

## Appendix A: The Creation of the Index of Social and Economic Indicators

### A measure of school performance in Alberta

Alberta Education provides the following information for each school with at least six students:

- the number of students in a year that are enrolled in the grade and eligible to write the assessment;
- the number of students who achieve an acceptable standard; and
- the number of students who meet the standard of excellence.

There are students absent from the Provincial Achievement Test (PAT), both excused and simply absent. This study focuses on students who achieve the standard of excellence as a percentage of students who were eligible to write that specific PAT.

Table A-1 presents, by year and language-subject grade grouping, the percent of all students in Alberta who achieve the standard of excellence on each PAT. There are five PATs in Grade 3, nine PATs in Grade 6 and thirteen PATs in Grade 9. In Grade 3, students write the PAT results in mathematics and in both English and French language. The PAT0308, PAT0608 and PAT9108 results, the French examinations written at French language schools, are written by very few students at very few schools, too few to establish a fair rating system.

In Grade 9, there are Knowledge and Employability (KAE) PATs in languages, mathematics, science and social studies written by students with skill levels at least 3 grade levels below their current grade. I also exclude these results. There appear to be careful safeguards in place preventing schools from moving students into these examinations.<sup>1</sup>

The table shows the effect of Form 2 examination in mathematics in Grade 3, 6 and 9 in 2009-10. The province does not report about half the mathematics results in the provinces for that school year. Because of this, I do not include mathematics results in 2009-10 in my measure of school success.

There is variation over the years in the percent of students achieving the standard of excellence on a given PAT. This necessitates that I adjust the annual measures of success at a school.

The percent of all students achieving the standard of excellence on PAT0300 (Grade 3 English Language), for example, varies by year. In 2010-11, of 40,650 students, 18.4 percent were excellent. But with similar numbers of students in 2009-10 20.4 percent were excellent and in 2011-12 21.3 percent were excellent. There are three ways this could happen:

- large numbers of students could vary in average quality;
- large numbers of teachers who are teaching and have taught these students from kindergarten to Grade 3 could vary in quality; or
- the test could vary in difficulty. Here the questions could vary in difficulty or questions of the same difficulty could be graded to different standards

If we accept that the tests did vary in difficulty, the most plausible option, then the appropriate adjustment is to subtract the percentage of students that achieved the standard of excellence in the province as a whole in that

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1 If a school were able to move a student into a KAE PAT, this would lower the number of students writing the non-KAE PAT and raise the percent of students at the school achieving the standard of excellence.

Table A-1: Percent of Students Meeting the Standard of Excellence

Test name	2009-2010		2010-2011		2011-2012	
	Enrolment (Schools)	Percent Excellent	Enrolment (Schools)	Percent Excellent	Enrolment (Schools)	Percent Excellent
PAT0300(LE)	39912 (1090)	20.4	40650 (1084)	18.4	42476 (1106)	21.3
PAT0301(LF)	3009 (98)	16.3	3176 (101)	15.9	3364 (99)	14.4
PAT0308(LFr)	493 (25)	16.6	516 (26)	18.8	499 (29)	12.7
PAT0310*(ME)	15004 (444)	28.0	37028 (1035)	27.0	38656 (1054)	26.3
PAT0315*(MF)	2523 (86)	20.9	3661 (127)	29.2	2833 (128)	29.5
PAT0600(LE)	41526 (1048)	19.7	41278 (1051)	19.4	41027 (1048)	18.6
PAT0601(LF)	2473 (88)	15.9	2635 (95)	17.1	2586 (93)	17.3
PAT0608(LFr)	419 (25)	19.0	431 (23)	18.0	443 (24)	22.1
PAT0610*(ME)	17444 (465)	17.7	38325 (1004)	18.4	38041 (1003)	17.1
PAT0615*(MF)	2357 (89)	18.8	3060 (118)	21.4	3004 (115)	19.3
PAT0640(ScE)	38407 (995)	28.3	37989 (998)	26.7	37774 (996)	29.9
PAT0645(ScF)	2882 (113)	18.3	3058 (118)	22.3	3009 (116)	24.3
PAT0650 (SsE)	38475 (995)	17.6	38056 (999)	20.1	37832 (994)	21.2
PAT0655(SsF)	2684 (112)	11.9	3046 (117)	12.7	2975 (114)	10.4
PAT9100(LE)	41833 (651)	15.5	41087 (653)	17.0	40472 (661)	17.0
PAT9101(LF)	2397 (62)	12.5	2309 (63)	15.1	2337 (65)	12.2
PAT9104(LK)	1317 (103)	8.0	1289 (100)	8.6	1333 (106)	5.7
PAT9108(LFr)	299 (15)	11.7	304 (13)	16.1	290 (13)	16.2
PAT9110*(ME)	17626 (296)	20.8	38206 (630)	18.0	37590 (636)	18.3

Table A-1: CONTINUED

Test name	2009-1010		2010-2011		2011-2012	
	Enrolment (Schools)	Percent Excellent	Enrolment (Schools)	Percent Excellent	Enrolment (Schools)	Percent Excellent
PAT9115(MF)	2296 (60)	26.8	2438 (69)	20.0	2469 (73)	22.0
PAT9111(MK)	1581 (118)	15.9	1611 (119)	14.8	1569 (115)	15.6
PAT9140(SsE)	38961 (623)	18.5	38479 (627)	21.7	37943 (637)	23.4
PAT9145(SsF)	2543 (70)	17.3	2473 (69)	21.0	2475 (71)	24.4
PAT9141(SsK)	1250 (100)	14.5	1277 (101)	16.0	1266 (103)	18.2
PAT9150 (SsE)	39209 (626)	19.6	38467 (627)	20.3	37841 (634)	20.5
PAT9155 (SsF)	2659 (77)	18.3	2610 (76)	14.2	2601 (78)	11.9
PAT9152(SsK)	1273 (102)	16.0	1259 (98)	14.2	1280 (101)	13.7

Notes: 1. Enrolment totals exclude small schools where no results are reported 2. Form 2 assessments in Grade 3 mathematics (English and French); Grade 6 mathematics (English and French); and Grade 9 mathematics (English and French) in 2009-10 have no results reported. 3. Coding on assessments: First letter denoted subject area: L=Language, M= Mathematics, Sc=Science, Ss Social Studies; Second letter denotes language or type of examination: E= English, F=French, Fr is a Francais Examination at a fully French-language school. K=Knowledge and Employability examination.

year from each school's percent excellent in the same year and use that adjusted percentage as the measure of each school's success on the PAT.

In each year, about 100 schools have results in the French language PAT in Grades 3 and 6 as well as the English language PAT. In Grade 9 there are about 50 such schools. The same occurs in mathematics, science and social studies. To incorporate the French language PATs in school results, I calculate the difference between the percent excellent at the school and the average for the province for each PAT. Then I create a weighted average, by number of students, of the deviations for each of language, mathematics, science and social studies as relevant in each grade in each school.

Finally, I calculate a simple average of the mathematics and language exam in Grade 3 and of the four PAT subjects in grades 6 and 9. There is one measure of success per grade. A measure of success of zero at a school indicates that this school the percent of students achieving the provincial standard of excellent was the average for the province. If the measure of success were 10 in Grade 6, then at this school, 10 percentage points more students achieved the standard of excellence than the provincial average over the 3 years in question. This

**Table A-2: The Regressions behind the Predicted Measure of School Performance**

Variable: demographics of areas students at school live in:	Coefficient in Grade 3 Regression (standard error)	Coefficient in Grade 6 Regression (standard error)	Coefficient in Grade 9 Regression (standard error)
The percentage of lone parents	-0.11 (0.06)	-0.10 (0.05)	-0.02 (0.05)
The percentage of persons who speak an official language at home	0.08 (0.04)	-0.005 (0.03)	-0.03 (0.04)
The percent of persons who are aboriginal	-0.17 (0.04)*	-0.13 (0.03)*	-0.11 (0.03)*
The percentage of persons who immigrated to Canada in the past 5 years	-0.62 (0.16)*	-0.83 (0.14)*	-0.80 (0.20)*
The logarithm of average household income	3.2 (1.8)	3.7 (1.8)*	2.1 (1.8)
The percentage of persons living in detached dwellings	0.08 (0.03)*	0.07 (0.02) *	0.05 (0.03)
the percentage of those over 20 years of age who have some university education	0.40 (0.05)*	0.49 (0.04)*	0.52 (0.05)*
Number of schools in the regression	850	802	457
Explanatory power of the regression	0.36	0.43	0.43

Note: \* indicates coefficient that is statistically different from zero at 5% level of significance.

measure of success is the dependent variable in my prediction regression. I include schools in my regression as long as there are 45 or more students in a subject (30 in mathematics) over the three-year period.

### Predicting School Performance in Alberta

The Predicted Measure of School Success are the fitted values from a regression of the measure of school performance on the social and economic characteristics of students attending the school. The fitted values are on the horizontal axis of Figure 1. Table A-2 presents the coefficients from these regressions.

The row entitled explanatory power of the regression has values between 0.36 and 0.43. This means that between 36 and 43 percent of the variation in school percentage of students with excellent standing is associated with variation in the background of students.

Some of the coefficients on variables in the regressions above are not statistically different from zero. However, I still use those variables to predict the schools performance and I include them to be certain that I have considered many sources of social and economic variation associated with variation in results. I use the same seven variables to predict success in all three grades. However, there are important differences in the coefficients on predictor variables between grades. The association of parents with a university education and performance increases with grade level. The relationship between this proxy for parental education and results is the strongest relationship. Students from heavily aboriginal areas struggle in all three grades. The relationship between the measure of success and the percent of aboriginals in the school falls as the grade level rises. The opposite is true for both the percent of students who come from lone parent families and the percent of students who speak an official language at home. Schools with many recent immigrants operate at a disadvantage. Higher income schools do better but the coefficient on income is only statistically significant in Grade 6.

The percentage of persons living in detached dwellings, which will be associated with family income, plays a larger role in grades 3 and 6. While much more could be said about these regressions, the table summarizes the salient relationships and shows that there is considerable variation between school performance that cannot be explained by variation in the social and economic background of students. If the explanatory power of these regressions had been 100 percent, then all schools in Alberta would be on the upward sloping line in Figure 1 and there would be no schools above or below the line at any predicted level of performance. This is clearly not the case. There is therefore substantial evidence that how schools do their job matters for student outcomes.