An Empirical Study of Factors Determining the Success Rates of Social Science Students at Dawson College: Attendance and Grades in an Introductory Economics Course

PAREA PROJECT PA2002-07

By
Worku Aberra (PhD)

Dawson College
Montreal

This research project is made possible by a grant from the Ministry of Education of the province of Quebec through PAREA

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The sole responsibility of this report rests with Dawson College and with the author

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Acknowledgments

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The Relationship between Attendance and Grades in Introductory Economics

1.0.0 Abstract

A number of studies have been conducted to assess the association between class attendance and academic performance, but the results have been inconsistent. While most studies demonstrate a strong association between attendance and academic performance, some studies show no significant relationship, most probably due to the lack of large data. This study, using long-term data, examines the relationship between class attendance and grades in an introductory economics course at Dawson College. Data on attendance and student performance were collected over a period of seven years between fall 1994 and winter 2001. To assess the impact of attendance on grades, the study estimates a regression equation that relates grades obtained in the course to academic aptitude, high school economics grade, the number of terms the student has been studying at the College, and absences. The study postulates that the relationship between absences and grades is non-linear, specified as a semi-log function. The results of the estimated equations show that attendance significantly influences grades and that the variables that influence attendance also influence grades. To examine whether student attributes such as gender, linguistic group, and the program in which a student has enrolled affect the influence of absences on grades, separate regression equations were estimated for each of these qualitative variables. The results of these separate estimations demonstrate that the impact of absences on grades varies with gender, linguistic group, and program of studies: the influence of absences on grades is stronger for male than for female students, greater for Commerce students than students in other programs, and higher for English-speaking students than for other linguistic groups. The results of the study have certain implications for attendance policy.

2.0.0 Introduction

Absences in introductory courses appear widespread in colleges and universities: on average about a third of students miss classes for a variety of reasons (Romer, 1993). The class size, the nature of the course, whether the course is an introductory or a higher level course, the type of institution where students are enrolled, part-time work, family income, social activities, the day and the time the course is given, the attendance policy of the instructor, and the quality of teaching all influence attendance (Hanson, 1990; Van Blerkom, 1992; Romer, 1993; Hancock, 1994; Xu, 1996; Devadoss and Foltz, 1996; Shimoff and Catania, 2001). Absences tend to be high in large classes, introductory courses, less-mathematically oriented courses, large colleges and universities, late afternoon classes, early morning classes, classes given on Fridays, classes where instructors follow no explicit attendance requirements, and courses in which students

consider the quality of teaching to be inferior. The reasons for absences may vary, but most studies show a strong and statistically significant relationship between attendance and grades (Hanson, 1990; Van Blerkom, 1992; Romer, 1993; Hancock, 1994; Durden and Ellis, 1995; Xu, 1996; Devadoss and Foltz, 1996; Shimoff and Catania, 2001).

However, these studies, even those showing a strong relationship between attendance and grades, are fraught with methodological problems related to data gathering, especially data on class attendance. In collecting attendance data, many researchers have relied on a limited number of surveys (Durden and Ellis, 1995; Xu, 1996, and Shimoff and Catania, 2001), which invariably incorporate response bias and increases sampling errors. Others have used counting and sign-ins to record attendance (Romer, 1993; Van Blerkom, 1992). Despite the efforts researchers have made to reduce response bias, data collected from surveys, especially on the self-reported grade data, are subject to sampling errors. Recognizing the shortcomings of data collected from surveys, some researchers have attempted to reduce the potential bias in self-reported grade data by using objective data on grades, but collecting class attendance data remains a problem. Because of the time constraint they face in taking class attendance by roll calls (Durden and Ellis, 1995), many researchers have gathered data on class attendance by asking students to register on sign-in attendance sheets (Shimoff and Catania, 2001), but class attendance data collected by signed-in attendance sheets will probably affect the reliability of the data, as some students may be tempted to sign in for their friends, especially when points are assigned for class attendance. To address this problem, some researchers have devised protocols for discouraging students not to sign in for their friends, but still the protocol cannot completely avoid erroneous reporting, particularly in big classes, where most of the studies have taken place.

3.0.0 Methodology and Sample

In this study, to ensure data reliability, attendance data were collected and recorded through roll calls at the beginning of each class. Since the maximum class size was institutionally set at 40 students per class, and the average class size was 38, taking attendance this way was not too time consuming. Data on attendance, assignments, tests,

and projects, were collected between fall 1994 and winter 2001 on a sample of female and male students from three major programs at the College – Business Administration, Commerce, and Social Science. (Although Commerce is officially classified as a profile under Social Science, because the unique academic characteristics of students enrolled in Commerce, it is classified as a separate program for the purposes of this study).

Table I

Distribution of the Sample by Program

Program	*Number*	*Percent*
Business Administration	148	25.88
Commerce	75	13.11
Other Programs	79	13.81
Social Science	270	47.20
Total	**572**	**100.00**

The rest of the students in the sample came from various programs, mostly from Office Technology. As can be seen in Table I above, Social Science students accounted for close to 50% of the sample, while Business Administration students accounted for more than 25% of the sample.

3.1.0 Gender

While the sample was almost evenly divided between female (49.30%) and male students (50.70%), there were significant gender differences in the distribution of students across programs, as shown in the table below.

Table II

Distribution of the Sample by Program and Gender

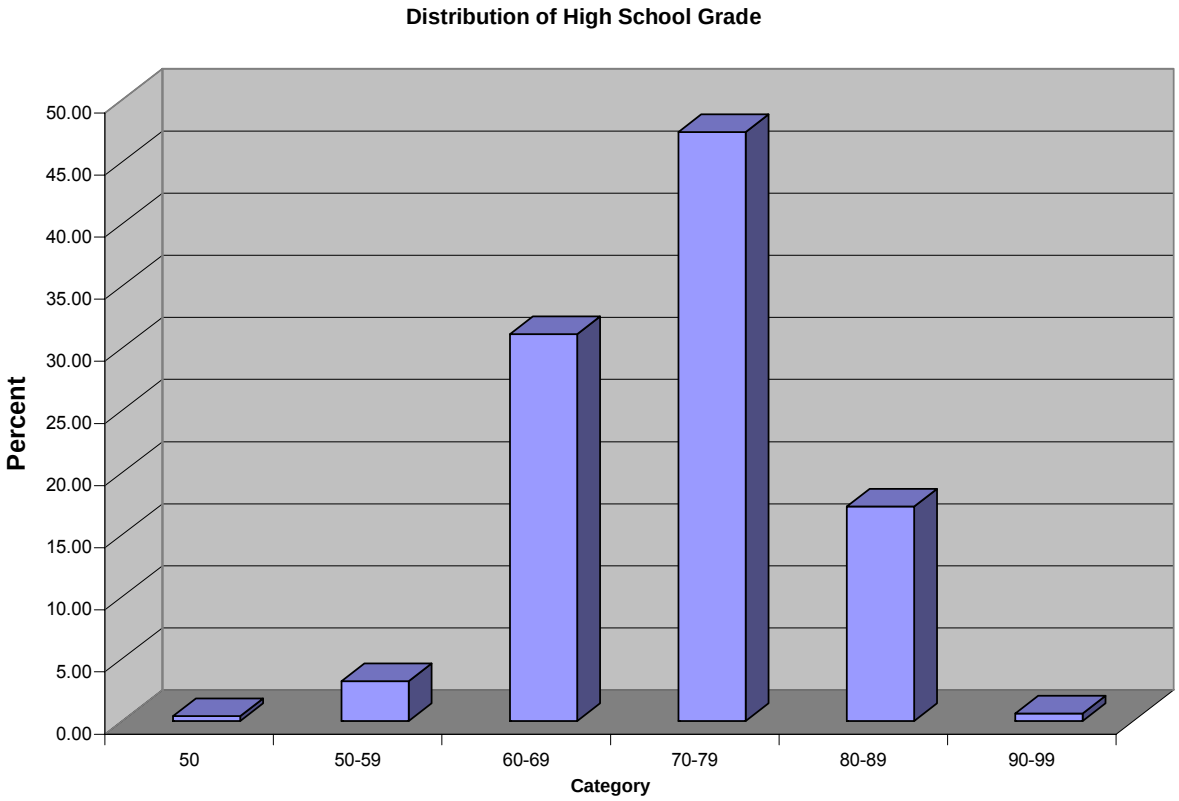
Proportion	BA	Commerce	Other	Social Science
Female	55.41	53.33	56.96	42.59
Male	44.59	46.67	43.04	57.41
Total	**100**	**100**	**100**	**100**

The proportion of female students in the sample varied significantly across programs for various reasons, from a low of slightly over 42% in Social Science to a high of close to 57% in other programs. The uneven distribution of students in the sample reflects gender differences in program choices and high school performance. The high proportion of female students in "other" programs reflects the fact that the majority of the students classified as being from "other" programs were from Office Technology, a career program designed for students interested in secretarial work, where close to 100% of the students were female. Although the criteria for being admitted into Business Administration and Social Science were identical, there were more female than male students enrolled in Business Administration, a three-year career program preparing students for the labour market. The high proportion of female students in Business Administration therefore suggests that female students tend to be more focussed in their choice of career goals. The relatively high number of female students in Commerce, which has higher admission requirements than the other programs, reflects in part the superior high school grades of female students, and in part the more academically focussed choice of female students.

3.2.0 High School Performance

The distribution of the secondary V mean grade of the sample appears to be concentrated around the mean, 72.9%; as the chart below shows, many of the students in the sample, close to 50% of the sample, had an average of between 70 and 79%, while a very small proportion of students had a grade of less than 50% and greater than 90%.

Chart I



The majority of the students in the sample, more than 78%, had a mean grade of between 60 and 79%. However, when the grade data were segregated by program, a different picture emerged, as reported in Table III below. The mean grade varied from a low of 70% for students in Social Science and other programs to a high of 80% for Commerce students. Once again, the high school mean grade of students in the sample appear to be fairly concentrated around the group mean for the different programs, especially for students in Commerce, as indicated by the lowest coefficient of variation.

Table III

Average High School Grades by Program

(Figures rounded off to the next unit)

Program	Number	Mean	Coefficient of Variation
BA	148	76	8%
COM	75	80	7%
OT	79	70	11%
SS	270	70	10%

The relatively low coefficient of variation for Commerce students, compared to that of the Social Science students, implies that distribution of high school mean grades of Commerce students is negatively skewed while that of the Social Science students is positively skewed. When a Tukey-Kramer HSD test was conducted to assess if there was a statistically significant difference in mean grades by program, it was found that the difference between the mean grades of Commerce students on the one hand and students from Business Administration, Social Science, and other programs, on the other hand, was statistically significant; as was the difference in the mean grades of students from Business Administration and that of students from Social Science and other programs.

To highlight the distribution of mean grades by program, the mean grades of students in the sample were broken down into grade categories, and a frequency table constructed.

Table IV

Distribution of High School Mean Grades by Program

Mean Group	Social Science	Commerce	BA
< 50	0.4	0.0	0.0
50-59	4.8	0.0	0.7
60-69	**45.2**	1.5	17.0
70-79	41.7	47.0	**61.5**
80-89	7.8	**48.5**	20.0
90-99	0.0	3.0	0.7

The skewness in the distribution of high school mean grades by program is shown in Table IV. A very small proportion of Social Science students had a mean grade of less than 50%, while there were no students in this category from Commerce or Business Administration. The majority of Social Science students had a high school mean grade of between 60 and 69%, BA students between 70 and 79%, and Commerce students between 80 and 89%. None of the Commerce students had a mean grade of less than 60%, and only 1.5% had a grade of between 60 and 69%, and none of the students in Social Science Program had a mean grade of higher than 90%.

The high school mean grades of students not only varied by program, but also across gender and languages. The high school mean grade of female students was 74.5% and that of male students was 71.4%, but the difference was statistically insignificant. The high school mean grade showed very little variation across linguistic groups: it was about 73% for all of the students coming from the three major linguistic groups: English speaking, French-speaking, and allophones.

The economics grades of the students in the sample showed similar distribution, in which they were concentrated around the group mean, as suggested by the low coefficient of variation, with the exception of the grade distribution of students from other programs. Although students from the other programs had the highest mean grade in high school economics, it appears that the economics marks were unevenly distributed, as indicated by the highest coefficient of variation, suggesting the high mean score must have been skewed by a small number of high grades.

Table V

High School Economics Grade by Program

(n=572)

Program	Number	Mean	Coefficient of Variation
BA	148	73	13%
COM	75	78	11%
OT	79	81	143%
SS	270	68	16%

A comparison of the distribution of high school economics grades of Social Science students with that of the students from Commerce and Business Administration indicates that Social Science students not only had a lower mean grade than students in the other programs, but that the mean grade was concentrated in the lower end of the distribution. In comparison to other programs, once again the distribution of high school economics grade in Social Science was skewed to the right. Despite major differences in distribution, if students from other programs are excluded, the difference in the mean

grades of students in economics showed little variation across language, gender, and programs, and was found to be statistically insignificant at 5% level of significance.

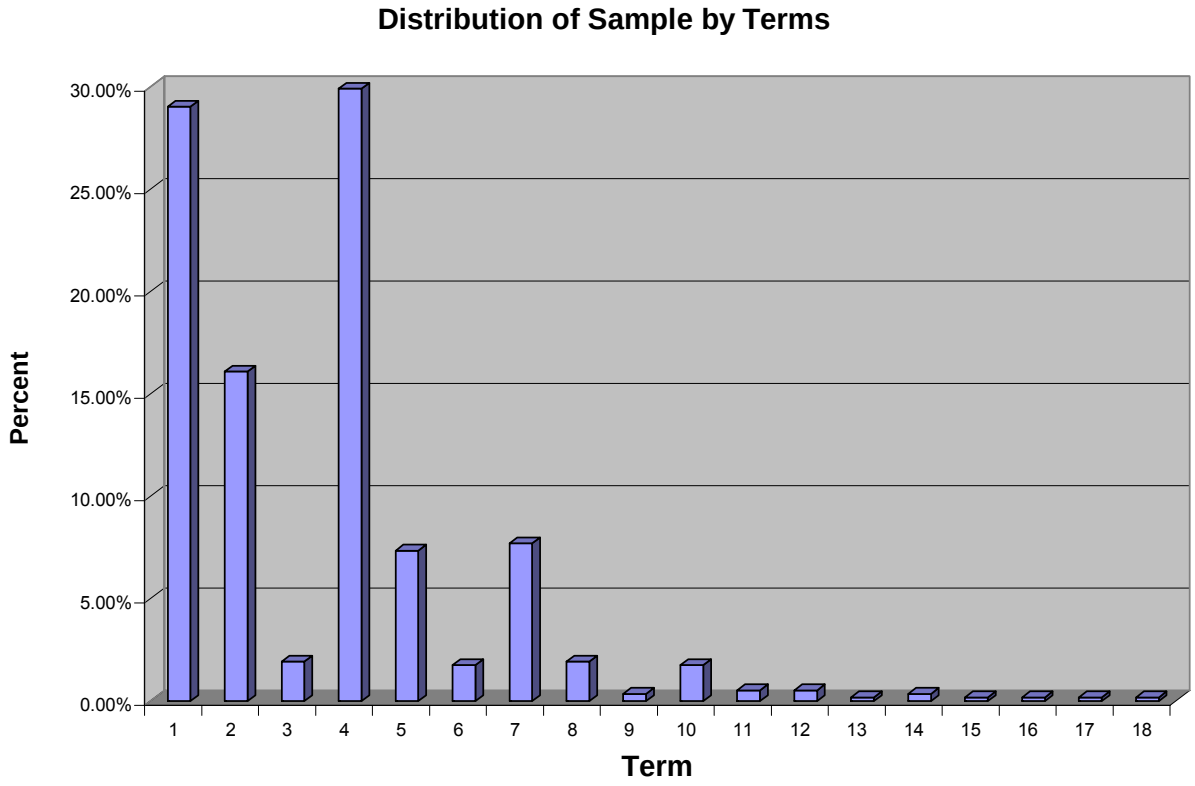
3.3.0 Winter and Fall Terms

The sample included students taking the course in the winter and fall terms; a clear majority of the students in the sample (68.7%) took the course in the fall terms, the remaining (31.3%) in the winter terms. The disproportionally high number of students taking the course in the fall term was in part due to the generally lower number of students taking economics in the winter term, and in part due to the fewer number of sections of the course that the instructor taught in the winter terms. However, the program that the students enrolled in influenced in which term students took the course: for students in Business Administration and Commerce, program requirements determined when they took the course. Until recently Business Administration students were required to take economics in the winter term, in their second year, while Commerce students are required to take economics in their first term, in the fall term. Social Science students have had the liberty of taking the course either in the fall or winter terms during their first year.

3.4.0 Number of Terms

The sample also showed variation in the number of terms students had been in the College when they took the course, as shown in Chart II.

Chart II



Less than 30% of the students took the course in their first year, but slightly higher than 15% took the course in their second term, and surprisingly only about 3% took it in their third term. The majority of the students, close to 30% of the total sample, took the course in their fourth term, in their second year of studies at the College. The high proportion of the students taking the course in the fourth semester was partly due to the fact that more than one-quarter of the students in the sample were students in Business Administration. As stated earlier these student were required to take the course in their fourth term. Further, the concentration of students taking the course in the first four terms is consistent with the graduation requirements of the College, and the unusually high proportion of students taking the course in the 4th semester is therefore due to the significant proportion of Business Administration students in this sample.

The data also show that a small proportion of students, either because of their decision to enrol in a smaller number of courses per term or to take time off from school, took the

course in their late terms. Twenty-three students, representing 3.91% of the total, took the course in the 10th or higher term.

3.5.0 Socio-economic Background

Since data on the family income of students were unavailable, to analyze the impact of family income on attendance and grades, the median income of the neighbourhoods from where students came was taken as a proxy variable for socio-economic status of the students. Data on median family income, taken from the Statistics Canada census data of 2001 on the basis of the first three characters of a student's postal code, was taken as an indicator of a student's family income, on the assumption that families with similar income in general tend to live in similar neighbourhoods. When one of the characteristics of the sample – language—is taken to analyze distribution of income, not surprisingly, it varied significantly according to which linguistic group students came from, as shown in Table VI below.

Table VI

Distribution of Median Income by Linguistic group

(Figures are rounded off to the nearest thousand)(N=569)

Language	Number	Mean	Standard Error
French	67	53000	2097
English	329	58000	946
Allophone	173	49000	1305

The median income of the neighbourhoods from which English-speaking students came, tended to be higher than that of the neighbourhoods of the French-speaking students and students who speak neither English nor French as their first language. The widest gap was between English-speaking neighbourhoods, with a median income of close to $60,000.00 and the allophone neighbourhoods, with a mean median income of just over $49,000.00. The median family income of the students coming from French-speaking neighbourhoods, while not statistically significant from that of the students coming from the English neighbourhoods, showed major variations, suggesting that the distribution of

income in the French neighbourhoods exhibits higher variation than that of the English neighbourhoods, which shows more concentration at the high end, skewed to the left.

The distribution of median family income also varied by the program in which students were enrolled, as can be seen from Table VII.

Table VII

Distribution of Median Income by Program

(Figures are rounded off to the nearest thousand)

Program	Number	Mean	Standard Error
BA	147	49000	1400
COM	75	60000	2000
OT	78	54000	2000
SS	269	56000	1000

The distribution of median family income by program shows that students enrolled in the Business Administration program came from neighbourhoods with the lowest family median income, just a little higher than $49,000.00, slightly lower than the median family income of $50,000.00 in Quebec in 2001, while students enrolled in Commerce came from neighbourhoods with the highest median family income of close to $60,000.00. Social Science students also lived in neighbourhoods with higher than the median family income for Quebec in 2001. The orientation of the programs in which students enrolled seems to reflect the differences in the family income of students. The Business Administration Program, a three-year career program designed for students interested in joining the labour market, as opposed to the pre-university programs -- Social Science and Commerce-- seems to attract students from low-income families. It is therefore not surprising that more students who come from low-income families would enrol in the Business Administration program than in the pre-university programs. Commerce students, who come from high-income families, tend to pursue university level academic goals, presumably resulting in managerial careers.

3.6.0 Linguistic Groups

The sample was linguistically diverse, with the majority of the students in the sample being English speaking (57.5%), followed by students whose mother tongue was neither English nor French (30.8%); the proportion of French-speaking students was low (11.7%). While the linguistic composition of the sample varied, the high school mean grade of students showed very little variation across linguistic lines, as reported earlier; the high school mean grade for the three linguistic groups was around 73%.

Some researchers, basing their argument on the high academic achievement of Asian students, attach more weight to cultural background than to socio-economic background in explaining academic performance (Vernez and Abrahamse, 1996) but this emphasis could be misleading. Since data on ethnicity were unavailable, to assess the impact of cultural background on student academic aptitude, the language the students spoke at home – English, French, or other-- was taken as a broad indicator of ethnicity. And when language was taken as an explanatory variable for academic aptitude, it was found that there was no statistically significant difference among students coming from the three broadly defined groups. Differences in family income, more than language, appears to be a better explanatory variable for student academic aptitude, as shown in other studies (Tozer, 2000; Lee and Barro, 2001).

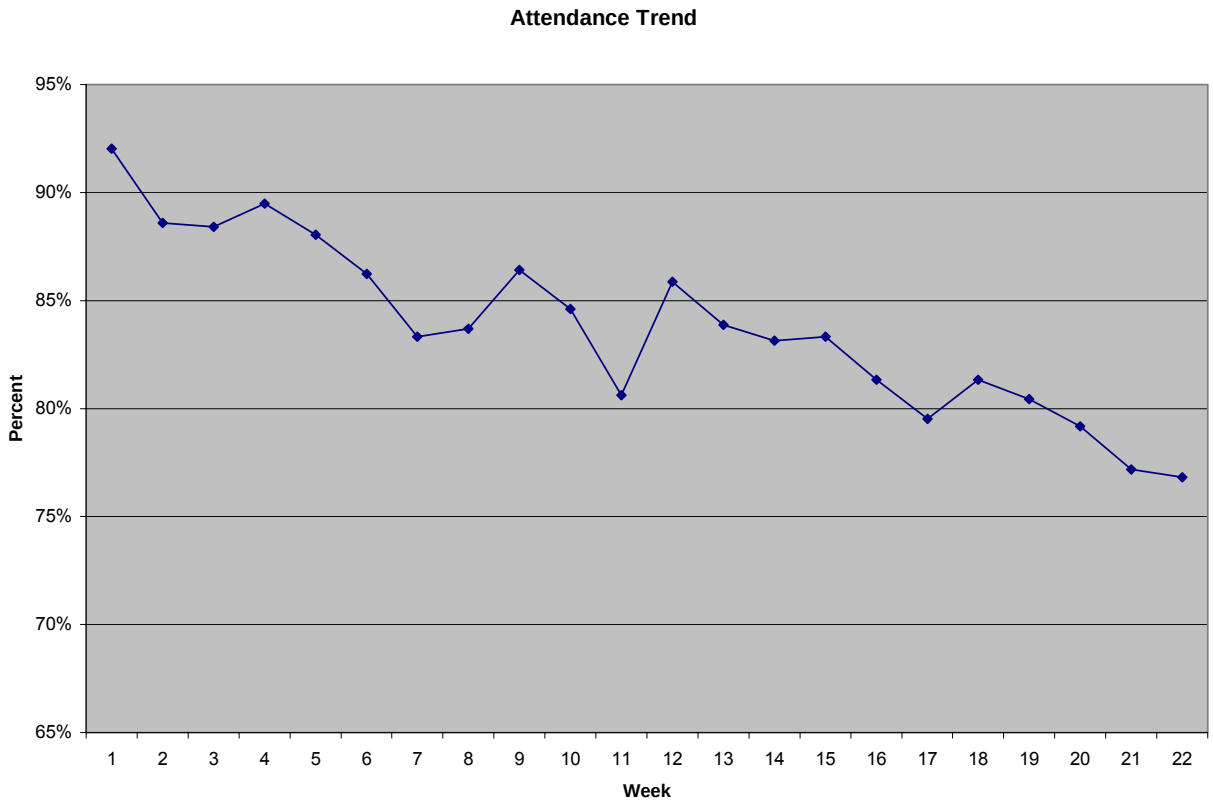
4.0.0 Variables Affecting Attendance

The variables affecting class attendance were discussed in section 1.0.0. In this study, the class size was institutionally determined at 40 students, although the mean number of students per class was slightly lower than 38. Most of the classes were held in the morning between Monday and Thursday, and the mathematical requirements for the course were minimal. Given the same course, the same instructor, and a slight difference in the time and day the course was given, attendance varied with student attributes: Class attendance varied with a student's gender, language, program of study, socio-economic background, high school average, and high school grade in economics. Before discussing the impact of each of these qualitative and quantitative variables on attendance, the trend in attendance will be presented.

4.1.0 The Trend in Attendance

Attendance in the course, with a mean attendance rate of 80.20%, varied over the term but was relatively high compared to attendance in first-year courses in universities, where about one-third of students miss classes (Romer, 1993). Starting at the highest attendance rate in the beginning of the term, attendance gradually decreased towards the end of the semester, when students had to ration their time in preparation for tests, assignments, and final exams in other courses. As the chart below shows the mean attendance rate declined from a high of about 92% at the beginning of the term, two weeks after classes began, to a low of 76% towards the end of the term. Within the term, attendance fluctuated, depending on when the exams were scheduled. Right before exams were given, the attendance rate increased and then declined in the subsequent classes. The low attendance rates, other than the classes after exams, were associated with non-statutory religious holidays, mostly for Jewish students.

Chart III



Within the overall declining trend in attendance rates during the term, attendance varied with gender, language, the program of study, the term the course was taken, academic aptitude, and socio-economic background.

4.2.0 Gender

To examine if there was a statistically significant difference in attendance between female and male students, an ANOVA test was conducted. The mean attendance rate was 82.5% for female students and 78.9% for male students, a statistically significant difference at 5% level of significance (F-ratio 3.72, and alpha = 0.05). It appears that female students missed fewer classes than their male counterparts probably because they are more motivated to obtain better grades, more academically focussed, and more career-oriented than male students.

4.3.0 Linguistic Groups

To investigate the impact of language on attendance, students were divided into three linguistic groups: French-speaking, English-speaking, and those speaking other languages. When the mean attendance rate for each group was calculated, it was found that the mean attendance rate varied from 83% for French-speaking students, 81% for English-speaking students, and to 80% for allophone students. Since an ANOVA test revealed that the difference was statistically insignificant, linguistic group fails to explain differences in attendance rates among the three linguistic groups. The higher attendance rate for French-speaking students may be due to their superior motivation in doing well in the course in an English institution.

4.4.0 Program

The program in which students were enrolled also influenced attendance rates. To analyze the impact of program on attendance, students were classified by the program they registered in: Business Administration, Commerce, Social Science, and other. Students who have higher academic credentials at admission are more likely to demonstrate high attendance rates than students with low academic credentials, and

students who take the course in their second year are more likely to miss fewer classes than students taking the course in their first year. Consequently, the College's admission and graduation policies in these programs indirectly affect attendance rates. At the College, admission requirements for Commerce are higher than they are in the other programs, and students in the Business Administration Program take the course in their second year while Social Science students and students from other programs take the course in their first or second term, in their first year. This suggests that Commerce students, because of their higher academic credentials, and Business Administration students, because they were taking the course in their second year, will have a higher attendance rate than Social Science students, who faced lower admission requirements and could take the course within the first two terms of their college education.

As expected, the attendance rate varied across programs. The mean attendance rate varied from a low of about 77% for Social Science students to a high of more than 86% for Business Administration students, as reported in Table VIII. Although the attendance rate was the lowest for Social Science students, it showed the highest variation, with a coefficient of variation of 31%.

Table VIII

Differences in Attendance Rates by Program

(n = 572)

Program	Mean	Coefficient of Variation
Business Administration	86.14	23%
Commerce	83.21	19%
Other Programs	79.80	26%
Social Science	77.34	31%

The mean attendance rate for Commerce students was more than 83%, with the lowest variation among the four groups of students. The relatively high coefficient of variation for the attendance rates for Social Science students suggests fairly stable attendance

behaviour: some students attended classes regularly while some missed classes frequently. In other words, compared to students in other programs, for Social Science students the difference between those who attended classes regularly and those who attended infrequently was high. On the other hand, among Commerce students the difference in attendance rates was relatively low, as indicated by the lowest coefficient of variation. The attendance behaviour among Commerce students, as indicated by the low coefficient of variation, is more erratic than the attendance behaviour of students in Business Administration, Social Science, or other programs. Since the attendance rate was higher for Commerce students than it was for Social Science students, Commerce students who missed classes tended to be absent more infrequently.

To highlight the difference in the average attendance rates of students across programs, a means comparison matrix was constructed, and reported in Table IX.

Table IX

Means-Comparison Matrix of Attendance Rates

(Difference =Mean[i]-Mean[j])

Program	Business Administration	Commerce	Other Program	Social Science
Business Administration	**0.0**	2.94	6.34	8.81
Commerce	-2.94	**0.0**	3.41	5.87
Other Programs	-6.34	-3.41	**0.0**	2.46
Social Science	-8.81	-5.87	-2.46	**0.0**

The table above shows absolute differences in the mean attendance rates of students in the various programs. The largest absolute difference in attendance rates was between the attendance rates of Business Administration and Social Science students, with a difference of close to 9 percentage points. There were also other differences in the mean attendance rates between Social Science students and students from other programs, but are these differences statistically significant?

To assess the impact of program on attendance rates, an ANOVA test was conducted. Because of student attribute differences in each program– motivation, academic credentials, gender—it was expected that there would be statistically different attendance rates. To test if the differences in the mean attendance rates among students in the four programs were statistically significant, a Tukey-Kramer HSD test was conducted, and the results reported in Table X below. The test shows that the only statistically significant difference in attendance rates was between Business Administration and Social Science students.

Table X

Comparisons of Average Grades all Pairs Using Tukey-Kramer HSD

(Absolute Difference – LSD)

(Alpha= 0.05)

Program	Business Administration	Commerce	Other Programs	Social Science
Business Administration	-6.5	-5.0	-1.4	3.1
Commerce	-5.0	-9.1	-5.6	-1.4
Other Programs	-1.4	-5.6	-8.9	-4.7
Social Science	3.1	-1.4	-4.7	-4.8

Positive values show pairs of means that are significantly different.

The difference in attendance rates among students from different programs is influenced by the distribution of the attendance rates, shown in Table XI.

Table XI

Distribution of Attendance Rates by Program

(n= 572)

Attendance	BA	Commerce	Other Program	Social Science
less than 49	33%	24%	25%	30%
50-59	0%	4%	3%	4%
60-69	6%	0%	10%	9%
70-79	9%	17%	10%	14%
80-89	18%	29%	28%	17%
90-100	34%	25%	24%	26%
Total	100%	100%	100%	100%

The attendance rates, concentrated at the low and high ends of the distribution, in all of the programs, show a bi-modal distribution in which the sample is almost equally divided between those who missed classes regularly and those who attended classes regularly. If we take an attendance rate of less than 59% as a benchmark, the distribution in the attendance rates show that in almost all the programs between 28 and 34% of students attended less than 59% of the classes, and about a similar proportion of students attended 90 to 100% of the classes. The bi-modal distribution of attendance rates suggests the regularity of attendances and absences. Student who are absent frequently tend to be absent more often and students who attend classes regularly tend to attend classes frequently, suggesting a certain degree of stability in attendance behaviour.

4.5.0 Winter and Fall Terms

The attendance rate was also affected by whether students took the course in the fall or winter term. The mean attendance rate for the fall terms was 82.36% with a standard error of 1.09, while in the winter terms it was 77.15% with a standard error 1.63. The difference was found to be statistically significant (at alpha = 0.0008). A number of variables explain why attendance rates are lower in the winter terms compared to the fall terms; although the difference is statistically insignificant, students taking the course in the fall terms tend to have grades in high school economics (74%) than students taking the course in the winter term (69%). As well, the majority of the students taking the course in the fall term were in-phase students, who generally tend to be better motivated to graduate on time and to obtain higher grades than out-of-phase students. The weather could also influence attendance in the fall and winter terms; the lower attendance rate in the winter could be attributed to the cold, snowy Canadian winter.

However, an analysis of the distribution of attendance rates in the fall and winter terms indicates some unexpected major differences in attendance patterns.

Table XII

Distribution of Attendance Rates by Terms

(n= 572)

Attendance	Fall Rate	Winter Rate
less than 49	33%	22%
50-59	2%	6%
60-69	6%	10%
70-79	12%	14%
80-89	20%	21%
90-100	28%	27%
Total	100%	100%

Once again the distribution of the attendance rates was concentrated in the extreme ends, but with a marked difference in the fall and winter rates. Although the mean attendance rate was higher in the fall terms than in the winter terms, a closer examination of attendance rates reveals that among those students who missed classed frequently, more than one-third of the students (35%) who took the course in the fall terms attended less than 59% of their classes, while more than one-fourth (28%) of the students who took the course in the winter terms attended less than 59% of their classes. If the winter weather had been an important factor influencing attendance, along with the lower attendance rate in the winter, the proportion of students who attended less than 59% of their classes should also be higher than that of the fall term, but it was lower, suggesting that staying one extra term in the College tends to discourage absence. Among those students who attended classes regularly, the difference in attendance rate for the two terms was small. Close to 50% of the students attended more than 80% of their classes in both terms.

4.6.0 Quantitative Variables

The quantitative variables affecting attendance for this research were academic aptitude, median family income, and the number of terms a student has been attending College. To

examine how these variables influence attendance, a regression equation relating attendance to these variables was estimated, using Ordinary Least Squares techniques. For the estimation, attendance was taken as the proportion of classes a student attended, academic aptitude was approximated by a student's high school mean grade, while the median income of the neighbourhood from which the student came was taken as a proxy for the a student's family income. It was postulated that academic aptitude is positively related to attendance; students with high academic aptitude are more motivated to attend classes more regularly than students with low aptitude. Hence the relationship between attendance and high school mean grade, the proxy variable for aptitude, is expected to be positive. It is also expected that a family's income will influence attendance in that the higher a family's income, the more likely the student is to attend classes, and the lower a family's income, the more likely the student will miss classes, most probably as students from lower-income families will have to work to support themselves financially.

The regression equation also included the grade of students in high school economics. A priori, it is difficult to ascertain how taking high school economics affects attendance; those who had good grades in high school economics may be tempted to attend class regularly so as to maintain their high grades in economics. It is also plausible that they may feel over confident and consequently miss many classes. On the other hand, students who obtained low grades in high school economics may be "turned off" by the subject and miss too many classes, or may be motivated to succeed in the course and miss fewer classes. Hence, the impact of the high school grade in economics cannot be determined in advance.

The equation relating attendance to academic aptitude, socio-economic background, the number of terms a student has been attending the College, and economics grade was specified as follows.

$$\text{Attend} = \beta_0 + \beta_1 \log \text{HS} + \beta_2 \log \text{HSE} + \beta_3 \text{Trm} + \beta_4 \text{Trm}^2 + \beta_5 \log \text{income} + U \quad \ldots\ldots(1)$$

Where: Attend = attendance

HS = high school grade

HSE = high School Economics Grade

Trm = the number of terms the student has been in the College

Income = the median income of the student's neighbourhood

U = the disturbance term

Equation #1 specifies attendance as a function of high school mean grade, high school economic grade, the number of terms a student has been at the College, and family income. It was postulated that the impact of high school grade is positive, but the rate at which it influences attendance decreases as mean grade increases. The same interpretation applies to how grades in high school economics and family income influence attendance. The relationship between attendance and the number of terms a student has been attending the College was specified as a quadratic function because it was hypothesized that as a student stays longer in the College, the student realizes the positive effects of attending classes and hence misses fewer classes, but as the student continues to stay longer at the College, the student becomes distracted from academic priorities and misses too many classes. Hence the expected sign on the coefficient of "term" is positive and that of "term squared" negative.

Table XIII

Least-Square Estimates and Their t-statistics of the Variables Affecting Attendance

(Semi-log model)

(n=572)

Variables	Constant	Log HS	Log HSE	Term	$Term^2$	Log Income
Beta	-259.77	191.78	-31.24	0.91	-0.02	7.33
t-statistic	-3.50	5.11	-1.83	1.00	-0.47	0.69

$\bar{R}^2$ = 0.05

F-ratio = 5.98

Table XIII shows that academic aptitude, operationalized as the high school mean grade, is positively associated with attendance, and that the relationship is statistically significant. The finding confirms that students with high academic aptitude attend classes more frequently than students with lower academic aptitude; the higher the academic aptitude the more frequent the attendance rate.

Academic aptitude, many studies show, is influenced by a student's socio-economic background in that students from the middle-income groups tend to obtain higher test scores on standardized tests and obtain better grades in colleges and universities than students who come from low-income groups, within the same country or across countries, one of the stylized facts of academic achievement (Tozer, 2000; Aronowitz, 1998; Wright, 1997; McLaren, 1998; Lee and Barro, 2001). The high academic achievement of students coming from middle-income groups has been attributed to the way they have been brought up. The middle class tends to encourage children to express themselves well, to give detailed explanations of events, and to be independent and self-reliant, resulting in superior verbal and communication skills and study habits (Bernstein, 1973; Bourdieu and Passeron, 1977; Bourdieu, 1986; Paulsen, 1991, Tozer, 2001) . Parental involvement in the academic work of their children, access to better resources, modelling of their parents, and the availability of a developmentally conducive social capital contribute to the better performance of students from the middle class background.

Unexpected was the influence of grades in high school economics on attendance. The impact of high school economics grade on class attendance was negative and statistically significant at 10%, suggesting that students who obtained high grades in high school economics attended fewer classes than students who received low grades in high school economics. This may probably be due to over confidence resulting in too many absences on the part of those who performed well in economics in high school, and a cautious decision not to miss too many classes on the part of those who did not do well in economics. The signs on "term", "term²", and income are as expected, but their impact on attendance was statistically insignificant.

The association between the median income of a student's neighbourhood and attendance is positive as expected, although statistically insignificant. This finding seems to be inconsistent with the conclusion of Wyatt (1992), who found that students coming from high income families tend to have lower attendance rates. Given the data used for the study were aggregate, a quadratic model assessing the impact of high income on attendance could not be developed and tested.

However, the positive association between attendance and family income, showing attendance increases with income, perhaps up to a point, is not surprising. This association suggests that students coming from low-income families will have lower attendance rates than students coming from high-income families. The reason for the low attendance rates of students from low-income families is most probably because these students, facing financial constraints, must work more than the optimal number of hours to support themselves. It could also be that they are academically less motivated to achieve higher academic goals than students coming from middle-income families. While the association between family income and attendance may not be surprising, the impact of the proportion of students from middle-income families on the class attendance rates of students who come from low-income families needs to be examined. Although the sample was small, Social Science students taking the course with Commerce students, despite coming from lower income neighbourhoods than Commerce students, tended to have higher attendance rates than the mean attendance rate of Social Science students. But to make a definitive statement on the attendance impact of students from middle-income families on students from low income requires a large set of data.

5.0.0 Variables Influencing Grades

Before examining the combined effects of gender, language, program, term, median family income, the amount of time the student has attended the College, and attendance on grades, the effects of each of the qualitative variables will be examined.

5.1.0 Gender

The grades that female and male students received in the course varied significantly; for female students the mean test score was 65% with a standard error of 1.30 and for male

students, 61% with a standard error of 1.28; this gender difference in mean test scores was statistically significant (alpha = 0.01) with an F-ratio of 6.182. This finding is inconsistent with other studies which either show that female students tend to under-perform in economics compared to male students (Siegfried, 1979; Lumsden and Scott, 1987) or conclude that there is no gender difference (Williams, 1992; Durden and Ellis, 1995; Greene, 1997). Although the adjusted R square was only 0.009, which means that gender differences explain only 0.9% of the variations in grades among students who took the course, a closer examination of the distribution of grades by gender shows more gender differences than is suggested by the mean test scores, as indicated by the table below.

Table XIV

Distribution of Grades by Gender

(n= 572)

Grades	Female	Male
less than 59	23.4%	27.9%
60-69	27.0%	28.6%
70-79	26.2%	25.2%
80-89	18.8%	16.2%
90-100	4.6%	2.1%
Total	100%	100%

As shown in Table XIV above, while the distribution of the grades appears to be somewhat similar among male and female students, female students are more successful in the course than their male counterparts. Close to 28% of the male students but slightly over 23% of the female students failed the course. Whereas the majority of both genders obtained a grade of between 60 and 69%, female students out-performed male students in higher grade categories. Close to 19% of the female students obtained a grade of between 80 and 89%, but slightly over 16% of the male students obtained a similar grade. The proportion of female students who received a grade of 90% or higher was greater than that of male students.

5.2.0 Program

The difference in mean test scores among students from different programs, reported in Table XV below, was found to be statistically significant.

Table XV

Differences in Average Grades by Program

(n = 572)

Program	Mean	Standard Error
Business Administration	73	1.73
Commerce	66	2.43
Other Programs	61	2.37
Social Science	57	1.28

The mean test score for the course varied from a high of more than 73% for Business Administration students to a failing mark of 57% for Social Science students. To closely examine the differences in the mean grades of students from the four programs, a means comparison matrix was constructed. When comparing the mean grade of Social Science students with that of students from other programs, it was found that the largest difference was between Social Science and Business Administration students, and the lowest difference between Social Science and students from other programs. Usually Commerce students, who have higher high school mean grades than the other students,

out-perform students in other programs, but in this course, Business Administration students out-performed Commerce students, with higher mean test score, higher passing rate, and an overall higher distribution of marks. This is probably due to the fact that Business Administration students took the course in their second year. It seems that one extra year of college influences grades significantly. (The sample of Commerce students also included the cohorts of 1998, some of whom had low academic credentials).

Table XVI

Means-Comparison Matrix of Average Grades

(Difference =Mean[i]-Mean[j])

Program	Business Administration	Commerce	Other Program	Social Science
Business Administration	**0**	7	12	**15**
Commerce	-7	**0**	5	**9**
Other Programs	-12	-5	**0**	**4**
Social Science	-15	-9	-4	**0**

To assess if the differences in mean test scores across programs were statistically significant, a Tukey-Kramer HSD test was conducted and the result reported in the table below.

Table XVII

Comparisons of Average Grades using Tukey-Kramer HSD

(Absolute Difference – LSD)

(Alpha= 0.05)

Program	Business Administration	Commerce	Other Programs	Social Science
Business Administration	-6.3	-0.7	4.3	9.9
Commerce	-0.7	-8.9	-3.9	1.4
Other Programs	4.3	-3.9	-8.6	-3.3
Social Science	9.9	1.4	-3.3	-4.7

Positive values show pairs of means that are significantly different. Adjusted R^2= 0.08

Statistically significant differences in mean scores were found between Business Administration and Social Science students, between Business Administration students and students from other programs, and between Commerce and Social Science students.

Not only was there a significant difference in the mean scores, but the distribution of grades by program, as reported in Table XVIII, varied considerably across the programs. The failure rate varied from a low of 12% for Business Administration students to a high of more than 32% for Social Science students. The majority of the students in three programs, with the exception of Business Administration students, received grades ranging between 60 and 69%. Only 1.5% of students in the Social Science Program received a grade of above 90%, compared to close to 7% in Business Administration and more than 5% in Commerce.

Table XVIII

Distribution of Grades by Program

(n= 572)

Grades	BA	Commerce	Other Program	Social Science
Less than 59	12.2%	16%	30.4%	32.3%
60-69	16.9%	33.3%	36.7%	30%
70-79	36.5%	24%	21.5%	21.5%
80-89	27.7%	21.3%	6.3%	13.7%
90-100	6.8%	5.3%	5.1%	1.5%
Total	100%	100%	100%	100%

The relatively low performance of Social Science students – the high proportion of students failing the course and the relatively small proportion of students obtaining high grades -- could be attributed to their lower high school average grade and unclear, ambiguous academic goals.

5.3.0 Winter and Fall Terms

The grades students obtained in the course were also influenced by when the students took the course: the winter or fall terms. The difference in the mean grade in the fall terms (64%) and in the winter terms (60%) was statistically significant at alpha = 2% with an F-ratio of 4.79. This difference is probably not due to the overall difference in the academic credentials of the students taking the course in the two terms, as the high school mean grade of students taking the course in the fall was 73% and those taking it in the winter was 72%, but due to the difference in their high school economics grade and the resulting attitude towards the course. Although the difference was statistically weak, the student who took the course in the fall terms had an average of 74% in high school economics compared to 69% for those who took it in the winter. The better performance of students in the fall term could therefore be in part attributed to differences in high school grades in economics and the resulting attitude towards economics as a subject. There could also have been a "weather effect", in that attendance rates decline in the winter, reducing the mean grade for the course in the winter.

Despite the difference in mean grades of students who took the course in the fall and winter terms, the distribution of the grades by term shows remarkable similarity as indicated in the table below. There were proportionally more students whose grades were in the 60's in the winter terms than in the fall terms and slightly more students who obtained grades in the 80's in the fall term than in the winter term.

Table XIX

Distribution of Grades by Term

(n= 572)

Grades	Fall	Winter
less than 59	24.93%	25.70%
60-69	26.72%	30.73%
70-79	26.21%	24.58%
80-89	18.32%	15.08%
90-100	3.82%	3.91%
Total	100%	100%

5.4.0 Linguistic Groups

It was reported earlier that there was no statistically significant difference in the high school mean grades of students coming from the three linguistic groups: English speaking, French speaking, and allophones. Is there an ethnic difference in grades students received in the course? To answer this question an ANOVA test was conducted and it was found that there was no statistically significant difference in mean scores, although somewhat surprisingly the mean test score for French-speaking students was the highest of the three groups (65%), for allophone students (63%), and the mean grade of English-speaking students was the lowest (62%). This result suggests that fluency in the English language seems to have had little or no effect on the grades students obtained in the course.

So far the impact of qualitative variables affecting grades—gender, program of study, the term the course was taken, and language—have been discussed. Of course, other qualitative variables such as the characteristics of the instructor, the content of the course, and student attributes, such as motivation, affect also grades. The characteristics of the instructor – his academic credentials, teaching practices, quality of teaching, interaction with students, grading style—were fortuitously controlled as it was the same instructor who taught all of the students. Because of the length of the time the study covered, it could be argued that some of these instructor attributes of the may have evolved. The instructor has accumulated more teaching experience, and the quality of his teaching and

style of grading could have altered over the period. While the mean grades of students taking the course has slightly increased over the years and the teaching style of the instructor has evolved to reflect the introduction of competency-based education, the data from student evaluations seem to indicate a certain degree of consistency in his quality of teaching. Since no substantial changes were introduced to the content of the course during the period and since the instructor's attributes have been fairly stable, student attributes not specified in the model could have affected the results of the estimation. However, it was postulated that student attributes not specified in the model could be approximated by the high school mean grades, reflected in the coefficient of high school mean grade.

It was demonstrated earlier that students from different linguistic groups belong to different income brackets, as reflected in the mean median income of their neighbourhoods, but the relationship between academic performance and family income remains to be explored. When a regression equation, with different specifications, relating performance in the course to family median income, was estimated, it was found that the relationship, as expected was positive, but statistically insignificant, presumably because the data on median family income was that of a neighbourhood and not the student's family. Despite this data limitation, the study confirms the positive association between high school average grade and median family income.

6.0.0 The Model

Now that the variables influencing attendance have been established and the qualitative variables contributing to performance in the course identified, the relationship between attendance and grades can be examined. Since it was postulated that the quantitative variables that affect attendance would also affect grades, an econometric model relating a student's grade to the student's high school mean grade, high school economics grade, number of terms a student has attended the College, and absences in the course, was developed.

6.1.0 Attendance and Grades

$$Grd = \beta_0 + \beta_1 \log HS + \beta_2 \log HSE + \beta_3 Trm + \beta_4 Trm^2 + \beta_5 \log Abs + U \quad \text{..... (2)}$$

Where:
- Grd = grade
- HS = high school grade
- HSE = high school economics grade
- Trm = number of terms the student has been in the College
- Abs = proportion of classes missed
- U = the disturbance term

It was hypothesized that the grade a student receives in the course is positively related to the student's mean grade in high school and the student's grade in economics, but it was postulated that the positive impact of these grades declines as they increase. Hence equation # 2 specifies the grade obtained in the course as a semi-log function of high school mean grade and high school grade in economics. It was also postulated as the number of terms a student stays in the College increases, the likelihood of obtaining a better grade increases up to a point and then the coefficient decreases; hence "term" is related to grade as a quadratic function and the coefficient of "term" and "term^2" will be positive and negative respectively. Lastly, the model suggests that absences have a stronger impact on grades in the early part of the course than they do in the later part of the course; grade is related to absences as a semi-log function.

When equation #2 was estimated using Ordinary Least Squares, the results reported in Table XX were obtained.

Table XX

Least-Square Estimates and Their t-statistics

Of the Variables Influencing Grades

(Semi-log model)

(n=572)

Variables	Constant	Log HS	Log HSE	Log Abs	Term	$Term^2$
Beta	-172	58.47	-1.80	-11.69	3.92	-0.14
t-statistic	-4.52	5.75	-0.43	-11.78	7.48	-4.86

R^2 = 0.43

F-ratio = 58.97

The results confirm, with the exception of the impact of high school economics grade, what has been hypothesized. The influence of high school grades on the grade in the course is positive and highly significant; the impact of "absences" is negative and highly significant. The impact of the number of terms a student has been in the College before taking the course is consistent with what was postulated and statistically significant. As expected, the results show that as the number of terms a student stays in the College increases, marks received in the course increases and then decreases, implying the longer the student stays in the College the higher the marks the student will obtain, up to a maximum level, and then start to decline. The coefficients on "term" and "term squared" suggest that the optimum term for taking the course is a latter term.

The results are mostly as expected, with the exception of the sign on the coefficient of high school economics. Although statistically insignificant, somewhat puzzling is the negative impact of high school economics grade on the grades students obtained in the course. This finding is not unusual; Siegfried (1979) found that the effect of taking high school economics on the grades students obtained in university-level economics was either neutral or negative, but other studies show a positive impact (Wyatt and Waddell, 1990; Durden and Ellis, 1995). The results of this study suggest that those students who did well in high school economics did badly in the course and those students who did badly in high school economics did well in the course. This is possible if the grades students obtained in high school economics affected their attitude towards the course and

their attendance: those who obtained good grades in high school economics perhaps felt that the course was not different from what they learned in high school, missed many classes and failed to make the effort to do well in the course, while those who received low grades in high school economics attended classes more regularly and prepared well for the tests, obtaining better marks than they did in their high school economics.

To simplify the interpretation of the results, a linear model, excluding high school grade in economics -- because of multicolinearity and statistical insignificance-- was estimated and the results reported in Table XXII below.

Table XXII

Least-Square Estimates and Their t-statistics of the Variables Affecting Grades

(Linear model)

(n=572)

Variables	Constant	HS	Abs	Term	$Term^2$
Beta	-13.42	.85	-2.22	4.03	-0.14
t-statistic	-4.52	9.69	-16.67	7.48	-5.97

$\bar{R}^2$ = 0.52

F-ratio = 136.88

As expected, the impact of high school performance on grades obtained in the course was positive and highly significant. The coefficient on the high school mean grade could indicate the extent to which students have adjusted to a college environment, including taking a college-level economics course. The higher the value, the better adjusted the student will be to college education. Given that college-level courses are more demanding than high school courses, this "adjustment coefficient" should be less than one. The results suggest, on average, for every one point a student gets in the high school mean grade, this student will receive 0.85 points in this course, holding other variables constant. As expected, the signs on "term" and "$term^2$" are positive and negative respectively, and the coefficients statistically significant, suggesting that students taking

the course later in their college life are more likely to obtain better marks than those who take the course during their first term.

The impact of absenteeism on grades is negative and highly statistically significant. The results are generally consistent with other empirical studies (Park and Kerr, 1990; Romer, 1993; Lai and Chan, 2000). On average, for every class a student was absent, that student lost 2.2 points, which means a student with a high school average of 70% must attend all of the classes to pass this course, holding other variables unchanged. On the other hand, if a student with a high school average of 80% misses 7 classes, that student will most likely fail the course, ceterus paribus. These results imply that students with low high school mean grades will lose the most when they miss classes.

6.2.0 Student Attributes Affecting the Model

To examine how students' qualitative attributes – gender, program, and linguistic group-- affect the relationship between grades and the variables specified in the model, the same equation was re-estimated for each of the qualitative variables and the results, not surprisingly, are different.

Table XXIII

Least-Square Estimates and Their t-statistics

On the Variables Affecting Grades by Gender

(Gender Differences)

(Linear model)

(n=572)

	Constant	HS	Abs	Term	$Term^2$	Adjusted R^2
Females	-17.98	0.88	-1.99	4.64	-0.20	
	(-1.88)	(6.82)	(-9.34)	(5.12)	(-2.95)	0.44
Males	-12.70	0.87	-2.47	3.93	-0.13	
	(-1.35)	(6.86)	(-14.49)	(7.7)	(-5.31)	0.60

(Figures in brackets represent t-statistics)

6.3.0 Gender Differences

The table above shows the results of the model re-estimated for female and male students separately; the findings are similar, except that the impact of attendance seems to be more important for male students. On average, for every class a female student missed, she lost about 2 marks, while if a male student missed a class the student lost about 2.5 marks. This difference in the impact of absence on marks probably reflects the academic strength of students; when stronger students miss classes they tend to make up for their absences by catching up better than weaker students. Hence weaker students lose more marks per absence. It was pointed out earlier that female students had slightly higher school averages than male students.

6.4.0 Program Impact

Does the program to which the student belongs influence the results of the model? To answer this question the model was re-estimated for students in different programs.

Table XXIV

Least-Square Estimates and Their t-statistics

Of the Variables Affecting Grades, by Program

(Program Differences)

(Linear model)

(n=572)

Program	Constant	HS	Abs	Term	$Term^2$	Adjusted R^2
BA	-47.98	1.33	-1.48	4.14	-0.22	
	(-2,26)	**(5.45)**	(-4.54)	**(1.00)**	(-0.71)	0.26
Commerce	-2.43	0.69	-2.50	2.64	-0.19	
	(-0.14)	(3.28)	(-7.58)	(0.88)	(0.44)	0.53
Social Science	-9.38	0.81	-2.33	3.52	-0.12	
	(-0.96)	(5.97)	(-13.86)	(6.62)	(-4.34)	0.59

(Figures in brackets represent t-statistics)

Table XXIV shows the results of estimating the model for students in the Business Administration, Commerce, and Social Science programs. The interaction between grade and the variables that influence it seem to vary across programs. For students in Business

Administration, the impact of high school grade was greater than one, as indicated by the coefficient on "HS", an unexpected result showing that students in Business Administration were able to obtain points that are about one-third higher in this course for every additional mark of their high school average, while "the rate of transformation" between high school mean grade and the grade in the course for the other programs was less than one. There may be reasons as to why the coefficient is greater than one. The low adjusted R^2 of the model for Business Administration students suggests only 26% of the variation in the grades of students in the course was explained by the variation in the independent variables specified in the model; the remaining variation in the grades of student in the program was explained by variables not specified in the model. The coefficient on "HS" therefore includes the effects of these excluded variables. The exclusion of possible explanatory variables, coupled with the fact that Business Administration students take the course in their second year, could explain why the coefficient on "HS" is greater than one.

The impact of absences on grades tends to vary across programs as well, with the largest impact of absences on grades being in Commerce, where for every day a student was absent, the student on average lost 2.50 points, higher than the points student in the Social Science program lost. (As pointed out earlier, the Commerce sample included an unusual number of weak students in the 1998 cohorts). A priori, the impact of absences on grades should be higher for weaker students—Social Science students—but in this case, the influence of absences on grades was the highest for the strongest students. This anomaly suggests that although Commerce students were academically stronger than Social Science students, Social Science students were able to catch up with the missed material more effectively than Commerce students.

The number of terms students have stayed in the College before taking the course appears to have differential impact on grades, depending on the program. For students in Business Administration, the impact of "term" was statistically insignificant, as the majority of the students took the course at their prescribed terms, while for students in Social Science, "term" had a statistically significant impact on their grades. The longer a student stays in

the College the better the mark in the course; on average, for every additional term a student stayed in the College, the students mark increased by about 3 points, reaching an optimum number of terms, and then declined, as indicated by the negative coefficient on "$term^2$". For Commerce students, similar to their counterparts in Business Administration, the number of terms a student had stayed in the College was statistically insignificant, most probably because the majority of these students take the course during their prescribed time.

6.5.0 Linguistic Differences

To assess if belonging to a linguistic group influenced the results of the model, the model was re-estimated for each of the linguistic groups, and the results reported in Table XXV below.

Table XXV

Least-Square Estimates and Their t-statistics

Of the Variables Affecting Grades, by Linguistic group

(Linguistic group Differences)

(Linear model)

(n=572)

Program	Constant	HS	Abs	Term	$Term^2$	Adjusted R^2
French	-23.12	0.95	-1.89	4.87	-0.14	
	(-0.96)	**(2.98)**	(-3.61)	**(1.57)**	(-0.42	0.32
English	-19.66	0.93	-2.41	4.18	-0.19	
	(-2.42)	(8.76)	(-14.25)	(8.69)	(-5.78)	0.60
Allophone	0.27	0.60	-1.95	7.98	-0.70	
	(0.02)	(3.37)	(-8.31)	(4.09)	(-3.28)	0.46

(Figures in brackets represent t-statistics)

The impact of the variables influencing grades varied across linguistic groups too. The influence of high school grades on the grades obtained in the course was positive and statistically significant for all linguistic groups. Since the difference in the high school mean grade across the three linguistic groups was insignificant, as stated earlier, the variation in the influence of the high school performance on grades was probably due to

the difference in adjustment students made to the college academic environment. As stated earlier, the coefficient on the high school mean grade partially reflects the extent to which students have adjusted to a college-level course: the higher the coefficient the better the adjustment. The highest coefficient on the high school mean grade was for French-speaking students, and the lowest for allophones, which means that French-speaking students were able to adjust to this course better than their Anglophone and allophone counterparts. For every one point they obtained in high school, French-speaking students were able to receive 0.95 marks in this course, while the "transformation ratio" was one point of high school average grade for 0.93 points for Anglophone and 0.6 points for allophone students. The better adjustment of French-speaking students could be due to their concerns in taking courses in a second language and being motivated to do well in an English institution.

The effect of the number of terms a student has stayed in the College on the student's grade in the course also varied with language. For French-speaking students, the influence of "term" on grades obtained in the course was statistically insignificant (at 5% level of significant), while for English-speaking and allophone students it was significant; the longer they stayed in the College the better their marks, up to an optimum number of terms. The findings also demonstrate that while French-speaking students took the course within the prescribed period, English-speaking and allophone students tended to take course at a later term, and presumably took longer to graduate. One of the reasons why students may take the course at a later term than in their expected term is that some students may have to work to support themselves. Thus students who come from low-income families may work longer hours, and hence take longer to graduate. It was pointed out earlier that there was a difference in the median income of students coming from the different linguistic groups: English-speaking students come from high-income families, while allophone students come from low-income families. Hence, the difference in family income could explain why allophone students, usually who come from low-income families, take the longest time to take the course. But differences in family income fail to explain why English-speaking students, with a higher median family income than French-speaking students take longer to take course. In this case the

difference could be due to French-speaking students being more motivated to graduate on time.

The influence of absences on marks, as expected was negative and statistically significant for all linguistic groups, but once again differed with language; the impact of absences on grades was the highest for English-speaking students and the lowest for French-speaking students. The differences in the impact of absences on grades, along with the difference high school academic performance, perhaps reflected differences in motivation to succeed in school. (The high school mean grade was 74% for French-speaking, 73% for English-speaking and allophone students). On average, English-speaking students lost 2.41 points for every class they missed, allophones students 1.95 points, and French-speaking students 1.89 points. It appears that French-speaking students, perhaps because they were more motivated than the other students, were able to make up for their absences more efficiently than the other two linguistic groups.

Overall, the general model is robust and explains the variations in the grades rather well, as indicated by its the relatively high adjusted R^2, but the robustness of the de-segregated model exhibits major linguistic differences. For French-speaking students, the model explained only 32% of the variation in their marks but explained 46% and 60% of the variations in the grades of allophone and English-speaking students, suggesting that variables excluded from the model such as motivation could be important in explaining the marks of French-speaking students in this course.

In summary, absences do influence the grades of students obtained in the course, but their impact varied with gender, program of study, and linguistic group. Absences had a stronger influence for male students than female students, for students in Commerce than in the other programs, and for English-speaking students than students speaking other languages.

6.6.0 Interaction between Attendance and Grades

A priori, just as attendance influences grades, grades can also influence attendance, although the direction of the influence cannot be unequivocally determined in advance. Hypothetically, the influence of grades on subsequent attendance is unclear. It is possible that a student who gets a good grade in the first test may not miss too many classes to retain his/her good grade; it is also possible the student, buoyed by the good grade in the first test, may feel over-confident, and miss many subsequent classes. On the other hand, a student who did badly in the first test may take the grade as a signal to attend classes more regularly and do well in the course; it is also possible the low mark may discourage the student from attending classes regularly, or even to drop out of the course altogether. Thus, a priori it is difficult to determine how previous grades affect subsequent attendance; grades in the previous test could affect attendance positively or negatively.

Three sectional tests were given in the course, with no final exam. To assess the impact of grades on attendance, attendance in the last third of the term was specified as a function of grades in the previous two tests. Since three sectional tests were given in the course, equation #3 specifies attendance in the last section of the course as a function of grades received in the two previous tests.

$$Att_t = \beta_0 + \beta_1 \log Grd_{t-1} + \beta_2 \log Grd_{t-2} + U \quad \text{.....(3)}$$

Where:

Att_t	=	attendance in the third section of the course
Grd_{t-1}	=	grade in the second section of the course
Grd_{t-2}	=	grade in the first section of the course
U	=	disturbance term

In assessing the impact of previous grades on attendance, attendance was measured as the percentage of the classes attended in the last third of the term and academic performance in the pervious sections was indicated by the numerical grades in test 1 and test 2. When

equation # 3 was estimated using the Least Squared techniques, the results reported in Table XXVI were obtained.

Table XXVI

Least-Square Estimates and Their t-statistics on the Interaction Between Attendance and Grades

Variables	Constant	Grade in 1st Test	Grade in 2nd test
Beta	-37.06	22.70	40.56
t-statistic	-4.96	5.44	13.76

$\bar{R}^2$ = 0.37

F-ratio = 160.91

The results show that grades do influence attendance positively; grades in the previous two tests positively influenced attendance in the last section of the course. As expected the impact of grades in the previous first two tests was positive and highly statistically significant. The coefficients on the grades of the first test and grades of the second test also suggest that the more recent grades had a stronger impact on attendance rates in the third section of the course. This means students with high grades in the first and second test had high attendance rates in the last section of the course and students with low grades in the first and second tests had low attendance rates in the last section of the course. The feedback effect of grades on attendance is positive; grades and attendance reinforce each other. These results confirm the findings of a previous study that demonstrates the simultaneity of attendance and grades (Jones, 1984).

7.0.0 Conclusion

The strong association between absences and grades has attendance policy implications for the College. While most of the variables affecting attendance and grades, such as a student's gender, family income, and linguistic group are outside the control of the College, there are policy variables that are within the control of the College that influence attendance and hence academic performance. Other studies show that when instructors pursue a mandatory attendance policy, attendance increases, and student performance improves. Given the results of this and similar studies, a mandatory attendance policy

could contribute towards raising success rates, especially for students in the Social Science program. Since the study has demonstrated that attendance is influenced by a student's high school grade, gender, program of learning, and linguistic group, an optimum composition of a class could be established so as to raise attendance and success rates. The data from this course demonstrate that when weaker students took the course with stronger students, their attendance rates improved, and their grade increased, compared to those students who were grouped with students of similar academic credentials. For example, when Social Science students took the course with Commerce students, their attendance rates and grades improved compared to the Social Science students who were grouped together.

More empirical is required to determine the optimum combination of students in a class – the mixture of students from linguistic groups, genders, programs, and academic aptitude—that could optimize attendance rates and academic performance; however, the study provides enough evidence to raise questions about the College's current policy of not allocating any points for attendance nor deducting any points for absences. Studies demonstrate that merely taking attendance, let alone using marks as incentives for enhancing attendance, raises attendance rates; therefore, the recent policy introduced by the senate of not attaching any points for attendance is somewhat misguided. The College needs to re-examine this policy. Along with re-examining the newly introduced attendance policy, the College may also experiment with establishing "optimum" classes based on student characteristics that will enhance learning, improve attendance rates, encourage more class participation, and raise overall success rates.

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