO SES Controls	11.07 (4.38)*	16.65 (3.83)*	1.42 (1.75)	-.36 (1.58)	3.76 (4.88)	26.21 (6.76)*	-3.99 (1.62)*
	With SES Controls	6.25 (3.69)*	15.98 (2.59)*	2.25 (1.16)*	5.62 (1.25)*	3.07 (4.14)	26.26 (7.06)*	3.17 (1.35)*
Percent Acceptable	NO SES Controls	2.06 (4.58)	15.2 (2.52)*	-.47 (1.77)	-.63 (1.69)	12.38 (2.65)*	19.73 (1.26)*	-.47 (1.77)
	With SES Controls	-3.04 (4.18)	13.32 (1.64)*	-2.16 (1.21)	6.81 (1.52)*	12.02 (3.10)*	19.04 (1.11)*	7.73 (1.57)*
Number of School-years Grade 6		Calgary			Edmonton			
		Private	Charter	Separate	Public	Private	Charter	Separate
		130	35	422	822	50	11	343
Percent Excellent	NO SES Controls	6.01 (3.80)	10.1 (4.89)*	.22 (1.64)	.14 (1.52)	2.73 (4.36)	28.36 (2.21)	-1.51 (1.72)
	With SES Controls	.75 (3.08)	7.10 (3.94)	.62 (1.09)	5.58 (1.27)*	2.74 (3.42)	29.1 (1.78)	4.99 (1.40)*
Percent Acceptable	NO SES Controls	.41 (4.99)	15.66 (3.65)*	-.09 (2.18)	-.63 (1.93)	5.86 (4.07)	23.16 (1.54)	.13 (2.44)
	With SES Controls	-6.94 (4.30)	11.56 (1.38)	-.39 (1.43)	7.99 (1.78)*	5.76 (4.04)	22.54 (1.26)*	9.42 (1.70)*
City		Calgary			Edmonton			
Number of School-years Grade 9		Private	Charter	Separate	Public	Private	Charter	Separate
		129	33	177	323	46	6	143
Percent Excellent	NO SES Controls	5.85 (4.56)	12.58 (5.92)*	-1.56 (2.39)	-.64 (2.88)	-1.52 (5.82)	25.90 (1.84)*	-3.58 (2.81)
	With SES Controls	-.52 (3.22)	9.91 (6.31)	-.24 (1.70)	8.62 (2.68)*	5.16 (4.77)	29.21 (2.23)*	7.07 (2.662)*
Percent Acceptable	NO SES Controls	5.57 (5.40)	19.82 (3.85)*	-2.03 (4.50)	-3.82 (3.59)	1.83 (6.37)	27.07 (2.12)*	-2.03 (4.50)
	With SES Controls	-1.29 (4.51)	16.83 (3.68)*	2.20 (2.45)	14.14 (2.76)*	13.76 (6.66)	32.38 (2.58)*	16.89 (3.52)*

Notes: The coefficients measure the difference in the percentage of all students achieving excellent (acceptable) between schools in the city and authority and schools in the Calgary Public school authority. Positive values indicate that schools in this city-authority pair have stronger PAT results than school in Calgary Public. The values in parentheses are standard errors. * denotes a value that is different from zero at a 5% level of significance.

Table 9: The Distribution of Students by Parental Education in the Cities of Calgary and Edmonton

Schools in 1995/1996 Academic Year described with 1996 Census Data										
Measure(number)	All Schools		Charter <High		Private<High		Public<High		Separate<High	
City	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number	311	294	0	1	20	5	184	182	72	73
Mean percent with degree	18.8	14.7	NA	15.7	24.6	13.0	18.4	15.1	18.2	13.3
Coefficient of Variation across schools	.41	.52	NA	NA	.29	.29	.44	.55	.37	.46
Average Coefficient of variation within schools	.15	.18	NA	.13	.12	.19	.15	.18	.15	.19

Schools in 2000/2001 Academic Year described with 2001 Census Data										
Measure	All Schools		Charter<High		Private<High		Public<High		Separate<High	
City	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number	333	296	4	2	20	4	185	179	76	73
Mean percent with degree	21.1	16.1	21.6	22.1	30.6	13.9	20.6	16.6	20.4	14.8
Coefficient of Variation across schools	.41	.49	.33	.07	.27	.24	.42	.53	.37	.45
Average Coefficient of variation within schools	.16	.19	.16	.15	.12	.18	.17	.19	.16	.19

Schools in 2005/2006 Academic Year described with 2006 Census Data										
Measure	All Schools		Charter<High		Private<High		Public<High		Separate<High	
City	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number	339	299	4	2	17	5	180	176	82	73
Mean percent with degree	24.5	18.2	25.9	22.5	33.5	13.4	23.9	18.7	23.1	17.1
Coefficient of Variation across schools	.35	.45	.33	.12	.27	.20	.37	.47	.33	.43
Average Coefficient of Variation within schools	.13	.16	.13	.13	.10	.16	.14	.16	.13	.16

Notes: Constructed by the author as described in the text. The categories in the columns are: Charter, Private, Public and Separate schools where only schools that do not offer high school grades are included.

Table 10: The Distribution of Students by Income Percentiles in the Cities of Calgary and Edmonton

Schools in 1995/1996 Academic Year described with 1996 Census Data										
Measure(number)	All Schools		Charter <High		Private<High		Public<High		Separate<High	
City	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number	309	290	0	1	20	5	184	182	72	73
Mean	61.1	58.9	NA	66.0	72.0	60.9	59.9	58.5	63.9	60.2
Coefficient of Variation	.24	.26	NA	NA	.16	.09	.24	.26	.21	.23
Average CV within	.45	.40	NA	.40	.32	.39	.41	.44	.36	.42

Schools in 2000/2001 Academic Year described with 2001 Census Data										
Measure	All Schools		Charter<High		Private<High		Public<High		Separate<High	
City	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number	335	300	4	2	19	4	189	183	76	74
Mean	61.2	61.3	63.4	73.8	75.2	63.1	59.7	61.0	62.9	62.9
Coefficient of Variation	.23	.21	.20	.13	.14	.14	.24	.22	.22	.20
Average CV within	.41	.40	.39	.30	.32	.39	.40	.42	.36	.39

Schools in 2005/2006 Academic Year described with 2006 Census Data										
Measure	All Schools		Charter<High		Private<High		Public<High		Separate<High	
City	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number	334	298	4	2	17	5	180	176	82	73
Mean	54.1	52.9	54.7	64.0	68.6	49.8	52.2	53.1	53.3	55.0
Coefficient of Variation	.31	.28	.32	.17	.24	.26	.32	.29	.30	.24
Average CV within	.50	.47	.48	.38	.37	.54	.49	.49	.45	.46

Notes: Constructed by the author as described in the text. The categories in the columns are: Charter, Private, Public and Separate schools where only schools that do not offer high school grades are included.

Table 11: The Distribution of Students by Travel Distance in the Cities of Calgary and Edmonton

Schools in 1995/1996 Academic Year described with 1996 Census Data										
Measure	All Schools		Charter <High		Private<High		Public<High		Separate<High	
	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number of students	103503	80843	NA	44	2232	906	63880	50447	25238	20065
Mean	7.56	5.87	NA	6.41	7.27	4.57	4.25	3.52	4.17	3.39
Coefficient of Variation	.74	.72	NA	.59	.71	.73	1.16	1.07	1.16	1.02
Average CV within	1.01	.99	NA	.59	.63	.68	1.09	1.05	1.12	1.04

Schools in 2000/2001 Academic Year described with 2001 Census Data										
Measure	All Schools		Charter<High		Private<High		Public<High		Separate<High	
	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number of students	109546	81046	1486	417	3250	675	63446	48576	29176	20150
Mean	7.24	5.83	9.52	5.38	7.53	5.29	4.26	3.82	3.90	3.79
Coefficient of Variation	.78	.76	.55	.76	.64	.76	1.14	1.02	1.20	.99
Average CV within	1.02	.96	.49	.76	.62	.76	1.12	1.02	1.15	1.01

Schools in 2005/2006 Academic Year described with 2006 Census Data										
Measure	All Schools		Charter<High		Private<High		Public<High		Separate<High	
	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number of students	116197	81373	1879	540	3456	675	63223	46554	29116	20373
Mean	7.09	5.43	7.83	6.43	6.19	5.61	4.25	3.57	4.07	3.32
Coefficient of Variation	.77	.77	.62	.75	.71	.50	1.10	1.02	1.21	1.02
Average CV within	1.02	.97	.61	.76	.66	.59	1.13	1.03	1.17	.95

Schools in 2011/2012 Academic Year described with 2006 Census Data										
Measure	All Schools		Charter<High		Private<High		Public<High		Separate<High	
	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM	CAL	EDM
Number of students	124679	87279	4377	736	1779	323	69415	50990	30803	22539
Mean	6.11	4.68	7.32	9.00	6.71	4.19	3.35	2.71	2.43	2.60
Coefficient of Variation	.82	.81	.56	.63	.65	.68	1.13	1.08	1.23	1.05
Average CV within	1.06	1.04	.49	.62	.64	.66	1.22	1.14	1.16	1.05

Notes: Constructed by the author as described in the text. The categories in the columns are: Charter, Private, Public and Separate schools where only schools that do not offer high school grades are included.

Table 12: Attendance at Closest Public or Separate School up to Junior Grades

Year	Calgary			Edmonton		
	Type	Total	Closest	Type	Total	Closest
2001/2002	Public or Separate	92,622	41,263 (44.5%)	Public or Separate	68,126	24,608 (35.8%)
	Public only	63,446	25,016 (44.8%)	Public only	48,576	16,041 (33.0%)
	Separate only	29,196	16,427 (44.3%)	Separate only	20,150	8,567 (42.5%)
2005/2006	Public or Separate	92,339	41,399 (44.8%)	Public or Separate	66,927	28,892 (40.2%)
	Public only	63,223	25,430 (40.2%)	Public only	46,554	16,805 (36.1)
	Separate only	29,116	15,969 (61.7%)	Separate only	20,373	10,087 (49.5%)
2011/2012	Public or Separate	89,691	45,236 (50.4%)	Public or Separate	73,329	36,282 (41.3%)
	Public only	63,352	28,979 (45.7%)	Public only	50,999	23,654 (46.4%)
	Separate only	26,339	16,257 (61.7%)	Separate only	22,539	12,628 (56.0%)

Note: this is the number of students in schools teaching elementary and junior grades attending the closest school of the configuration and board. These include only public and separate board schools. They include only the pairs where school and student address are both within the City of Calgary and the City of Edmonton respectively

Appendix Table 1: Regressions predicting the percentages of students excellent across urban areas

Key to column variables: Abor. (aboriginal); Lone (lone parents);Lang(home language English or French):

Year	Exam	Abor.	Lone	Lang.	Imm.	Degree	Moved	Imm-1	Det.	Owned	Urate	N	R ²
Regressions estimated with data from Calgary and Edmonton Census Metropolitan Areas													
G3	Lang.	-.09 (.10)	-.09 (.03)*	-.01 (.04)	-.15 (.10)	.65 (.04)*	-.07 (.07)	-.86 (.55)	.06 (.04)	.10 (.06)	-.33 (.19)	7306	0.34
G6	Lang	-.10 (.12)	-.13 (.06)*	-.05 (.06)	-.16 (.09)	.84 (.04)	-.12 (.08)	-1.58 (.59)*	.06 (.04)	.06 (.06)	-.35 (.16)*	7248	0.40
G9	Lang.	-.13 (.17)	-.11 (.07)	-.04 (.10)	-.14 (.14)	.91 (.07)*	-.13 (.11)	-1.72 (1.07)	.06 (.06)	.02 (.08)	-.17 (.26)	3612	0.40
G3	Math	-.33 (.15)*	-.07 (.06)	-.16 (.09)	-.31 (.13)*	.79 (.04)*	-.17 (.08)*	-.43 (.66)	.06 (.05)	.17 (.06)*	-.32 (.21)	6824	.33
G6	Math	-.10 (.13)	-.09 (.05)	-.08 (.06)	-.07 (.10)	.83 (.05)	-.19 (.08)*	-1.55 (.65)*	.04 (.04)	.10 (.06)	-.13 (.18)	6775	.36
G9	Math	-.27 (.22)	-.12 (.08)	-.14 (.11)	-.02 (.05)	.97 (.10)*	-.23 (.11)*	-.44 (1.17)	.02 (.06)	.06 (.08)	-.21 (.27)	3372	.40
Regressions estimated with data from the Cities of Calgary and Edmonton													
G3	Lang.	-.20 (.20)	-.16 (.06)*	.04 (.12)	-.06 (.16)	.61 (.05)*	-.16 (.08)*	-.62 (.62)	.10 (.05)	.05 (.07)	-.24 (.55)	5730	.39
G6	Lang	-.29 (.20)	-.17 (.07)*	.03 (.14)	-.02 (.18)	.82 (.06)*	-.24 (.09)*	-1.35 (.65)*	.10 (.06)	.01 (.07)	-.02 (.22)	5713	.46
G9	Lang	.19 (.37)	-.20 (.10)*	.08 (.15)	.13 (.20)	.93 (.10)*	-.31 (.14)*	-1.73 (1.16)	.06 (.11)	-.009 (.14)	-.58 (.46)	2572	.46
G3	Math.	-.33 (.24)*	-.15 (.07)*	-.11 (.13)	-.17 (.17)	.77 (.06)*	-.31 (.09)*	-.13 (.74)	.01 (.06)	.19 (.08)*	-.38 (.30)	5349	.37
G6	Math	-.19 (.22)	-.12 (.06)	.03 (.13)	.17 (.17)	.84 (.06)*	-.35 (.09)*	-1.31 (.74)	.02 (.06)	.11 (.08)	.22 (.25)	5342	.40
G9	Math	-.10 (.40)	-.09 (.12)	-.07 (.16)	.29 (.22)	1.09 (.13)*	-.44 (.14)*	.15 (1.33)	-.01 (.12)	.13 (.14)	-.08 (.52)	2399	.44

Imm. (born outside Canada); Degree(completed university degree); Moved(moved in last year) ; Det. (live in a detached home); Owned (live in an owner-occupied home); Urate (the unemployment rate of adults in households with children); N, the number of observations in the regression; R², the explanatory power of the regression.

The values in this table are regression coefficients and standard errors. A * denotes statistical significance at a 5% level of significance. The regressions are estimated over schools located in the CMAs (upper panel) or cities (lower panel of Calgary and Edmonton. The left hand side variable is the indicator of student success at a school. The regression include indicator variables for each year and variables that measure the difference between Calgary and Edmonton results as discussed in the text. The coefficients on these variables are not presented. Estimates use ordinary least squares with robust standard errors and are clustered at the school level. These regressions are used to construct Tables 3 and 4

Appendix Table 2: Regressions predicting the percentages of students acceptable across urban areas

Year	Exam	Abor.	Lone	Lang.	Imm.	Degree	Moved	Imm-1	Det.	Owned	Urate	N	R ²
Regressions estimated with data from Calgary and Edmonton Census Metropolitan Areas													
G3	Lang	-.34 (.19)	-.17 (.07)*	-.06 (.08)	-.31 (.11)*	0.41 (.04)*	-.007 (.06)	-1.45 (.65)*	0.11 (.05)*	0.18 (.06)*	-0.63 (.27)*	7306	.31
G6	Lang	-.62 (.22)*	-.03 (.07)	-.12 (.10)	-.34 (.13)*	.51 (.04)*	-.01 (.07)	-2.0 (.69)*	.11 (.05)*	.22 (.07)*	-.73 (.23)*	7248	.34
G9	Lang	-1.15 (.47)*	-.04 (.14)	-.09 (.16)	-.22 (.22)	.55 (.08)	-.10 (.12)	-1.23 (1.48)	.15 (.15)	.36 (.16)*	-.38 (.46)	3612	.35
G3	Math	-.51 (.22)*	-.14 (.07)*	-.16 (.09)	-.39 (.12)*	.48 (.04)*	.05 (.07)	-1.41 (.70)	.11 (.04)*	.20 (.06)*	-.72 (.28)*	6824	.33
G6	Math	-.71 (.25)*	-.10 (.09)	-.14 (.10)	-.30 (.13)*	.66 (.05)*	.01 (.09)	-2.08 (.72)*	.09 (.07)	.26 (.08)*	-.60 (.28)*	6775	.35
G9	Math	-1.23 (.51)*	-.13 (.14)	-.009 (.21)	.04 (.28)	.86 (.10)*	-.26 (.14)	-.70 (1.85)	.07 (.14)	.39 (.16)*	-.33 (.51)	3372	.37
Regressions estimated with data from the Cities of Calgary and Edmonton													
G3	Lang	-.85 (.30)*	-.18 (.07)*	-.10 (.14)	-.27 (.18)	.39 (.06)*	-.09 (.07)	-1.62 (.75)*	.07 (.06)	.18 (.08)*	-.69 (.35)	5730	.34
G6	Lang	-1.26 (.38)*	-.01 (.08)	.02 (.20)	-.12 (.27)	.46 (.06)	-.09 (.08)	-1.85 (.79)*	.02 (.07)	.31 (.08)*	-.48 (.33)	5713	.36
G9	Lang	-2.58 (.57)*	.11 (.16)	-.01 (.22)	-.21 (.32)	.45 (.10)*	-.31 (.11)*	.57 (1.76)	.14 (.15)	.42 (.20)*	.05 (.72)	2572	.45
G3	Math	-1.21 (.32)*	-.16 (.07)*	-.13 (.14)	-.33 (.19)	.42 (.06)	-.02 (.07)	-1.41 (.82)	.05 (.06)	.21 (.08)*	-.61 (.37)	5349	.36
G6	Math	-1.50 (.47)*	-.11 (.08)	.09 (.24)	-.02 (.31)	.54 (.07)*	-.09 (.09)	-1.50 (.83)	.03 (.07)	.29 (.09)*	-.38 (.38)	5342	.38
G9	Math	-2.41 (.67)*	-.01 (.18)	.04 (.27)	.10 (.39)	.80 (.12)*	-.56 (.15)*	1.84 (2.16)	.10 (.16)	.41 (.22)*	-.01 (.74)	2399	.46

Notes: see Table A-1