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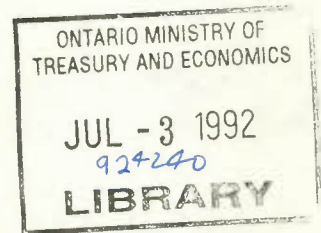
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**The Influence of Socioeconomic
Background on Education**

Tom Siedule



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The Influence of Socioeconomic Background on Education

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Foreword

Since the publication of the 1966 Coleman report in the United States, policymakers, educators and economists have agreed that socioeconomic factors have a profound influence on education. This report summarizes an empirical investigation of this very important issue. Its specific contribution is the analysis of a large Canadian sample of individuals, using educational attainment (years of schooling) as the dependent variable. This contrasts with most studies of this sort, which have typically used smaller samples to evaluate young children's tests or examination scores — rather than attainment — as the outcome variable. The estimates here of the impact of a comprehensive set of individual socioeconomic factor on education will undoubtedly be of interest to policymakers. It is to be hoped that the results will also enhance public understanding of the issue.

This paper was prepared by Tom Siedule, an economist on the staff of the Council. It was undertaken as part of the Council's research program on the Canadian education system.

Judith Maxwell
Chairman

Abstract

The major concern of this study is whether socioeconomic status influences an individual's education. It uses the microdata file of the 1986 Population Census along with the analysis of variance technique, to determine this. The findings not only authenticate the correlation between educational attainment and socioeconomic status, but also quantify the effect of low socioeconomic status on an individual's education. The study estimates that the difference between very favourable and inordinately unfavourable socioeconomic influence can account for five years of additional education completed. The message is loud and clear. If the country is interested in raising the educational standard of all Canadians, then, in addition to the perennial search for a more efficient education system, policymakers have to find ways to alleviate some of the unfavourable social and economic influence on the less fortunate youths. The study estimates the overall influence as well as the factorial contributions of socioeconomic factors on education. It covers the population of all provinces and territories. The results should be relevant to both educators and social-policymakers.

Introduction

In 1966 Coleman *et. al.* concluded that the most important influence on educational attainment was socioeconomic background and not schools.¹ The report's famous claim that "schools make little difference to children's education" is still controversial, but researchers generally agree that, *a priori*, socioeconomic factors have a profound influence on education.

Policymakers are also aware of the impact of socioeconomic background on children's education. Project Head Start was a federally funded U.S. program designed to improve the educational achievement of children from disadvantaged socioeconomic backgrounds. Whether the project succeeded in achieving its goals has been a matter of controversy since its inception in 1965. However, a number of evaluations concur that the program had a significant impact on children from minority groups and on white children from single-mother families. The test scores of the program participants were consistently higher than the test scores of nonparticipants of similar socioeconomic status from the same schools.² Similarly, a benefit-cost analysis of the Perry Preschool Program finds that the return to investment in improving the education of the disadvantaged appears to be very high.³

Canadian evidence leads to a similar conclusion.⁴ Unfortunately, Canadian studies are primarily based on the empirical findings of a single school board or a city. They are not representative of the whole country. If we are concerned with the educational attainment of all Canadian youths, then a study based on a nationwide coverage is a prerequisite for a better understanding of the topic. Moreover, most of the existing studies only provide policymakers with the correlation between socioeconomic status and children's educational attainment. They do not specifically estimate the influence of individual socioeconomic factors. The research reported here may help to fill this information gap.

Consensus and Disagreement

Project Head Start was the most famous policy measure implemented to offer disadvantaged preschool children special educational measures to compensate for background deficiencies. Even though the programs were also available to youths of higher socioeconomic status, the highest participation was from individuals of low socioeconomic status. Coleman *et. al.* concludes that Head Start programs tended to benefit only black children from the poor families of Southern states.⁵ Subsequent research by others has found that the Head Start programs also benefitted

2 The Influence of Socioeconomic

under-privileged youths of white and other ethnic origins.⁶ Some researchers contend that the beneficial effects of the programs were transitory and the participants tended to lose the advantages gained after three years. In view of the fact that students stayed in Project Head Start for only a summer or a year, this debate over whether the effects were transitory or permanent seems immaterial. The question is whether or not the program benefitted the children. If the benefit lasted only one year after the children left the program, the program still demonstrated its effectiveness. Such an empirical finding simply suggests that low socioeconomic status has a powerful, detrimental impact on education. And for children of low socioeconomic status to excel (or simply to live up to their potential) in the education system, they need more than once-in-a-lifetime help at the beginning of their learning journey.

The Perry Preschool program, which was a very small project similar to Project Head Start, has also demonstrated beneficial effects on students and society. Weighing the program's benefits and costs to the society, one study estimates that the benefit-cost ratio of the program for society is six.⁷ That is, for every dollar invested in the program, society would get back six in the long run. How is this possible? The answer is simple: higher tax revenue and a reduction in the cost of social services are more than enough to compensate for the investment. The benefit-cost analysis traces the participating and nonparticipating students' development from preschool days up to age 19. It includes data on educational attainment, employment, and criminal involvement. It concludes that a higher proportion of the participants were literate, employed, or enrolled in postsecondary education, and a lower proportion of the participants dropped out of school, were arrested for delinquent or criminal acts, or became welfare recipients.

In a sense, Project Head Start and the Perry Preschool program were the policymakers' answer to the socioeconomic problems of under-privileged children. In other words, policymakers presupposed the existence of the problems and used these programs to solve them. These programs, therefore, were not a direct test of the existence of socioeconomic influence on education.

Since the appearance of the Coleman report, economists have attempted to address the socioeconomic influence issue directly. All of them attempt either to prove the validity of Coleman's contention or to refute its conclusion. Most researchers contend that schools do matter in an extremely subtle way. For example, Murnane finds that the teacher's choice of techniques and general characteristics are important in predicting teaching effectiveness.⁸ Summers and Wolfe contend that the effects of the school environment, facilities, and teachers can only be determined

from the details of microdata.⁹ Specifically, they find that underachievers, students from low income families, and black students respond to some school inputs reasonably well. Murnane *et. al.*,¹⁰ on the other hand, emphasize the importance of family background. They conclude that differences in the child care provided by mothers with different levels of education have a profound influence on children's achievements, but material wellbeing at home does not seem to have systematic impact on their education.

While there appears to be general agreement that socioeconomic factors significantly affect individuals' educational achievement, there are a number of methodological problems associated with these analyses. Most studies since the Coleman report focus on the effectiveness of schools, not the effectiveness of the individuals in the education system. This approach has certain pitfalls. For example, as a rule, the analytical unit has to be the school, and consequently, students' educational achievement is measured in terms of school averages. The aggregative nature of the data tends to disguise the school's true impact on individuals. Some studies¹⁰ recognize the inadequacy of "school averages" and use student-specific microdata,¹¹ but they still fail to circumvent another serious problem: their geographical coverage is limited. It is methodologically difficult to derive a general conclusion from these studies, because what is true in, say, the Philadelphia school districts may not be so in other school districts. Some of these studies also use crude measures of socioeconomic influence (e.g., they use "black" or "white" to approximate racial differences and the student's family income to capture all socioeconomic influence) and leave out too many important dimensions of socioeconomic background.

The present report does not attempt to refute existing studies. Instead, it tries to give the reader an impression of the debate in the literature. There are some gaps. For example, a nationwide study on the influence of socioeconomic factors on education is overdue; furthermore, if the argument of the microdata users is valid, then only an analysis of a nationwide microdata base can give us an overall picture. The present study explores this relatively unknown area of education economics.

Ideally, a study of the output of the education system should cover the influence of institutional as well as personal attributes. Unfortunately, statistical agencies have found it impossible to integrate both dimensions in a nationwide micro database. The existing Canadian database includes information on individuals' educational attainment and their socioeconomic characteristics. The data are not, however, part of the school data. At present there is no acceptable method that enables researchers to link the information on individuals to the school data.

This study uses the available microdata from the 1986 Population Census to study Canadians' success and failure in the education system. Because of the limitations of the data, the study focuses only on the quantitative dimension of socioeconomic influence.

A Matter of Semantics

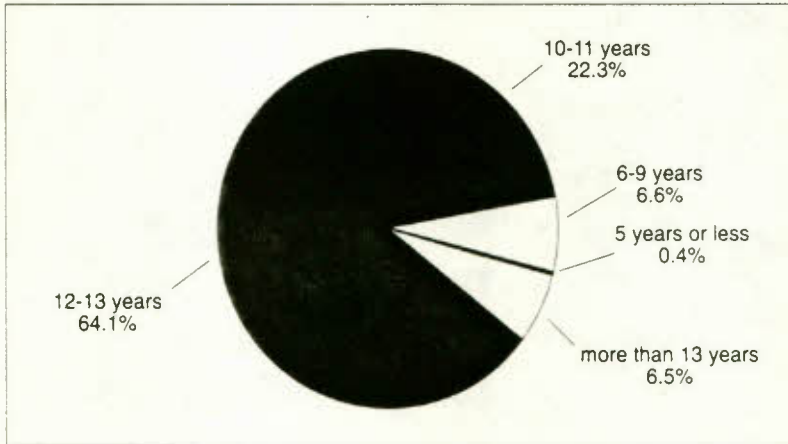
In education economics, many researchers use the same term to convey substantially different concepts. For example, the term "educational attainment" may mean different things to different authors. Some use the term to denote the grade-point average of a student, others use it to refer to the grade-point average of a class, a school, or a school board. Another example is the term "output of the educational system." This may denote the number of excellent, good, average, and inferior students produced by educational institutions. However, some analysts also use the term to denote variations in school attendance, student behaviour, or delinquency rates.

We do not dispute the importance of the many facets of education. In this study, however, the limitations of the data require us to use the term "educational attainment" to mean the number of years of formal education completed by individuals, and the term "socioeconomic factors" to denote social, economic, demographic, and geographic factors.

Historical Perspective

In 1986, more than 29 per cent of 18-year-olds in Canada completed at most 11 years of formal education, while 64 per cent completed 12 to 13 years, and more than 6 per cent of the youths of the same age group completed more than 13 years (Figure 1). "Years of education completed" refers to the level of education (grades and years completed) in elementary and secondary schools plus the total number of completed years of education at postsecondary institutions. If the individual took 14 years to complete grade 12, he/she would have only 12 years of education completed. On the other hand, a youth who finished grade 13 in eleven years would have the credit of 13 years of formal education.

The statistics show that there are some "over achievers" as well as many "under achievers." In Canada, children usually enter grade one at the age of six. Therefore, by the age of 18, they should have completed more than 11 years of formal education. The question is why did one in three 18-year-olds not reach their potential in the education system in 1986?

Figure 1**Years of education completed by 18-year-olds, Canada, 1986**

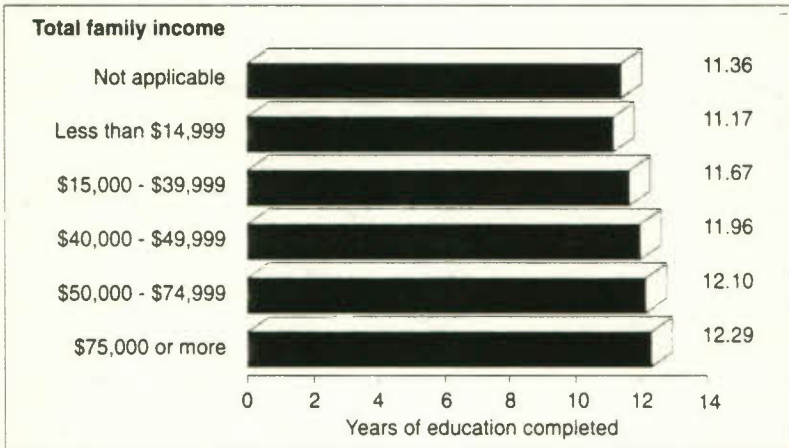
SOURCE Based on data from the 1986 Population Census.

A quick examination of the available data would reveal that economic conditions (approximated by family income) had an effect on the average educational attainment of 18-year-olds (Figure 2). Youths from the higher-income families had, on average, more years of education than their counterparts from lower-income families. From a methodological point of view, however, there are reasons to question the implications drawn from the raw data. First, is the difference large enough to be statistically significant? Second, family income is only one of the many factors that may influence the level of educational attainment. For example, ethnic origin, whether the setting is urban or rural, the residential environment, the province of residence, the size of the family, and whether or not the individual is from a husband/wife family may also have had an important impact on individual educational attainment. Researchers must systematically test these hypotheses with the appropriate data and statistical techniques.

In terms of educational accomplishment, the 26-year-olds were similar to the 18-year-olds — 27 per cent had completed 11 or fewer years of formal education and 9 per cent failed to reach grade 10 (Figure 3). For 26-year-olds, the measurement of success must go beyond the education system and include experience in the labour market. The majority of individuals in this age group should have completed their formal education by 1985. Wages and salaries and weeks worked in a year should, therefore, be good measures of their performance in the labour market. Apparently, a sizable segment of them (25-year-olds in 1985) did not earn a good living in 1985. A total of 46 per cent made less than \$10,000 in

Figure 2

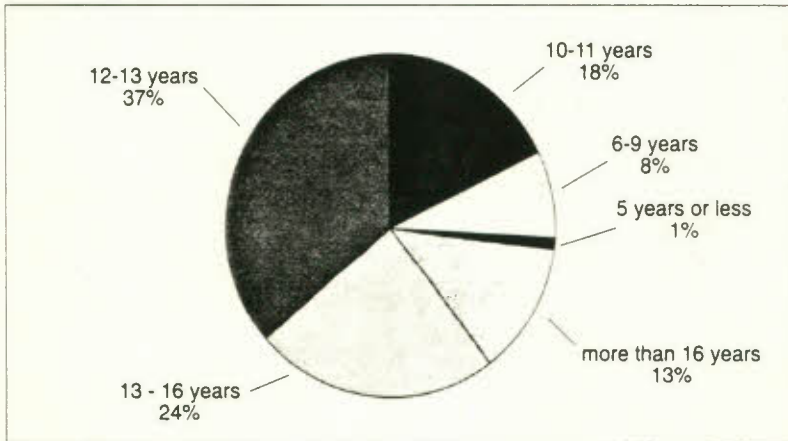
Years of education completed and family income, 18-year-olds, Canada, 1986



SOURCE Based on data from the 1986 Population Census.

Figure 3

Years of education completed by 26-year-olds, Canada, 1986

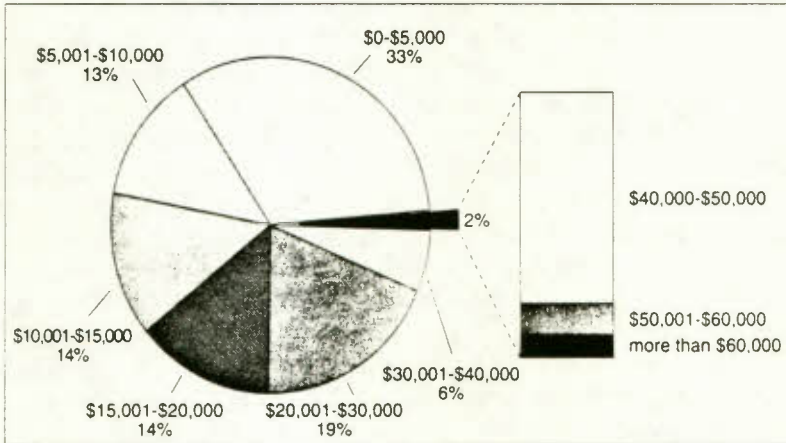


SOURCE Based on data from the 1986 Population Census.

1985; an overwhelming 33 per cent had annual incomes of \$5,000 or less (Figure 4). Statistics on weeks worked reveal a pattern that is consistent with the wage-and-salary information. Thirty-five per cent of the people in this age group worked less than 30 weeks in 1985, including a majority who had gainful employment for less than 10 weeks in 1985 (Figure 5).

Figure 4

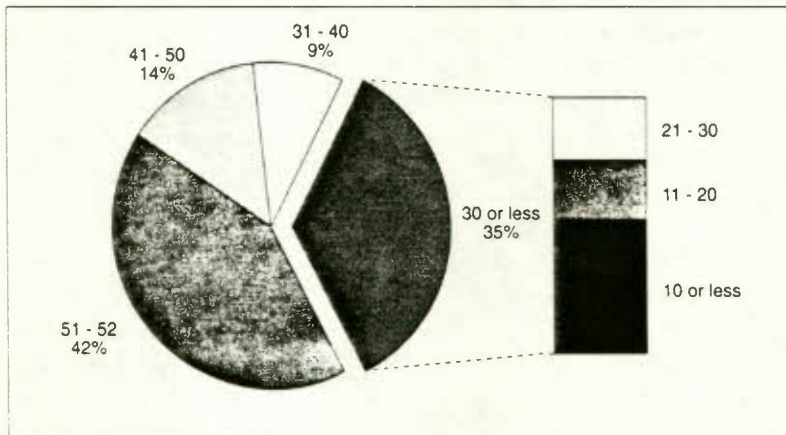
Wages and salaries of 26-year-olds, Canada, 1985



SOURCE Based on data from the 1986 Population Census.

Figure 5

Weeks worked by 26-year-olds, Canada, 1985



SOURCE Based on data from the 1986 Population Census.

Are low educational attainment, low employment income, and involuntary unemployment interrelated problems? Can they be traced to the same socioeconomic factors? These are some of the questions that the present paper hopes to answer.

Methodology

For any empirical study, the researcher has to work with what is available in the database. Since most of the data for this study is drawn from the 1986 Population Census, the empirical work has to be defined in terms of what is in the census. For this reason, the number of years of formal education completed is taken as the dependent variable for 15–22 year-olds. For individuals aged 23–26, the focus is broadened to include three dependent variables — years of formal education completed, wages and salaries earned in a year, and the number of weeks worked in a year — in an attempt to determine what “success” means to more mature individuals at this stage of their career. The census contains sufficient information for researchers to calculate all three dependent variables. To calculate number of years of formal education, it contains information on the highest degree, certificate, or diploma obtained; the highest grade of elementary or secondary school completed; the total number of years completed at a degree-granting educational institution; and the total number of years completed at a non-degree-granting educational institution. As well, it includes weeks worked and wages and salaries earned in 1985.

The census also contains information on a number of potential explanatory (independent) variables, such as age, gender, province of residence, whether the residence is urban or rural, census family status and living arrangement, ethnic origin, whether the person worked full time or part time in 1985, hours worked in the reference week, labour force activity, major field of study, number of persons in a census family, total census family income, and the value of the dwelling. Obviously many of these are classification variables. For example, “province of residence” is by definition not a metric measure, and must be coded by a classification name or a discrete number. Even total family income in the census microdata is coded by income intervals, not by exactly how much the family made in 1985. Fortunately, classification independent variables are perfectly suitable for the statistical analysis of variance (ANOVA).

We hypothesize that an individual’s educational attainment depends on six socioeconomic factors: family income, commercial value of dwelling, ethnic origin, province of residence, family size, and family status/living arrangement. Family income as a socioeconomic factor is self explanatory, but the influence of the remaining independent variables requires elaboration. The commercial value of the dwelling where the child lives is a proxy for the environmental effects of the location of the residence and school. With the exception of the children of wealthy families who are sent to private schools, Canadian youths usually attend schools in the neighbourhood of their residence. Naturally, a well-to-do

neighbourhood tends to be associated with a more favourable environment for academic endeavour, whereas a school in a "ghetto" is likely to encounter more problems with drug abuse and delinquency. The influence of ethnic origin on children's educational attainment is empirically verified by Cheng *et. al.*¹² The effects of the province of residence variable is less obvious. They may come from two sources. First, cultural and circumstantial differences among the provinces influence an individual's perception of the optimal amount of education necessary for his/her work (e.g., a farmer from the prairies would probably not consider a Ph.D. essential for raising livestock). Second, provinces do not devote identical amounts of resources to education (the federal government's equalization payments on education help, but they cannot really put all the provinces on an equal footing). These differences among provinces should, therefore be manifested in the educational attainment of their populations. "Family size" affects children's educational attainment in a particular way.¹³ *Ceteris paribus*, we expect a threshold value for the family size to be most favourable for educational accomplishment. A youth from a one-child family does not have any siblings with whom to share academic experiences, which may work against the child's educational aspirations. On the other hand, if a family has too many children, those children have to share not only the limited financial resources of the family but also their parents' limited time for guidance. Finally, the family-status variable (whether the child lives in a husband/wife household, a single-parent family, or with relatives or unrelated individuals) is self explanatory.

Although the quantitative effects of these variables have to be empirically verified, few researchers would reject them as potential explanatory variables. Conceptually, however, there are other socioeconomic variables that fit the hypothesis well. The list given here represents the variables that enter the finalized version of the statistical exercises. The study excludes other variables for various reasons: (1) they are not included in the 2-per-cent sample of the 1986 census tape; (2) they were initially included but subsequently dropped because they showed no statistically significant influence on a person's educational attainment; or (3) they are not essential to the socioeconomic theme.

Conceptually, there is nothing to prevent the researcher from specifying the analysis outlined above in a multiple regression. Practically, however, there are a number of problems with this approach. For example, the researcher may set the dependent variable equal to the "years of formal education completed" and the independent variables equal to the socioeconomic attributes associated with the individual, which may be expressed as large sets of dummy variables in terms of "0" and "1." The dependent variable presents no problem, since the child's educational

attainment is measured in terms of number of years of education completed. The independent variables are, however, more complex. The census microdata file presents family income in terms of 24 income groups. The province-of-residence variable is similar. The child must have come from one of the 10 provinces or the Yukon/Northwest Territories. This means that for the province of residence variable alone, the researcher needs 10 dummy variables to capture the provincial effects on education.¹⁴ In addition to five sets of dummy variables to represent five socioeconomic attributes, the researcher has to consider the interaction effects. For example, the average family income is much higher in Ontario than it is in Saskatchewan. Therefore, we may expect a family income of \$50,000 per year to have different influence on the educational attainment of the individuals in these two provinces, which is technically the interaction effect of the family-income and province-of-residence variables. Similarly, the researcher may consider the interaction effects of other socioeconomic attributes. The finalized estimating equation could easily have more than 150 dummy variables and interaction terms. In applied econometrics, an equation with so many regressors (independent variables) is generally considered unwieldy. However, there are other reasons for not applying the multiple regression technique to the present problem. For example, if the influence of the province of residence on the child's education is not different from the national average, then the estimated coefficient for this dummy variable would turn out to be statistically insignificant. On the other hand, the influence of selected provinces can be substantially different from the national average and the estimated coefficients for these dummy variables can be highly significant. Thus, the estimated coefficients provide us with certain indications of provincial effects individually. However, we still have no clear answer to the simple question. "Does the province of residence make any difference to a child's education?" The researcher can only answer this question by testing the statistical significance of the *whole set* of coefficients for the provincial dummies once again (i.e., performing the test after estimating the equation). Moreover, the researcher occasionally wants to know whether or not the effect of one region (e.g., the Atlantic region) is significantly different from that of another region (e.g., Ontario). Without additional statistical calculations, the estimated equation does not give the researcher this information. Thus, in practice, forcing the socioeconomic hypothesis to fit the "straight jacket" of multiple regression is not the best statistical method.

Analysis of variance (ANOVA) is a statistical method that can be used to study the effects of multiple independent variables (all in classification form) on one or more dependent variables (all in metric measure). When the researcher relates one dependent variable to a set of independent variables, it becomes an application of univariate analysis of variance. When

the researcher attempts to measure the effects of multiple independent variables on two or more dependent variables simultaneously, it becomes a problem of multivariate analysis of variance (MANOVA). In this study, we have applied the data of individuals aged 15-22 to univariate analysis of variance. The data for individuals aged 23-26 were subjected to both univariate and multivariate analyses, because for the study analyzes not only their educational attainment but also their employment income and weeks worked. The empirical results of ANOVA and MANOVA are consistent with each other, but we have found that the MANOVA findings shed no further light on the issue. For this reason this report does not discuss the MANOVA results any further. The remainder of this report uses the term analysis of variance, or ANOVA, strictly in its univariate analysis context.¹⁵

The socioeconomic hypothesis outlined above is a typical of the kind of problem to which researchers apply ANOVA. Technically, the *null hypothesis* is that socioeconomic factors have no effect on individual educational attainment. Correspondingly, the alternative to the *null hypothesis* is that socioeconomic factors do matter. We propose to include six socioeconomic factors in the test. Each factor (independent variable) has several classes (e.g., the province-of-residence variable has 11 classes) and a factor may interact with other factors. The statistical technique, specified in terms of a high-order structure-of-variance analysis, is capable of taking into account the effects of all socioeconomic factors simultaneously.

For the statistical analysis, in addition to the necessity of having all dependent variables in metric measure and independent variables in classification form, the researcher must know the characteristics of the data; i.e., are they balanced or unbalanced? The ANOVA statistical technique for *balanced data* is quite different from that for unbalanced data.¹⁶ Applying the inappropriate technique to the unbalanced data can lead to misleading conclusions. Unfortunately, in economic data, unbalanced design is the norm rather than an exception. For example, if the researcher hypothesizes that youths from the middle and high income families tend to have higher educational attainment than those from low income families, then the researcher has a simple one-way ANOVA problem. However, this says nothing about balanced and unbalanced designs. The researcher has to learn this from counting the number of individuals in each cell of the ANOVA design. If the number of youths from low income families is not equal to the number of youths from middle and high income families, then the problem automatically becomes a one-way ANOVA of unbalanced design.¹⁷

The Generalized Linear Model of ANOVA allows us to estimate the expected educational attainment of an individual, subject to the influence

of a specific combination of socioeconomic factors (e.g., a combination of many unfavourable factors or a combination of the most favourable factors). It can be performed as an option in the statistical run of ANOVA. It not only produces data on the estimated years of education completed for the individuals in question, but also tells us whether or not the estimate is statistically significant. In short, the analysis of variance is a more convenient and powerful technique than traditional multiple regression for the empirical work of this study, permitting as it does the analysis of metric (dependent) variables and multiple classification (independent) variables and providing a useful set of statistics and estimated equations of coefficients (the estimated equations are available in the Generalized Linear Model of ANOVA).

For descriptive convenience, this report primarily describes and discusses the historical data and statistical results for individuals aged 18 and 26. Data from all the provinces and territories are included. The coverage and the technique of applying the analysis of variance to microdata make this study, perhaps, the first of its kind in Canadian education research.

Empirical Findings

A priori, young people from urban centres have different educational aspirations than do those from rural areas. For this reason, the empirical analysis classifies all individuals aged 15–26 according to whether their residence is urban or rural. In other words, we analyze the urban and rural subpopulations separately. The two subpopulations are: (a) urban — individuals who lived in census metropolitan areas with urbanized cores of 100,000 or more population in 1986, and (b) rural — all other individuals who lived in small cities, towns, and rural areas. This data stratification automatically separates the effect of urban environment on education from that of rural setting. The task of the ANOVA exercises is, then, to determine the influence of other factors on education.

This study recognizes the relationship between formal education and age. The statistical work analyzes the data pertaining to individuals aged 18 and 26 separately. These ages represent two critical stages of young people's educational and career development. At age 18 an individual typically has to decide whether or not to enter the labour force for the first time or to pursue further education and training. At age 26 a person has usually completed his/her education and may have even been in the work force for a few years already. Statistical analyses of these two age groups are, therefore, essential to the socioeconomic theme. The results of these statistical analyses for those aged 18 and 26, therefore, are reported in Tables A-1 to A-8.¹⁸

Eighteen-Year-Olds

As shown in Tables A-1 and A-2, the factors included to explain the educational attainment of 18-year-olds from urban and rural areas are highly significant by usual statistical criteria. The statistics are for Type III analysis of the Generalized Linear Model of ANOVA. In this type of analysis, the main effect of a factor (independent variable) is adjusted for the effects of other factors and interaction effects. The statistical analysis also gives us the results of other types of ANOVA analyses, which do not fully take the adjusted effects of Type III into consideration.¹⁸ These results are not reported here. Suffice it to point out that the statistical results for the other types of analysis are at least as strong as the ones reported in Tables A-1 and A-2. These tables show that, in addition to the obvious differences in statistical significance, ethnic origin appears to have significant influence on the educational attainment of 18-year-olds from rural areas but not on that of youths from large urban centres. Perhaps the melting pot of large urban centres assimilates youths of different ethnic origins and dilutes the effect of cultural background. The corollary of this argument is that youths of different ethnic origins from rural areas do not have sufficient opportunity to meet people of other cultural backgrounds. Therefore, they tend to preserve the cultural flavour of their ethnic origins. The interaction terms for income class/province of residence and income class/family size also turn out to be statistically significant for youths from large urban areas but insignificant for 18-year-olds from rural areas. Since income class, province of residence, and family size by themselves have a significant influence on the educational attainment of 18-year-olds in both urban and rural settings, the interaction terms capture the effects over and above those of the three variables separately. The interaction effects conceptually show the desirable or detrimental influence of the combination of socioeconomic attributes.

Effects of Individual Factors

Family income — For 18-year-olds from both large census metropolitan centres and rural areas (with the exception of the “not applicable” class which covered youths in collectives, in households outside Canada, temporary residents and nonfamily persons), youths from well-to-do families consistently completed more formal education than did those from poor families. The educational attainment of youths from families with incomes of \$40,000–\$49,999 or greater is statistically higher than that of individuals from families with annual incomes of less than \$14,999. The influence of family income on education is unambiguous.

Value of dwelling — This variable is highly significant, but its effect on education requires careful interpretation. Youths living in rented households tend to have less education than those living in family-owned houses. The educational attainment of youths from expensive dwellings is, however, only slightly higher than that of those from less expensive residences. The ANOVA Contrast Test confirms that the environmental difference between family-owned houses and rented houses is responsible for the statistical significance of this variable. Therefore, for both the urban and rural areas, this variable captures the different effects of rented and owned houses rather than the influence of property values on educational aspiration.

Province of residence — The province-of-residence variable significantly affects the educational attainment of youths from large urban centres and rural areas, but the statistical significance is weaker for urban than for rural areas. Youths from large urban centres in Quebec and Ontario slightly outperform their counterparts in Manitoba, Saskatchewan, Alberta, and British Columbia. (It should be noted that the 2-percent sample 1986 census tape does not include a single census metropolitan area in the Atlantic provinces, the Yukon, or the Northwest Territories. Therefore, the urban-population sample does not cover individuals from these provinces and territories.) The educational attainment of youths from rural areas exhibits more variation across provinces. Generally speaking, 18-year-olds from the Atlantic provinces completed less education than those from other provinces. Youths from the Yukon and the Northwest Territories tend to have the least formal education.

Ethnic origin — The 1986 census classifies individuals into 28 ethnic groups. However, if the data are cross-classified according to the urban/rural settings and the 28 ethnic origins, many cells contain few if any observations. For this reason, the 28 ethnic groups have been aggregated into five large groups. However, while this procedure circumvents the data problem, it creates a special problem for the group labelled "minority," which now consists of ethnic individuals of heterogeneous origin, including those of West Asian and Arab origin, South Asians, Chinese, Filipinos, East and South-East Asians, aboriginal people, blacks, African blacks, and those from the Caribbean. Because of this aggregation, the statistical analysis fails to detect the diversity among people of minority-group origin. Given this data limitation, the ethnic-origin variable is only significant for the results from the rural areas.

Family size — In both urban and rural areas, youths from four-person families tend to have more formal education than those from larger and smaller households. Youths from families (regardless of family size) tend

to do better than those of the same age from nonfamily households. The overall impression is that a family of four people is most favourable for children's pursuit of formal education, while very large and very small families and the nonfamily environment seem less conducive to academic achievement.

Family status and living arrangement — Children from husband/wife households and single-male-parent families have a better chance of completing more formal education than those who live with single mothers, relatives, nonrelatives, common-law spouses, or alone. This underlines the importance of the home environment on education. This is true of urban and rural areas.

A Few Words of Caution

The associations drawn between educational attainment and socioeconomic factors imply extremely complex relationships. Socioeconomic factors can influence but cannot cause an individual's success or failure in the education system. In the real world, family income approximates several factors. In some cases it is a proxy for the parents' educational background, the parents' ability to organize and use their time properly, and their ability to guide their children through the "jungle" of the education system. If this is true, then it is the implicit quality of the family income rather than the dollar value of the income that influences a child's education. Similarly, it is the environment created by the value of dwelling, family size and family status/living arrangement that contributes to individuals' success or failure in the system. The upshot is that policymakers have few feasible options in attempting to mitigate the effects of low socioeconomic status. High educational attainment requires proper educational facilities and favourable environments for all Canadian youths. So far, neither the government nor educators have been able to provide less fortunate youths with these amenities adequately.

Twenty-six-Year-Olds

As mentioned earlier, for 26-year-olds the study attempts to determine success in life, which includes both success in the education system and in the labour market. Accordingly, the research involves pinpointing the socioeconomic factors that can significantly affect individuals' years of education completed, employment income, and weeks worked in a year. Since educational achievement can affect an individual's income and employment, and weeks worked has a direct impact on employment income, new classification variables have to be created when used as

explanatory variables. In particular, the research design regroups the years of education completed into three education classes. Individuals with less than 10 years of education are grouped into education class 1, those with more than 11 but less than 12 years of education are grouped into education class 2, and those with 13 or more years of formal education are grouped into education class 3. Weeks worked are similarly coded into a classification variable where needed. Tables 3 to 8 summarize the results for 26-year-olds from urban and rural areas and for each of the dependent variables separately.

The results for the educational attainment variable are consistent with those reported for 18-year-olds. Family income, value of dwelling, ethnic origin, and family size show significant influence on the educational attainment of young people aged 26 from both urban and rural areas. Provincial differences contribute to the educational achievement of 26-year-olds from rural areas in more than one way. First, the province-of-residence variable by itself affects a 26-year-old's chance of success in the education system. Second, province of residence also interacts with family income to exert further influence on an individual's education. For 26-year-olds from census metropolitan areas with populations of 100,000 or more, the interaction between province of residence and value of dwelling has an indirect effect on the individuals' education, but the impact of province of residence by itself is insignificant.

Although the results for 26-year-olds appear to be consistent with the findings for 18-year-olds, the implications are not necessarily identical. The statistical associations between the educational attainment and family income variables are for the two ages similar. As expected, individuals from well-to-do families tend to complete more education. However, family income does not have the same connotation for 18-year-olds as it does for 26-year-olds in 1986. The majority of 18-year-olds are still full-time students and do not contribute to family income. On the other hand, the majority of 26-year-olds are already members of the labour force and are probably major contributors to family income. Therefore, the correlation between their educational attainment and family income takes on different meaning. The relationship in this case is a statistical association (i.e., educational attainment and family income tend to move together) with no clear indications of cause and effect. Because most individuals aged 26 have already completed their formal education, the empirical relationships between the socioeconomic factors and educational attainment must be interpreted with discretion.

The results show that province of residence, family size, education and weeks worked have a statistically significant influence on employment income. The impact of province of residence, years of education

completed, and weeks worked, on employment income is clear. The correlation between family size and employment income, however, is probably a statistical association rather than a cause-and-effect relationship.

The statistical results illustrate that many factors — including family income, province of residence, family size, education class, and the interaction effect between family income and education class — systematically affect individuals' work experiences (i.e., weeks worked). This is true of individuals from large census metropolitan areas as well as those from rural areas. The relationship between work experience and education is such that, *ceteris paribus*, more educated individuals always have more success in the work place than less educated individuals.

The Quantitative Effects of Socioeconomic Factors on Education

So far, the report has only presented the statistically significant factors individually. There are occasions, however, when more specific information is preferable. For example, the reader may want to know how much low family income and poor residential environment contribute to the poor educational attainment of individuals from poverty stricken neighbourhoods, after the effects of all other factors have been taken into account simultaneously. The Estimate Statement, which is one of the options of the ANOVA Generalized Linear Model,²⁰ deals directly with this type of question. The following discussion focuses on 18-year-olds from rural areas, but the results are generally applicable to other age groups and to urban areas.

In measuring the impact of favourable and unfavourable socioeconomic forces on the education of 18-year-olds, we use the terms "favourable" and "unfavourable" in a hypothetical, illustrative sense. An 18-year-old is said to come from a favourable socioeconomic background if he/she is from a family with an income of \$75,000 or over, lives in a family-owned house valued at \$150,000 or more, is a resident of Quebec, is from a family of multiple ethnic origins (e.g., a British father and a French mother), is a member of a four-person family, and lives in a husband and wife family. A youth is said to come from an unfavourable socioeconomic background if he/she is a member of a low income family (a family with total family income of less than \$14,999); lives in a dwelling valued under \$79,999; is a resident of Nova Scotia; is from a minority ethnic group; is from a family of six or more persons; and lives with relatives. Of course, in the real world, better or worse combinations are possible. These two extreme socioeconomic combinations are chosen strictly for illustrative purposes. They represent the ideal and worst possible worlds for individuals, limited by the sample size on the

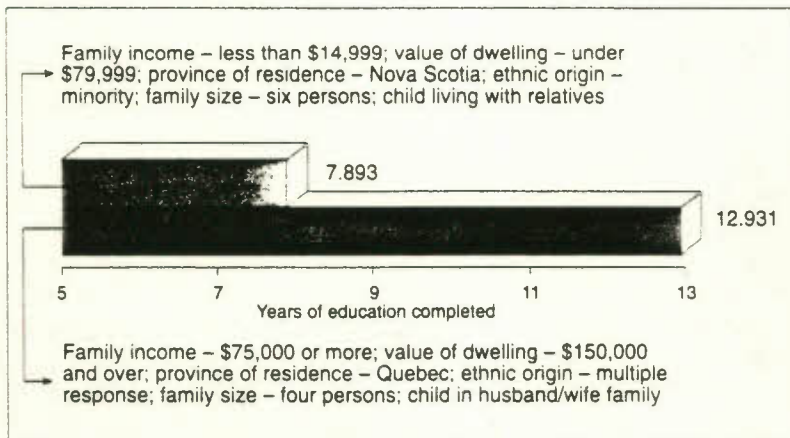
census tape. For example, it is possible to think of a better or worse combination of socioeconomic factors, but if there are no 18-year-olds with such socioeconomic attributes on the microdata tape, then the effect of this hypothetical socioeconomic background on education cannot be estimated.

Individuals from a favourable social and economic background may expect to complete 12.9 years of formal education by age 18 (Figure 6). The estimated figure is statistically significant at the level of 0.01 per cent; there is hardly any chance for the estimate to be a statistical artifact. At the other end of the spectrum, an individual from an unfavourable socioeconomic background can expect to complete only 7.9 years of formal education (Figure 6 and Table A-9). It should be mentioned that these estimates refer to average educational attainment. Certain individuals would of course accomplish more or less, depending on the personal traits. For example, if a person is more gifted than other members of the group, then the educational attainment of this individual will probably be higher than the estimated figure.

Figure 7 is a summary of the factorial contributions of the socioeconomic forces. The graph presents the net effect of each favourable factor in an additive, sequential fashion. The first part of the stack-bar graph illustrates that if the individual is from a family of unfavourable socioeconomic background, then the expected educational attainment for this 18-year old is 7.9 years of "education completed."

Figure 6

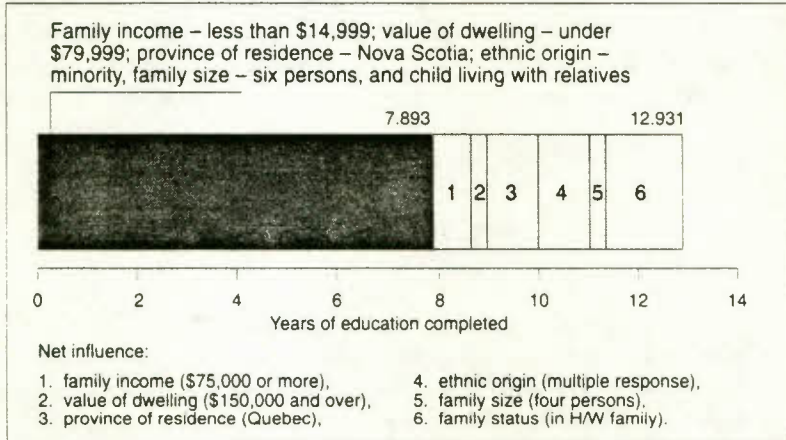
The effects of socioeconomic forces on the education of 18-year-olds from rural areas, Canada, 1986



SOURCE Based on data from the 1986 Population Census.

Figure 7

The effects of favourable socioeconomic factors on the education of 18-year-olds from rural areas, Canada, 1986



SOURCE Based on data from the 1986 Population Census.

However, if the individual were from a family with an annual income of \$75,000 or more, with all other unfavourable factors unchanged, his/her educational attainment would be higher. The net increase in educational attainment is illustrated by rectangle 1 of the stack-bar graph. Similarly, rectangles 2 to 6 represent the net influence of other favourable factors on the individual's formal education. In the real world as well as in the statistical analysis, these factors affect education simultaneously. Therefore, the reader should take the graph simply as a presentation device. A husband-wife household has the largest impact on a child's education. Factors such as family income, province of residence, and ethnic origin also play a substantial role in determining a child's educational achievement. On the other hand, the contributions of family size and high property value are relatively modest.

In summary, the evaluation exercise has demonstrated that socioeconomic factors can make a great difference to a person's success in the educational system. Indeed, according to the example given here, the difference between very favourable and inordinately unfavourable socioeconomic factors can account for about five years of additional education completed. Clearly, if the country is interested in raising the educational standard of all Canadians, then, in addition to the perennial search for a more efficient education system, ways must be found to alleviate some of the unfavourable social and economic influence on less fortunate youths.

Concluding Remarks

This analysis has established that social and economic factors profoundly influence an individual's formal education. This finding is consistent with the consensus of past researchers in education economics. The contribution of this study is not that it has unearthed surprising results. On the contrary, its contribution is that it empirically confirms a popular belief. Furthermore, although past observers have acknowledged the influence of social and economic factors on education, they have seldom produced quantitative estimates for the contributions of a comprehensive set of individual socioeconomic factors. The present study may be the first research effort to do this.

From the list of significant variables found to affect educational attainment, there are few that the government has control over. For example, policymakers are in no position to change the economic status of poor families, to alter family size, or to provide single parent families with another parent.

A priori, poverty, large family size, and the lack of a husband/wife home are not directly responsible for low educational attainment. Only the overall environment created by these factors impede high educational attainment. How can the government help less fortunate youths to reach their potential? The U.S. Head Start programs have demonstrated that there are no "quick fixes." Preschool programs may help some underprivileged children for a short period. However, even the most enthusiastic supporters of Head Start do not expect the beneficial effects of the program to last throughout a child's academic career, for youths of low socioeconomic status are presented with too many chances of failing. Policymakers presently have no real answers to this problem. In North America, the children of wealthy families are often sent to private "prep schools" during their formative years. These fortunate youths tend to enjoy proportionately more success in the education system than their counterparts from the poor families. *A priori*, one must at least attribute part of their superior performance to the superior learning environments of "prep schools." Why, then, does the government not solve the socioeconomic problem by providing less fortunate children with a free "prep school" education? The answer, of course, is that the cost of such a program would be prohibitive. Given present fiscal stances, the federal and provincial governments simply cannot afford such a costly undertaking. Moreover, even if the government had the money to initiate and finance such a program, it is not clear that many poor parents would choose to send their children to free "prep schools," and they cannot be forced to do so. A free "prep school" program without participants can only become a white elephant. It would not solve the problem. If policymakers consider this solution impractical, then they should immediately consult the experts in education, psychology, criminology, and the police for a viable alternative.

Appendix

Summaries of Univariate Tests

Table A-1

Dependent variable — years of education completed; sample — all 18-year-olds from census metropolitan areas with populations of 100,000 or more, 1986

Independent variable (Source of variation)	F Value	Level of significance ¹ (Per cent)
Income class	8.18	0.01
Value of dwelling	17.38	0.01
Province	3.22	0.67
Family size	6.95	0.01
Family status	4.01	0.13
Income class province	1.69	1.70
Income class family size	2.15	1.15

¹ In Type III analysis, the main effect of an independent variable is adjusted for the effects of other independent variables and the interaction effects. For more details, see R.J. Freund, R.C. Littell, and P.C. Spector, *SAS System for Linear Models* (Cary: SAS Institute Inc., 1986), and *SAS/STAT User's Guide*, Version 6, Fourth Ed, (Cary: SAS Institute Inc., 1990).

SOURCE Based on data from the 1986 Population Census.

Table A-2

Dependent variable — years of education completed; sample — all 18-year-olds from small towns/cities and rural areas, 1986

Independent variable (Source of variation)	F Value	Level of significance (Per cent)
Income class	16.63	0.01
Value of dwelling	6.75	0.01
Province	14.78	0.01
Ethnic Origin	16.67	0.01
Family size	8.28	0.01
Family status	12.68	0.01

Table A-3

Dependent variable — years of education completed; sample — all 26-year-olds from census metropolitan areas with populations of 100,000 or more, Canada, 1986

Independent variable (Source of variation)	F Value	Level of significance (Per cent)
Income class	55.80	0.01
Value of dwelling	5.21	0.03
Ethnic origin	6.40	0.01
Family size	26.53	0.01
Province value of dwelling	1.71	1.68

Table A-4

Dependent variable — employment income in 1985; sample — all 26-year-olds from census metropolitan areas with populations of 100,000 or more, Canada, 1986

Independent variable (Source of variation)	F Value	Level of significance (Per cent)
Province	6.41	0.01
Family size	4.13	0.02
Education class	14.17	0.01
Weeks-worked class	556.77	0.01

Table A-5

Dependent variable — weeks worked in 1985; sample — all 26-year-olds from census metropolitan areas with populations of 100,000 or more, Canada, 1986

Independent variable (Source of variation)	F Value	Level of significance (Per cent)
Income class	133.57	0.01
Province	8.65	0.01
Family size	71.34	0.01
Education class	11.06	0.01
Income class education class	2.59	0.07

Table A-6

Dependent variable — years of education completed; sample — all 26-year-olds from small towns/cities and rural areas, Canada, 1986

Independent variable (Source of variation)	F Value	Level of significance (Per cent)
Income class	25.98	0.01
Province	5.51	0.01
Ethnic Origin	10.15	0.01
Family size	44.42	0.01
Income class province	1.56	0.75

Table A-7

Dependent variable — employment income in 1985; sample — all 26-year-olds from small towns/cities and rural areas, Canada, 1986

Independent variable (Source of variation)	F Value	Level of significance (Per cent)
Province	6.25	0.01
Family size	5.59	0.02
Education class	16.06	0.01
Weeks-worked class	514.24	0.01

Table A-8

Dependent variable — weeks worked in 1985; sample — all 26-year-olds from small towns/cities and rural areas, Canada, 1986

Independent variable (Source of variation)	F Value	Level of significance (Per cent)
Income class	85.09	0.01
Province	7.55	0.01
Family size	73.20	0.01
Education class	15.66	0.01
Income class education class	1.98	1.34

Table A-9

Quantitative effects of socioeconomic factors on education, Canada, 1986

18-Year-olds from urban centres

Unfavourable influence

Family income — \$14,999 or less in 1985
Value of dwelling — \$79,999 or less
Family size — six or more persons per family
Living arrangement — child living with relatives

Estimated years of education completed — 9.610
(statistically significant at 0.01 per cent)

Favourable influence

Family income — \$75,000 or more in 1985
Value of dwelling — \$150,000 and over
Family size — four persons per family
Living arrangement — child living in husband/wife family
Estimated years of education completed — 12.422
(statistically significant at 0.01 per cent)

18-Year-olds from rural areas

Unfavourable influence

Family income — \$14,999 or less in 1985
Value of dwelling — \$79,999 or less
Province of residence — Nova Scotia
Ethnic origin — minority
Family size — six or more persons per family
Living arrangement — child living with relatives

Estimated years of education completed — 7.893
(statistically significant at 0.01 per cent)

Favourable influence

Family income — \$75,000 or more in 1985
Value of dwelling — \$150,000 and over
Province of residence — Quebec
Ethnic origin — multiple response (e.g., British and other)
Family size — four persons per family
Living arrangement — child living in husband/wife family

Estimated years of education completed — 12.931
(statistically significant at 0.01 per cent)

Notes

- 1 See James Coleman *et al.*, *Equality of Educational Opportunity* (Washington, D.C.: Department of Health, Education, and Welfare, 1966).
- 2 See James Coleman *et al.*, *Equality of Educational Opportunity*; and Burt S. Barnow and Glen G. Cain, "A reanalysis of the effect of head start on cognitive development: Methodology and empirical findings," *Journal of Human Resources* Spring 1977, 12(2): 177-97.
- 3 W. S. Barnett, "Benefit-cost analysis of the Perry Preschool Program and its long-term effects," *Educational Evaluation and Policy Analysis* 1985, 4(7): 333-42.
- 4 See Maisy Cheng *et al.*, *The Every Secondary Student Survey* Fall 1987 (Toronto Board of Education, June 1989).
- 5 See Coleman *et al.*, *Equality of Educational Opportunity*.
- 6 See, for example, Barnow and Cain, "A reanalysis of the effect of Head Start."
- 7 Barnett, "Benefit-cost analysis of the Perry Preschool Program.
- 8 Richard J. Murnane, "What do effective teachers of inner-city children have in common?" *Social Science Research* March 1981, 10(1).
- 9 Anita A. Summers and Barbara L. Wolfe, "Do schools make a difference?" *The America Economic Review* September 1977, 67(4).
- 10 Richard J. Murnane *et al.*, "Home resources and children's achievement" *Review of Economics and Statistics* August 1981, 63(3): 369-77.
- 11 See, for example, Summers and Wolfe, "Do schools make a difference?"
- 12 Maisy Cheng *et al.*, *The Every Secondary Student Survey*.
- 13 See, for example, Murnane *et al.*, "Home resources and children's achievement."

- 14 The census microdata file has separate data for 10 provinces and the Yukon/Northwest Territories (combined). Therefore, we only need 10 dummy variables to capture the provincial effects. The effect of the omitted territory is imbedded in the constant term of the estimated equation. 15ANOVA is a well developed theory in the history of statistics. The reader should have no problem locating some good books on the topic. See, for example, S.R. Searle *Linear Models* (New York: John Wiley & Sons, 1971), and F.A. Graybill, *Theory and Application of the Linear Model* (Belmont, Ca: Wadsworth Publishing, 1976).
- 16 This statistical property is not well known among the users of the multiple regression technique. For more information, see F.A. Graybill, *Theory and Application of the Linear Model*; R.J. Freund *et. al.*, *SAS System for Linear Models* (Cary: SAS Institute, 1986); and *SAS/STAT User's Guide*, Version 6, fourth ed. (Cary: SAS Institute, 1990).
- 17 In passing, we may point out that the Census information used in this study is always in the form of unbalanced design. The Generalized Linear Model of ANOVA enables us to deal with the data problem correctly and efficiently. See *SAS/STAT User's Guide*.
- 18 We did not ignore individuals aged 15-17 and 19-25 completely. For the sake of economizing the amount of statistical work, we divided young people into three age groups — 15-17, 19-22, and 23-25. This allowed us to study the behaviour of these individuals economically without introducing too many age-specific aggregation problems. The results for those aged 15-17 and 19-22 match fairly closely those for the 18-year-olds, and the results for the 23-25 year-olds are similar to those of the 26-year-olds. These results are available from the author upon request.
- 19 For more detail on this topic, see Freund *et. al.*, *SAS System for Linear Models*; and *SAS/STAT User's Guide*.
- 20 See *SAS/STAT User's Guide*.

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