

School Program Choice and Streaming:  
Evidence from  
French Immersion Programs

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## ABSTRACT

This study uses data from Cycle 3 (1998/99) of the National Longitudinal Survey of Children and Youth to compare children and their families in French Immersion programs to those in English language programs. A model of school program choice is presented and used to show that the existence of French Immersion programs operating in parallel with the regular English program may result in a selection or “streaming” of higher ability children into French Immersion. Evidence is found that children in French Immersion have higher scores in reading and mathematics tests and that their parents are more likely to have university degrees than are children in English programs. In addition, children in French Immersion programs are from families with higher income and lower rates of receipt of government benefits. The results indicate that a one standard deviation improvement in a child’s reading score is associated with a 14 to 23 percent increase in the child’s probability of being enrolled in French Immersion.

## **1. Introduction**

Allowing parents to choose the type of education that their children will receive has great appeal to many parents and educators. Parents often understand their children's strengths, as well as the areas in which remedial help is needed, and incorporating the parents into the decision making is could be helpful in terms of developing a successful, child-specific education program. In order to facilitate this, many school districts have introduced heterogeneity in the school programs on offer in order to allow parents to choose the program that is best suited to their children. However, a concern related to school program choice is that this may lead to inequities in the school opportunities of different children. For example, if children from lower income families are less likely to choose newer programs perhaps due to a lack of familiarity on the part of their parents or because of added costs associated with the programs, then it may be that differential educational opportunities will be generated due to the availability of program choice.

One of the challenges related to testing for these relationships between school program choice and educational outcomes is the lack of data on these programs. Many programs either have low enrollment making the children difficult to identify in national data sets or the programs are relatively new making them also difficult to analyze thoroughly. One exception is French Immersion which is a program that is offered by many English language school boards in Canada. In French Immersion, children are immersed in French as a form of second language training at a relatively early age with the goal of generating fluency in French. Typically, the child's mother-tongue is not French and the children must adjust quickly to the new language or face switching out of

the program – usually back into the English program. These French Immersion programs were introduced starting in the 1970s as a way to try to increase the overall bilingualism of the country. Therefore, the origins of the program are not so much driven by a commitment to school choice as by the desire to increase the number of Anglophones who are fluent in French. Nevertheless, the creation of these French Immersion programs, operating in parallel with (primarily) English programs, has been one of the main dimensions along which parents can exercise choice over the education of their children.

An important feature of French Immersion programs is that they are academically demanding. The children are expected to achieve the same minimum level of performance over the same curriculum as children in other programs while also having to master a second language, French. Consequently, school officials often warn parents not to enroll children in French Immersion programs if the child is struggling in school, if the child has learning disabilities or emotional/behavioural difficulties. Therefore, it is reasonable to expect that children in French Immersion programs will have higher performance on academic tests such as mathematics tests as well as having higher scores on measures of emotional and behavioural tests. One of the goals of this study is to provide nationally representative estimates of the nature and magnitudes of any differences across children in French Immersion programs and those in English programs.

An extensive literature in education research exists on second language training and on language immersion programs. For a good review of the literature on French Immersion in Canada see Swain (2000). A well-known concern is over the possibility that a French Immersion program running in parallel to a traditional English program will

lead to the “streaming effect” where the higher ability/higher socio-economic status children enter the more demanding French Immersion program. The streaming issue is frequently mentioned in the literature (see, for example, Lawton, 2001). However, this paper fills an important void in the literature by comparing the characteristics of children in each program using nationally representative data.

A growing literature on the economics of school choice exists. Hoxby (2000) analyzes the impact of greater choice in terms of number of school districts within a metropolitan area on school performance based on the argument that greater choice leads to increased competition among schools and better educational services provided to students. She finds evidence in support of greater school choice leading to better outcomes for students.<sup>1</sup>

The current study also contributes to the literature on the economics of school choice by analyzing the factors that affect a family’s decision to place a child in a “specialty” program. In addition, this study contains an analysis of a popular, long-standing program (French Immersion) and analyzes the extent to which its existence has led to a streaming of students by program type along the dimensions of the child’s ability and socio-economic status.

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<sup>1</sup> See also Epple and Romano (1998) and Hoxby (1999).

## 2. Model

### 2.1. The Program Choice

A model is presented of the decision by families over whether to place a child in French Immersion or instead place the child in an English language program.<sup>2</sup>

Consider a group of families each with one child with all of the children being in the same grade at a particular school. Two school programs exist at the school. Each family must choose whether to place their child in: 1) the English program ( $FI_i=0$ ) versus 2) the French Immersion program ( $FI_i=1$ ).

The family's level of utility (or welfare) is assumed to be a function of: 1) the child's success in school, represented by the index  $S_i$ , 2) the child's French Immersion enrollment status, and 3) family consumption,  $C_i$ .<sup>3</sup> The family utility function is assumed to take the following form:

$$U_i \equiv \gamma_i FI_i + S_i + V(C_i) \quad (1)$$

for family  $i$ ,  $i=1, \dots, N$ ; where  $\gamma_i$  is a family specific preference parameter that depends in general on a set of family characteristics (such as each parent's mother tongue),  $X_i$ , such that  $\gamma_i = X_i \gamma$ .

The child's success in school,  $S_i$ , is determined, by his or her skill at learning, which will be referred to as the child's human capital and denoted as  $K_i$ . The level of

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<sup>2</sup> A number of decisions may have been made prior to this French Immersion decision that are not modeled explicitly such as: 1) the place of residence of the family, 2) the decision to send the child to a public school versus a private school, and 3) the decision to attend a public school from a Catholic school board rather than a regular (non-denominational) school board. Parents may have knowledge of the different program offerings at different school boards prior to the choice of school board, or choice of residence. However, we argue here that the French Immersion decision is typically made after the child has been at an English language school board school for at least one year and, therefore, this decision can be thought of as being separate from the earlier decisions.

<sup>3</sup> In principle, the model could be extended to analyze the allocation of family income to different types of consumption goods (i.e. educational versus other). This information is not available in the NLSCY data and, therefore, the issue is not addressed in this paper.

human capital of a child is determined by the skills acquired in the child's household environment and by his/her innate ability. A human capital production function exists that describes how families can add to their child's human capital through activities such as helping with homework, hiring tutors and purchasing educational materials for use outside of the school.<sup>4</sup> Therefore, we can express the child's human capital as:

$$K_i \equiv Z_i\pi + \pi_E E_i \quad (2)$$

where  $E_i$  is an index representing the education of the parents that is assumed to be distributed with density function,  $f(x)$ , that satisfies the conditions,  $f(x) > 0$ , for all  $x$ ,  $\lim_{x \rightarrow \infty} f(x) = 0$  and  $\lim_{x \rightarrow -\infty} f(x) = 0$ .<sup>5</sup> Parental education level is assumed to have a positive impact on the child's human capital. Parental education being high increases the benefits the child receives from help from homework and overall learning while at home. The vector  $Z_i$  contains controls that impact upon the accumulation of human capital of the child.<sup>6</sup>

Children with more human capital,  $K_i$ , are likely to have higher success in school. In addition, children with higher human capital are more likely to be successful in French Immersion since French Immersion can be thought of as having to learn the same curriculum but also learn a new language. The following equation determines these relationships:

$$S_i \equiv K_i + (\delta + \beta K_i) FI_i \quad (3)$$

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<sup>4</sup> In a dynamic model, quality of previous years of in school instruction would also be important. However, given the static nature of the problem, this issue cannot be introduced into the model.

<sup>5</sup> Other parental characteristics could also be included such as income. In order to simplify the model we will treat parental education as a measure of the family resources that are available to assist the child in learning while outside of the classroom.

<sup>6</sup> In the empirical analysis, a set of indicator variables are included to control for size of area of residence and province of residence in order to capture possible differences in the learning environment across households in different geographic areas.

The parameter,  $\beta \geq 0$ , represents the differential impact that the human capital of the child has on school success in French Immersion compared with the case of the child being enrolled in the English program. The relationship is demonstrated in Figure 1. Assuming  $\beta > 0$ , the marginal impact on the success of the child of an increase in  $K_i$  is larger in French Immersion than it is in the English program. In the case of Figure 1, this means that children with high levels of human capital are more successful in the French Immersion program than in the English program. Children with low levels of human capital are more successful in the English program than in the French Immersion program. The value of  $\delta$  is important in that it determines the intercept of Figure 1, or the difference in success in school in French Immersion versus in the English program, for a child with  $K_i = 0$ .

Using (1)-(3), it is possible to define an index function that is positive if the child is enrolled in French Immersion and negative otherwise:

$$\begin{aligned}
 I_i &\equiv U(FI_i = 1) - U(FI_i = 0) \\
 &= X_i \gamma + S_i(FI_i = 1) - S_i(FI_i = 0) \\
 &= X_i \gamma + \delta + \beta K_i
 \end{aligned} \tag{4}$$

Substituting in for  $K_i$  using (2) gives:

$$I_i = X_i \gamma + \delta + \beta \{Z_i \pi + \pi_E E_i\} \tag{5}$$

## 2.2. Streaming by Program Type: Human Capital and Parental Education

The model can be used to generate predictions regarding the possible streaming of children based on human capital,  $K_i$ , by program. Using (4), the child will be enrolled in French Immersion if  $I_i > 0$  or equivalently if  $K_i > -\{(X_i \gamma + \delta) / \beta\}$ . To simplify the notation,

let,  $X_i\phi \equiv -\{(X_i\gamma + \delta)/\beta\}$ . Therefore, the expected human capital of a child in French Immersion is:

$$E[K_i / K_i \geq X_i\phi] = \int_{X_i\phi}^{\infty} Kg(K / K \geq X_i\phi)dK \quad (6)$$

where  $g(K/K \geq X_i\phi)$  is the conditional density function that can be derived using (2) and  $f(E)$ . Given, that only children with human capital levels above  $X_i\phi$  are enrolled in French immersion, and children with human capital levels below  $X_i\phi$  are enrolled in the English programs, it is the case that streaming exists on higher human capital children into French Immersion.

A similar argument can be used to show that the selection of students into the different programs leads to French Immersion students having higher expected parental education. Using (5), the decision to enroll a student in French Immersion can be expressed in terms of a range of values of parental education,  $E_i > -\{X_i\gamma_i + \delta + \beta Z_i\pi\}/\beta\pi_E$  for the case of  $\beta > 0$ . For simplicity, let  $M_i\eta \equiv -\{X_i\gamma_i + \delta + \beta Z_i\pi\}/\beta\pi_E$ . Therefore, the expected parental education of a child in French Immersion is:

$$E[E_i / E_i \geq M_i\eta] = \int_{M_i\eta}^{\infty} Ef(E / E \geq M_i\eta)dE \quad (7)$$

where  $f(E/E \geq M_i\eta)$  is the conditional density function of  $E$ . It is straightforward to show that this is greater than both the expected value of parental education for all children and the expected value of parental education of children in the English program.

It is important to note that these predictions from the model rely on the fact that  $\beta > 0$  which implies that there is a differential impact of human capital on success in school in the French Immersion program, from equation (3). Children with high human

capital (who are also children of parents who have higher education) are more likely to be in French Immersion since French Immersion is a more difficult program than the English program, and success in that program is more sensitive to the child's level of human capital than is the case for the English program. For example, if success were the same for a given child in each program ( $\beta=0$  and  $\delta=0$ ) then the decision to enroll a child in French Immersion (see equations (4) and (5)) would not depend on either the child's human capital or the parental education. Therefore, no streaming would occur.

### **3. Data and Sample Selection**

The data employed are taken from Cycle 3 of the National Longitudinal Survey of Children and Youth (NLSCY) of Statistics Canada. The Cycle 3 sample contains 31 963 children age 0 to 15 living in a province of Canada in 1998/99. The Survey was originally conducted in 1994/95 and has been repeated every second year. Cycle 3 occurred in 1998/99 and collected detailed information on children, their families, their schools and neighbourhoods. The most recent cross-section of the survey was selected since it is the most up to date snapshot of Canadian children that is available. In addition, Cycle 3 is the first cycle of the NLSCY data to contain questions on enrollment in language immersion programs. The Cycle 3 data have a set of cross-sectional weights and these are employed in the analysis.

At the time of interview, one adult in the child's household is identified (by the family) as the "Person-Most-Knowledgeable" (PMK) about the child. For over 90 percent of the children, this person is the child's biological mother. Detailed demographic

information is collected on the PMK and the PMK's spouse. This information is used in the analysis to capture parental information for the child.<sup>7</sup>

The sample employed in this paper is comprised of school-age children. The PMK is asked a series of questions on the type of education that the child is receiving. From the answers to these questions, it is possible to identify whether the child is in a publicly funded school. Only children currently enrolled in publicly funded schools (both Catholic and non-Catholic) were included in the sample.

In Cycle 3, the PMK was also asked whether the child was in a French Immersion program. From column (1) of Table 1, we see that 10 percent of children in the sample are enrolled in French Immersion. The remainder of the first column of Table 1 gives the breakdown of the French Immersion enrollment by province. Enrollment in French Immersion is high (relative to the national average) at 19.5, 18, and 16.8 percent in Prince Edward Island, New Brunswick and Manitoba. The percentage of students in French Immersion in both Quebec and Ontario is near the national average. In interpreting the Quebec figures, it is important to recall that French Immersion is a program offered in English language school systems for students whose first language is typically not French. Therefore, the percentage for Quebec is low due to the high percentage of students studying in French language schools in the French language system. It is also worth noting that for these francophone students in Quebec, an equivalent school choice of immersion in English (instead of the main French language program) is not currently

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<sup>7</sup> Information exists for the PMK and the PMK's spouse if present. In order to allow for differences in effects of variables in the analysis according to the gender of the parents, PMKs and spouses were assigned as mother or father of the child in the following way. In terms of the definitions used in the analysis, the child's mother is defined to be the child's PMK if the PMK is female or the PMK's spouse if the spouse is present and female. The child's father is defined to be the child's PMK if the PMK is male or the PMK's spouse if the spouse is present and male. If the PMK's gender was the same as the PMK's spouse's gender,

available. Therefore, the model described in (1) is not applicable for these students. The same can be said for students studying in French schools in other parts of Canada that are not part of a French Immersion program. For example, in Ontario, publicly funded French language schools operate. However, these schools are typically in different school boards from the English-language schools. Therefore, students in English-language school board schools do not have the option of entering into the French-language school board programs.

In order to focus in on the implications of school choice (in the form of access to a parallel French Immersion program) on streaming of students in programs according to ability and socio-economic background, children in French-language schools who are not in French Immersion programs are excluded from the sample. The sample means by province for the remaining students are presented in the second column of Table 1. The national proportion of the students who are in French Immersion rises from 10 percent to 12.7 percent. The largest increases at the provincial level occur in the provinces where there is a large proportion of the province's children who are enrolled in French-language school board schools. By far the largest increase is for Quebec, where the proportion in French Immersion rises from 10.7 percent to 74 percent after children attending French-language school board schools are excluded from the sample. Also, New Brunswick's proportion increases from 18 percent to 25 percent.

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the child was excluded from the analysis. The very small number of children in this category makes it prohibitively difficult to analyze this group separately.

#### 4. Evidence on Streaming by School Program Type

Table 2 contains mean characteristics of the children (not in French schools) broken down by whether the child is enrolled in French Immersion.<sup>8</sup> The proportion of French Immersion students who are female is 53.3 percent compared with 47.1 percent for the English program children. This may be due to girls generally having more developed language skills at an early age than boys. Given that a child's capacity to learn a new language in an immersion environment relies heavily on language ability, it may be that girls are more able to handle this extra demand associated with the French Immersion program.

Children in French Immersion have parents who are generally more educated than children not in French Immersion. This is most pronounced at the university degree level where 23 percent of children in French Immersion have mothers with university degrees compared with 15.3 percent for children in English Programs. A similar pattern exists for father's education. This is preliminary evidence of an endogenous selection of children of high socio-economic status into French Immersion.

Table 3 contains mean characteristics of children's parents based on mother tongue.<sup>9</sup> It is likely that parents whose mother tongue is French find French Immersion relatively more attractive since they may wish to ensure that their children develop fluency in French. This is especially likely in families where one parent has English as a mother tongue and one parent has French as a mother tongue. For at least some of these families, it will be the case that they choose to send their children to a school in an

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<sup>8</sup> The remaining analysis employs the sample from column (2) of Table 1 which excludes children not in French Immersion who are studying in French.

<sup>9</sup> If the parent reported both English and French as mother tongues, then the parent was assigned as having French as a mother tongue.

English language school board. However, they may also choose to place the child in a French Immersion program at the local English language school board in order to ensure that the child develops fluency in French. Children in French Immersion programs are more likely to have a mother whose mother tongue is French (22.1 percent compared with 2.7 percent). A similar difference exists for the father's mother tongue. It is worth noting that roughly the same percentage of children in each program have parents with a mother tongue other than English or French. This indicates that children in immigrant families from non-traditional source countries may be as likely to be in French Immersion as in an English Program.

Table 4 contains mean characteristics of the children's parents in terms of income of the mother, income of the father and whether either parent received social assistance and employment insurance benefits. Mothers of children in French Immersion have incomes that are on average over \$4,300 higher (in 1998 Canadian dollars) than do mothers of children in English programs. The fathers' incomes are also higher on average for children in French Immersion with the difference being somewhat smaller at approximately \$3,400 and this difference is significant only at the 10 percent level. Parents of children in French Immersion are less likely to be receiving social assistance (5.9 percent compared with 9.6 percent for the children in the English Program). A similar pattern is also present for receipt of Employment Insurance however the differences are smaller, 10.5 percent for French Immersion children and 12.9 percent for English Program children. Since social assistance is a means-tested program, the receipt of it is more strongly related to low-income status than is the receipt of Employment Insurance. Therefore, this difference in rates of receipt of social assistance between the

families of children in French Immersion relative to children in the English Program is evidence of a streaming on socio-economic status of the family.

The results to this point indicate that children in French Immersion programs differ on average from children in English programs along a number of dimensions of parental characteristics. Preference factors – or factors likely to be related to parents’ preferences over enrollment in French Immersion – such as having French as a mother tongue are associated with children being enrolled in French Immersion. In addition, the family’s economic situation is also correlated with French Immersion enrollment. Children in French Immersion have parents with higher incomes and lower probabilities of collecting both social assistance and employment insurance.

One final area in which a comparison of children in French Immersion and English programs can be made is in terms of the children’s academic test scores and other characteristics. In particular, the NLSCY data contain detailed information on the children’s school performance defined in terms of scores on formal tests in mathematics and reading as well as in terms of behavioural and emotional development. Table 5 contains means of various measures of both test scores and expectations of future educational achievement of the child. For each of the test scores, the scores were re-scaled to have a mean of 50 and a standard deviation of 10. The first two scores are for reading and mathematics. These tests were administered to children in grade 2 or higher if the parent gave permission for the tests to be conducted. For both tests, the mean scores are higher for the children in French Immersion (52 for mathematics and 52.3 for reading) compared with the children in the English Program (49.7 for both mathematics and reading). These differences of approximately one quarter of a standard deviation in

each of the test scores between the two groups of students are consistent with the predictions of the model that higher ability children select themselves (or are selected by their parents) into French Immersion. It is interesting that the differences are virtually the same for the two different tests. One would expect that any ability advantage on the part of the French Immersion students might be larger in the area of reading given the need for strong reading skills in a second language immersion program. The fact that the same difference is present for mathematics indicates that this is not the case.

An important issue related to interpreting these differences is that the children's performance in reading and mathematics on the tests will be in general a function of the quality of the past instruction and the quality of the learning environment. For example, it may be that the French Immersion children are having higher tests scores in reading and mathematics because of higher quality teaching or possibly a better classroom environment. It is difficult to control for these determinants of test score performance.

The next six rows of Table 5 give mean scores along a number of dimensions of behavioural, emotional and social development. These scores are described in detail in the NLSCY documentation and are indexes based on a series of specific qualitative questions asked of the PMK related to the child's behaviour. The mean scores for these measures are typically very similar for children in French Immersion programs compared with children in English programs. This is somewhat surprising since children with learning disabilities and behavioural problems are often thought to have difficulty adjusting to the French Immersion curriculum. The largest difference is for the case of Conduct Disorder/ Physical Aggression score index in which children in French

Immersion programs have a mean for this score that is 1.28 points higher than the mean for children in the English programs.

The final two rows of Table 5 give the mean number of years of education that the teacher expects the child to eventually attain and the number of years that the mother “hopes” that the child will eventually attain. Given the similarities between the means of the two test scores it appears that the PMKs interpreted the question as meaning “expect” rather than “hope” and this is the way in which the variable is interpreted in this paper. The PMKs of children in French Immersion expect their children to have 16.56 years of education which is roughly one quarter of a year larger than the 16.32 years of education expected by PMKs of children in English programs. The teachers’ expectations are available only for a subset of the children for which the teachers were interviewed and answered this question. The mean years of education expected by the teacher for children in French Immersion programs is slightly lower than that of the PMKs for each group of children. Also, the difference in the means between children in the French Immersion programs (15.96 years) and the children in English programs (15.23 years) is larger than was the equivalent difference for the PMKs at 0.73 years.

The results to this point indicate that factors likely to impact on preferences for French Immersion on the part of families differ between children in French Immersion programs and children in English programs. Children in French Immersion programs are more likely to have a father and a mother who report French as a mother tongue. This is consistent with the idea that there exists heterogeneity in the Canadian population of families in terms of preferences for different types of education. The fact that we see so many children enrolled in French immersion is consistent with the idea that school choice

is welfare improving in the sense that a wider choice set is available to families and many families find French Immersion a more attractive school program for their child than the English Program would be.

However, as was stated above, the existence of school choice raises the possibility of “streaming” by ability and/or socio-economic status. The results indicate that children in French Immersion programs are typically from higher income families, with mothers and fathers who are more likely to have university degrees. In addition, children in French Immersion families are less likely to be receiving social assistance and employment insurance. These mean differences are preliminary evidence in favour of the “streaming” hypothesis.

In order to translate these mean differences at the aggregate level into expected mean differences in characteristics across programs for children in individual school boards, it must be the case that heterogeneity in each of these variables across regions and residential areas is not correlated with incidence of French immersion program participation. For example, if French immersion programs are more common in more affluent urban areas then the French Immersion sub-sample may be dominated by children from high income families while the English program children may be (relatively) more representative of lower income families. In order to investigate the possibility that heterogeneity across areas of residence may affect the estimated differences in mean characteristics across children in the two programs, regression analyses are carried out that relate different characteristics of the children and their families to participation in French Immersion as well as different sets of controls for: 1) region of residence and size of area of residence, 2) a set of dummy variables for CMAs,

and smaller centers of residence<sup>10</sup> and 3) a set of dummy variables for the school board to which the child's school belongs.

The first column of Table 6 contains the coefficient estimate on the French Immersion indicator variable for regression models of various family characteristics. The general form for the models of Table 6 is:

$$y_i = M_i\gamma + \gamma_{FI}FI_i + \varepsilon_i \quad (8)$$

where  $M_i\gamma$  is an intercept in column (1), an intercept and indicator variables for region of residence and population size in column (2), an intercept and indicator variables for living in a rural area versus living in one of 137 urban centers in column (3), and an intercept and indicator variables for each of the school boards for all students in the sample in column (4).

The sample in each case includes both children in French Immersion programs and children in English programs. These estimates are comparable with the differences in mean characteristics that can be derived from the sample means of the variables in Tables 2 through 5. The first two rows of column (1) give the estimated differences in probabilities of each parent having a university degree. Both mothers and fathers of children in French Immersion are close to eight percent more likely to have a university degree than are parents of children in English programs. Mother's income is approximately \$4,200 higher for children in French Immersion programs than for children in English programs. A positive estimate is found for the case of father's income; however, the estimate is not significant at the 10 percent level. Families of children in French Immersion are 3.5 percent less likely to receive social assistance. They

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<sup>10</sup> The analysis involves introducing intercept shifts for each of values of the CMA-Census code variable

are 2.3 percent less likely to receive employment insurance; however, this effect is only significant at the 10 percent level. As was found in Table 5, French Immersion children have scores that are over two marks higher in mathematics and reading compared with children in English programs. In terms of the behavioural scores, the coefficients are generally not statistically significant. The exception is the Conduct Disorder/Physical Aggression score where children in French Immersion have scores that are 1.2 points lower than those children in the English programs. Finally, both the PMK's hope for the child's education and the teacher's expectation of the child's education are significantly higher for children in French Immersion than in English programs with the difference of 0.72 years being three times the size for teachers compared with PMKs.

In general, these estimated differences are qualitatively unchanged when the estimation is repeated including: 1) controls for region of residence and size of urban residence – column (2), 2) controls for rural residence and each urban centre – column (3), and 3) controls for each school board – column (4). There is some variation in the point estimates across each version of each model; however, no clear patterns are present. Also, the statistical significance of the coefficients on the French Immersion variable in each case are generally unchanged. This indicates that these differences in parental education, mother's income, receipt of social assistance, performance in reading and mathematics and expectations of the children's eventual educational achievement do not appear to be driven by unobserved heterogeneity associated with place of residence.

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for the NLSCY data. This identifies whether the child resides in a rural area or one of 137 urban areas.

## 5. Estimation of Models of French Immersion Enrollment

The results to this point are generally consistent with the “streaming” hypothesis, which argues that children with higher intellectual ability and those from families with higher socio-economic status are more likely to be placed in French Immersion compared with other children. However, given that many of these family characteristics have a positive correlation (i.e. parental education and income) it is not clear which factors are most important in terms of the selection into French Immersion. It is also unclear how important the child’s academic ability is in terms of determining French Immersion enrollment. In order to explore these issues, the next stage of the analysis involves the estimation of models of the decision to enroll children in French Immersion.

Table 7, contains estimates from linear probability models of French Immersion enrollment.<sup>11</sup> In column (1), estimates are presented from a reduced form model of French Immersion enrollment. Girls are three percent more likely to be enrolled in French Immersion than are boys. A child’s probability of enrollment in French Immersion is 25 percent higher if the child’s mother stated that French was her mother tongue and 17 percent higher if the father’s mother tongue was French.<sup>12</sup> The child’s mother having a university degree is associated with a four percent increase in the child’s probability of being in French immersion; however, this effect is only significant at the ten percent level.<sup>13</sup> The child’s father having elementary education or less is associated with a seven percent decrease in the probability of the child being in French Immersion. A somewhat surprising result is that a child having a father with post-secondary education (below the level of a university degree) is associated with a four percent lower probability of being

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<sup>11</sup> The analysis was repeated using logit models with qualitatively similar results.

<sup>12</sup> The default category for each set of mother tongue variables is English.

in French immersion. The final four rows contain coefficient estimates on the variables related to family socio-economic status. It is interesting to note that while mother's income is positively associated with enrollment in French Immersion, it is the only economic variable that is significant and this is only at the 10 percent level. The coefficient estimate indicates that a child with a mother who had no income would have a two percent lower probability of being in a French Immersion program than an otherwise similar child whose mother had \$40,000 in income.

It is surprising that the education variables and the income variables are not playing a larger role to play in determining the child's French Immersion enrollment given the significant differences in education of parents between children in French Immersion and children in English programs from Table 6.

Column (2) of Table 7 contains the estimates from a structural model based on equation (4). The reading test score is employed as the measure of the child's human capital. Alternatively, the child's mathematics test score could be used. The reading score was chosen since French Immersion aptitude is more likely to be related to language skills than to mathematics skills. However, the analysis was repeated using the mathematics score instead of the reading score and the results were qualitatively the same. It should be noted that there are many other aspects of a child's human capital (such as knowledge of history, science, literature, etc.) that might be important for learning. The reading test score is used mainly due to availability. However, it is also a measure of the skills that are most likely to have an important impact on a child's success in school.

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<sup>13</sup> The default category for each set of education variables is secondary education with graduation.

A number of variables are included in the equation to proxy a family's preference for French Immersion for their child. The mother tongue controls for each parent are included as well as the indicator variable for the child's gender.

The reading score is only available for children who underwent the test. Using this variable would greatly reduce our sample size for the estimation of the model. In order to avoid this problem, a first stage reading score model was estimated and used to predict values for the reading score for all children in the sample. One advantage to this approach is that it removes the effect of differences in school environment and curriculum on the reading score since the predicted reading score model does not contain controls for whether the child is enrolled in French Immersion or not. This means that the resulting reading score is determined by the characteristics of the child's family.

Table 8 contains the estimates from the first stage reading model. Both parental education and measures of father's income are found to be statistically significant determinants of the child's reading test score. This procedure for estimating a linear probability model with an endogenous right-hand-side variable (the test score) is based on the approach suggested by Heckman and MaCurdy (1985).

The coefficient on the predicted reading score variable is positive and significant implying a 1.4 percent increase in the probability of being in French Immersion for each one point increase in the reading score. This is a strong relationship given that it implies that a one standard deviation increase in the test score would be associated with a 14 percent increase in the probability of being in French Immersion. This indicates that academic performance is an important determinant of a family's decision to enroll in French Immersion and is further evidence that school choice of this type is consistent

with streaming of high ability/human capital children into the non-traditional school program choice. The remaining coefficient estimates in Column (2) of Table 7 are similar in magnitude to those of Column (1). Families with parents who reported French as a mother tongue have a preference for French Immersion as does the family when the child is a girl.

The identification of the structural model relies on the restriction that parental education and the family economic variables may impact upon the child's performance in the reading test but do not impact upon the family's preference for French Immersion. It is common in the labour supply literature to assume that education and other labour market variables such as wage rates do not enter directly into the family's utility function (see, for example, MaCurdy, 1981). Therefore, this identifying assumption is consistent with that approach.

Column (3) of Table 7 contains estimates from a second version of the structural model of French Immersion enrollment. This model relaxes the assumption that parental education does not directly affect the family's preference for French Immersion for the child. This means that the identification of the effect of the reading score relies on the significance of the economic variables and, in particular, the father's income variable since the other variables are not statistically significant in the reading score model. The coefficient estimate on the reading variable rises somewhat and implies a 2.3 percent increase in the probability of French Immersion enrollment with each one point increase in the reading score. The statistical significance drops from the one percent level in column (2) to the five percent level in column (3). The coefficients on the variables common to the equation in Columns (2) and (3) are qualitatively similar. Also, the

coefficients on the parental education variables are generally insignificant with the one exception being the coefficient on the indicator variable for the father having a post-secondary education. Therefore, the results are consistent with parents' education not being closely related to preferences over the child's enrollment in French Immersion.

## **6. Discussion**

A number of issues related to the interpretation of the structural model should be mentioned. First, the theoretical model assumes that both an English program and a French Immersion program are available at the child's local school. This is true for some children but in general one would expect that while the local school may have an English program, it may be that the child must attend a school further from the child's house in order to be enrolled in a French Immersion program. Unfortunately, the NLSCY data do not include information on the school options available at the local schools. Ideally, one would know the distance that the child must travel to be enrolled in the nearest English program as well as the distance to the nearest French Immersion program. A related point is the fact that French Immersion may not be available as a program at all grades. Once again, detailed information on the program offerings at the neighbouring schools would greatly facilitate the analysis.

In addition, the analysis of this paper has abstracted from other types of school program choices. In many parts of Canada, the public school system operates alongside a publicly-funded Catholic school system. Also, other types of program choice exist, such as Alternative programs, as well as programs for gifted children. An important extension

of the analysis of this paper would be to incorporate these types of school program choices.

## **7. Conclusions**

The debate over the existence and expansion of school choice in the Canadian Education system has raised many important questions related to the efficiency and equity of public education. This paper has analyzed one aspect of school choice using the case of French Immersion programs in Canada. A theoretical model has been presented and used to show how school program choice can lead to streaming of children across two types of programs according to the children's levels of human capital and the parents' education. Empirical evidence has been presented on the issue of "streaming" or the selection of children with high ability and from high socio-economic families into French Immersion programs.

Children in French Immersion programs are found to have higher performance in both reading and writing compared with children in English language programs. The French Immersion children are from families that are more likely to have mothers and fathers with university degrees, have higher parental income and are less likely to rely on government programs such as social assistance. While family "preferences" for French Immersion are apparent and can be related to the parents having French as a mother-tongue, economic factors also appear to play an important role in determining the composition of children in French Immersion programs in comparison to children in English programs.

Estimates from a structural model of French Immersion enrollment indicate that both Family preferences (proxied by the parents' having French as a mother tongue) as well as the child's performance in reading are important determinants of the decision to enroll a child in French Immersion. In particular, a one standard deviation increase in a child's reading score is associated with an increase in the probability of French Immersion enrollment by 14 to 23 percent.

The results indicate that streaming of children by academic ability and socio-economic status has occurred with respect to Canada's French Immersion program. This lends support to the argument that school program choice within the public school system may create privileged enclaves within the public school system leading to different types of education with differing levels of quality. Future work should explore the costs and benefits of school program choice, factoring in not only the benefits to the students of the increase in the number of program options, but also the public education system's capacity to provide these choices while also ensuring equality of opportunity within the education system.

## References

- Epple, D. and R.E. Romano (1998) 'Competition Between Private and Public Schools, Vouchers, and Peer-Group Effects,' *American Economic Review*, 88(1): 33-62.
- Heckman, James J. and Thomas E. MaCurdy (1985) "A Simultaneous Equations Linear Probability Model," *Canadian Journal of Economics*, 18(1):28-37.
- Hoxby, Caroline M. (2000) "Does Competition among Public Schools Benefit Students and Taxpayers?" *American Economic Review*, 90(5): 1209-38.
- Hoxby, Caroline M. (1999) 'The productivity of Schools and other Local Public Goods Producers,' *Journal of Public Economics*, 74: 1-30.
- Lawton, Stephen B. (2001) "Educational Finance and School Choice in the United States and Canada," Occasional Paper No. 17, National Center for the Study of Privatization in Education, Teachers College, Columbia University, March.
- MaCurdy, Thomas E. (1981) "An Empirical Model of Labor Supply in a Life-Cycle Setting," *Journal of Political Economy*, 89(6): 1059-85.
- Swain, Merrill (2000) "French Immersion Research in Canada: Recent Contributions to SLA and Applied Linguistics," *Annual Review of Applied Linguistics*, volume 20, 199-212.

**Figure 1**

Success in School as a Function of Human Capital  
by School Program Type

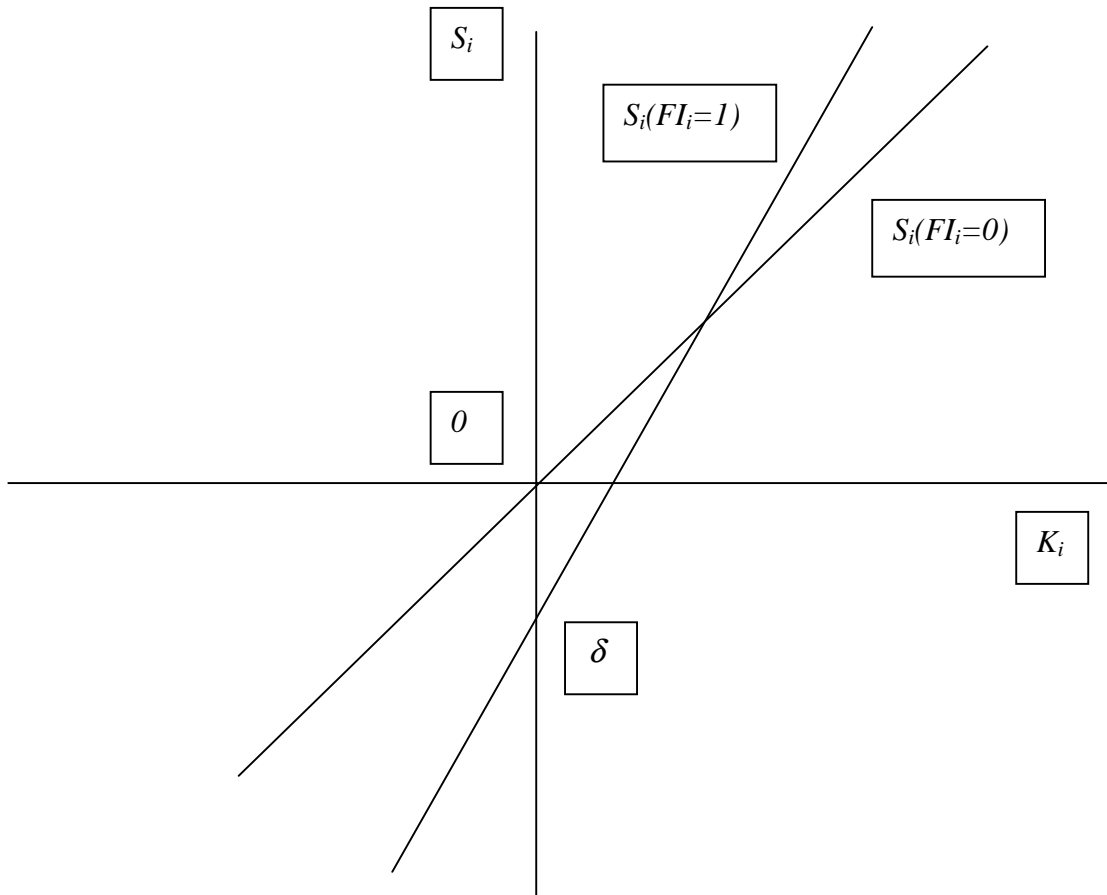


Table 1  
Percentage of Students Enrolled in French Immersion

	All Children	Excludes Children not in FI but attending French Schools
	(1)	(2)
All of Canada	.0995 (.299) [16,055]	.1265 (.332) [12,682]
Newfoundland	.0705 (.256) [833]	.0711 (.257) [829]
Prince Edward Island	.1947 (.397) [313]	.2043 (.404) [300]
Nova Scotia	.1173 (.322) [968]	.1213 (.327) [916]
New Brunswick	.1800 (.384) [957]	.2546 (.436) [671]
Quebec	.1073 (.310) [2,987]	.7443 (.437) [315]
Ontario	.0983 (.298) [4,884]	.1037 (.305) [4,577]
Manitoba	.1680 (.374) [1,021]	.1715 (.377) [993]
Saskatchewan	.0624 (.242) [1,119]	.0626 (.242) [1,117]
Alberta	.0791 (.270) [1,586]	.0793 (.270) [1,580]
British Columbia	.0773 (.267) [1,387]	.0774 (.267) [1,384]

**Note:**

1. Standard deviations are in round brackets, sample sizes are in square brackets.

Table 2  
Sample Means of Demographic Variables  
by School Program Type

	French Immersion	English Program
Female	.5331*** (.499)	.4713 (.499)
Sample Size	1,468	11,214
Mother's Education		
Elementary or less	.0132** (.114)	.0214 (.145)
Secondary without graduation	.0820 (.274)	.0880 (.283)
Secondary with graduation	.1697** (.376)	.1955 (.397)
Post-Secondary (some or certificate)	.5004*** (.500)	.5416 (.498)
University degree	.2301*** (.421)	.1526 (.360)
Sample size	1,448	11,056
Father's Education		
Elementary or less	.0229 (.1497)	.0222 (.147)
Secondary without graduation	.0825*** (.275)	.1134 (.317)
Secondary with graduation	.1963** (.397)	.1685 (.374)
Post-Secondary (some or certificate)	.4198*** (.494)	.4999 (.500)
University degree	.2643*** (.441)	.1875 (.390)
Sample Size	1,271	9,718

**Note**

1. Children in French language schools who are not in language immersion programs are excluded from the sample.
2. Standard deviations are in round brackets.
3. Tests of differences in means were performed between the French Immersion and English Program samples: \*\*\*, \*\* and \* denote significance at the one, five and ten percent levels, respectively.

Table 3

Sample Means of Parents' Linguistic Background  
by School Program Type

	French Immersion	English Program
Mother's mother tongue – French	.2208*** (.415)	.0272 (.163)
Mother's mother tongue – English	.6003*** (.490)	.7934 (.405)
Mother's mother tongue – other	.1535 (.361)	.1554 (.362)
Sample Size	1,448	11,056
Father's mother tongue – French	.1749*** (.380)	.0226 (.148)
Father's mother tongue – English	.5999*** (.490)	.7633 (.425)
Father's mother tongue – other	.1821 (.386)	.1636 (.370)
Sample Size	1,271	9,718

**Note**

1. Children in French language schools who are not in language immersion programs are excluded from the sample.
2. Standard deviations are in round brackets.
3. Tests of differences in means were performed between the French Immersion and English Program samples: \*\*\*, \*\* and \* denote significance at the one, five and ten percent levels, respectively.

Table 4  
 Sample Means of Parental Income, Receipt of Employment Income  
 and Social Assistance by School Program Type

	French Immersion	English Program
Mother's Income (in thousands of 1998 dollars)	28.23*** (27.9) [1,448]	23.88 (22.2) [11,056]
Father's Income (in thousands of 1998 dollars)	50.04* (63.3) [1,271]	46.62 (37.4) [9,718]
Parental Receipt of Social Assistance	.0593*** (.236) [1,468]	.0957 (.294) [11,214]
Parental Receipt of Employment Insurance Benefits	.1053*** (.307) [1,468]	.1292 (.335) [11,214]

**Note**

1. Children in French language schools who are not in language immersion programs are excluded from the sample.
2. Standard deviations are in round brackets.
3. Tests of differences in means were performed between the French Immersion and English Program samples: \*\*\*, \*\* and \* denote significance at the one, five and ten percent levels, respectively.

Table 5  
Sample Means of Test Scores and School Achievement Expectations  
by School Program Type

	French Immersion	English Program
Mathematics Score	51.99*** (9.99) [429]	49.72 (9.97) [3,419]
Reading Score	52.27*** (9.39) [428]	49.67 (10.0) [3,423]
Hyperactivity/Inattention Score	49.61 (9.61) [1,060]	50.06 (10.0) [8,800]
Prosocial Behaviour Score	49.98 (9.89) [1,004]	50.00 (10.0) [8,109]
Emotional Disorder/Anxiety Score	49.89 (9.07) [1,063]	50.02 (10.1) [8,468]
Conduct Disorder/Physical Aggression Score	48.88*** (8.34) [1,064]	50.16 (10.2) [8,460]
Indirect Aggression Score	50.34 (10.4) [1,100]	49.95 (9.95) [8,078]
Property Offences Score	49.44** (8.61) [1,065]	50.08 (10.18) [8,488]
Hope for Child's eventual number of years of education (Mother)	16.56*** (1.19) [1,454]	16.32 (1.41) [11,047]
Expectation of Child's eventual number of years of education (Teacher)	15.96*** (1.62) [472]	15.23 (1.91) [3,677]

**Note**

1. Children in French language schools who are not in language immersion programs are excluded from the sample.
2. Standard deviations are in round brackets. Sample size are square brackets.
3. Tests of differences in means were performed between the French Immersion and English Program samples: \*\*\*, \*\* and \* denote significance at the one, five and ten percent levels, respectively.

Table 6  
Regression Estimates of Differences in Family Characteristics  
by School Program Type

	Controls in addition to the French Immersion Variable			
	No Controls	Region and Pop. Size	Rural/Urban Centres	School Boards
	(1)	(2)	(3)	(4)
Mother has a university degree	.0783*** (.021)	.0788*** (.023)	.0664*** (.023)	.0839*** (.027)
Father has a university degree	.0772*** (.026)	.0526** (.026)	.0516* (.027)	.0542* (.028)
Mother's income (C\$1000s)	4.239*** (1.49)	4.772*** (1.53)	5.046*** (1.63)	4.815*** (1.80)
Father's income (C\$1000s)	3.426 (3.19)	3.930 (3.36)	3.726 (3.58)	5.958 (3.82)
Receipt of social assistance	-.0354*** (.010)	-.0363*** (.010)	-.0388*** (.011)	-.0489*** (.011)
Receipt of Employment Insurance	-.0227* (.013)	-.0188 (.013)	-.0207* (.012)	-.0314** (.015)
Mathematics Score	2.288*** (.865)	1.882** (.845)	2.520*** (.878)	2.149** (.957)
Reading Score	2.581*** (.708)	2.418*** (.769)	2.808*** (.802)	2.523*** (.872)
Hyperactivity/Inattention Score	-.3859 (.666)	-.5603 (.688)	-.7553 (.733)	-.3725 (.815)
Prosocial Behaviour Score	-.0384 (.663)	.5352 (.702)	.9398 (.735)	.1800 (.766)
Emotional Disorder/Anxiety Score	-.0822 (.641)	-.0171 (.668)	-.2120 (.707)	.5523 (.707)
Conduct Disorder/Physical Aggression Score	-1.177** (.493)	-.8197 (.544)	-1.229** (.540)	-1.117** (.547)
Indirect Aggression Score	.4215 (.735)	.2883 (.708)	.3166 (.757)	.5418 (.726)
Property Offences Score	-.5549 (.545)	-.4767 (.565)	-.8674 (.578)	-.4033 (.603)
Hope for child's education (PMK) – years	.2340*** (.066)	.1495** (.068)	.1868*** (.073)	.1668** (.076)
Expectation of Child's education (Teacher) – years	.7201*** (.124)	.6913*** (.129)	.6867*** (.133)	.7772*** (.131)

**Note**

1. Children in French language schools who are not in language immersion programs are excluded from the sample.
2. Standard errors are in round brackets.
3. Statistical significance denoted by \*\*\*, \*\* and \* for the one, five and ten percent levels, respectively.

Table 7  
 Linear Probability Model Estimates of Reduced Form and  
 Structural Form Models of French Immersion Enrollment

	Reduced Form	Structural without Parents' Education	Structural with Parents' Education
	(1)	(2)	(3)
Reading (predicted)	n.a.	.0137*** (.003)	.0231** (.010)
Child is female	.0319*** (.010)	.0274*** (.010)	.0250*** (.011)
Mother's mother tongue is French	.2511*** (.043)	.2505*** (.043)	.2516*** (.043)
Mother's mother tongue is neither French nor English	-.0080 (.021)	-.0075 (.020)	-.0078 (.021)
Father's mother tongue is French	.1682*** (.035)	.1710*** (.036)	.1685*** (.035)
Father's mother tongue is neither French nor English	.0220 (.023)	.0225 (.024)	.0220 (.023)
Mother's education – Elementary or less	-.0075 (.032)	n.a.	.0678 (.050)
Mother's education – secondary without grad.	.0044 (.018)	n.a.	.0141 (.020)
Mother's education – post-secondary	-.0029 (.014)	n.a.	-.0200 (.016)
Mother's education – university	.0405* (.021)	n.a.	-.0092 (.033)
Father's education – Elementary or less	-.0676** (.031)	n.a.	-.0362 (.036)
Father's education – secondary without grad.	-.0304 (.023)	n.a.	.0033 (.029)
Father's education – post-secondary	-.0358** (.017)	n.a.	-.0421** (.017)
Father's education – university	-.0058 (.024)	n.a.	-.0434 (.028)
Mother's Income	.0005* (.0002)	n.a.	n.a.
Father's Income	.00006 (.0002)	n.a.	n.a.
Receipt of social assistance	-.0212 (.015)	n.a.	n.a.
Receipt of employment insurance	-.0084 (.012)	n.a.	n.a.
Intercept			
R <sup>2</sup>	.1997	.1974	.2010
Sample Size	12,377	12,377	12,377

**Note:**

1. Children in French language schools who are not in language immersion programs are excluded from the sample.
2. Controls for child's age, residence in a rural area, size of urban area of residence and region of residence are also included.
4. Standard errors are in round brackets.
5. Statistical significance denoted by \*\*\*, \*\* and \* for the one, five and ten percent levels, respectively.

Table 8  
First Stage Reading Score Model Estimates

Child is female	.3055 (.374)
Mother's education – Elementary or less	-3.223*** (1.19)
Mother's education – secondary without grad.	-.4218 (.718)
Mother's education – post-secondary	.76469 (.472)
Mother's education – university	2.294*** (.734)
Father's education – Elementary or less	-1.414 (1.37)
Father's education – secondary without grad.	-1.502** (.695)
Father's education – post-secondary	.2043 (.507)
Father's education – university	1.451** (.683)
Mother' Income	.0130 (.009)
Father's Income	.0079*** (.003)
Receipt of social assistance	-1.027 (.762)
Receipt of employment insurance	-.1027 (.471)
Intercept	
R <sup>2</sup>	.1997
Sample Size	12,377

**Note:**

1. Children in French language schools who are not in language immersion programs are excluded from the sample.
2. Controls for child's age, residence in a rural area, size of urban area of residence and region of residence are also included.
3. Standard errors are in round brackets.
4. Statistical significance denoted by \*\*\*, \*\* and \* for the one, five and ten percent levels, respectively.