Back to the Basics: Socio-Economic, Gender, and Regional Disparities in Canada's Educational System

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This study reassessed the extent to which socio-economic background, gender, and region endure as sources of educational inequality in Canada. The analysis utilized the 28,000 student Canadian sample from the data set of the OECD's 2003 *Programme for International Student Assessment (PISA)*. Results, consistent with previous findings, highlight the uneven distribution of educational achievement in Canada along socio-economic, gender, and regional lines, and point to the continued necessity of policy to mitigate the impact of gender, class, and regional inequalities on the educational outcomes and life chances of young Canadians.

Key words: social inequality, educational outcomes, educational aspirations, SES, cultural capital, PISA

Dans cet article, les auteurs se demandent dans quelle mesure le statut socioéconomique, le sexe et la région demeurent des sources d'inégalité en matière d'éducation au Canada. L'analyse repose sur l'échantillon des 28 000 élèves canadiens tiré de l'ensemble de données du Programme international pour le suivi des acquis des élèves (PISA) de 2003 de l'OCDE. Les résultats, conformes aux conclusions antérieures, mettent en évidence la répartition inégale de la réussite scolaire au Canada selon le statut socioéconomique, le sexe et la région et indiquent la nécessité d'atténuer l'impact du sexe, de la classe sociale et des inégalités régionales sur les résultats scolaires et les chances d'épanouissement des jeunes canadiens.

Mots clés : inégalité sociale, résultats scolaires, aspirations quant aux études, statut socioéconomique, capital culturel, PISA

A fundamental concern within sociology of education research is the extent to which formal education both fosters socio-economic opportunity and also reproduces social inequality (Wotherspoon, 2004). The notion of education as *the great equalizer* has a prominent place in the ideology of modern liberal democratic states such as Canada and the United States. This popular belief in meritocracy is also paralleled by more formal conceptualizations informing the social policy-making process. Prominent among these is *human capital theory* (McBride, 2000; Woodhall, 1997), which holds that investment in education brings both individual returns (such as increased social mobility) and societal returns (such as economic growth, decreased inequality, and enhanced social cohesion). Evidence of the return to individuals from education has generally been more forthcoming; in particular, the correlation between education and income is well-established (e.g., Krueger & Lindahl, 2001; Sweetman, 2002). However, consistent evidence of social returns such as rising prosperity and lower inequality has been much more problematic to measure (Levin & Kelley, 1997). Exemplary of the elusive social returns from education is the United States, the richest country in the world, with one of the most educated populaces, but which also happens to exhibit one of the greatest degrees of social inequality among advanced Western nations (United Nations Development Programme [UNDP], 2003).

Although Canada compares favourably with other advanced Western nations in terms of educational equality (e.g., Marks, 2005; UNICEF Innocenti Research Centre [UNICEF], 2002),[1] the distribution of educational achievement in Canada has historically been subject to structural asymmetries related to socio-economic background, gender, and geography.[2] Given the spate of social trends that have in recent times significantly reshaped the Canadian social landscape (Roberts, Clifton, Ferguson, Kampen, & Langlois, 2005), it is important to reassess the extent to which these traditional dimensions of educational inequality continue to endure. The present availability of a world-class data set in the form of the Organisation for Economic Co-operation and Development (OECD) *Programme for International Student Assessment* (*PISA*) study provides an excellent opportunity to undertake just such a reassessment.

PISA measures student performance in mathematics, science, and reading as well as a number of student background and school characteristics directly relevant to the examination of educational inequality. In this study, we utilized the 2003 Canadian *PISA* sample to examine the effects of socio-economic status (SES), gender, province, and educational aspirations on scores in mathematics, science, and reading and to determine whether SES moderates the effect of educational aspirations on these scores.

THREE KEY DIMENSIONS OF EDUCATIONAL INEQUALITY IN CANADA

The Socio-Economic Gradient

Numerous observers have concluded that in Canada socio-economic background continues to be a persistent source of educational inequality (Davies & Guppy, 2006; de Broucker & Noel, 2001; Guppy & Davies, 1998; Wanner, 1999). Although some contend that formal education in advanced capitalist societies perpetuates class inequalities by channelling students into different class-contingent educational (and occupational) trajectories (Apple, 2004; Bowles & Gintis, 1976), others argue that schooling contributes to the reproduction of class differences via its central location in the process of intergenerational transmission of economic, cultural, and social resources and advantages (Bourdieu, 1977, 1997; Coleman, 1997; see Davies & Guppy, 2006; Wotherspoon, 2004, for reviews). Although it is beyond the purposes of this empirically focussed article to present a full account of the variously theorized mechanisms underlying the connection between socio-economic privilege and academic (as well as subsequent occupational) success, we think it useful for heuristic purposes to draw readers' attention to the key concept of *cultural capital*. Cultural capital is one of the forms of capital deployed by Bourdieu (1997) to explain social reproduction. Bourdieu sees the forms of capital as mutually constitutive because financial capital affords the time and resources for investment in the development of children's cultural capital (i.e., dispositions, knowledge, educational qualifications), which is associated with future educational and occupational success and in turn contributes to the accumulation of financial capital. Socio-economic success is also associated with greater social capital because one's social network becomes broader, more influential and more conducive to opportunity and further enhancement of one's other capital stocks. Although Bourdieu's conceptualization of cultural capital is abstract and much debated, particular elements have been brought into relief and handed down as essential. Lareau and Weininger (2003) observe that the prevailing interpretation that has guided the majority of cultural capital research in North America is based on two premises: (a) cultural capital entails familiarity and competence with highbrow cultural tastes, and (b) cultural capital is distinct from other knowledge or ability involving technical skills or competence (e.g., human capital) (p. 568). Lareau and Weininger argue that this interpretation misrepresents Bourdieu's ideas and has needlessly circumscribed the scope of research related to cultural capital.

Lareau and Weininger (2003), who revisit Bourdieu's treatment of cultural capital, offer a broader interpretation of the concept which they believe is not only more consistent with his intentions, but also, most importantly, more analytically useful than the received interpretation. First, they contend that cultural capital entails more than being conversant with highbrow cultural preferences (which are of decreasing importance in contemporary society); rather, it includes adaptive cultural and social competencies such as familiarity with relevant institutional contexts, processes and expectations, possession of relevant academic and social skills, and greater preparedness to strategically intercede, all of which enhance parental ability to successfully affect their children's educational outcomes. Second, they argue that cultural capital cannot be divorced from academic or technical skills; the two interpenetrate. A prominent example of this is literacy skills that not only reflect cultural preferences but are indeed fundamental academic skills, the development of which teachers expect to involve high parental participation. In short, Lareau and Weininger focus on ". . . micro-interactional processes whereby individuals' strategic use of knowledge, skills, and competence comes into contact with institutionalized standards of evaluation. These specialized skills are transmissible across generations, are subject to monopoly, and may yield advantages or 'profits'" (p. 569).

Although some scholars (Kingston, 2001) express concern over a more expansive definition of cultural capital, we believe a broader conceptualization offers useful language to discuss important aspects of how socio-economic advantage translates into academic advantage, of how "higher SES families produce more of the kinds of skills [cognitive and non-cognitive] that schools reward" (Davies & Guppy, 2006, p. 106). Swidler (1986) describes culture as a "'tool kit' of habits, skills, and styles from which people construct 'strategies of action'" (p. 273). The composition of this tool kit is largely dependent on one's location within the social structure that conditions how a person perceives and relates to his or her world (which Bourdieu [1977, 1984] refers to as one's *habitus*). This definition invites a much richer conception of cultural capital, viewing culture as the situated frame through which individuals meet the world rather than the more limited notion of culture as marker of class. In this broader sense, cultural capital becomes not merely an arbitrary set of elitist esthetic and social hallmarks, but rather an adaptive set of cognitive skills (such as verbal, reading, writing, mathematics, and analytical reasoning skills) and non-cognitive habits (such as diligence, self restraint, and delay of gratification) that are associated with academic and, subsequently, occupational success (Farkas, 2003). The implementation of this cultural tool kit – the skills and preferences conducive to successful navigation of a particular institutional terrain (which Bourdieu [1977, 1984] would term a *field*) – is not internalized evenly across the socio-economic spectrum, and these disparities tend to be transmitted intergenerationally. Put another way, the cultural tool kit of middle-class fam-ilies has greater currency within formal institutional settings such as the school than does that of working-class families, and the resulting differences in educational and socio-economic outcomes tend to perpetuate this imbalance across the next generation.

Formal education plays a crucial role in this transmission; for instance, higher levels of parental education and income are associated with a greater likelihood of participation in post-secondary education (Drolet, 2005; Knighton & Mirza, 2002). Parents with higher levels of educational and occupational attainment tend to pass proportional levels of aspiration and achievement motivation (which Bourdieu would see as aspects of habitus) to their children as well as important skill sets required for academic success (de Broucker & Underwood, 1998; Lareau & Weininger, 2003). More educated parents are likely to instill within their children an appreciation of the fundamental importance of education and the attitudes and behavioural repertoire conducive to success within the (predominantly middle-class) school culture (Bernstein, 1997; Bourdieu, 1977; Forcese, 1997). Educated parents not only provide the enriched home learning environment (cultural and material) required from an early age to elevate educational trajectories (Hertzman, 2000; UNICEF, 2002), but also are more likely to be actively involved in their children's education through such means as helping with homework and effectively liaising with the school and teachers (Lareau, 1997, 2000; Schneider & Coleman, 1993). Middle-class parents are also more likely to have greater financial resources to spend on educational materials, tutors, and structured extra-curricular activities, as well as more flexible schedules conducive to volunteering at the school. They are more likely to have connections to other higher status parents and to education-related institutions. Lareau (2002, 2003) observed a more interventionist middle-class parental logic that she described as "concerted cultivation" (p. 2). Parents invoking this logic are much more actively involved in attempting to engineer appropriate life-skill promoting activities and experiences (compared to the more laissez-faire approach to extra-curricular activity more typically observed among working-class parents). She also noted a greater "sense of entitlement" (p. 6) among middle-class parents in terms of greater propensity to question and intercede with institutional authorities (e.g., teachers, doctors) than among working-class parents who tend to be more constrained and deferential (although at the same time distrustful) in their approach. These different attitudes and styles (part also of what Bourdieu would term habitus) are passed on to their children.

Gender

Although equality between the sexes has improved in recent decades, differential gender socialization is still a fundamental process in society; societal conceptions of appropriate gender roles are still substantially constrained by essentialist sex-stereotypes. Consequently, traditional gender typing influences the educational careers of many boys and girls (Gaskell, 1992; Mandell & Crysdale, 1993; Moss & Attar, 1999). Some gender socialization-contingent factors proffered to account for male-female differences in academic trajectories include gender differences (a) in coping strategies (Struthers, Perry, & Menec, 2000; Tamres, Janicki, & Helgeson, 2002), (b) in sense of academic self-efficacy (Malpass, O'Neil, & Hocevar,1999), (c) in attributional style (Fear-Fenn & Kapostasy, 1992), and (d) in individual achievement-orientation (Chee, Pino, & Smith, 2005).

Although formal obstacles to female participation in various occupations have decreased dramatically over the years, strong gendered cultural currents still affect girls. Persistent gender messages regarding self-worth and appropriate forms of work also press male students in particular directions. One of the strongest patterns to emerge from such pervasive gender typing is that males tend to be disproportionately channelled toward mathematics and sciences while females are geared towards the arts and humanities (Bernhard & Nyhof-Young, 1994; Forcese, 1997; Weiner, Arnot, & David, 1997). As Schaeffer (2000) concluded in her review of education in British Columbia, much evidence exists that ". . . **a stunning amount of gender stereotyping remains** . . .

from Kindergarten through graduate school and beyond. Males still dominate in the 'hard' sciences, technology and engineering, while females still dominate in the arts and the helping professions" (p. 72, [bold in original]). Consistent with this pattern, evidence indicates gender disparities in academic performance in mathematics and reading. For instance, results from the School Achievement Indicators Program (SAIP) show that, among 13- and 16-year-old Canadian students, girls performed consistently better than boys in writing and reading achievement (Council of Education Ministers, Canada [CMEC], 2002), while boys performed slightly better than girls in mathematics (CMEC, 2001a). On the other hand, contrary to much previous research, recent SAIP science scores – which showed no significant gender differences – suggest that the gender gap in science performance seems to have closed (CMEC, 2004). Thus one of the questions for the current study is whether or not the traditional gender differences in academic performance persist.

Province

The have-not provinces in Canada are not only economically disadvantaged but also their populations display lower general levels of education (Wien & Corrigall-Brown, 2004). For example, traditional have-not regions such as the Atlantic provinces (Newfoundland and Labrador, Nova Scotia, Prince Edward Island, and New Brunswick), Manitoba, Saskatchewan, and Quebec all exhibit mean and median levels of educational attainment below the national level (12.3 and 12.7 years of schooling) while the have provinces of Ontario, Alberta, and British Columbia all meet or exceed the national figures (Statistics Canada, 2003). In Canada, education is a provincial (and territorial) jurisdiction and, although the federal government provides a form of fiscal equalization to ensure relatively equal quality of education at the post-secondary and vocational levels, it does not do so at the K-12 level.[3] In the 1990s government priorities took a neo-liberal turn and subsequent changes to the cost-sharing and funding formulas shifted the financial burden down-ward, raising concern in some quarters that inequalities may be on the rise (Barlow & Robertson, 1994; Dei & Karumanchery, 2001; Dibski, 1995). In its attempt to reduce public debts and deficits, the federal government reduced transfers to the provinces and territories which, in turn, reduced expenditures on education (CMEC, 2001b). As provincial governments continue to look for ways to contain social spending, it could be that regional disparities may increasingly manifest as provinces with stronger economic bases experience an advantage when it comes to financing strong K-12 educational systems (Dibski, 1995).[4] As Davies (1999) points out, although "resource level itself does not directly produce better educational outcomes, better-funded schools produce an environment that is more conducive to educational success" (p. 140). Because variations occur in fiscal capacity across provinces, it is likely that there is corresponding variation in levels of student achievement across provinces as well.

REVISITING SES, GENDER, AND PROVINCIAL GAPS IN ACADEMIC ACHIEVEMENT

As our literature review has highlighted, children from lower socio-economic backgrounds – for reasons related to disparities in family resources (economic, social, and cultural) – tend to be educationally disadvantaged. For instance, the level of family cultural resources, or cultural capital, can have an important impact on a child's educational career. Marked differences exist across social classes in the cognitive and social skills and dispositions that parents instill in their children. Middle-class parents are more likely than their working-class counterparts to pass on that set of skills and dispositions (cultural capital and habitus) most conducive to success in the formal education system (field). There are social class differences not only in how cognitively enriching children's home environments are, but also in how parents interface with schools and teachers and the general orientation toward school that they engender in their children. For example, more educated, higher-status parents are likely to be more familiar with the "ins and outs" of formal education contexts, to be more actively engaged in their children's education, and to impart higher achievement expectations. These class-rooted differences in assets and dispositions are reflected in the socio-economic gradient describing the association between socio-economic status and educational achievement. In the present study, it is expected that the traditional positive relationship between socio-economic status and educational achievement will prevail, and that a similar positive relationship between educational expectations and achievement will also be evident. But is the association between expectations and achievement consistent across the socio-economic spectrum, or might expectations have a different impact at different levels of socio-economic status? Although the conditions contributing to the achievement gap between lower and higher status students are multiple, a finding that suggests that educational aspirations are particularly important for lower status students might in itself have some useful implications. Although combating all the causes of educational inequality continues to prove a formidably complex challenge, it could be that, for instance, strategies aimed at instilling lower socio-economic status students and their parents with higher educational expectations might contribute a piece to the puzzle.

The literature review for this study also touched upon two other traditionally important dimensions of educational inequality in Canada: gender and province. Evidence of the persistence of the traditional gaps in performance between the sexes will underscore the importance of continued development and implementation of policies and practices intended to level the educational playing field for boys and girls. Likewise, evidence of enduring gaps in achievement across provinces will give further notice to a perennial source of educational disparity in Canada that remains seriously under-addressed.

FRAMING THE PRESENT STUDY

Hypotheses

Given the structural asymmetries related to socio-economic background, gender, and region, the purpose of this study was to contribute to the existing literature on educational inequality by analyzing within the Canadian context several hypotheses regarding socio-economic, gender, and regional dimensions. Specifically, and in light of the literature reviewed above, the following hypotheses were evaluated: (a) that socio-economic status (SES) is positively related to performance on all academic criteria (mathematics, reading, and science); (b) that student educational aspirations (expected level of educational attainment) are positively related to performance on all academic criteria (i.e., higher expectation levels will be associated with higher performance levels); (c) that the educational aspiration-academic performance relationship is moderated by socio-economic status; (d) that males outscore females in mathematics and science, while females outscore males in reading; and (e) that there is significant variation across provinces on all academic performance variables.

By updating the existing body of evidence, this study contributes to the literature by illustrating the enduring magnitude of educational inequality in Canada as well as the need to preserve and extend policy initiatives aimed at ameliorating these disparities. Toward this purpose, the study utilized the OECD's 2003 *PISA* data set, which includes numerous variables directly relevant to the examination of educational inequality.

PISA both measures student performance in the mathematics, science, and reading domains and provides data on important student background and school characteristics.

METHOD AND DATA

Data Set and Sampling

Close to 272,000 students in 41 countries participated in the 2003 *PISA* survey, which assessed the performance of 15-year-old students in the domains of mathematics, reading, and science. In Canada 28,000 fifteen-year-old students from the 10 provinces participated in the survey.

The *PISA* sample for Canada was obtained using a two-stage, stratified sampling strategy. The first stage involved sampling individual schools that had 15-year olds enrolled. Schools were sampled systematically with probabilities proportionate to size (with size measured in relation to the estimated number of eligible 15-year olds enrolled in a school). The second stage of selection involved sampling students from within the sampled schools. For each selected school a list of that school's 15-year old students was generated, and from this list 35 students were randomly selected (if a school had fewer than thirty-five 15-year olds then all students were selected). Further details on data, tests, and sampling strategies are available in the official *PISA* reports (OECD, 2003, 2004, 2005a, 2005b).

Calculation of sampling variance is complicated by the two-stage stratified sampling design of the *PISA* survey. OLS (ordinary least squares) regression assumes that residuals (differences between model-predicted and observed values) are normally distributed, independent with a mean of zero and a constant variance. The independence assumption is unlikely to hold when a cluster sampling method is employed as it was in the *PISA* survey. That is, students selected from the same school are more likely similar on relevant variables (e.g., curriculum, school resources, and community characteristics) than are students randomly selected from the population. Thus a serious concern with employing OLS regression to estimate statistics for clustered data (such as *PISA*) is the underestimation of standard errors, leading to inflated probability of Type I error (alpha inflation). However, PISA used resampling procedures to deal with this concern.

PISA employed the Fay Modification of the Balanced Repeated Replication (BRR) resampling method to obtain accurate standard error estimates that take into account the stratification and the two-stage clustering (OECD, 2005b, pp. 49-50). Basically, 80 replicate samples (subsamples) are drawn from the whole sample and the statistic of interest is computed for each replicate sample and compared to the statistic calculated for the whole sample. The replicate estimates are then compared to the whole sample estimate and the sampling variance is calculated using the formula:

$$\sigma^2_{(\hat{\theta})} = \frac{1}{G(1-k)^2}\sum_{i=1}^{G}(\hat{\theta}_{(i)} - \hat{\theta})^2$$

Dependent Variables

The *PISA* instrument is a paper-and-pencil test lasting for two hours. A team of international experts, who have agreed that test items should reflect the functional knowledge and skills necessary for active participation in society, defined the academic domains that *PISA* measures (for more detail on the *PISA Assessment Framework* see OECD, 2003).

PISA 2003 utilized a rotating booklet design with 13 different booklets (subsets from the item pool), which are systematically linked by sets of common items. For reasons related to this incomplete (rotating booklet) design, *PISA* employs Item Response Theory (IRT) methods to generate an estimate of student ability (see OECD, 2005b). The IRT scaling procedures used in *PISA* 2003 factor in both the number of correct answers that a student gives as well as the difficulty of each item administered to that student. Estimates of item difficulty are determined in relation to how students of differing ability do on each item, while correspondingly, the level of student ability is estimated in relation to a student's performance on items of varying levels of difficulty (see OECD, 2005b, pp. 60-67). In addition to IRT procedures, *PISA* also used plausible values (see OECD, 2005b). The methodology of plausible values assumes that, given uncertainty due to sampling error and the incomplete design of *PISA*, any single estimate is just one possible value amid a distribution of possible values (plausibly accurate estimates). Rather than produce a single estimate (a point estimate) of a student's ability on a given academic performance scale, the plausible values method produces several estimates. It does this by randomly selecting several values (five in the case of *PISA*) from the distribution (assumed to be normal) of plausible values, and each value is considered representative of the range of possible values (scores).[5] Thus, rather than each student obtaining a single ability estimate (scale score) for each academic domain, he or she is given five estimates.[6] Moreover, unique parameter estimates must be calculated for each plausible value; for example, if one wishes to calculate a correlation coefficient between SES and reading performance, a separate coefficient must be calculated for each plausible value and then the average of the five coefficients is reported as the parameter estimate.[7]

For the mathematics scale (*mean* = 512.9; *SE* = 1.1), the measurement of skills is conceptualized in terms of "a wider, [sic] functional use of mathematics . . . [which] . . . requires the ability to recognize and formulate mathematical problems in various situations" (OECD, 2004, p. 26). Mathematics performance was the primary domain of assessment in the PISA 2003. The test item pool for the mathematics scale consisted of 85 items.

For the reading scale (*mean* = 509.1; *SE* = 1.2), literacy skills were conceptualized as "[m]uch more than decoding and literal comprehension, reading involves understanding and reflection, and the ability to use reading to fulfil one's goals in life" (OECD, 2004, p. 26). The test item pool for the reading scale consisted of 28 items.

The science scale (*mean* = 499; *SE* = 1.3) conceptualizes scientific literacy as an "understanding of scientific concepts, an ability to apply a scientific perspective and to think scientifically about evidence" (OECD, 2004, p. 26). The test item pool for the science scale consisted of 35 items.

Predictor Variables

In addition to the academic assessment component of *PISA*, students filled out a 20-minute student background questionnaire about themselves, their family, and their home. School principals also completed a 20-minute questionnaire concerning key characteristics of their schools. The questionnaires and codebooks are available in the *PISA 2003 Data Analysis Manual* (OECD, 2005b).

The socio-economic status (SES) index[8] consists of three measures related to family background: (a) highest level of parental education, (b) highest parental occupation status, and (c) an index of home possessions ($\propto$ = .75). The SES (ESCS) index is OECD-standardized; a person who scores zero on the index is at the OECD average for SES. Next, sex of the respondent was a single dichotomous variable recoded as 1=female, 0=male. The province variable was originally a single nominal variable with each province assigned a unique value ranging from 0 to 10. This variable was recoded into a series of dummy variables for entry into regression, with Alberta being the reference variable (because it had the highest average scores on all three academic criteria). Student level of educational aspiration was coded as a Likert type variable with possible values as follows: 0 = Primary, 1 = Lower Secondary, 2 = Vocation/Prevocation Upper Secondary, 3 = Upper Secondary or Non-Tertiary Post-Secondary, 4 = Vocational Tertiary, and 5 = Theoretically Oriented Tertiary and Post Graduate.[9] For use in regression, this ordinal variable was converted into a more interval scale of approximate years of schooling, and centred to the mean for the Canadian sample.

We performed three OLS regressions, one for each of three academic domain scores (mathematics, reading, and science). The regressions were conducted utilizing SPSS (Statistical Package for the Social Sciences) macros that incorporated plausible values and BRR (Balanced Repeated Replication) replicate weights to produce unbiased standard error estimates (OECD, 2005b; Willms & Smith, 2005). The set of predictor variables was the same for each regression: (a) socio-economic status, (b) educational aspirations, an SES-Education Aspirations interaction term, (c) sex of student, and (d) province. Examinations of regression residual scatterplots indicate that the multivariate assumptions of normality, linearity, and homoscedasticity of residuals are adequately met. *Tolerance* (close to 1) and *VIF* (less than 2) values indicate that multicollinearity is also not a concern for any of the non-dummy predictor variables in the initial regressions.

FINDINGS

The results of the regression analyses are largely consistent with the general argument that educational achievement remains unevenly distributed in Canada across socio-economic, gender, and regional lines. In terms of the specific hypotheses, as expected, higher socio-economic status predicted higher scores on all three academic outcomes, as was higher level of educational aspiration. Further to this finding, socio-economic status moderated the effect of educational aspiration on mathematics and science but not on reading, with the effect of this interaction being greatest at lower levels of socio-economic status. Also as expected, traditional gender disparities in academic performance persist, with males significantly outscoring females in mathematics and science, while females significantly outscored males in reading. The reading gap for boys (at 25 points) was larger than either the science or mathematics gap for females, both 18 points. Significant differences, as predicted, were also evident across provinces for student scores on all three academic criteria, although the pattern of inter-provincial differences was only partly consistent with expectations.

Table 1 provides regression results for all models. Results of the regression model for reading scores reveal that, as hypothesized, SES, expected years of schooling, sex, and province are statistically significant predictors of student science scores, while, contrary to our expectations, the SES-Education Aspirations interaction is not. More specifically, (a) for every 1-unit increment on the SES index, a student's reading score increases by 24 points; (b) a 1-year increment in expected number of years of schooling is associated with an increase in reading score of 12 points; (c) girls display a 25-point advantage over boys in the reading score; and (d) students in all provinces except Quebec and British Columbia score significantly below their Alberta counterparts, with Prince Edward Island showing the largest gap at 43 points. *Thus, consistent with our hypotheses, higher SES, higher educational aspirations, and being female are associated with higher reading scores, while attending school in any province other than British Columbia or Quebec is associated with a significant decrement in reading score relative to Alberta students.*

As expected, when looking at the regression model for mathematics outcomes, we observed that SES, expected years of schooling, the SES-Education Aspirations interaction, sex, and province are statistically significant predictors of student mathematics scores. That is, (a) a 1-unit increment on the SES index is associated with a mathematics score increase of 24 points; (b) a 1-year increment in expected number of years of schooling is associated with an increase in mathematics score of 13 points; (c) boys show an 18-point mathematics score advantage over girls; and (d) students in all provinces except Quebec score significantly below their Alberta counterparts, with Prince Edward Island again exhibiting the largest gap of 42 points. *Thus, consistent with our hypotheses, higher SES, higher educational aspirations, and being male are associated with higher mathematics scores, while attending school in any province other than Quebec is associated with a significant decrement in mathematics score relative to Alberta students. As well, the effect of educational aspiration on the mathematics score is moderated by SES.* An increase in expected years of schooling has the greatest positive effect on mathematics score for lower SES students and the least effect for higher SES students. For example, for a lower SES student (20th percentile), the mathematics score difference associated with high (80th percentile) versus low (20th percentile) level of educational aspiration is 28 points, while the corresponding difference for a high SES (80th percentile) student is only 20 points.

Table 1
Unstandardized Regression Coefficients and Standard Errors for Reading, Mathematics, and Science Models

	Reading		Math		Science	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Constant	509.1***	1.2	512.9***	1.1	499.0***	1.3
SES	23.7***	1.5	24.4***	1.5	30.3***	1.7
Aspiration	12.0***	0.6	12.6***	0.6	13.0***	0.7
Interaction	1.1	0.6	2.6***	0.6	2.4**	0.8
Sex	24.8***	1.9	-18.2***	1.9	-18.3***	2.5
NFL	-13.8***	4.1	-23.0***	3.5	-14.00**	4.4
PEI	-43.3***	3.7	-42.0***	3.3	-41.9***	4.4
NS	-24.4***	4.0	-28.0***	3.3	-26.1***	4.3
NB	-32.2***	3.8	-28.9***	3.1	-30.8***	4.3
QB	-7.1	5.1	0.1	4.8	-5.9	6.1
ON	-13.3**	4.2	-17.9***	3.8	-21.9***	4.9
SK	-22.6***	4.6	-23.9***	4.2	-23.1***	5.1
MB	-16.1***	4.5	-13.5***	4.0	-18.0***	5.2
BC	-5.3	3.5	-8.1*	3.4	-9.2*	4.3

* $p \leq .05$ ** $p \leq .01$ *** $p \leq .001$

In the regression model for science scores, as hypothesized, we find that SES, expected years of schooling, the SES-Education Aspirations interaction, sex, and province are statistically significant predictors of student science scores. More specifically, (a) a 1-unit increment on the SES index is associated with a science score increase of 30 points; (b) a 1-year increment in expected number of years of schooling is associated with a 13-point increase in science score; (c) boys show an 18-point science score advantage over girls; and (d) students in all provinces except Quebec score significantly below their Alberta counterparts, with Prince Edward Island showing the largest gap at 42 points. Furthermore, the effect of educational aspiration on science scores is modified by SES.

That is, an increase in expected years of schooling has the greatest positive effect on science scores for lower SES students and the least effect for higher SES students. For example, for a lower SES student (20th percentile), the science score difference associated with high (80th percentile) versus low (20th percentile) level of educational aspiration is 27 points, while the corresponding difference for a high SES (80th percentile) student is only 19 points. *Thus as hypothesized, higher SES, higher educational aspirations, and being male are associated with higher science scores, while attending school in any province other than Quebec is associated with a significant decrement in science score relative to Alberta students.* As well, the effect of educational aspiration on science scores is moderated by SES.

DISCUSSION

As detailed above, the results of the present regression analyses, which largely confirm the authors' hypotheses, are basically consistent with previous findings in the literature that highlight the uneven distribution in Canada of educational achievement along socio-economic, gender, and regional lines. The observed pattern of differences between boys and girls in academic performance would seem consistent with previous findings that underscore the persistence of gendered socialization tendencies that orient boys toward mathematics and sciences, and girls toward arts and humanities. This finding lends further credence to the argument that, despite some improvement, societal gender typing is still operant in the educational system, needlessly constraining the cognitive potentials and educational horizons of both boys and girls.

In terms of inter-provincial differences, as expected, the have-not provinces were consistently behind Alberta in academic performance in all domains. Prince Edward Island was consistently the furthest behind followed by New Brunswick, Nova Scotia, and Saskatchewan. Newfoundland/Labrador and Manitoba also trailed Alberta, although to a slightly lesser degree than the other provinces. Contrary to expectations, Quebec students did not score significantly below Alberta students in any of the academic domains. Also contrary to expectations, student scores in the have province Ontario were significantly below those of their Alberta counterparts, while British Columia student scores were significantly lower in mathematics and science.

The significant result for the effect of SES on student scores suggests that social class remains an important determinant of educational achievement**.** Higher socio-economic status (SES) predicts significant increments in academic performance, while the interaction between educational aspiration and SES can also be seen as related to the asymmetrical impact of social class on educational trajectories. The finding that level of student educational aspiration has the greatest effect on test scores in mathematics and science for students from lower SES backgrounds may be, in part, a consequence of the disparate baselines from which higher and lower SES students consider their educational (and subsequent occupational) possibilities. For instance, students from higher SES backgrounds, whose parents are university graduates with professional occupations, may find it rather commonplace, even taken for granted, that they will attend university; thus reporting this level of aspiration is not necessarily indicative of high levels of motivation and commitment and hence offers less differentiation between higher and lower performers. Conversely, for a student coming from a working class background where university graduation is the exception rather than the rule, university-level aspirations can perhaps be seen as more indicative of a high level of motivation and commitment; thus it follows that reported levels of educational aspiration would provide a greater degree of differentiation (i.e., steeper performance slope) between higher and lower performers at lower SES levels. Furthermore, some students from lower SES backgrounds may express lower levels of educational aspiration because they do not perceive education as a possibility or a necessity for the kinds of employment they anticipate for themselves (an outlook Bourdieu would attribute to their class-based habitus); hence their motivation for and commitment to performing well in school may be correspondingly diminished. Put another way, the perceived penalties for underperforming academically may pose less of a deterrent to lower SES students who are not anticipating substantial return from continued formal education, while the cost of underperforming for higher SES students may be perceived more intensely (due to parental and peer influence) and thus may act to compress the distribution of higher SES student scores (i.e., raises the floor). This explanation is consistent with the literature citing the effects of class-based differences in frames of reference on student motivation and aspiration levels (see Davies, 1999, for a review). In addition to the motivational differences noted above, it may also be that lower SES parents, for a number of reasons (e.g., see Lareau, 1997), have less capacity (financially, socially, and otherwise) and/or less inclination than higher SES parents to intervene (e.g., help with homework, pay for extra tutoring, meet with teachers) about their child's academic underperformance, thus further amplifying the importance of aspiration-related motivation and commitment levels for lower SES students.

Limitations

The findings of this study should be considered in light of their particular limitations, foremost among them the fact that several variables regarding student attitude and behaviour were not included in the regressions because too many cases were missing (e.g., attitude toward school, perception of student-teacher relations). Additionally this study does not consider the potential influence of institutional features on educational outcomes. Multilevel modelling might prove instructive regarding the question of why level of educational aspiration is more significant for lower SES students than for higher SES students. Could the steeper slope be related to contextual or school composition effects? Multilevel modelling could perhaps also help assess the degree to which higher aspiring/higher performing, low SES students may be benefiting from more conducive educational environments than their peers. May, for instance, the aspiration/performance gradient among low SES students be related to the SES profile of the schools or classrooms they attend, with some lower SES students (those on the higher end of the aspiration/ performance gradient) benefiting from attendance with higher SES peers (see Willms, 2002)? As well, underlying the issue of unequal achievement is the possibility of inequality of educational opportunity; accordingly it might also be fruitful in future research with *PISA* to incorporate variation in quality of school resources as a proxy for educational opportunity into any multilevel models. In particular, assessing interprovincial or rural-urban variation in quality of school resources may prove insightful regarding the regional dimensions of unequal educational opportunity.

Implications

Although it is beyond the scope of the present article to provide specific detailed policy recommendations, the results pertaining to SES-contingent academic advantage and the greater relative importance of educational aspirations for lower SES students point to the continued importance of the need to better engage students from lower SES backgrounds in the educational process, to expand their aspirational horizons, and to support them in their day-to-day learning. This recommendation requires not only additional resources for teaching but also additional resources for outreach to lower SES parents. Although schools cannot reasonably hope to completely overcome the persistent gaps in family resources (financial, cultural, and social) that place lower SES students at a disadvantage from the very start of their educational careers, they can strive to mitigate the worst of these deficits by finding new ways to involve lower SES parents in the schooling process and by helping lower SES students and their parents expect more from themselves and the education experience. Parental engagement with schools is key to children's educational success. But, as the work of Lareau (2001) and others suggests, lower SES parents too often feel on the outside looking in at their children's education; this sense of alienation is not conducive to their fostering and supporting their children's day-to-day learning nor their children's longer-term educational success. This insight is not new, but one that bears continual heralding if it is to register amid the cacophony of competing demands confronting public policy makers today.

Similarly, evidence of persisting gender differences in academic performance reminds educators that although changes in societal expectations and improvements in gender equitable educational practices have increased female participation in mathematics, science, and traditionally male-dominated occupational fields, there is still a way to go. Moreover, some gender equity policies intended to encourage girls' academic success may even have the contradictory result of exacerbating the reading performance gap for boys (Gambell & Hunter, 1999). Educators must continue to ensure that boys and girls are encouraged and supported to realize the full range of their learning potential, unhindered by narrow gender preconceptions. There has been an impressive diversity of pedagogical responses to this challenge and a growing appreciation of the need to accommodate differences in *how* – as opposed to simply *what* – boys and girls learn (Kitchenham, 2002). Continued support for such initiatives will require that the issue of gender equity in education maintains a prominent place within the public debate.

Gender differences are not only an issue of gender equity but also an issue of lost scientific, social, and economic productivity. Social conditioning of individuals into gendered educational trajectories and occupational paths yields a suboptimal allocation of human capital with the result that Canada is deprived of the ultimate potential of many individuals who might have otherwise more truly realized their natural aptitudes and interests (e.g., female engineers or male elementary school teachers).

The observed interprovincial differences in academic proficiency are in general consistent with long standing disparities between provinces in fiscal capacity, and they highlight traditional concerns about the ability of have-not provinces to provide their citizens with public services that will place them on even footing with their wealthier provincial counterparts. As the Council of Ministers of Education, Canada (2001b), notes, one of the "fundamental values" guiding Canadians expectations for universal public education is "the concept of *uniformity of educational resources* – a person's place of residence should not adversely affect the quality or choice of programs" (p. 12, [emphasis in the original]). Furthermore, Section 36(2) of the *Constitution Act, 1982* (Canadian Charter of Rights and Freedoms) commits the federal government "to the principle of making equalization payments to ensure that provincial governments have sufficient revenues to provide reasonably comparable levels of public services" (Government of Canada, 1982, Section 36[2]). When it comes to education, this commitment is visible at the post-secondary and vocational levels but not at the K-12 level. Considering the cumulative nature of educational disadvantage, this gap would appear to be an issue of utmost importance. Given the evidence of regional disparities in educational outcomes such as those found in the present study, it would seem incumbent upon the federal government (in collaboration with the provinces) to find new ways to realize its constitutionally mandated commitment to ensure equality of educational opportunity to all Canadian students, regardless of what region of the country they live in,[10] and, of course, regardless of their gender or socio-economic status.

In sum, the present findings underscore for policy makers the continued importance of redoubling efforts to reduce the import of gender, class, and regional inequalities in shaping the educational outcomes and life chances of young Canadians.

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NOTES

[1] For example, Canada ranked fourth best among 24 OECD countries in the fourth *Innocenti Report Card* (UNICEF, 2002), the USA was 18th.

[2] Another important factor – ethnic/racial background – is not included as a variable in the PISA 2003 data set.

[3] Secondary education ends at grade 11 in Quebec (CMEC, 2001b).

[4] Higher GDP provinces have a growing fiscal advantage in the current climate of inter-provincial tax competition (see Mackenzie, 2006).

[5] "[P]lausible values are a representation of the range of abilities that a student might reasonably have . . . instead of directly estimating a student's ability θ, a probability distribution for a student's θ, is estimated. That is, instead of obtaining a point estimate for θ, (like WLE), a range of possible values for a student's θ, with an associated probability for each of these values is estimated. Plausible values are random draws from this (estimated) distribution for a student's θ" (Wu & Adams, quoted in OECD, 2005b, p. 75).

[6] Simply calculating the mean of the plausible values at the student level and using this value to estimate population statistics results in biased estimates (see OECD, 2005b, chap. 5).

[7] In fact, due to the utilization of the BRR resampling method to estimate sampling variance, each statistic is calculated 405 times (80 replicates x 5 plausible values + 1 full sample x 5 plausible values).

[8] Called the ESCS (economic, social, and cultural status) index in the PISA data set, the index has an alpha coefficient of .62 which is sufficiently close to .70 to enable researchers to interpret it (with due caution) as an adequate index of socio-economic status. Precedence for this decision can be found in the *PISA 2003 Data Analysis Manual* (OECD, 2005), which utilizes the same alpha value

[9] See OECD (1999) for more information on the OECD education level classification system.

[10] Mackenzie (2006) makes a similar argument regarding the funding of public services in general. He suggests several strategies by which the federal government might intervene to restore greater equality of "fiscal capacity" among provinces.

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