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THE UNIVERSITY OF ALBERTA
AN ANALYSIS OF FACTORS ASSOCIATED WITH VARIATIONS
IN CANADIAN UNIVERSITY OPERATING EXPENDITURES
IN THE DECADE 1960/61 TO 1969/70

by



CHARLES HYMAN

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

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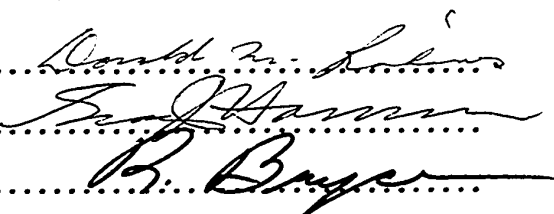
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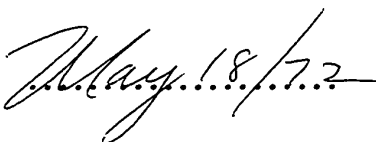
FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "An Analysis of Factors Associated With Variations in Canadian University Operating Expenditures in the Decade 1960/61 to 1969/70" submitted by Charles Hyman in partial fulfilment of the requirements for the degree of Doctor of Philosophy.


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ABSTRACT

The purpose of this study was to examine the relationship between university per student operating expenditures and several aspects of the university-government relationship in Canada during the period 1960/61 to 1969/70. A four dimensional model consisting of measures of: a) economic growth, b) population characteristics, c) fiscal resources, and d) university revenues and programme was developed as a theoretical construct for the analysis. Relevant variables were selected from the broad area of public expenditure analysis, or were constructed on the basis of several critiques of the economics of Canadian higher education.

Elasticity coefficients were employed to describe the associations between inter-dependent variables. Derived coefficients indicated the relative change of one variable with the corresponding change of an associated variable. Since the analysis dealt with a time-series of data, a modification of stepwise regression analysis was used to isolate significant associations with expenditure over time.

Income elasticities of expenditure were found to be in excess of unity in all provinces, though higher in the Atlantic Region than in Central or Western Canada. Longitudinal elasticities contained upward moving shifts in both Newfoundland and Prince Edward Island, downward movements in Nova Scotia and New Brunswick, and fairly stable sub-period elasticities in all other provinces. There was some evidence of a regression toward a mean elasticity level for all provinces when economic growth factors other than income were taken into account.

The highest elasticities obtained in the model were characteristic of a human stock variable used as a proxy for education level of provincial populations. Related to this finding was the observation that expenditures were more responsive to increases in participation rates by the end of the decade. This trend reversed the pattern of earlier years in which an eligibility factor appeared to have had the closest association with the most recurring portion of university expenditures.

The proportional use of fiscal resources, defined as effort and ability factors, was found to be more closely associated with increases in expenditure than were absolute measures of resource availability. This finding suggested a more careful consideration of policy factors in future studies of higher education expenditure. Elasticities in excess of unity were not characteristic of this dimension of the model.

The interaction between university programme levels and alternative revenue sources led to no uniformity in the association between inter-dependent variables within or among provinces. Nonetheless, the proportion of total operating income from provincial sources was significantly associated with expenditure in five of the ten provinces. The elasticity coefficients for these two measures were generally in excess of unity and were marked by a great deal of inter-provincial variation.

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CHAPTER I

STATEMENT OF THE PROBLEM

I. INTRODUCTION

The expansion of university enrolment has been described as the single most important factor contributing to the financial plight of Canada's universities (Proceedings, 1955, pp. 39-46). Traditional revenue sources, such as tuition fees, have become inadequate bases to support the growing costs and expenditures associated with rapid increases in enrolment. One consequence of this situation is the gradual but steady evolution of government involvement in university finance (Hyman, 1968). By the mid 1960's there had emerged a new relationship between universities and government, the nature of which had important implications for every facet of university operations (Hurtubise and Rowat, 1970).

The most striking feature of the university-government relationship was, and is, the reliance of the former upon the latter for the bulk of its revenues. For the year 1966/67, gross federal support for universities outside Quebec accounted for 27 percent of total revenues while provincial grants constituted 45 percent of revenue (D.B.S. Daily, October 29, 1968, p. 4). Under the Federal Provincial Fiscal Arrangements Act (1967), provincial support rose to almost 80 percent of revenue. The disappearance of federal payments made university support "solely the concern of the provinces" (Cameron, 1969, p. 5).

In this context, the interprovincial variation in support of

university expenditures has emerged as another characteristic of the present financial relationship. Whereas several studies have attempted to describe this phenomenon, few have taken into account the complex of socio-economic and governmental factors that may be associated with university expenditure variations on both inter and intraprovincial bases. In an attempt to overcome the deficiency, this study examines the financial aspect of Canadian university-government relationships by focusing on several characteristics of each institution. A multiple regression technique is used to test the influence of independent variables derived for this study on university expenditures throughout the 1960's. Although the research has no policy objectives, the isolation of variables associated with expenditure may serve to assist future policy makers in arriving at decisions. Judgments about what variables can or cannot be manipulated may be improved by a consideration of past experience.

II. STATEMENT OF THE PROBLEM AND SUB-PROBLEMS

Problem

The problem that this study is designed to investigate is stated in the form of a question:

What factors have been associated with variations in university expenditures within and among the Canadian Provinces in the decade 1960 to 1970?

Sub-Problems

The evolving relationship between university and government

has been characterized as multidimensional.

Rapid change is only one problem: a more difficult one is to distinguish between local situations and aberrations on the one hand, and the basic difficulties that confront university-provincial relations. It is often too tempting to ascribe current difficulties to local peculiarities of institutions, without going through the more difficult process of analysis to see whether the problems are of a more profound nature (Hurtubise and Rowat, 1970, p. 79).

We have not yet recognized all of these dimensions. Those that have attracted Canadian interest are treated in the following sub-problems.

1. The relationship between higher education and economic growth has been stressed in several Canadian studies, the most notable of which is Bertram (1966). The explicit assumption of many subsequent writers has been that government recognition of the importance of higher education can be measured by the financial inputs of provincial and federal governments to this process (Cameron, 1969, Ch. I, Waines, 1970, Intro., Economic Council of Canada, 1970, Ch. 5). Implicitly, the assumption is made that increases in higher education expenditure can help to sustain economic growth. Although it is not the intention of this study to investigate the contributions of higher education to economic growth, an analysis of the impact of economic factors on university expenditures is in order. Thus, the first sub-problem deals with the following question: To what extent do variations in economic factors explain variations in university expenditures over time?
2. A second, but related dimension, has to do with the fiscal resources available to governments for their financing of

higher education. It has been suggested that the resources of the citizenry, and its tax burden, are variables affecting university support (though the pattern varies from state to state. Gregory, 1967, p. 126). The extensive use of direct grants and fiscal transfers for higher education makes necessary their inclusion in any analysis of fiscal resources. Therefore:

To what extent do variations in the use of fiscal resources explain variations in higher education expenditures over time?

3. The evolving relationship between provincial governments and universities may also be characterized as a closer relationship between universities and provincial populations. It was Porter's contention, that for the period 1951 to 1961, social class was a major determinant of access to higher education. Various measures of class were used in this pioneering work. They included family income distribution, occupational level, number of children per family, and education level of parents (Porter, 1965, pp. 183-191). Ethnicity and religion were also related to the educational aspirations of the Canadian population. The extent to which some or all of these characteristics have proceeded to exert an influence on the Canadian social structure is a matter of continuing concern. Therefore:

To what extent do variations in population variables explain variations in higher education expenditures?
4. The dependence of publicly supported institutions of higher

education upon both public and private income is another dimension of the university-government relationship.

Considerations such as these have received much attention in the American literature of higher education as well as in many recent Canadian studies (Cameron, 1969, Waines, 1970, pp. 43-57, Hurtubise and Rowat, 1970, Ch. 6). Suggestions dealing with alternative forms of university finance are generally based on the assumption that certain university revenues have increased or decreased in importance relative to others. Nonetheless, generalizations about university finance in Canada may be invalidated by the provincial structures in which universities operate and by the different characteristics of universities from province to province. Thus:

To what extent do variations in university programmes and in the use of alternative revenues explain variations in expenditure over time?

III. SIGNIFICANCE OF THE STUDY

This study is part of the broader area of public expenditure analysis. Pryor (1968, p. 35) contended that the process of building a positive theory of public expenditure involved the answering of four basic questions.

- (1) What types of goods and services are publicly financed?
- (2) What are the determinants of the volume of public expenditure?
- (3) What are the factors underlying other behavioral properties of public expenditure?
- (4) And what difference does it make whether a good or service is financed in the public sector?

This study is primarily concerned with Pryor's second question. In consideration of several criticisms of "determinants" studies expressed by Bird (1970, Appendix B), it attempts to investigate only one government function and to place the investigation within the wider context of government finance.

The relationship of government spending on higher education to a positive theory of government spending has not been elaborated as well as other relationships in the public sector. The rising volume of expenditure for higher education in relation to Gross National Product (circa 1% in the 1950's, 1.5% in 1967, and a projected 2.5% for 1975, Waines, 1970, p. 31), is indicative of the need for analysis of government spending on this function. The limited theoretical development in the area of elementary and secondary education provides some background against which to formulate hypotheses. Nonetheless, considering the differences between public and higher education, it would appear constructive to isolate factors of particular relevance to higher education before formulating more rigorous hypotheses.

The economics of higher education is a relatively new field of inquiry. It has been shaped, in part, by traditional views of higher education held in Western Europe and North America, and by the economic needs of developing nations. In the American writings of Harris (1962), Danieri (1964), and Cartter (1968), the primary concern is with university internal operations and their costs, private demand for higher education, and alternative forms of finance. Although there is a recognition of the growing dependence of universities upon governments, the tendency is to suggest ways of

mediating this relationship. Thus, Benson (1968) recommended a shift of federal research from private industry to universities, the provision of block grants for higher education to state governments, and the creation of loan schemes for individuals. Little consideration is given to the propensity of government to support higher education. In this respect, the Canadian pattern of university-government relations is markedly different.

The foregoing indicates the lack of theoretical development in the economics of higher education. What little work has been done can be summarized as follows:

1. One of the first studies of the demand for higher education in the United States concluded that parental aspirations for the educational future of children are dependent upon socio-economic and educational "experiences" of parents. These aspirations are important indicators of both future enrolments and public willingness to pay for higher education.

Increasing educational attainments of parents, increasing incomes, increasing proportions of the labor force in professional, managerial, and other white collar occupations will lead to greater demands for higher education (Brazier and David, 1962, p. 41).

2. The propensity of a state to finance higher education is a function of demand, "limit" of financial ability, and the substitution of private and/or out of state "choices" for public institutions. As demand rises (measured by per capita income), the income elasticity of demand will shrink "despite the reduced effort required to add state appropriations with increasing income" (Gregory, 1967, p. 133).

A similar conclusion was offered by McIntyre in his nationwide American study. As demand increased (per capita income), effort declined as a predictor of higher education expenditure (1969, p. 271).

3. Education expenditures respond differently to per capita income over time and space because of increasing technological complexity . . . (Pryor, 1968, p. 184).

This theoretical consideration of education as a social investment held true for Pryor's combined analysis of pre and post-secondary education spending in market and centralized economies.

4. . . . larger percentages of children and larger enrollments lead to larger propensities to spend in the lower income states that taper off in the high income states where the birth rates decline. Children and enrollments simultaneously generate demands for the maintenance of expenditure during cyclical declines and to the growth of expenditure over time at a rate faster than income (McMahon, 1970, p. 251).¹

These theoretical considerations of the nature of higher education as an economic good have yet to be adequately tested on Canadian data, though some progress has been made on particular aspects of the problem put forward in this study. The development of a conceptual framework to explain the university-government relationship in Canada should begin by testing these and other variables (particularly government) in the provincial and national contexts.

¹The McMahon study dealt with elementary and secondary school finance. It was a first effort to build an econometric model incorporating research from previous studies. As such, it may be useful for the definition of factors related to higher education spending.

IV. DELINEATION OF THE STUDY

Delimitations

1. This study is restricted to a consideration of aggregate university operating expenditures per full time student for the years 1960/61 to 1969/70. Part time students have been excluded from the calculation of expenditures per student ratios because, (a) available figures for part time enrolments are not based on any uniform definition, (b) there is no common agreement as to the method of converting part time enrolment to full time equivalent enrolment, and (c) part time enrolments in Canadian universities have only been reported since 1962/63. Until the mid 1960's the reported figures were based on a small sample survey.

2. A university is defined as a degree granting institution. Therefore, junior colleges, community colleges, and other post-secondary institutions not affiliated with universities are excluded from the research population.

3. The province is defined as the relevant level of analysis because of the university-government relationship already posited. Only institutions that have received public funds are considered as part of the population. Thus, this study is delimited to publicly supported universities.

4. Provincial characteristics that have been shown to be associated with the variation in university operating expenditure are selected from the literature of education finance and from studies of Canadian higher education and intergovernmental relations.

Limitations

1. Aggregate data derived from government sources fail to account

for varying definitions used and omissions made over time. The precision of this study is limited by these considerations. In addition, analysis at a provincial level is unable to demonstrate the operations of individual universities.

2. Longitudinal analysis reveals little about variable structures at certain points in time. Because the purpose of this study is to make dynamic inferences, i.e., to analyze changes over time, inter-provincial comparisons may be complicated by structural changes that have taken place during the period under consideration.

3. The use of ratios limits the interpretation of their association with variations in the magnitude of expenditure. Thus, both the numerator and the denominator are considered in attempting to explain variations in the dependent variable.

Assumptions

1. Variables other than university costs act as determinants of university expenditures. Socio-economic, demographic, and other characteristics of a province are influential factors in determining expenditure variations.

2. The relationship between universities and governments makes university finance dependent, in part, upon factors that operate to determine expenditures in other areas of the public sector.

3. The type of public good under consideration, i.e., higher education, differentiates it to some extent from other types of public goods. These differentiations are also associated with expenditure.

4. Changes in the dependent variable are jointly determined by changes in the independent variables. The assumption of interaction between independent variables dictates the type of research

design used in this study.

5. The multi-dimensional relationship put forward as a conceptual framework for the analysis of university expenditures is a valid structure in which to analyze the past state of university-government relations.

6. The occasional existence of data for non-publicly supported institutions within published expenditure and enrolment figures does not distort the overall pattern of expenditure.

Definition of Terms

The following terms are used throughout the study. Others will be defined when necessary.

Operating expenditure. Expenditure on daily operations which includes the costs of instruction, research, libraries, plant maintenance, scholarship, administration, and other. These can be divided into direct expenditures such as academic and non-academic salaries and benefits and non-wage items such as stationery, educational appliances; and indirect expenditure such as general administration, maintenance and management such as cleaning, light, water, heating, repairs of buildings and equipment, etc.; and general educational expenditures such as examinations, conferences, etc.; expenditure on student provisions such as student residences, cost of dining hall, recreation, etc. . . . (Tu, 1971, pp. 23-24).

Higher education. This term is used synonymously with university education as previously defined.

Post secondary education. This term includes the range of studies beyond provincial definitions of junior matriculation up to, but not including, university education.

Publicly supported universities. This categorization includes all degree granting institutions that have received provincial and/or federal operating grants in the decade 1960/61 to 1969/70.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

I. INTRODUCTION

Higher education finance has not been the subject of many of the extensive analyses of government spending performed in the past two decades. A contrasting situation exists with respect to education expenditures which have been subjected to perhaps more analysis than any other government function, particularly at state and local levels. Whereas studies of government spending have been conducted at various levels of analysis (international, national, state, district, etc.), cross-sectional analyses vastly outnumber time-series research in the published literature. Since it is the purpose of this study to identify and analyze factors associated with spending on higher education, the bulk of this Chapter is devoted to a consideration of research related to education finance.

A large proportion of the literature on education finance is made up of research based on the use of regression techniques. Such efforts are concerned with factors both theoretically and empirically related to expenditure. Since there has been great similarity in the use of variables and in the findings of these studies, they are subjected to critical examination in Sections II, III, and IV of this Chapter. Table 2.1 (p. 16) provides a summary of some of the more important studies.

II. VARIABLES USED IN STUDIES OF EDUCATIONAL EXPENDITURES

Income per capita. This measure of ability to finance education has generally accounted for the largest portion of variation in expenditure measures. It has been found to be highly correlated with other "wealth" measures, such as, median family income, and property valuation. Income per capita has generally been treated as a measure of demand but, in some cases, where private sector models have been used to explain public spending, it has been defined as a supply factor (Miner, 1963, and Gregory, 1967). Whether or not this separation seems useful depends upon the extent of intercorrelation between explanatory variables. Thus far, attempts to define the function of income per capita have proven disappointing (Miner, 1963, p. 136, Bird, 1970, p. 210).

Median family income. Though usually highly correlated with income per capita, median family income has emerged as a leading predictor of education expenditures in some studies of metropolitan school districts. The rationale for its use tends to be the assumption that pre-secondary education support is a function of family rather than individual income, particularly in cities where the possibility is high of more than one wage earner per family. It has been a useful explanatory variable in studies of city and suburban education expenditures if the school district spending under consideration was independent of state finances (Brazer, 1959, James, Thomas and Dyck, 1963, Garms, 1967, Kee, 1967).

Property valuation. This variable, related to the legal structure of school finance, has been influential in studies of

school expenditure from "own sources" (Hirsch, 1960, Alkin, 1966, Fisher, 1967, Harvey, 1969). As a local wealth measure, it has been a good predictor of expenditure in studies in which "state aid" is unimportant to local finances (Harvey, 1969).

Enrolment variables. In studies in which measures of enrolment have been included, they have invariably been among the three leading predictors of school expenditure. They have been far more influential in studies of low income areas where state aid is generally based upon per pupil enrolment as well as upon fiscal capacity of the local area. In high income states, "wealth" variables (income, property valuation) have functioned as better indicators of expenditure. The use of enrolment ratios, such as elementary to secondary, is usually explained as an effort to derive the influence of the student "mix" on expenditure. In almost all cases, the proportion of secondary students enrolled emerges as the better indicator of expenditures due to the higher costs associated with high school education. The influence of wealth and enrolment variables together have been summarized by Pryor (1968, p. 226).

The ratios of public consumption expenditures for education to the G. N. P. are related to the per capita income in the time series data. Nevertheless, the number of school age children acts as a constraint on the increase of total expenditures.

Labour force variables. Measures of the proportions of the labour force in various occupations have been hypothesized as determinants of public education expenditures (Shapiro, 1962). As surrogates of the extent of industrialization, they are supposedly related to spending in that they purport to measure the response to technological change. The assumption here is that highly industrialized

areas will tend to spend more on education than areas whose economies are based on agriculture or natural resources. In studies of large school districts throughout the United States these variables have been identified as significant determinants of school expenditures (Miner, 1963, James, Thomas, and Dyck, 1963, Potter, 1966). Recently, some attention has been devoted to the percentage unemployed as a predictor of expenditures but the results have shown inconsistency in that both positive and negative associations with the criterion variable have been uncovered (James, Thomas, and Dyck, 1963, Garms, 1967).

The failure of occupational variables to consistently explain school expenditures might be related to the tendency of local school districts to provide a "common" curriculum to all pupils. It may well be that expenditures on higher education are more closely related to occupational levels since higher education has traditionally been viewed as the repository of more advanced skills.

Urbanization. The high correlation between labour force variables and urbanization has tended to suppress the influence of this "classical" determinant (Hickrod and Sabulao, 1969). All other things being equal, the influence of urbanization on school expenditures should be significant in areas where urban density has created a need for special services. The tendency for state aid to be significantly correlated with measures of urbanization supports this type of hypothesis.

Fiscal resources. Studies of school expenditure have generally limited their investigation of fiscal resources to state aid and property valuations. These two variables are hypothesized

Table 2.1

Studies of Education Expenditure: Levels of Analysis,
Techniques, Variables, and Major Findings

Study	Level of Analysis and Technique	Dependent Variable	Leading Predictors and Major Findings
Fabricant (1952)	State (C.S.)	State ed'n. expenditure per capita	Personal income per capita, density, and urbanization. Independent variables accounted for a greater proportion of variance in 1957 than in 1942.
Brazer (1959)	Cities (C.S.)	Current ed'n. expenditure per capita	Median family income. Whereas government aid per capita and number of pupils exerted strong positive influences on the dependent variable, density and industrial employment had no statistically significant effects. $R^2 = .41$
Miner (1963)	State (C.S.)	Aggregate state and local ed'n. expenditure per capita	State personal income per capita. Increases in the dependent variable were associated with increases in revenues for local schools collected from state sources.
Sacks, Harris, Carrol (1963)	County (C.S.)	Current ed'n. expenditure per capita	State aid per capita, property valuation, income per capita. $R^2 = .90$
Kee (1965)	Cities (C.S.)	Current ed'n. expenditure per capita	Income, attendance. State aid was not significant. $R^2 = .59$
Potter (1965)	City school districts (C.S.)	Current ed'n. expenditure per capita	Regional differences in "dummy variables." $R^2 = .36$ in 1950. $R^2 = .80$ in 1960.

Table 2.1 (continued)

Study	Level of Analysis and Technique	Dependent Variable	Leading Predictors and Major Findings
Sacks, Ranney	Suburban districts (C.S.)	Current ed'n. expenditure per capita	Income per capita, state aid, enrolment. $R^2 = .67$
Hirsch (1960)	Districts (C.S.)	Current ed'n. expenditure per pupil	Per pupil assessed valuation of real property, income per capita. High correlation between predictors. $R^2 = .85$
Sacks, Hellmuth (1961)	Districts (C.S.)	Current ed'n. expenditure per pupil in average daily attendance	Average daily membership, state aid, property valuation. $R^2 = .87$
Shapiro (1962)	State (C.S.)	Current ed'n. expenditure per pupil in average daily attendance	Personal income per capita, labour force in non-agricultural employment, children aged 5-17 enrolled, proportion of total enrolment in high school.
James, Thomas, Dyck (1963)	Districts (C.S.)	Current ed'n. expenditure per pupil	Median family income, property valuations, percent unemployed. $R^2 = .77$
Garms (1967)	Districts (C.S.)	Current ed'n. expenditure per pupil	Unemployment ratio, median family income, percentage homeowners, median years of schooling, property valuation per pupil, percent in private schools. $R^2 = .85$ Sample included 107 school districts of populations over 25,000.

Table 2.1 (continued)

Study	Level of Analysis and Technique	Dependent Variable	Leading Predictors and Major Findings
Paterson (1967)	Provinces (C.S.)	Current ed'n. expenditure per pupil in average daily attendance	Personal income per capita for non-policy determinants. R^2 = circa .86 Salary level and school size for policy determinants. R^2 = .75 to .93
Fisher (1967)	Cities (C.S.)	Current ed'n. expenditure per pupil from own taxes	Per pupil property valuation, median family income, government aid per pupil. R^2 = .67 Education level of adults significant in high income districts.
Kee (1967)	Districts (T.S.)	Current ed'n. expenditure per pupil	Absolute change in median family income. R^2 = .41 State aid had a negative association with expenditure. Possibility of substitution.
Pryor (1968)	National Comparisons (C.S. and T.S.)	Aggregate per pupil expenditure for pre and post- secondary education	Level of economic development, proportion of school age children in population.

Explanation of symbols

C.S. = Cross sectional

T.S. = Time series

 R^2 = Proportion of variance accounted for as a percentage

as having a negative relationship, i.e., the higher the property valuation, the lower the state aid. There has been ample evidence of the relationship at the school district level (Hirsch, 1960, Miner, 1963, Sacks and Hellmuth, 1961, Kee, 1965 and 1967). Aggregate studies have not been able to arrive at the same conclusion because of the influence of intervening variables (Shapiro, 1962).

III. STUDIES OF HIGHER EDUCATION

Gregory (1967) attempted to explain the variations in state and local appropriations for higher education by using multiple regression techniques on a cross-section of data. He tested several hypotheses related to factors associated with variation, the "kind" of economic good under consideration, and consumption and production within the American states. He assumed that a private sector demand model might explain appropriations in the public sector. In addition, constraints on spending as well as "other" outlets to relieve the burden of demand were included as amplifiers of the demand model.

Demand was related to size of age group in population eligible for higher education, tastes of citizens, ability, and other miscellaneous factors. Several measures of each of these demand factors were developed but the most significant were the size of age group and the educational level of the population (a measure of taste).

"Outlets" to relieve the burden of demand were defined as private institutions, migration out of state, and migration "into" state, the latter being a source of relief because of higher tuition costs to out of state residents. Both private substitutes and migratory outflow were positively associated with appropriations.

Constraints were defined as taxable capacity (per capita income), and effort. These too, were significantly related to the dependent variable (1967, p. 132). The final equation took the form:

$$Y = -8.15 + .18X^1 + .77X^2 + .007X^3 - .0000015X^4 - .10X^5 - .07X^6 + .42X^9$$

where: X^1 is education level of population, X^2 is proportion of the 18 to 24 age group eligible for higher education, X^3 is income per capita, X^4 is income per capita squared, X^5 are private outlets, X^6 is out of state migration, and X^9 is effort.

McIntyre (1969) attempted to explain interstate variations in expenditure for public higher education, "taking into account the significant differences in sources of funding that exist among different types of public institutions" (p. 262). A model was developed that excluded measures of expenditure found to be highly correlated with the dependent variable, instructional expenditure per student. Explanatory variables appear to have been chosen on the basis of their success in previous studies. A cross-sectional analysis of 1966 data was conducted for each type of institution. Table 2.2 (1969, p. 268), summarizes the results of this research (see page 21).

IV. VARIABLES USED IN STUDIES OF HIGHER EDUCATION

Student Measures

Proportion of college-age population in total population.

Gregory found that the correlation between this variable and state-local appropriations per capita was .01 (1967, p. 113). The exclusion of students "not eligible" for college entrance from the original

Table 2.2

Regression Coefficients Between Instructional Expenditure
Per Student and Independent Variables for California
State System of Higher Education, 1965-66

Independent Variables	Public Universities	Public Four Year Colleges	Public Junior Colleges
Extent of full time enrolment	.22 ^a	189.17 ^a	.23
Income per capita	.48 ^a	7.55 ^a	.17
State expenditure on other functions	-46.06 ^a	416.86 ^a	- - -
Effort	3.47	-9.25 ^a	.02
Proportion of total instructional income from state	-.20 ^a	-.69	-218.32 ^a
Proportion of total instructional income from tuition	-.28 ^a	-1.73 ^a	-213.86 ^a
Coefficient of multiple determination	.50	.80	.44
^a = Significant at the one percent level			

calculation resulted in a new correlation of .50. However, this adjusted measure of demand was rejected by Schaafsma (1968, p. 12) because it restricted analysis to a very "short-run approach" and, did "not always reflect clearly changes in the demand for higher education."

The student "mix". Studies of higher education have attempted to assess the influence of programme levels (graduate, undergraduate), and academic activity (full time, part time) on expenditure. It is assumed that these measures of the "nature of the

activity" distinguish it, in some way, from other educational activities. They are perhaps more closely related to demand than measures of faculty-student ratios and other internal (Gregory, 1967, p. 117, Schaafsma, 1968, p. 6). The major problem with these measures is that a two-way relationship may exist with the criterion variable. Universities may be prone to spend more on high cost programmes because of varying grant structures in use across Canada.

Private outflow and migration. Neither of these measures appear suitable for analysis in the Canadian context. Literally all universities in Canada are publicly supported despite the private origins of some. The only problems that seem to have arisen are related to the endowments incomes of some of Canada's older private universities. In some cases these funds have been deducted from provincial operating grants. The second measure, that of migration, does not appear substantial, except perhaps in the Maritimes (Hurtubise and Rowat, 1970, p. 34, Lacroix and Proulx, 1971, p. 16).

Economic Development

Income per capita, Income distribution. It has been suggested that "more wealthy states would tend to provide larger per unit levels of support for higher education than the less wealthy states" (McIntyre, 1969, p. 265). This phenomenon was substantiated in both the Gregory and McIntyre studies. In both cases per capita income proved to be a better predictor than income distribution, the latter being a significant determinant of attendance at university in Canada (Porter, 1965, Schaafsma, 1968).

It appears that general ability to pay for higher education tends to suppress the influence of income distribution on expenditure. It was for this reason that Schaafsma computed the average income earned by the members aged 35 to 64 of each occupation in his study of demand for higher education in Canada (1968, p. 16). It would appear that the level of analysis should dictate the use of one or the other variable.

Industrialization. Gregory found that the percentage of persons in selected occupations requiring a college education was so highly correlated with educational level of the population (.78), and with per capita income (.70), that he omitted it from his regression. The problem with defining the "need for a college education as the criterion for occupational classification has been discussed by Schaafsma (1968, p. 20). It omits all those who "aspire to" a university education for their children and fails to account for the influence of large sectors of the labour force traditionally omitted from higher education.

Revenue sources and use. The structure of higher education finance in Canada necessitates a much closer investigation of fiscal resources than has been undertaken in U.S. studies. It could be that McIntyre and Gregory measures are far too gross for Canadian data. McIntyre's measure of ability (instructional expenditure on higher education as a proportion of total state spending) does not account for the structural changes that may take place in government spending over time. Any consideration of fiscal effort must take into account the influence of inter-governmental transfer

payments and/or direct grants to universities. The study of revenue utilization by universities is made more complex by these considerations.

Education level of population. Gregory found that a one per cent increase in the educational level of the population was matched by a \$0.63 increase in state and local appropriations per capita (1967, p. 116). This variable has not been isolated in Canadian studies of higher education but Paterson found that the percent of the population with nine or more years of formal education was positively and significantly correlated with per pupil school expenditures in 1941, 1951, and 1961. Schaafsma suggested that it was a major determinant of demand for higher education in Canada. When accompanied by average income in his regression the proportion of variance accounted for was .95 (1968, p. 17).

V. STUDIES OF OTHER GOVERNMENT FUNCTIONS

Regional Variables

The association of regional variables with government expenditure has received some attention in the United States (Sharkansky, 1967, 1968) but almost none in Canada (Bird, 1970, p. 213). Sharkansky used five independent variables (per capita income, federal aid, state effort, state role, previous expenditure) in an initial effort to separate state and local data. His dependent variable was state government expenditure per capita in 1963. He found state role and previous expenditure to be positively associated with the criterion variable but, personal income failed to explain any significant portion of the variation

in expenditure. This brought the conclusion that personal income had a more profound influence over local governments. "State officials appear to benefit from access to a more extensive and varied economy" (1967, p. 174). A further study of regional characteristics and their relationship to three measures of economic status identified several significant correlations but Sharkansky found large residuals "not explained by economics alone" (1968, p. 19).

Political Factors

Among the most prominent efforts to quantify political activity were Fisher's index of two party competition, Morss' measure of legislative apportionments and Gramlich's legal constraint against borrowing (Bird, 1970, p. 214). Both Morss and Gramlich found significant relationships with measures of spending but Bird contended that so few studies were a meager basis for theory building. Hickrod concluded that political variables had been a "crashing disappointment" in studies of public school expenditure (1970, p. 42).

Intergovernmental Aid

The literature of intergovernmental aid has contributed confusing and conflicting results (Gramlich, 1969). Whether or not the grant and transfer schemes studied have stimulated, complemented, or substituted for local spending has been the subject of much debate. Results appear to be a consequence of how "aid" variables are entered in regression equations. The problem of autocorrelation, noted by Morss, has yet to be solved (1966). Alternative methods have been suggested but, for each technique

there is a criticism, and consensus about the effects of intergovernmental fiscal arrangements is hard to reach.

VI. STUDIES OF HIGHER EDUCATION IN CANADA

The literature of Canadian higher education consists of several studies devoted to the university-government relationship (see particularly Hurtubise and Rowat, 1970 and Financing Higher Education in Canada, a study commissioned by The Council of Ministers for Education in 1970) and the financial situation of Canada's universities (Bladen, 1965, Waines, 1970, Wright, 1970, and Slater, 1970). Only Hanson (1969) and Cameron (1969) take into account the fiscal positions of the provinces. Though few could be classified as empirical studies, they make up a substantial body of literature contributing to this study.

Until recently, the most comprehensive analysis of university financial requirements was Financing Higher Education in Canada, also known as the Bladen Report (1965). It recommended a perpetuation of the federal per capita grants programme with substantial increases in operating, capital, and research funds. The justification for increased federal aid was the fear that provinces would have insufficient revenues to finance universities at a level necessary to their satisfactory operation. Unfortunately, the Report did not consider the possibility of provinces administering the same funds which the federal government supposedly had available. Perhaps, the commissioners felt that Ottawa would be more generous than provincial legislatures. If so, they gave no justification for this sentiment (Rosenbluth, 1965, p. 96). As for intergovernmental relationships, the Report simply

recommended federal-provincial meetings for the purpose of revising the grant structure.

The failure of the Bladen Report to consider even the most elementary data concerning the progress of provincial involvement in higher education finance was one of its major weaknesses. Such data were available in a series of monographs begun in 1960 by the Canadian University Foundation (later the Association of Universities and Colleges of Canada). The main economic indicators of these studies were measures of ability and effort. They tended to show that throughout the period 1958/59 to 1962/63, there were marked variations in the year by year ranking of provinces on both indicators with Alberta maintaining the highest overall average and Newfoundland, the lowest.

A more comprehensive study of university finance, published in 1969, provided an extensive coverage of provincial involvement since the mid 1960's (Cameron, 1969). Using measures identical to the C. U. F. and A. U. C. C. monographs (grants as a percentage of net general expenditure, grants as a percentage of income per capita), the study showed the dominant position of Alberta followed by the other Western Provinces, Ontario, Quebec, and Maritimes in 1965/66. The pattern was maintained in 1966/67 but, in 1967/68, the first year of the Fiscal Arrangements Act, Nova Scotia and Quebec showed substantial increases in effort while Saskatchewan declined relative to the other provinces. On the basis of preliminary data, the period 1968 to 1970 was characterized by the increased effort of Nova Scotia and Newfoundland, and the decline of British Columbia, Quebec, Saskatchewan, and New Brunswick.

The Cameron study was one of the first to make mention of provincial ability to raise funds and make use of various revenue sources for the financing of higher education. Unfortunately, the topic was not treated at any length (1969, pp. 167-168). By relying heavily on measures of ability and effort, the study was unable to relate the use of alternative revenue sources to university finance. Nonetheless, the emergence of university financing as a provincial concern was recognized.

A substantially revised version of the Cameron study was submitted to the Council of Ministers for Education in 1971 as part of a broader investigation of post-secondary finance (Graham and Cameron, 1971). Fiscal capacity received some consideration in the context of equalization and regional disparity. Since one dimension of the present study is devoted to fiscal variables, the Graham and Cameron findings are reported here (1971, p. 274). They offer some background for the analysis of data in ensuing Chapters.

The provinces which have benefitted most from the federal programme (Fiscal Arrangements Act, 1967) are relatively wealthy . . . The success of the programme appears to be in preventing a widening of regional disparities in the provision of post-secondary education, not in removing or decreasing differences.

CHAPTER III

THE RESEARCH DESIGN

I. INTRODUCTION

The use of private sector models has brought about major problems of interpretation in many previous studies of pre and post-secondary education expenditures. Miner (1963) concluded that his model, which specified supply and demand factors, did not have "great explanatory power" due to "substantial intercorrelation between explanatory variables." There was the possibility "that the fundamental assumption is false and the agencies that determine local school expenditures are not motivated by rational economic objectives" (p. 136). Gregory, too, found high intercorrelation between "demand" and "constraint" variables in his model of the determinants of state-local appropriations for higher education (1967).

Hickrod (1971, p. 42) commented on the difficulty of adapting a private sector model to the public sector. He chose to illustrate his argument by explaining the role of the price variable in the private sector.

Usually (in the public sector) either the tax rate or the amount of taxes paid is nominated to play the role of this variable. In the private sector, price is assumed to have a negative effect on consumption, ceteris paribus. But the Hogan and Bentley study (1969) and the Hickrod and Sabulao study (1969) found that the net regression coefficient for tax rate was positive rather than negative, which casts some doubt on whether tax rate really does function like a price variable.

The specification of a model for use in the public sector must take into consideration the nature of the good, public demand,

and ability to finance the good (Gregory, 1967, p. 112). An analysis of these considerations should go further than specifying solely economic factors since "conditioning" and "social factors" are also part of the expenditure process (Musgrave, 1969, p. 69). Studies of public spending that have used multiple regression techniques are evidence enough of the desire to incorporate as many factors as possible in an effort to explain associations with particular spending patterns. Indeed, it has been the use of so many unspecified and intercorrelated variables that has brought about criticism (Bahl, 1969, Gramlich, 1969, Bird, 1970, Hickrod, 1971).

II. THE MODEL

The model used in this study attempts to analyze variations in university expenditures associated with each of the dimensions of the university-government relationship identified as sub-problems. In so doing, there is no suggestion that these dimensions represent the necessary and sufficient conditions for a study of higher education expenditure. They represent some of the more important issues that have been recognized and debated in a relatively new field, namely, the economics of Canadian higher education.

The Canadian university is regarded as a multipurpose institution whose relationship with its environment is undergoing rapid change. One example of this change is the increasing reliance upon provincial governments for its revenues. The assumption is made that university expenditure is a function of income primarily from government sources. The propensity of a government to finance higher education can be interpreted as a response to public demand.

Thus:

$$E = f(I) = f(D)$$

where, E is university expenditure, I is university income from government, and D is public demand for higher education.

1. Previous studies suggest that the demand for public education is a function of wealth and wealth-related variables (Pryor, 1968, McMahon, 1970) "more so when demand is measured in terms of expenditure than when it is measured in terms of fiscal effort" (Hickrod, 1971, p. 45). However, higher education, as an economic good, may differ from public education. University education is both non-compulsory and unrelated to "earmarked" taxes such as property valuation is to school finance. In addition, there are possibilities of substitution within the realm of post-secondary education in each Province and across Canada. These substitutions may be cheaper to the purchaser. They may also be perceived as offering greater short term and/or long term monetary returns e.g., technical and vocational colleges. Considering these possibilities, to what extent do factors associated with current levels of income help to explain variations in university expenditures?

$$E = f(I_p)$$

where I_p is income within a province.

2. The demand for higher education has also been related to sociological characteristics of the Canadian population (Porter, 1965, Schaafsma, 1968). Unfortunately,

these studies have been limited to one or two points in time. Do changes in the character of a population over time help to explain the variation in university expenditures? A major limitation on coming to grips with this problem is the use of census data which is gathered too infrequently for time series analysis. It is proposed that the use of proxy variables may substitute for "harder data" if only to obtain some knowledge about population changes and their association with the variation in university expenditure. Thus:

$$E = f (P)$$

where P represents population characteristics.

3. Fiscal resources and their use were characterized as a third dimension of the university-government relationship. We are concerned here with the extent to which tax, and other revenues have been associated with variations in university expenditure over time. A concern about the use of fiscal resources can be characterized as an attempt to measure government activity in the public sector (Sharkansky, 1967, 1968). In Canada, this involves a consideration of both provincial and federal spending for higher education. Thus:

$$E = f (F)$$

where F represents fiscal resources.

4. One of the major problems facing universities is finding financial support for various instructional activities. The debate over revenue sources and revenue utilization

does not center on any one issue (Hyman, 1968). There are concerns over the extent to which provinces have supported part-time enrolment and graduate work. The Government of Canada has been the focus of many university briefs calling for additional support for research, graduate studies, and special services. Are increases in graduate or other enrolment associated with increases or declines in government and/or alternative revenue sources? How have these factors operated as predictors of the variation in university expenditure in the past decade? Thus:

$$E = f (P, R)$$

where P is program and R represents alternative revenue sources.

III. REQUIRED VARIABLES

The Dependent Variable

(X₁) University operating expenditure per full time student.

Studies of educational expenditure suggest the use of a measure of current spending as the appropriate indicator of demand for educational services. Since operating expenditure is the most recurring portion of total university expenditure, it, more than any other measure, represents the focus of the problem put forward in this study.

Operating expenditures may be treated totally or proportionally, in deflated dollars or in current dollars. Since proportional expenditure makes some correction for size of population and permits a consideration of the rate of investment in each student, it is

assumed to be a better indicator than total expenditure of the scope of educational services. Variations in operating expenditure that may be due to changes in the value of money are difficult to assess. The development of a higher education price index in Canada has been severely retarded by the lack of uniformity in university accounting and reporting procedures (Interview with M. Wisenthal, June, 1971). The use of other price indices "can be just as misleading as relying on current expenditures . . ." (Sharples, 1971, p. 44). Therefore, in the absence of a generally accepted higher education price index, expenditure is measured in current dollars.

The Independent Variables for $E = f(I_p)$

(X₂) Personal income per capita. In almost all previous studies of education expenditure, this variable has emerged as the leading predictor of variation in the criterion variable. Its high correlation with other measures of wealth such as median family income, property valuation, etc., substantiates its use as a measure of economic development. It is therefore assumed that the higher the ability to pay for higher education, the higher will be the effective demand for higher education as reflected in levels of university expenditure.

The shortcomings inherent to the use of income per capita as a measure of economic capacity have been considered by both Sharples (1971) and Paterson (1967). In general, income per capita fails to consider income distribution within a political unit, such as a province. However, for purposes of this study, a measure is required that represents both disposable income of individuals as well as

tax sources available to government. Income per capita best suits these criteria. It should also be noted that over a relatively short period of time, such as ten years, the correlation between personal and disposable income per capita in each province is invariably .90 .

(X₃) Proportion of labour force in manufacturing sector and,
(X₄) proportion of labour force in service sector. Both of these measures have been referred to as surrogates of economic development in that they measure response to technological change. Schaafsma found that the background (occupation of father) of university "eligibles" was a significant determinant of university attendance (1968, p. 17). However, as the proportions of the labour force in various occupations rose over time, productive "spillovers" enabled less favoured socio-economic aspirants to benefit from a university education (1968, p. 31).

(X₅) Proportion of labour force unemployed. In two recent studies of school expenditure, an unemployment ratio was used to measure the influence of cyclical declines in the economy (James et al., 1963, and McMahon, 1970). The longitudinal association of variations in yearly average unemployment with variations in university operating expenditure is open to conjecture. It may be that high rates of unemployment are associated with low per student expenditures. On the other hand, the possible tendency of students to remain in university during periods of unemployment may maintain or even raise per student expenditure.

The Independent Variables for $E = f(P)$

(X₆) Proportion of the population aged 18 to 24. The

use of this variable is suggested by the studies of Pryor (1968, p. 226), McMahon, (1970, p. 251), Gregory (1967, p. 132), Cameron (1969), and Schaafsma (1968). Canadian experience dictates that whereas the high post World War II birth rate alone can account for increasing enrolments, the aspirations of the college age population are perhaps a more significant measure of demand for university education. Spending for higher education can naturally be related to those in attendance, but this is considered as more of an institutional measure than a measure of population.

(X₇) Education level of population. The education level of the population has been found to be a significant determinant of education expenditures in cross-sectional studies of all levels of education (Gregory, 1967, Hickrod, 1967, Shapiro, 1962, and Paterson, 1967). Schaafsma identified educational level of parent as an important indicator of a child's opportunity to attend university (1968).

One of the problems inherent to the use of education indicators is the identification of a level representative of common achievement across structural units. In the Paterson study, the proportion of the population having nine or more years of formal schooling was used as a surrogate for education level. His comparative cross-sectional study covered the years 1941, 1951, and 1961. While the ninth year of school may have been indicative of generally uniform compulsory school age in Canada at those times, the pattern has since changed. Both compulsory school age and retention rates beyond minimum schooling vary considerably from province to province. This more recent phenomenon has prompted the use of variables representative of the proportion of population having a college education. However,

as pointed out previously, the limitation of education level to "college educated" fails to account for the aspirations of less educated members of the population.

The problem of selecting an adequate measure of education level has been described as an effort to define the "stock" of human capital. "The stock of human capital indicates the level of human resource development which has been achieved by a country" (Harbison and Myers, 1964, p. 24). Ideally, actual level of educational attainment would be the most useful indicator, but it cannot be calculated on a longitudinal basis. For purposes of this study, the number of teachers (elementary and secondary levels) per 10,000 of population has been borrowed from the Harbison and Myers work.

Several assumptions are implicit in the use of this variable. Firstly, it is assumed that the proportion of teachers in the population is a more adequate representation of "native" stock than the number of engineers, scientists, physicians, and dentists. The latter variables, also used by Harbison and Myers, correlated at a much lower level with a composite index of human resource development. Secondly, it is assumed that the teacher/population ratio is an adequate descriptor of education levels since the numerator includes varying degrees of post-secondary education (one year training and beyond). Other indicators, based on the stock of professional occupations, tend to include education levels far beyond those of the majority of the population. A third assumption, that no substantial portion of Canadian teachers was unqualified or untrained throughout the 1960's, appears tenuous. The variation in qualifications should be considered as a limitation upon the use of X_7 as an education index.

When population characteristics associated with higher education expenditures interact, the resulting equation ($X_1 = X_6.X_7$), is similar to the demand functions used by Schaafsma (1968) and Tu (1971).

Other Variables

The socio-demographic characteristics of a population can be represented by variables other than size and education levels. In the American context, percent of population non-white has been tested as an indicator of willingness to spend on education. McMahon demonstrated that racial variables may have short term influences but are generally insignificant in the context of overall development (1970). In other words, the use of racial variables is apparently dependent upon an assumption of zero growth. It is also statistically dependent upon a uniformity in sample from one jurisdiction to another. Neither of these assumptions appears valid in the Canadian context thus mitigating against the use of measures of religion and/or ethnicity. This is not to deny the possible importance of these variables, but to suggest that other types of research design are more suitable for their testing.

A third factor, urbanization, has been hypothesized as a significant determinant of government and non-government spending on both public and private goods. It is not used in this study since a time series of urbanization data for the Canadian provinces does not exist. The annual reports of Provincial Departments of Municipal Affairs are a potential source but, there is no uniform definition of urbanization used by the provinces for purposes of

calculating a common base, e.g., proportion of population dwelling in centres of over 25,000 people. Finally, the correlation between income and urbanization is usually so high that it is difficult to make any sort of judgment about independent effects.

The Independent Variables for $E = f(F)$

A major problem in analyzing fiscal measures related to Canadian higher education is that programmes have changed over the decade 1960 to 1970. For instance, direct federal grants to universities were replaced by tax transfers, and adjustment and equalization payments to provincial governments in 1967/68. One of the assumptions of longitudinal analysis is that variable structures remain comparable over time. In this case, no such assumption is warranted. Thus, adjustments are made to compensate for programme shifts. These may place some limitations on both the accuracy and the interpretation of multiple regression coefficients.

- (X₉) Provincial "own source" revenues. For the purpose of this study, "own source" revenue is defined as the aggregate of revenues from a) taxes, b) privileges, licenses, and permits, c) sales and services, d) fines and penalties, e) interest, discount, and foreign exchange, f) own enterprises, and g) other revenue. These seven categories are generally defined as Gross Revenue from Own Sources (Statistics Canada, Provincial Government Finance: Revenue and Expenditure). This classification fails to consider the structural differences in revenue sources between and within provinces over

time. Neither does it include federal grants and shared-cost contributions to provincial revenues. It is instead, a gross measure of the amount of money available to a province for the funding of public services. Although a simplified measure of provincial fiscal capacity, it does help to evaluate the function of certain revenues vis-a-vis others (transfers and direct grants).

(X₁₀) Provincial operating grants to universities as a proportion of total personal income. This measure of "fiscal effort", suggested by Hickrod (1967), has appeared in cross-sectional studies as the income elasticity of demand for education. Its use in longitudinal research has been minimal and, Hickrod, in his study of ecological changes and expenditures, was one of the first to define it as "effort through time". In cross-sectional research this variable has had a consistent relationship with per capita income. Briefly, as per pupil expenditure rose with rising income, in high income areas, fiscal effort tended to decline. Longitudinal studies have been unable to arrive at the same conclusion, there having been conflicting results with the use of this variable.

According to Bird, the confusion over fiscal effort is partially attributable to the fact that few programmes are related to average per capita income. Therefore, causal statements based on observed changes in income and expenditure have been meaningless in studies of aggregate government spending (1970, p. 90). However, studies of particular government functions may come closer to the meaning of effort.

(X₁₁) The ratio of provincial operating grants to

universities to net provincial expenditures on education. This inverse measure of sectoral ability, used by McIntyre (1969), may help to validate the contention that university finances must compete with other provincial spending on education. The Cameron study (1969) disclosed a drop in provincial spending on universities since the inception of the Federal-Provincial Fiscal Arrangements Act (1967). However, the study failed to relate the decline to the possibility of alternative public preferences expressed in greater spending on other forms of education.

(X₁₂) Federal transfer payments for all other functions (excluding transfers based on higher education and post-secondary education operating expenditures made since 1967). Federal transfers for "other" services have been hypothesized as stimulative to spending for higher education. The spillover argument may have validity in the Canadian context, since many shared-cost programmes during the 1960's were related to education or "training".

The calculation of this variable is facilitated by a Federal Government reporting procedure that classifies transfers as Conditional, Unconditional, and Other. "Other transfers" consist mainly of transfers to certain provincial institutions and to municipalities. From 1960/61 to 1966/67, university per capita grants are included in this category. As of 1967/68, "Other transfers" includes all transfers (abatements, equalization, and adjustment payments) made in respect of post-secondary education under the Federal-Provincial Fiscal Arrangements Act. Therefore, "other transfers" are removed from the calculation of federal transfer payments so as to insure that the measure of "stimulation" or "spillover" does not include any portion

of the criterion variable.

It should be noted that at the time of data collection (December, 1971), the fiscal data provided by the Department of Finance had not been adjusted to include current figures relating to post-secondary transfers from 1968 to 1970. These figures have been adjusted by the writer based on the most current release of the Education Support Branch, Department of the Secretary of State (April, 1971).

(X₁₃) Direct grants to universities and fiscal transfers based on post-secondary operating expenditure. These two programmes that characterized the intergovernmental relationship in the last decade have been the subject of several studies reviewed in Chapter II. It is not the intent of this study to reexamine the particulars of these programmes, but to assess their relationship to expenditure over time. To do so, a variable must be designed that reflects the interrelationship of provincial and federal spending patterns.

There is certainly no consensus about the division of financial responsibilities between levels of government involved in university finance. Although the federal presence was manifest prior to 1967/68, through the operation of the per capita grants programme, there existed at least two situations that illustrated the debate over direct involvement.

Due to the intransigence of the Government of Quebec, universities in that province were compelled to refuse federal grants from 1952 until 1960. As of 1956, the distribution of federal grants was administered by the National Council of Canadian Universities, later the Canadian Universities Foundation. However, this attempt to please

critics of direct federal involvement had little appeal to the Quebec government. In March of 1960, Ottawa presented a new proposal whereby federal payments to universities could be made by either the C. U. F. or a province. The latter alternative envisaged an increase in provincial corporation tax and a corresponding decrease in the federal tax. The option applied to all province.

In the debate which preceded the bill, Mr. Fleming, then Minister of Finance, pointed out that the additional one per cent abatement had a different value in each province. In some provinces the value of the abatement would be much greater than the \$1.50 per capita paid by C. U. F. while in others it would be an insufficient amount for purposes of university finance . . . Because of this fluctuation in value, the federal government offered to provide revenues in provinces where the abatement value was less than \$1.50 and to deduct revenues where the value was higher than \$1.50 (Hyman, 1968, p. 49).

Quebec was the only province to accept the federal proposal. There was some concern among the province's universities that they would not receive the equivalent \$1.50 per capita payment, but it disappeared when Quebec raised its own per capita grant to \$2.00. It should be noted that direct operating grants for assisted research were not part of this debate and Quebec's universities received such grants throughout the period.

There is no doubt that the fiscal arrangements of 1967 placed post-secondary and higher education finance solidly within the realm of provincial decision-making. Although attempts have been made to demonstrate a decline in provincial spending as a response to the new programme, they are based on calculations of effort prior to 1967. In other words, critics of provincial finance assume that tax abatements, adjustments, and equalization payments should be used as indicators of federal support for post-secondary education.

This method of analysis is rejected in this study. The provinces are under no obligation to spend transfer payments on post-secondary education. The decision to spend, and on what services, is entirely their own and is treated as such in the following Chapters.

The foregoing analysis suggests the use of a variable that measures the constant involvement of both levels of government throughout the 1960's. An elasticity of expenditure with regard to the "mix" of government spending serves this purpose provided that the "mixed" independent variable is structurally consistent throughout the decade. This standard can be obtained by using the ratio of federal to provincial spending on higher education. Thus,

$$X_{13} = \frac{\text{federal operating grants to institutions of higher education}}{\text{provincial operating grants to institutions of higher education}}.$$

The numerator includes federal per capita payments from 1960 to 1967, the adjusted value of the 1% corporation tax abatement to Quebec in the same period, and operating grants for assisted research from 1960 to 1970. The denominator consists of provincial direct operating grants to universities including those for assisted research from 1960 to 1970. Operating grants post 1967/68 are treated as provincial grants.

The Independent Variables for $E = f(R, P)$.

Sources of revenue. Three sources of revenue have been associated with the current expenditures of universities-federal direct grants from 1960 to 1967, provincial operating grants throughout the decade, and tuition fees. These major sources were frequently complemented by other operating grants to offset the costs of

assisted research. In addition, universities received funds from the sale of goods and services and from private donors. The latter was a rare source of operating revenue since it usually took the form of capital grants. The relative importance of different revenue sources is tested through the use of three variables:

(X₁₅) Provincial operating grants including grants for assisted research as a proportion of total operating income,

(X₁₆) Federal operating grants including grants for assisted research as a proportion of total operating income, and

(X₁₇) Other source operating income including tuition fees, revenues from the sale of goods and services, private donations, endowment funds, etc., as a proportion of total operating income.

Programme. Two measures of programme are used in the equation:

(X₁₈) Proportion of full time undergraduates to total enrolment,

(X₁₉) Proportion of full time graduate students in total enrolment.

These variables are included in the model to explain expenditure variations that are expected to occur due to differences in levels of academic activity (McIntyre, 1969, p. 264).

IV. COLLECTION OF DATA

The statistical data for the study are taken from published and unpublished tables provided by several federal agencies. Data collection was carried out in Ottawa in June and December of 1971. Tables of basic data and their sources are provided in the Appendices.

V. TREATMENT OF DATA

An assumption of interaction between variables requires a

model that predicts the change in per student operating expenditures for any combination of independent variables rather than for the separate effects of each one (Kurnow, 1965, p. 253). Thus, for each of the dimensions, an equation taking the following form is used:

$$E = aX_1^{b_1} X_2^{b_2} \dots X_n^{b_n},$$

where E represents the criterion variable, a, the constant, X, the independent variable, and b, the weight.

According to this hypothesis, the effects of a change in an independent variable will depend on the values of the other independent variables as well as on the size of the change (Morss, 1966, p. 102).

The above equation can be applied to both longitudinal and cross-sectional data. However, since the assumption of linearity is seldom valid for data in time series form, there is required a different approach to that used in cross-sectional studies. Therefore, all variables are converted into logarithms thus estimating in the regression analysis the proportionate change in E to be expected from a given proportionate change in X. This conversion, commonly known as the "elasticity" of a relationship, is performed by a number of available computer programmes. It results in an equation taking the form: $\log E = \log a + b_1 \log X_1 + b_2 \log X_2 + \dots + b_n \log X_n$.

The derived weights, or regression coefficients, are estimates of the percentage increase in the dependent variable associated with a one percent increase in an independent variable. To account for the association of the criterion with more than one independent variable, a multiple linear regression of the stepwise type is applied to the time series. This procedure ranks variables and enters them into the regression in a stepwise fashion in accordance with their marginal

explanatory power, i.e.,

. . . the variable with the highest R^2 is entered first; the variable with the highest partial correlation coefficient after the entrance of the first variable is then added, etc. (Morss et al., 1967, p. 497).

The statistical significance of derived correlations is not of vital importance in this study. The data are treated as a population and not as a sample. Of greater importance is the fact that there is no logical basis for estimating the coefficient of correlation for time series (Croxtton, et al., 1967, p. 495).

The chief objection to the use of any reliability test for r for time series is that the different observations are not randomly distributed - each observation in a time series is related to values in that series for preceding and subsequent points of time. Furthermore, we cannot ordinarily generalize concerning the exact nature of this interrelationship.

The choice of an appropriate set of predictor variables is determined by a) the application of "F" ratio tests to the multiple regression coefficients, b) the point at which no further variance is accounted for by the inclusion of additional variables, and c) a consideration of the possible influence of suppressor variables. Any regression coefficient within, but not beyond, the .10 level of significance is considered as an acceptable indicator of criterion responsiveness to changes in the predictor.

Suppressor variables are those that tend to distort the weights of any given set of "good" predictors. Such variables have no, or relatively low correlation with the criterion, but are highly correlated with one or more independent variables strongly associated with the dependent variable (Paterson, 1967, p. 103).

CHAPTER IV

INTERPROVINCIAL COMPARISONS

I. INTRODUCTION

This Chapter contains an interprovincial comparison of factors associated with per student operating expenditures. The findings of the empirical part of the study are presented in relation to each of the four dimensions identified as sub-problems in Chapters I and III. Both the variables and the justification for their use were presented in Chapter III. Table 4.1 provides a list of the variables and associated symbols. The latter are used throughout the following Chapters.

II. INCOME AND EXPENDITURE

The relationship between changes in the dependent variable and changes in income factors was advanced in Chapter III. It was suggested that per capita personal income was, perhaps, in itself, a sufficient indicator of the economic development of a province. Evidence to this effect was provided in several studies of economic growth and its relationship to spending. The introduction of variables thought to have an influence on spending, along with personal income, has generally led to problems of multicollinearity. Size of population and density, urbanization, and other related measures are usually so highly correlated with income per capita that their possible relationship to the criterion variable is obscured. Therefore, the first set of regression coefficients derived in this study deal with the relationship between income per capita and the dependent

Table 4.1

Variable Definitions and Symbols Used in the Empirical Analysis

The Dependent Variable

X_1 - University operating expenditure per full time student

The Independent Variables for $E = f(I_p)$

- X_2 - Per capita personal income
- X_3 - Proportion of labour force in the manufacturing sector
- X_4 - Proportion of labour force in the service sector
- X_5 - Proportion of labour force unemployed

The Independent Variables for $E = f(P)$

- X_6 - Proportion of the population aged 18 to 24
- X_7 - Education level of population (Number of teachers per 10,000 of population)
- X_8 - Proportion of 18 to 24 age group attending university

The Independent Variables for $E = f(F)$

- X_9 - Provincial "own source" revenue
- X_{10} - The ratio of provincial operating grants to universities to total personal income
- X_{11} - Provincial operating grants to universities as a proportion of net provincial expenditures on education
- X_{12} - Federal conditional and unconditional transfer payments for purposes other than education
- X_{13} - The ratio of federal to provincial operating grants for higher education
- X_{14} - Federal conditional transfer payments

The Independent Variables for $E = f(R, P)$

- X_{15} - Proportion of total university operating income from provincial grants
- X_{16} - Proportion of total university operating income from federal grants
- X_{17} - Proportion of total university operating income from all other sources
- X_{18} - Proportion of full time undergraduate students in total full time enrolment
- X_{19} - Proportion of full time graduate students in total full time enrolment

variable throughout the period 1960/61 to 1969/70.

Table 4.2 contains simple correlation coefficients between these variables. Since the stepwise regression procedure calculates correlations based on the annual value of variables, the illustrated statistics do not provide any indication as to the relationship between relative changes in variables from year to year. It is apparent that a very substantial relationship exists between income per capita and the criterion variable. Although correlations consistently above .90 make difficult any meaningful discussion of variance, it should be noted that Prince Edward Island and Saskatchewan, and to a lesser extent, Newfoundland and Quebec, do not exhibit the almost perfect correlation found in the remaining provinces. The lower correlations are a consequence of less stable income levels.

Table 4.2

Coefficients of Simple Correlation Between Per Capita Personal
Income and University Per Student Operating Expenditures;
1960/61 to 1969/70

Nfld.	PEI.	NS.	NB.	Que.	Ont.	Man.	Sask.	Alta.	BC.
.94	.91	.98	.99	.95	.99	.99	.92	.99	.99

Calculation of Regression Coefficients

Regression coefficients are derived from the application of a linear equation to the logarithmic values of both independent and dependent variables. Therefore, a weight may be interpreted as an

elasticity, a measure of the percentage increase in the criterion associated with a one percent increase in the predictor, assuming that all other variables remain constant. This procedure is used for all subsequent calculations. The annual unadjusted values of the variables, used in their logarithmic form for data analysis, are found in Appendix B.

The regression coefficients, or elasticities, are supplemented by the following statistics: (a) the constant of the regression equation, or the value of X_1 when $X_n = 0$, and (b) R^2 , the square of the multiple correlation coefficient or, the proportion of variance in the criterion variable accounted for by changes in the predictors.

Income Elasticity of University Operating Expenditures

Table 4.3 contains coefficients derived from the regression of X_2 on X_1 . The high R^2 obtained indicate that per capita personal income is a good indicator of university per student operating expenditures in this part of the model. All elasticities are greater than unity signifying that percentage increases in university expenditures were greater than those for income per capita throughout the period under study. Newfoundland, which had the lowest income per capita, exhibits the highest income elasticity of expenditure (1.92). Ontario, the province with the highest per capita income in the 1960's, shows an elasticity of 1.47, almost in the centre of the Canadian range. With the exception of New Brunswick, the Atlantic Provinces tend to display higher elasticities than their counterparts in Central Canada and the Prairies. Only British Columbia has an elasticity commensurate with those shown in the Maritimes (1.54).

Table 4.3
Regression Coefficients for Per Capita Personal Income and
University Per Student Operating Expenditures:
1960/61 to 1969/70

Province	Constant	Per Capita Personal Income	R ²
Nfld.	-6.271	1.92	88.69
PEI.	-3.801	1.54	82.08
NS.	-4.804	1.68	96.77
NB.	-1.869	1.27	98.58
Que.	-1.628	1.23	91.13
Ont.	-3.534	1.47	98.23
Man.	-0.789	1.11	97.22
Sask.	-0.634	1.09	83.87
Alta.	-1.758	1.25	98.12
BC.	-4.314	1.54	99.16

Factors Associated With Income

The conceptual framework put forward in Chapter I suggests that expenditures on higher education may be associated with factors related to the per capita income of provincial populations. Three such factors were identified; proportion of labour force in manufacturing, proportion of labour force in the service sector, and proportion of labour force unemployed. The first measure tends to differentiate provinces according to technological complexity, the second, according to services offered to populations, and the third, according to non-participation in the productive labour force.

The direction of association between each of these variables and operating expenditures per student is open to question. High proportions of the labour force in manufacturing may generate demands for university trained personnel thus influencing expenditure. It may also be the case that the manufacturing sector relies upon semi-skilled labour, a large proportion of which is trained on the job or, that labour mobility is a substitute for local recruitment. In these cases, there would be no strong correlation between manufacturing labour force and university expenditures.

The service sector labour force is generally comprised of a high proportion of university trained manpower. Thus, increases in the service labour force may be a major influence on university spending. However, since increases in the proportion of the labour force in the service sector are usually associated with higher per capita income, the expenditure effect may be a reflection of greater financial ability to support university operations rather than a sign of increased usage of university facilities. These two-edged reactions may also be characteristics of the unemployment rate. Increased unemployment can influence governmental revenues, hence the expenditures made by universities. However, if unemployment is particularly high in the young labour force, university students may decide to continue their studies thus maintaining or increasing expenditures.

Prior to the description of findings related to these variables, a comment is warranted about availability of data and the construction of variables. Province by province breakdowns of the labour force were not available before 1966. The regional estimates, going back

to 1960, include the Maritimes, Quebec, Ontario, the Prairies, and British Columbia. Therefore, labour force data over a ten year period are available for only three provinces, and over a four year period, for all provinces.

The Federal Government is just beginning to develop measures of sectoral employment within the labour force. The system in use until 1970 simply classified the labour force as the number over 14 years of age, employed, unemployed, male, or female. To ascertain the proportion of the labour force in certain sectors of employment it is necessary to work from a document entitled Estimates of Employees by Province and Industry (D.B.S., 1969). This publication contains estimates of sectoral employment based on sample surveys of establishments employing 20 or more workers. The survey is not the same one used to establish the size of the labour force. For these reasons, and others, it underestimates the absolute size of sectoral employment.²

In view of these limitations findings are reported only for Quebec, Ontario, and British Columbia. Since a regression procedure requires at least one degree of freedom, it is impossible to regress four independent variables made up of only four observations. This eliminates the opportunity of investigating data limited to the years 1966 to 1969 inclusive. The following criteria have been used in variable construction for the three provinces under study:

²A large proportion of the directors of incorporated businesses reported themselves as "owners" rather than "employees". This error was not isolated until 1968, seven years after the introduction of the survey (Personal interview with W. A. Campbell, Chief, Employment Section, Labour Division, Statistics Canada, December, 1971).

X_3 - Proportion of labour force in the manufacturing sector.

"Manufacturing sector" is as defined in Estimates . . . Industry.

X_4 - Proportion of labour force in the service sector includes all employees in Community, Business, and Personal Service, Commercial and Non-Commercial Sectors, Public Administration and Defense (excluding non-civilians) and, Finance, Insurance, and Real Estate.

X_5 - Proportion of labour force unemployed is derived from The labour force (Statistics Canada, September 1971, p. 51).

The correlation matrix in Table 4.4 indicates the degree of association between the independent variables X_2 , X_3 , X_4 , and X_5 and the criterion. Manufacturing sector employment is positively correlated with expenditure in Ontario but negatively correlated in both Quebec and British Columbia. Service sector employment shows a strong positive correlation with expenditure in all three provinces while unemployment, is negatively associated with the criterion.

The high correlation between service sector employment and per capita income has been alluded to on page 53 and is substantiated by the statistical analysis. It can be expected that the inclusion of the former variable in a regression equation will add little to a knowledge of its influence on expenditures. None of the other correlations exhibit a uniformity in direction among the three provinces. British Columbia and Quebec demonstrate similar negative trends with respect to the relationship between unemployment and the service sector labour force, while Ontario exhibits a strong positive association. The important negative association in Ontario is between

unemployment and manufacturing labour force. In this province, both income per capita and service sector employment are positively related to manufacturing while the reverse holds true for British Columbia and Quebec. Overall, the strongest intercorrelations between variables are in Ontario and the weakest in Quebec.

In summary, it would appear that factors theoretically associated with income per capita exhibit a range of behaviour that invalidates generalizations with respect to these three provinces and, most likely, to the other provinces as well. Their association with spending on higher education seems to be dependent upon the nature of particular economies rather than upon any consistent law of economic behaviour.

Table 4.4

Coefficients of Simple Correlation Between Independent Variables
for Factors Associated With Per Capita Personal Income
and University Per Student Operating Expenditures
in Quebec, Ontario, and British Columbia;
1960/61 to 1969/70

Province		Variables			
		X ₂	X ₃	X ₄	X ₅
Quebec	X ₁	.95	-.48	.90	-.26
	X ₂		-.38	.97	.53
	X ₃			-.30	-.16
	X ₄				-.60
Ontario	X ₁	.99	.65	.95	-.62
	X ₂		.68	.97	.65
	X ₃			.76	-.89
	X ₄				.95
British Columbia	X ₁	.99	-.73	.94	-.60
	X ₂		-.70	.94	-.65
	X ₃			-.57	.04
	X ₄				-.65

The stepwise regression based on an interaction of the four independent variables produces weights shown in Table 4.5. The unemployment ratio in Quebec raises the cumulative R^2 from 91 percent for per capita income alone to 99 percent for a combination of the two variables. There is an indication that increases in unemployment have a slight positive influence on university spending since the regression coefficient for proportion unemployed is .41. Labour force variables in Ontario do not contribute to the variance in expenditure, a result indicated by the strong correlations shown in Table 4.4. Although service sector employment and proportion of labour force unemployed have positive elasticities in British Columbia, they add little to the variance in expenditure after the introduction of per capita income.

The results imply that in a highly integrated economy (e.g., Ontario and to a lesser extent British Columbia), the influence of labour force variables on higher education expenditures is overshadowed by the overwhelming influence of income. Nonetheless, the contribution of the unemployment ratio to the total variance in expenditure in Quebec offers some indication that similar factors may be influential in less developed provincial economies.

Table 4.5

Regression Coefficients for Per Capita Personal Income and
Associated Factors in Quebec, Ontario, and British
Columbia; 1960/61 to 1969/70

Province	Constant	Income	Mfg.	Service	Unemployed	R^2
Quebec	-2.230	1.46				
Ontario	-3.534	1.47			.41	99.39
BC.	-2.690	1.46		.48	.11	99.62

III. POPULATION AND EXPENDITURE

The second dimension of the model put forward in Chapter III involves an investigation of the proportion of population eligible to attend university and the education level of the population. Their association with expenditure has been explained in terms of a modified demand function. The selected variables, and the statistical technique employed in their analysis were outlined in Chapter III. Annual raw data are presented in Appendix B.

Table 4.6 contains simple correlations between independent variables X_6 and X_7 as well as between these population measures and the criterion. Both measures of population exhibit strong positive associations with the dependent variable. The Harbison and Myers "human stock" variable, used as a proxy for education level (X_7), tends to have a higher correlation with expenditures than the 18 to 24 age group measure (X_6), the exceptions being Newfoundland and Prince Edward Island.

It is important to note the high intercorrelations between X_6 and X_7 . This pattern can be explained by the fact that increases in the proportion of population 18 to 24 years of age are bound to be associated with increases in the number of elementary and secondary school teachers in the preceding years. Therefore, the variables are essentially measures of the same thing. A time lag might overcome this problem, but data limitations in the 1950's prevent such a test. Thus, in their present form, either of the variables would suffice for purposes of prediction.

Awareness of multicollinearity suggests extreme caution in interpreting results since derived elasticities are somewhat

Table 4.6

Coefficients of Simple Correlation Between Proportion of
Population Aged 18 to 24 (X_6), Education Level of
Population (X_7), and University Per Student
Operating Expenditures (X_1); All
Provinces, 1960/61 to 1969/70

Correlations	Nfld.	PEI.	NS.	NB.	Que.	Ont.	Man.	Sask.	Alta.	BC.
$r_{X_1X_6}$	.95	.92	.90	.96	.81	.95	.95	.91	.83	.93
$r_{X_1X_7}$	.84	.89	.98	.99	.83	.98	.96	.98	.99	.98
$r_{X_6X_7}$	.93	.90	.94	.97	.76	.92	.93	.88	.83	.91

suppressed. It also prompts a search for alternative measures of demand that are relatively independent of one another. It has been suggested that one such alternative is the use of a measure of the proportion of the 18 to 24 age group in actual attendance at university (Peitchinis, 1971, pp. 105-115). Supposedly, this variable indicates the capacity of provincial institutions to fulfill aspirations of both parents and students. However, a regression of this variable (X_8) upon the criterion did not change the weights reported in Table 4.7 that had already been obtained for variables X_6 and X_7 .

In the light of these findings, coefficients reported in Table 4.7 can be treated in at least three ways. They are the results obtained for the regression of X_6 and X_7 on X_1 . However, due to high correlation, the independent variables could well be statistical measures of the same thing. A similar interpretation can be applied to X_8 . In this perspective, approximately two to four percent increases in university per student operating expenditures were the response to one percent increases in either X_6 or X_7 over the decade 1960/61 to

1969/70. The upper end of the scale is approached in Newfoundland, New Brunswick, and Nova Scotia, followed, in the three percent range by Saskatchewan, and British Columbia. Prince Edward Island and, to a lesser extent, Quebec and Alberta exhibit close to two and a half percent elasticities, followed by Manitoba (two percent) and Ontario (one and a half percent). Since an orthodox interpretation of the coefficients is negated by substantial intercorrelation, it is doubtful as to whether education level was a more influential predictor of expenditures in Newfoundland and Prince Edward Island.

Table 4.7

Regression Coefficients Derived From the Stepwise Regression
of Proportion of Population Aged 18 to 24 (X_6), and
Number of Teachers Per 10,000 of Population (X_7)
on the Dependent Variable; All Provinces,
1960/61 to 1969/70

Province	Constant	X_6	X_7	R^2
Nfld.	15.791	3.87	-	89.98
PEI.	13.203	2.62	-	83.92
NS.	-1.210	-	3.74	95.51
NB.	-1.820	-	3.84	97.68
Que.	2.090	-	2.35	68.20
Ont.	6.712	.94	1.47	97.26
Man.	3.284	-	1.94	92.32
Sask.	.016	-	3.18	95.80
Alta.	2.321	-	2.31	98.63
BC.	1.500	-	2.84	95.73

IV. FISCAL RESOURCES AND EXPENDITURE

Five measures of fiscal resources and their use are considered as potential indicators of expenditure for higher education. The log linear regression equation takes into account the interaction between variables and produces weights which establish their relative importance. The variables employed in this dimension of the model attempt to measure the relative importance of provincial fiscal capacity (X_9), provincial fiscal effort (X_{10}), provincial sectoral ability (X_{11}), "spillovers" from federal transfer payments (X_{12}), and the "mix" of government spending for higher education (X_{13}).

Simple correlations between each fiscal resource measure and the criterion variable (Table 4.8) indicate a) strong positive associations for X_9 , X_{10} , X_{11} , and X_{12} , and b) a uniform negative association for X_{13} . The exception to a) above is X_{11} in New Brunswick, and the exception to b) is X_{13} in Prince Edward Island. The exceptional cases illustrate the same uniformity in direction as do the other variables, but show weaker correlations with the criterion.

Since all or these measures are related, in one way or another, it is logical to assume high intercorrelation between variables. However, the purpose of this part of the analysis is to identify important predictors of expenditure and thus eliminate some of the confusion about the use of fiscal resources. Therefore, the inclusion of all variables is necessary.

Derived regression coefficients are produced in Table 4.9. Provincial fiscal effort (X_{10}) is the leading predictor of expenditure variation in seven of the ten provinces during the decade. The

Table 4.8

Coefficients of Simple Correlation Between Measures of Fiscal Resources and University Per Student Operating Expenditure
(X₁): All Provinces, 1960/61 to 1969/70

Variables	Nfld.	PEI.	NS.	NB.	Que.	Ont.	Man.	Sask.	Alta.	BC.
X ₉	.91	.94	.96	.96	.92	.99	.99	.96	.97	.99
X ₁₀	.98	.95	.99	.95	.92	.99	.99	.96	.99	.99
X ₁₁	.96	.94	.98	.57	.75	.97	.96	.98	.95	.97
X ₁₂	.89	.87	.92	.98	.85	.91	.96	.95	.94	.97
X ₁₃	-.92	-.50	-.89	-.81	-.77	-.93	-.78	-.88	-.85	-.92

Explanation of Symbols:

- X₉ - Provincial "own source" revenue
- X₁₀ - The ratio of provincial operating grants to universities to total personal income
- X₁₁ - Provincial operating grants to universities as a proportion of net provincial expenditures on education
- X₁₂ - Federal conditional and unconditional transfer payments for purposes other than education
- X₁₃ - The ratio of federal to provincial operating grants for higher education.

exceptions are New Brunswick, Manitoba, and Saskatchewan, in which the leading predictors are federal transfer payments, provincial fiscal capacity, and sectoral ability respectively. There is apparently no consistent relationship existing among the provinces with respect to a uniform combination of variables capable of explaining variations in expenditure. Provincial sectoral ability is the most frequently recurring measure of expenditure variation after the introduction of X₁₀ but, its association with X₁₀ is not consistent. The same conclusion is applicable to other measures of fiscal resources.

The empirical findings of this part of the analysis are similar to those of Gregory (1967, p. 133) and McIntyre (1969, p. 271), namely, that the elasticity association between effort and expenditure does not exceed unity. In only one of the provinces where X_{10} predicts expenditure variation does the elasticity equal unity (Quebec, 1.01). British Columbia, Alberta, and Newfoundland have elasticities in the range .66 to .74. Ontario's coefficient is .51 and Prince Edward Island's is .37, while Nova Scotia exhibits a negative coefficient of -.32.

The coefficients of X_{11} (sectoral ability) are negative in Alberta and British Columbia, and close to unity in only one province, Saskatchewan (.93). Since other measures of fiscal resources appear as statistical predictors in so few provinces, it is difficult to make any meaningful comparison of trends.

It could be argued that variable X_{12} is not an adequate measure of transfer payments leading to "spillover" effects since unconditional transfers are not expenditure related. To test for the possible influence of conditional transfers, the regressions were rerun substituting X_{14} (federal conditional transfer payments) for X_{12} (federal conditional and unconditional transfer payments for purposes other than education). With the exception of Nova Scotia, this adjustment did not change the findings presented in Table 4.9.

In summary, it would appear that fiscal variables related to proportional use of revenues are, for the most part, better statistical predictors of expenditure variations than measures of actual revenue. New Brunswick is the only province for which one or more proportional revenue measures do not contribute to prediction of variation in the

criterion. The validity of this statement is limited to the interactive model used in this research. Any one of the fiscal resource measures, if used independently, will "explain" variation. There is evidence however, that the magnitude of revenues available to provincial governments is less important than decisions about how revenues are to be spent.

Table 4.9

Coefficients Derived From Stepwise Regression of Fiscal Resources Measures on University Per Student Operating Expenditures; All Provinces, 1960/61 to 1969/70

Provinces	Constant	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	R ²
Nfld.	18.382		.66	.45	-.30	.49	99.16
PEI.	9.287		.37				89.38
NS.	- 1.013	.46	-.32	.75			99.94
NB.	- 5.086	.25			.43		97.47
Que.	13.450		1.01			.37	91.88
Ont.	10.769		.51			.10	99.66
Man.	1.234	.36		.29			98.87
Sask.	9.585			.93		.28	98.09
Alta.	10.759		.72	-.30			99.08
BC.	10.999		.74	-.33			99.07

Explanation of Symbols: X₉ - Provincial own source revenue

X₁₀ - The ratio of provincial operating grants to universities to total personal income

X₁₁ - Provincial operating grants to universities as a proportion of net provincial expenditure on education

X₁₂ - Federal conditional and unconditional transfer payments for purposes other than education

X₁₃ - The ratio of federal to provincial operating grants for higher ed.

V. UNIVERSITY REVENUE SOURCES, PROGRAMME, AND EXPENDITURE

The fourth dimension of the university-government relationship attempts to examine the influence of alternative revenue sources and programme on expenditure. Variables describing student enrolment are included in the model to explain expenditure variations expected to occur due to differences in the programmes offered by universities within a province. A province having a high proportion of graduate students may exhibit higher per student expenditures than a province having predominantly undergraduate programmes.

Graduate instruction is normally characterized by smaller class size, fewer teacher units per faculty member, and occasionally, higher average faculty salaries. More faculty are required for a given student enrollment and the costs per student are higher as a result (McIntyre, 1969, p. 264).

The three variables describing particular income sources are used so as to establish their relative importance to the operating expenditures of publicly supported universities. This is so since none of the provincial systems exhibit any tendency to use a particular income source to the virtual exclusion of another.

The degree of association between each of the predictors and the criterion variable is summarized in Table 4.10. Increases in the proportion of revenues from provincial sources are more closely associated with per student expenditures in Ontario, British Columbia, and Nova Scotia (.98, .96, and .95 respectively) than in the other provinces. Newfoundland, Prince Edward Island, Saskatchewan, and Alberta tend to cluster around .87 while Quebec shows the lowest correlation at .77.

The decade was marked by an overall decline in the proportion of federal to total operating revenues, although, there were some

deviations from this trend. Thus, the correlations in Table 4.10 are negatively associated. Newfoundland has the highest correlation (-.94) followed by Ontario, British Columbia, Saskatchewan, Alberta, and New Brunswick in the range -.80 to -.89. Manitoba, Quebec, Nova Scotia and Prince Edward Island fall below this range with correlations of -.75, -.71, -.67, and -.23 respectively.

Other revenues are highly correlated with X_1 in Ontario (-.97) and British Columbia (-.91). While all other provinces show correlations ranging from -.77 to -.85, Alberta and Saskatchewan exhibit r 's of -.60 and -.37 respectively.

Decreases in the ratio of undergraduate students to full time enrolment are highly correlated with increases in per student expenditures in Alberta (-.97), Nova Scotia (-.93), and Saskatchewan (-.92). Manitoba, Newfoundland, Alberta, Quebec, and British Columbia fall into the -.78 to -.89 range, while New Brunswick has an r of -.48. Since the ratio for Prince Edward Island is constant over time, a slight adjustment to the final year figure allows for the calculation of a correlation coefficient of -.64.

Increases in graduate enrolment are positively associated with the criterion. The range of correlation between these two variables is narrower than preceding ranges in this dimension. Alberta, Saskatchewan, Nova Scotia, and Manitoba are above .90, New Brunswick, Ontario, and Newfoundland exceed .80, and British Columbia and Quebec exhibit correlations in excess of .70.

Table 4.11 contains derived regression coefficients based on the log linear equation. Once all other variables are controlled, provincial grants emerges as the leading predictor of changes in the

Table 4.10

Coefficients of Simple Correlation Between Measures of University
Revenue Sources and Programme, and University Per Student
Operating Expenditures; All Provinces, 1960/61 to 1969/70

Variables	Nfld.	PEI.	NS.	NB.	Que.	Ont.	Man.	Sask.	Alta.	BC.
X ₁₅	.88	.86	.95	.80	.77	.98	.79	.87	.87	.96
X ₁₆	-.94	-.23	-.67	-.80	-.71	-.89	-.75	-.88	-.83	-.89
X ₁₇	-.79	-.84	-.77	-.85	-.81	-.79	-.80	-.37	-.60	-.91
X ₁₈	-.88	-.64	-.93	-.48	-.79	-.85	-.89	-.92	-.97	-.78
X ₁₉	.80	. . .	.92	.85	.75	.84	.90	.92	.94	.76

Explanation of Symbols:

- X₁₅ - Proportion of total university operating income from provincial sources
- X₁₆ - Proportion of total university operating income from federal sources
- X₁₇ - Proportion of total university operating income from all other sources
- X₁₈ - Proportion of full time undergraduate students in total full time enrolment
- X₁₉ - Proportion of full time graduate students in total full time enrolment

variation of expenditure in four provinces. The response of a change in expenditure to a one percent change in the ratio of provincial to total university operating income is 1.57 in Ontario and 1.21 in British Columbia. Both Nova Scotia and Prince Edward Island exhibit elasticities less than unity being .82 and .60 respectively. In Manitoba, where the elasticity coefficient is also significant there is a .61 percent increase in expenditure as a response to a one percent increase in provincial grants.

Table 4.11

Coefficients Derived From Stepwise Regression of University
Revenue and Programme Measures on University Per Student
Operating Expenditures; All Provinces,
1960/61 to 1969/70

Provinces	Constant	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	R ²
Nfld.	6.598		-.51				87.89
PEI.	7.819	.60					73.91
NS.	8.544	.82					91.13
NB.	7.795			-1.00		.42	95.43
Que.	8.437			- .86		.60	92.50
Ont.	9.712	1.57	.34				97.04
Man.	9.720	.61				.56	90.27
Sask.	11.603		-.38			1.48	94.25
Alta.	6.109			- .49	-11.21		97.77
BC.	8.644	1.21					91.39

Explanation of Symbols:

- X₁₅ - Proportion of total university operating income from provincial sources
- X₁₆ - Proportion of total university operating income from federal sources
- X₁₇ - Proportion of total university operating income from other sources
- X₁₈ - Proportion of full time undergraduate students in total full time enrolment
- X₁₉ - Proportion of full time graduate students in total full time enrolment.

Federal grants are a leading predictor of variations in expenditure in only one province, Newfoundland (-.51), but significant in Ontario (.34) and Saskatchewan (-.38) as well. The ratio of graduate students to total enrolment is a leading predictor in

Saskatchewan (1.48), Quebec (.61), Manitoba (.56), and New Brunswick (.42), while the ratio of undergraduate students is a leading predictor in Alberta (-11.21). Other revenues are significant in Alberta (-.49), Quebec (-.86), and New Brunswick (-1.00).

The empirical findings tend to suggest no uniformity in the relationships between university expenditures, revenues, and programmes among provinces. Reliance upon a provincial revenue source seems to give rise to increases in expenditure, though not necessarily commensurate with increases in income. Expenditures exhibit a mixed reaction to federal grants and a uniformly negative response to other revenues. While graduate enrolment shows positive elasticities ranging from .42 to 1.48, a percentage decrease in the ratio of undergraduate students is associated with a high percentage increase in expenditure in at least one province.

CHAPTER V

INTRAPROVINCIAL ANALYSIS

I. INTRODUCTION

The findings of the second stage of the empirical analysis, involving the examination of intraprovincial factors associated with variations in university per student operating expenditures, are given in this Chapter. Significant variables, identified in Chapter IV, are discussed with reference to both the time series elasticities and the trend of annual data contained in Appendix A. Since the bulk of data used in this Chapter has already been introduced in the preceding Chapter, correlation and regression coefficient Tables are reproduced at the end of each provincial section.

II. NEWFOUNDLAND

Income and Expenditure

For the decade 1960/61 to 1969/70, university per student operating expenditures rose almost two percent for every one percent rise in per capita personal income. However, this overall average for the period is misleading. From 1960/61 to 1964/65, the income-expenditure elasticity was less than unity (approximately .73). In 1965/66, the percentage increase in per capita income was four times the percentage increase in operating expenditures. In the remaining years of the decade, the income elasticity coefficient rose to 3.54. These wide fluctuations reflect the changing structure of higher education in Newfoundland throughout the 1960's. Because structure is more appropriately related to provincial use of fiscal resources,

and university revenue sources and programme, the analysis of these dimensions will add to an understanding of the income elasticities presented in this section.

Population and Expenditure

The highest partial elasticity for any combination of variables used in the model is arrived at in this dimension. As mentioned previously, the high correlation between population measures dictates similar interpretation for all variable coefficients derived from the regression procedure.³ However, the cross-sectional data in Tables A6 and A8, Appendix A, indicate that whereas the greatest increases in the proportion of the population aged 18 to 24 took place in the latter half of the decade, the highest percentage increases in attendance were characteristic of the years 1960/61 to 1966/67. Although there is no significant difference between the $X_1.X_6$ and $X_1.X_8$ correlations, the continual and rapidly accelerating percentage increases in operating expenditure were more closely associated with the proportion of population aged 18 to 24 (.95) than with the participation rate (.92).

The elasticities for X_6 (Proportion of the population aged 18 to 24) and X_8 (Proportion of the 18 to 24 age group attending university) are identical (3.87). When considered in the above-

³The interaction of variables X_6 and X_7 , and X_6 and X_8 in a regression equation has predictable results. X_6 will always "explain" the greatest portion of variation in the dependent variable because a) it has the highest correlation (.95) with the criterion, and b) statistically, X_7 and X_8 are measures of the same thing ($r_{X_7.X_8} = .96$). When X_7 and X_8 are used in the same regression, X_7 has the larger coefficient because of its higher correlation with the criterion (.84). X_8 , having a lower correlation with the criterion (.77), but a high r with X_7 (.96) acts as a suppressor by lowering the R^2 to 70.66. It is possible that X_7 has similar effects on the R^2 of the $X_1 = X_6.X_7$ equation.

mentioned perspective, they indicate that Newfoundland's rising operating expenditures responded to percentage increases in both variables in a similar manner. However, the annual data suggests that it cost more to educate decreasing percentages of the 18 to 24 age group population in actual attendance. In the last three years of the decade, 25 percent annual increases in expenditure were associated with almost a constant $7\frac{1}{2}$ percent of the 18 to 24 age group in attendance over the same period. Thus, the costs related to the problem of how to increase the education level of larger percentages of this age group are dramatically illustrated in this province.

Fiscal Resources and Expenditure

After controlling for all other fiscal measures, the ability variable (X_{10}) emerges as the leading predictor of variation in expenditure exhibiting a coefficient of .66. While the ratio of provincial grants to total personal income rose from 1960/61 (.0007) to 1966 (.0014), it levelled off for three years at .0011. The effects of the Fiscal Arrangements Act are illustrated in the last three years of the decade by which time Newfoundland was spending more than one percent of total personal income on higher education operating grants.

The erratic elasticities illustrated in the Income and Expenditure section are highlighted in this dimension. Table 5.1 compares annual percentage increases in operating grants, the numerator of variable X_{10} , with annual percentage increases in total personal income, the denominator of the same variable. The year to year percentage increases partially explain problems that others have

faced in attempting to explain the rationale behind Newfoundland's grant allocations.

Since there is only one university in Newfoundland, there has been no need to establish a formal advisory commission on higher education. . . . In the course of allocating funds, the province does not use a formula as such. Rather, grants are determined after discussions (underlining mine) between the university and the provincial government (Cameron, 1969, p. 58).

Table 5.1

Annual Percentage Increases in Provincial Operating Grants to Universities and Total Personal Income; Newfoundland, 1960/61 to 1969/70

	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69
	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70
Gts.	47	-04	28	05	11	43	537	66	17
TPI.	06	04	07	09	09	12	11	08	10

The addition of other variables in the regression equation results in only a slight increase in the cumulative R^2 (from 95.29 for X_{10} alone to 99.16 for a combination of X_{10} , X_{11} , X_{12} , and X_{13}). However, since the additional variables are significant at the predetermined .10 level, their coefficients merit attention.

Operating expenditures per student increased close to one half a percent in response to a one percent increase in the "mix" of government activity (X_{13}). The ratio of federal to provincial grants is shown in Table A13, Appendix A. The higher the ratio, the greater the federal vis-a-vis the provincial contribution. Under the per capita grants scheme, federal contributions were twice to three times as high as provincial grants. Table 5.2 compares annual percentage

increases for each of these government allocations. On a cumulative percentage basis for the years 1960/61 to 1966/67, the federal contribution increased 180 percent while provincial contributions increased 130 percent. Thus, federal involvement in university operating finance surpassed provincial efforts on both an absolute and relative (to the provincial past performance) basis.

Table 5.2

Annual Percentage Increases in Federal and Provincial Operating Grants to Universities; Newfoundland, 1960/61 to 1969/70

	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69
	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70
Fed.	- 02	33	05	11	14	119	- 70	18	31
Prov.	47	- 04	28	05	11	43	537	66	17

Variable X_{11}^{11} displays a coefficient of .45. The ratio of provincial grants for higher education to net educational expenditures ranged from one and one half to two percent for the period 1960/61 to 1966/67. By the end of the decade, Newfoundland was spending almost sixteen percent of its education budget on operating grants for higher education. Since provincial grants to higher education make up a portion of the net education expenditure, a simple subtraction of the numerator from the denominator of X_{11} gives the provincial net expenditure on education excluding operating grants to universities. Table 5.3 presents the annual percentage increases for both measures of provincial expenditure. While expenditures on both forms of education kept apace from 1960/61 to 1966/67, the results indicate

that Newfoundland may have alternated its use of funds acquired under the Fiscal Arrangements Act in 1967/68 and 1968/69.

The negative response of operating expenditure to federal transfer payments for programmes other than higher education suggests that statistically, there is no evidence of these payments stimulating higher education expenditure .

Table 5.3

Annual Percentage Increases in Net Provincial Education Expenditure Including and Excluding Provincial Operating Grants to Universities; Newfoundland, 1960/61 to 1969/70

	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69
	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70
Incl.	14	17	04	08	06	92	19	- 06	07
Excl.	14	18	04	08	06	93	09	13	05

University Revenues, Programme, and Expenditure

The only significant predictor of changes in the variation of operating expenditure per student is variable X_{16} , the proportion of total university operating income from federal grants. It carries a negative coefficient of $-.51$ indicating a rise in expenditure with a percentage decrease in the independent variable. Throughout the decade, Newfoundland's system of higher education relied more heavily upon federal revenues than any other publicly supported provincial system (see Table A16, Appendix A). Expenditures in each year tended to increase over the preceding year, while the proportion of federal revenues exhibited percentage decreases, 1961/62 to 1962/63 being the

sole exception. Therefore, a negative coefficient would also have been obtained if data for the period 1960/61 to 1966/67 had been used.

III. PRINCE EDWARD ISLAND

Income and Expenditure

The log linear regression of income per capita on university operating expenditures per full time student results in an R^2 of 82.08 and an elasticity coefficient of 1.54. Prince Edward Island is one of the few provinces in which changes in income alone account for less than 90 percent of the variation in the criterion. Therefore, cross-sectional or cumulative elasticities based on less than ten years of data will be somewhat higher than those calculated from regression equations. Keeping this limitation in mind, the income-expenditure elasticity for 1960/61 to 1965/66 is .50, and for 1966/67 to 1969/70, 3.33.

The absence of graduate students from Prince Edward Island's enrolment suggests that almost all increases in per student expenditures can be associated with increases in undergraduate students. Between 1960/61 and 1968/69 per student expenditure and enrolment showed a 100 percent increase while income per capita rose 80 percent in the same period. The last year of the decade saw less than a one percent increase in students, a 37 percent increase in expenditures, and an eight percent increase in per capita income. Thus, Prince Edward Island may well be entering a third period of expenditure growth in relation to income level in the province.

Table 5.4

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; Newfoundland, 1960/61 to 1969/70

Income	X ₂					
r	.94					
Elasticity Coefficient	1.92					
R ² = 88.69	Constant	- 6.271				
Population	X ₆	X ₇	X ₈			
r	.95	.86	.77			
Elasticity Coefficient	3.87					
R ² = 89.98	Constant	15.791				
Fiscal Resources	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄
r	.91	.98	.96	.89	-.92	.76
Elasticity Coefficient		.66	.45	-.30	.49	
R ² = 99.16	Constant	18.382				
University Revenues, Programme	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	
r	.88	-.94	-.79	-.88	.80	
Elasticity Coefficient		-.51				
R ² = 87.89	Constant	6.598				

Population and Expenditure

The response of operating expenditures to percentage increases in population variables tends to exhibit uniformity in both direction and magnitude (Range: 2.62 to 2.69). A closer look at the annual data in Table 5.5 indicates that the greatest cumulative increase in any of the predictor variables has taken place in X_8 though it is less closely associated with the criterion (.83) than either X_6 (.92) or X_7 (.89).

A somewhat normal distribution exists for percentage increases in X_7 and X_8 over the period. Per student operating expenditures have grown at widely fluctuating rates while the proportion of population aged 18 to 24 shows a steadily declining rate of increase in the latter half of the decade. The overall pattern suggests that Prince Edward

Table 5.5

Annual Percentage Increases in Population Measures and University
Per Student Operating Expenditures; Prince Edward Island,
1960/61 to 1969/70

	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69
	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70
X_1	16	- 30	13	04	46	21	03	18	37
X_6	0	0	0	0	0	11	10	09	08
X_7	03	04	05	02	04	09	06	03	02
X_8	23	03	01	10	11	12	13	03	- 07

Explanation of Symbols:

- X_1 - University per student operating expenditures
- X_6 - Proportion of the population aged 18 to 24
- X_7 - Education level of population (Number of teachers per 10,000 of population)
- X_8 - Proportion of 18 to 24 age group attending university

elasticity coefficient of .60 is relatively high, since larger increases in provincial rates of participation in university finance came only in the last four years of the decade.

Though none of the other revenue sources have any statistical effect on the variation in expenditure, it is worth while noting both the magnitude and trend of variables X_{15} (provincial grants), and X_{16} (federal grants) in Tables A15 and A16, Appendix A. From 1961/62 to 1964/65, federal funds made up a larger proportion of university operating revenue than did provincial grants, but maintained a similar stability. Since Prince Edward Island had no graduate students during the decade, it is not surprising to note the virtual disappearance of federal money in the years 1967/68 to 1969/70. The bulk of such finance went to offset operating expenditures associated with assisted research. The latter was highly correlated with the number of graduate students in a province.

The largest proportion of university operating income came from sources other than government until 1967/68. The related variable (X_{17}) showed no variation in the years 1961/62 to 1964/65. It, too, declined vis-a-vis provincial grants as a proportion of university income in the years after 1967.

Since variation in alternative sources of revenue and programme had little statistical relationship to expenditure changes throughout most of the decade, the post 1967 period was, as in the other dimensions, a departure from previous relationships described in the model.

Island may just be entering a stage in which per student expenditures tend to grow at rates far surpassing any increases in demand factors.

Fiscal Resources and Expenditure

The ratio of provincial grants to total personal income is the only significant predictor of change in operating expenditures for the decade. The elasticity coefficient of .37 tends to be a less adequate descriptor of criterion responsiveness to percentage increases in X_{10} for periods preceding and following the inception of the Fiscal Arrangements Act. Comparison of cumulative percentage increases in both X_1 and X_{10} by the use of an elasticity calculation results in a coefficient of .50 for 1960/61 to 1966/67, and .28 for 1967/68 to 1969/70. These variations are certainly not as great as those shown in Newfoundland. Furthermore, they suggest that the overall coefficient is a measure reflecting some structural consistency in variable X_{10} .

University Revenues, Programme, and Expenditure

The proportion of university operating revenues derived from provincial sources explain 74 percent of the variation in operating expenditures. By comparison with other provinces, this is the lowest R^2 derived for any one or more variables used in the dimension. The relatively low variance is related to the trend of annual data shown in Table A15, Appendix A. From 1961/62 to 1965/66, provincial grants as a proportion of revenues remained stable. A marked increase in this ratio came in response to the federal \$5.00 per capita grant of 1966/67, and the subsequent transfer of federal funds to the provincial government. Meanwhile, operating expenditures tended to climb though the pattern fluctuated from year to year. Therefore, it would appear that the

Table 5.6

Coefficient of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; Prince Edward Island,
1960/61 to 1969/70

Income	X ₂					
r	.91					
Elasticity Coefficient	1.54					
R ² = 82.08	Constant	- 3.801				
Population	X ₆	X ₇	X ₈			
r	.92	.89	.83			
Elasticity Coefficient	2.62					
R ² = 83.92	Constant	13.203				
Fiscal Resources	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄
r	.94	.95	.94	.87	-.50	.85
Elasticity Coefficient		.37				
R ² = 89.38	Constant	9.287				
University Revenues, Programme	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	
r	.86	-.23	-.84	-.64	---	
Elasticity Coefficient	.60					
R ² 73.91	Constant	7.819				

IV. NOVA SCOTIA

Income and Expenditure

Changes in per capita income account for 97 percent of the variation in the criterion variable. The derived elasticity of 1.68 is the highest for any province, except Newfoundland. It is worthwhile noting that the elasticity coefficients for these two provinces consist of opposing trends. Whereas Newfoundland exhibited a .73 coefficient for the first half of the decade, and a 3.54 coefficient in its last three years, Nova Scotia's related elasticities are 2.32 and 1.13.

Population and Expenditure

Operating expenditures per student are highly correlated with each of the three measures of population used in this dimension; .90 with X_6 , .98 with X_7 , and .96 with X_8 . However, since the degree of association between X_7 and X_8 is .98, increases in the stock of human capital, as well as in the proportion of youth attending university, are significantly related to changes in per student expenditures. Cumulative percentage increases in all variables are shown in Table 5.7. Since the \$5.00 per capita grant of 1966/67 apparently led to a 28 percent increase in expenditure, this year can be identified as a breaking point in the association between X_1 and X_8 . The education-expenditure elasticity for the period 1960/61 to 1965/66 is 3.92, and 3.39 for the remaining years of the decade. Thus, the overall 3.74 coefficient is a relatively good descriptor of operating expenditure responsiveness to changes in education level throughout the decade.

The high intercorrelation between education level (X_7) and proportion of population aged 18 to 24 in attendance at university (X_8) justifies a consideration of the latter variable, since statistically, X_7 and X_8 are measures of the same thing. The overall coefficient for the regression of X_8 on X_1 is 1.70. A calculation of elasticity breakdowns for the same periods used above yield 1.24 and 2.44. These deviations from the mean coefficient suggest that whereas expenditures were far more responsive to changes in education levels, there may have been a tendency toward accelerated spending vis-a-vis the proportion of relevant population in actual attendance.

Table 5.7

Annual Percentage Increases in Population Measures and University Per Student Operating Expenditures; Nova Scotia, 1960/61 to 1969/70

	60/61 61/62	61/62 62/63	62/63 63/64	63/64 64/65	64/65 65/66	65/66 66/67	66/67 67/68	67/68 68/69	68/69 69/70
X_1	14	06	14	06	11	28	21	07	05
X_6	0	0	0	10	0	0	0	09	0
X_7	03	02	03	02	03	02	05	05	06
X_8	10	05	08	07	11	0	04	07	14

Explanation of Symbols:

- X_1 - University per student operating expenditures
- X_6 - Proportion of the population aged 18 to 24
- X_7 - Education level of population (Number of teachers per 10,000 of population)
- X_8 - Proportion of 18 to 24 age group attending university

Fiscal Resources and Expenditure

The variation in changes in expenditure has, as its leading predictor, the effort variable (X_{10}). A negative coefficient indicates that operating expenditures have tended to decline in response to increases in the ratio of provincial grants to total personal income. The decline is so small (less than one third of one percent), that it is difficult to attach any significance to such a trend. However, one feature of Nova Scotia's effort to finance higher education does merit attention. There is a close relationship between provincial operating grants to universities and total personal income in the period preceding and following the introduction of the Fiscal Arrangements Act (1967). The ratio, based on cumulative percentage increases in both variables, is .79 for the period 1960/61 to 1966/67, and .73 for the remaining years. The slight decline may not be a sign of decreasing effort although provincial grants were offset, to some extent, by federal tax abatements and adjustment payments. Nova Scotia was one of the few provinces that showed increased effort if one considers the absolute figures in Table A10, Appendix A. What is apparently important is the declining percentage increase in total personal income in the last two years of the decade. If such a trend should continue the province may not be able to delegate any large proportion of its revenues to higher education.

Nova Scotia is one of the few provinces in which own source revenues (X_9) tend to exert a positive influence on operating expenditure. This finding is thoroughly consistent with Nova Scotia's increasing effort to support higher education. Though substantially less than unity (.46), the own source revenue-expenditure elasticity suggests

that the province has made some use of its resources to support rising operating costs, rather than simply substituting federal for provincial finances.

The sectoral ability coefficient (X_{11}) is also a significant predictor of expenditure variation. Table All, Appendix A, contains annual ratios of provincial operating grants to net education expenditure. Annual percentage increases in net education expenditure including and excluding provincial operating grants to universities are shown in Table 5.8. From 1960/61 to 1966/67 provincial spending on education, including higher education, showed a 104 percent increase compared with a 66 percent increase in provincial spending on all other forms of education. The response to the change from a \$5.00 per capita grant to tax abatements is shown in the column 1966/67 to 1967/68. By itself, this large percentage increase explains the increased effort for higher education in the last three years of the decade. Nevertheless, the last two years suggest that Nova Scotia may have alternated its use of revenues transferred under the Fiscal Arrangements Act.

Table 5.8

Annual Percentage Increases in Net Provincial Education Expenditure
Including and Excluding Provincial Operating Grants to Universities;
Nova Scotia, 1960/61 to 1969/70

	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69
	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70
Incl.	06	11	49	00	19	19	105	- 02	02
Excl.	00	15	04	13	16	18	- 01	23	12

University Revenues, Programme, and Expenditure

A .95 correlation indicates the close association between operating expenditures and the proportion of university income from provincial source (X_{15}). The elasticity coefficient of this income-expenditure relationship approaches unity (.82). A closer look at the annual data in Tables A1 and A15, Appendix A, indicates that expenditures were much more responsive to provincial revenues in the period preceding 1967. As early as 1963/64, grants began to grow as a proportion of total revenue, and surpassed federal contributions to become the second most important university operating revenue source. After 1967, the revenue-expenditure elasticity declined to .43. The levelling off of provincial support seems to have had some influence on other source revenues, which reached a peak of 40 percent of all income in 1969/70.

V. NEW BRUNSWICK

Income and Expenditure

Although operating expenditures increased at rates higher than those of income per capita, there was evidence of a lower income-expenditure elasticity in the last four years of the decade. The overall coefficient of 1.27 seems to be a valid indicator of the responsiveness of per student operating expenditures to changes in income level since, it does not contain marked deviations over prolonged periods of time. One feature of this relationship in New Brunswick differentiates it, to some extent, from patterns displayed by other provinces. Whereas income per capita tended to increase at rates concomitant with those of other provinces, increases in expenditure fell within a narrower range (two to 18 percent) than in

Table 5.9

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; Nova Scotia, 1960/61 to 1969/70

Income	X_2					
r	.98					
Elasticity Coefficient	1.68					
$R^2 = 96.77$	Constant	-	4.804			
Population	X_6	X_7	X_8			
r	.90	.98	.96			
Elasticity Coefficient		3.74				
$R^2 = 95.51$	Constant	-	1.210			
Fiscal Resources	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
r	.96	.99	.98	.92	-.89	.99
Elasticity Coefficient	.46	-.32	.75			
$R^2 = 99.94$	Constant	-	1.013			
University Revenues, Programme	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	
r	.95	-.67	-.77	-.93	.92	
Elasticity Coefficient	.82					
$R^2 = 91.13$	Constant		7.819			

all other provinces except Alberta.

Population and Expenditure

There is a great similarity in the responsiveness of higher education expenditures to growth in education level in both New Brunswick and Nova Scotia. However, New Brunswick's increase in X_7 is more closely associated with increases in expenditure (.96) than is the case in Nova Scotia (.90). This explains the former's slightly higher coefficient of 3.84. In New Brunswick, the rate of increase in expenditure was greater in relation to the 18 to 24 proportion of the population than to the participation rate but, there is evidence of a reversal in this trend toward the end of the period under study.

Fiscal Resources and Expenditure

New Brunswick is the only province in which federal transfers, in the form of conditional and unconditional payments, is the leading predictor of variation in university per student operating expenditures. It, along with provincial "own source" revenues, accounts for 97 percent of the variation in expenditures. Both measures display relatively low coefficients; .43 for X_{12} and .25 for X_9 . Table 5.10 gives annual percentage increases in each of these variables. Using 1965/66 to 1966/67 as a dividing point, the data imply that increases in the criterion variable were far more responsive to increases in X_9 than to increases in X_{12} in the first part of the period. The situation was reversed in the remaining years of the decade. Substituting conditional transfers for X_{12} results in a minor adjustment in elasticity coefficients. The derived values are .37 for X_{14} and .33 for X_9 . Since federal payments to universities and transfers related

to provincial spending on post-secondary education were not included in the calculation of X_{12} , the findings suggest limited stimulation of university operating expenditures as a possible consequence of spillovers.

Table 5.10

Annual Percentage Increases in Provincial Own Source Revenue (X_9), Federal Transfer Payments (X_{12}), and University Per Student Operating Expenditures; New Brunswick, 1960/61 to 1969/70

	60/61 61/62	61/62 62/63	62/63 63/64	63/64 64/65	64/65 65/66	65/66 66/67	66/67 67/68	67/68 68/69	68/69 69/70
X_1	09	02	13	02	18	16	11	07	15
X_9	- 04	07	02	12	06	30	38	20	20
X_{12}	02	09	12	27	25	- 01	42	03	08

University Revenues, Programme, and Expenditure

Per student operating expenditures rose less than one half a percent in response to a one percent increase in the ratio of graduate to total full time student enrolment (X_{19}). This variable alone, accounts for 72 percent of the variation in expenditure but, in combination with "other grants" (X_{17}), the explained variation rises to 95 percent. One characteristic of New Brunswick's graduate to total enrolment ratio, was its tendency to increase more frequently than was the case in all other provinces. This feature, coupled with some large year to year changes (50 percent from 1960/61 to 1961/62, 33 percent from 1961/62 to 1962/63), helps to explain the relationship between X_{19} and the dependent variable.

The negative unitary elasticity for other source income-

expenditure is somewhat inflated. This result can be explained by the fact that both X_{19} and X_{17} correlate $+0.85$ and -0.85 respectively, with the criterion variable. A comparison of annual percentage increases in both other source revenue and expenditure results in an elasticity of -0.48 . Toward the end of the decade, there was a trend to an even higher negative relationship between the two variables.

VI. QUEBEC

Income and Expenditure

From 1960/61 to 1967/68, the rate of growth in per capita income only slightly exceeded the growth rate of operating expenditures. In the last two years of the decade percentage increases in expenditure were twice to three times greater than increments in per capita income. Therefore, the overall derived elasticity of 1.23 seems to reflect the sudden shift in expenditures in the latter part of the decade.

Quebec was one of three provinces for which a ten year series of labour force data was available. Proportion of labour force in the service sector (X_4), is the only measure showing a substantial positive correlation with operating expenditures. However, since its intercorrelation with per capita income is $.97$, it is not a useful predictor variable. After income per capita, proportion of labour force unemployed (X_5) has the highest partial correlation with the criterion, and raises the explained variance to 99 percent. The derived income elasticity of 1.46 is a better estimate of expenditure responsiveness to income because of the higher predicted variation resulting from the use of two variables.

Since the response of X_1 to a one percent increase in X_5 was

Table 5.11

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; New Brunswick,
1960/61 to 1969/70

Income	X ₂					
r	.99					
Elasticity Coefficient	1.27					
R ² = 98.58	Constant - 1.869					
Population	X ₆	X ₇	X ₈			
r	.96	.99	.97			
Elasticity Coefficient		3.84				
R ² = 97.68	Constant - 1.820					
Fiscal Resources	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄
r	.96	.95	.57	.98	-.81	.97
Elasticity Coefficient	.25			.43		
R ² = 97.47	Constant - 5.086					
University Revenues, Programme	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	
r	.80	-.80	.85	-.48	.85	
Elasticity Coefficient			-1.00		.42	
R ² = 95.43	Constant	7.795				

less than one half of one percent, there might be slight support for the hypothesis that unemployment in the labour force provokes students to enter or remain in university. However, the very low negative correlation between X_1 and X_5 (-.26) makes any such conclusion suspect. Although it is beyond the scope of this study, an investigation of the relationship between seasonal unemployment, and university attendance and expenditure, might serve to validate the findings presented in this section.

Population and Expenditure

The interrelationships between population variables and university per student operating expenditures in Quebec are considerably different from those found in other provinces. No single measure correlates more than .83 with expenditures, and X_8 , the proportion of the 18 to 24 age group in attendance, exhibits the lowest correlation coefficient with the criterion variable for any province (.13). The intercorrelations between predictor variables suggest that the measures are relatively independent of one another since $r_{X_6.X_7} = .76$, $r_{X_6.X_8} = .18$, and $r_{X_7.X_8} = .54$.

There is, however, one serious limitation on any interpretation of the relationship between education level (X_7) and other variables used in this dimension. Calculation of this variable was based on the number of elementary and secondary school teachers in both public and private schools within each province. Data provided by the Education Division, Statistics Canada, did not include teachers within Quebec's private sector. In most other provinces this omission would not seriously affect the structure of X_8 since private schools did not

contain any significant proportion of provincial student populations. In Quebec, however, there were over 60,000 students attending private schools in 1960, 1961, and 1962.

A general ratio of 30 to 1 would have been used to arrive at an estimated number of private teachers if student data had been available for the entire decade. Unfortunately, enrolment figures are not available for the years 1963, 1964, and 1965. In 1968, the Quebec Department of Education reported 75,000 students enrolled in private schools in 1966, 64,000 in 1967, and 48,000 in 1968. Figures for 1969 were not available at the time of writing. The sharp declines in enrolment from 1966 to 1968 are open to interpretation. Since increases in public school enrolment were not sufficient to offset the private sector decline, it is difficult to determine the location of literally thousands of students. It could well be that the bulk of private students attended Colleges Classique and, therefore, became part of the C.E.G.E.P. system. Since Quebec's method of reporting enrolment data changed in 1966, there is no way of substantiating this possibility. On the whole, private enrolment seems to have decreased but, its influence on the teaching force is open to question. Therefore, Quebec's stock of human capital ratio should be higher, since it includes only public school teachers. Such an adjustment, if it were possible, would increase the predictive power of this variable.

The proportion of the 18 to 24 age group in university declines from 11 percent in 1967/68 to 8.6 percent in 1968/69 and 1969/70. The decline can be attributed to the introduction of the C.E.G.E.P., a compulsory intermediate step for all students wishing to attend

university. A first year, formerly within university, is now part of the C.E.G.E.P. system. Since the annual ratios for X_8 from 1960/61 to 1967/68 tend to follow a pattern similar to other provinces, the sudden drop in 1968/69 accounts for the low correlations already described.

The log linear regression of X_6 and X_7 on X_1 produces an education-expenditure elasticity of 2.35. X_6 is not a significant predictor, and X_7 , alone, accounts for only 68 percent of total variation in the criterion variable. Because X_7 does not include private teachers per 10,000 of population, the annual percentage increases in this variable do not adequately reflect education level within the province. It is possible that the inclusion of this sector would have led to the calculation of percentage increases higher than those in any other province. Indeed, Quebec's education system witnessed the largest increases in enrolment and number of teachers of any Canadian province during the decade.

Because the proportion of the population aged 18 to 24 is the only measure not subject to dramatic structural changes, it was tested as a predictor of variation in expenditure. The derived elasticity was 1.89 with 66 percent of variation in the criterion accounted for. Since r_{X_6, X_7} is .76, it could well be that an adjustment in X_7 would raise this correlation and produce a new coefficient for X_7 in the $X_1 = X_6, X_7$ equation which would be closer to 1.89 than it would be to 2.35. Under such conditions, one could surmise that the responsiveness of increases in per student operating expenditures to increases in either education level or the proportion of youth in the population is equal. In such a case, both X_6 and X_7 would be the influential population factors associated with expenditure, and not the participation rate (X_8).

Fiscal Resources and Expenditure

Quebec is the only province for which the fiscal effort variable (X_{10}) shows an elasticity equal to unity. It, along with the mix of government spending (X_{13}), accounts for 92 percent of the variation in operating expenditures. The latter variable, having a low positive coefficient of .37, does not appear to have much value as an indicator of criterion responsiveness.

Unlike the other provinces Quebec's ratio of provincial operating grants to universities to total personal income did not exceed one percent by the end of the decade. The changeover from the one percent corporation tax abatement to the Fiscal Arrangements Act brought about a sudden upward shift in the ratio of grants to total personal income. It would appear that this increase cancels out the declines of preceding years, thus elevating the largely negative cross-sectional elasticities to an overall positive coefficient. The unitary elasticity is not, in fact, a valid indicator of criterion responsiveness to effort over time. An elasticity calculation based on year to year percentage increases in both X_1 and X_{10} produces a coefficient of .58. If X_{13} is removed from the stepwise regression, the coefficient for X_{10} falls to this level.⁴

University Revenues, Programme, and Expenditure

The leading predictor of expenditure variation is the proportion of total university operating income from "other" sources. Controlling for the effects of other variables, it accounts for 65

⁴The introduction of X_{13} , which increases the coefficient for X_{10} , is explained by the following correlations: (1) $r_{X_1.X_{10}} = .92$, (2) $r_{X_1.X_{13}} = -.77$, and (3) $r_{X_{10}.X_{13}} = -.95$. This statistical paradox is a reversal of the suppressor effect.

percent of the variation in the criterion. One other variable, proportion of graduate students, has a significant coefficient of .60, and in combination with X_{17} explains 93 percent of the variation in university operating expenditure.

The negative coefficient (-.86) for "other" sources is not surprising since expenditures have constantly increased while other revenue sources have declined as a proportion of total revenues. However, this decline is far less than that shown in other provinces suggesting that tuition fees, in particular, remained an important source of income to Quebec's universities.

Yearly percentage increases in the proportion of graduate students were substantial from 1962/63 until 1965/66 and greatly exceeded the rate of increase in per student operating expenditures. The .60 elasticity for X_{19} contains opposing trends since, expenditure increases in the latter part of the decade, far exceeded the rate of increase in graduate to total enrolment. However, increases in the magnitude of expenditures may be thoroughly consistent with the levelling off of the proportion of graduate students in the latter half of the decade. Since the ratio of graduate to total enrolment was .09 from 1965/66 to 1968/69, compared with lower ratios in the preceeding years, larger increases in expenditure may reflect the maintenance of higher proportions of graduate students in university.

VII. ONTARIO

Income and Expenditure

The regression of per capita personal income on the dependent variable produces an income elasticity of expenditure of 1.47 and

Table 5.12

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; Quebec,
1960/61 to 1969/70

Income	X ₂	X ₃	X ₄	X ₅		
r	.95	-.48	.90	-.26		
Elasticity Coefficient	1.23			.41		
	1.46					
R ² = 91.13	Constant	- 1.628	R ² = 99.39	Constant	- 2.230	

Population	X ₆	X ₇	X ₈			
r	.81	.83	.13			
Elasticity Coefficient		2.35				
R ² = 68.20	Constant	2.090				

Fiscal Resources	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄
r	.92	.92	.75	.85	-.77	.75
Elasticity Coefficient		1.01			.37	
R ² = 91.88	Constant	13.450				

University Revenues, Programme	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	
r	.77	-.71	-.81	-.79	.75	
Elasticity Coefficient			-.86		.60	
R ² = 92.50	Constant	8.437				

an R^2 of 98 percent. There is some indication of a decline in the elasticity in the period following the inception of the Fiscal Arrangements Act, since per capita income began to increase at rates exceeding those of expenditure. However, the margin is so narrow that it gives little justification for comment. The derived coefficient for ten years of data can be assumed to be an adequate descriptor of operating expenditure responsiveness to increases in per capita income. Unlike Quebec, the addition of labour force measures has no influence on the original coefficient.

Population and Expenditure

Ontario is the only province for which two significant coefficients are derived from the regression of education level and population measures upon per student operating expenditures. Criterion responsiveness to X_6 (proportion of population aged 18 to 24) is .94, and 1.47 to X_7 (education level of population). These coefficients are produced in spite of substantial intercorrelation between independent variables. Removing X_6 from the equation, and replacing it with X_8 (participation rate), leads to an education-expenditure elasticity of 2.16, which is a much closer approximation of the association between X_1 and X_7 throughout the decade. In this equation, the response of expenditures to the participation rate is not significant.

Since Newfoundland and Prince Edward Island are the only other provinces in which X_8 is a predictor of variation in expenditure, a comparison of percentage increases in all three provinces offers some explanation of criterion responsiveness to the participation rate.

It would appear that the latter part of the decade was the time in which increases in the "eligible" population began to be very closely associated with expenditures. While many other provinces shared this phenomenon, declines in preceding years cancelled out the influence of later increases. Such declines took place in Alberta, British Columbia, and Quebec, while other provinces went through three or four year periods in which the ratio of eligibles to total population remained constant. Beyond these possibilities, there is little else in the data to explain the association between X_6 and X_1 . It could well be that a continuation of the increases in the ratio of eligibles to population, accompanied by increasing education levels, might lead to a situation whereby expenditure would be equally responsive to both factors.

There is certainly evidence that Ontario's expenditures on higher education were responding to increases in the participation rate, though the regression equation derived an insignificant elasticity after controlling for the effects of education level. It should be noted that $r_{X_7.X_8}$ is .99. Since $r_{X_1.X_7}$ exceeds $r_{X_1.X_8}$, the education level is selected as the better predictor of expenditure. Nevertheless, a calculation of elasticity for attendance and expenditure, based on cumulative percentage increases in each variable, produces a coefficient of unity. This finding is similar to the derived coefficient for X_6 and helps to corroborate the analysis in the preceding paragraph.

Fiscal Resources and Expenditure

Fiscal effort, as expressed in X_{10} , is the leading predictor

of variation in expenditure accounting for 99 percent of cumulative variance in the criterion. The accompanying coefficient of .51 indicates a one half percent increase in expenditures as a response to a one percent increase in the grants to income ratio. Since a slight decline in effort-expenditure elasticity came as a response to the 1967 fiscal arrangements, and in the absence of any other important indicators of fiscal resources, it might be concluded that increases in university operating expenditures were not very responsive to alternative provincial fiscal resources or their use.

University Revenues, Programme, and Expenditure

Increases in the proportion of university revenues from provincial sources correlate .98 with increases in university per student operating expenditures. An elasticity coefficient of 1.57 describes the responsiveness of X_1 to increases in X_{15} . With the exception of 1967/68, a year in which provincial grants bolstered by federal transfers showed a dramatic increase, the decade is well described by the derived coefficient. Since the statistical weight for federal grants (.34) does not contribute much to an understanding of its association with expenditures, and even declines in the latter part of the decade to a negative level, a decision as to the importance of alternative revenue sources is decidedly in favour of provincial grants.

Ontario's university expenditures in relation to alternative revenue sources well illustrate the problems of higher education finance. In the early 1960's, characterized by the relatively equal importance of the three revenue sources under study, per student

operating expenditures rose roughly five percent per annum. The increasing reliance upon provincial grants, toward the middle and latter years of the decade, was associated with even higher rates of increase in expenditures. Whether centralization of revenue sources will bring about a declining rate of increase in per student expenditures is a matter yet to be determined.

VIII. MANITOBA

Income and Expenditure

By comparison with all other provinces, Manitoba had the least cumulative percentage increase in university per student operating expenditures. The income elasticity of expenditure for the period 1960/61 to 1969/70 is 1.11. The coefficient is a very reliable indicator of criterion responsiveness to increases in per capita income since a) $r_{X_1.X_2} = .99$, b) $R^2 = 97$ percent, and c) variation in the elasticity is almost absent in the periods preceding and following 1967.

Population and Expenditure

The derived coefficient of 1.94 for X_7 (education level) indicates that university per student operating expenditures rose almost two percent for every one percent increase in education level. Since there is a great similarity in the degree of association between each of the predictor variables and the criterion, as well as between the independent variables themselves, each of the variables is, in a statistical sense, a measure of the same thing. The assurance that each variable can account for a large proportion of the variance in

Table 5.13

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; Ontario,
1960/61 to 1969/70

Income	X ₂	X ₃	X ₄	X ₅		
r	.99	.65	.95	-.62		
Elasticity Coefficient	1.47					
R ² = 98.23	Constant	- 3.534				

Population	X ₆	X ₇	X ₈			
r	.95	.98	.97			
Elasticity Coefficient	.94	1.47				
R ² = 97.26	Constant	6.712				

Fiscal Resources	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄
r	.99	.99	.97	.91	-.93	.91
Elasticity Coefficient		.51			.10	
R ² = 99.66	Constant	10.769				

University Revenues, Programme	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	
r	.98	-.89	-.97	-.85	.84	
Elasticity Coefficient	1.57	.34				
R ² = 97.04	Constant	9.712				

X_1 promotes some investigation of their independent associations with the criterion.

Like many other provinces, Manitoba's increases in the proportion of population 18 to 24 years of age were high in only three years of the decade. These infrequent, yet substantial increases, and their association with increases in expenditure over time, are difficult to assess. Since the method of deriving elasticities in this study is based on the addition of year to year percentage increases, a coefficient for X_6 would reflect only three years in the entire decade. In this case, an elasticity of 2.30 is obtained by adding yearly increases in X_1 and dividing the result by annual increases in X_6 . However, this method leads to an overstatement of the actual coefficient since it is based on the assumption that X_6 predicts 100 percent of the variation in X_1 . In fact, its associated R^2 is 91 percent, and the resulting lower coefficient of 1.94 is identical to the one derived for X_7 . The statistical evidence implies that criterion responsiveness to increases in X_6 and X_7 was identical.

The derivation of an elasticity to assess the degree of criterion responsiveness to increases in the proportion of the 18 to 24 age group in university is based on procedures outlined in the preceding paragraph. A coefficient of 1.02 is obtained for the entire decade. However, there are indications of disparities within this measure. It would appear that the largest annual increases in X_8 came during the first half of the decade. and showed signs of tapering off toward the end of the period. Expenditures, on the other hand, rose fairly evenly until 1964/65, declined from 1964/65 to 1965/66, and rose sharply over the next two years. Undoubtedly,

expenditure increases in 1966/67 and 1967/68 can be associated with both the five dollar per capita grant (1966/67) and the fiscal transfers (1967/68). But, as well, there may be a relationship between rising expenditures and the proportion of the 18 to 24 year old population that entered university in the years preceeding 1966. Higher expenditures could be a reflection of higher cost programmes in the senior undergraduate and post graduate years of university.

Fiscal Resources and Expenditure

The response of changes in operating expenditure to various measures of fiscal resources and their use is not sufficient to warrant much interpretation. Manitoba is the only province in which provincial revenues is the leading predictor of variation in expenditure ($R^2 = 97.28$), but the elasticity coefficient of .36 is not indicative of high sensitivity. The additional predictor, the measure of sectoral ability (X_{11}), displays an even lower coefficient of .29.

On a ten year average, Manitoba spent more on university operating grants in proportion to net education expenditure than any other province in Canada (see Table A11, Appendix A). Table 5.14 contains the year to year percentage increases in net provincial education expenditure including and excluding operating grants to universities. With the exception of two years, 1960/61 to 1961/62, and 1964/65 to 1965/66, university operating grants accounted for somewhat higher provincial spending on education. The trend was maintained after 1967, but the margin decreased in the last two years of the decade.

Table 5.14

Annual Percentage Increases in Net Provincial Education Expenditure
Including and Excluding Provincial Operating Grants to
Universities; Manitoba, 1960/61 to 1969/70

	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69
	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70
Incl.	04	11	- 02	11	49	- 01	38	13	23
Excl.	17	10	- 01	05	58	- 06	27	12	22

University Revenues, Programme, and Expenditure

There is a much closer degree of association between the criterion and the proportion of graduate students in total enrolment ($r_{X_1.X_{19}} = .90$) than between X_1 and the proportion of university income from provincial sources ($r_{X_1.X_{15}} = .79$). The former variable predicts 80 percent of the variation in expenditure, and, in combination with X_{15} , the R^2 rises to 90 percent. The responsiveness of university per student operating expenditures to increases in both measures is .56 for X_{19} and .61 for X_{15} .

Although the proportion of graduate students did not increase in every year of the decade, the derived coefficient is a good approximation of cross-sectional elasticities. The provincial revenue-expenditure elasticity does not retain the same structural consistency; its positive value is largely made up of revenue and expenditure changes during the last years of the decade. Prior to this, the coefficient was largely negative.

Table 5.15

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; Manitoba,
1960/61 to 1969/70

Income	X_2		
r	.99		
Elasticity Coefficient	1.11		
$R^2 = 97.22$	Constant - 0.789		

Population	X_6	X_7	X_8
r	.95	.96	.95
Elasticity Coefficient	1.94		
$R^2 = 92.32$	Constant	3.284	

Fiscal Resources	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
r	.99	.99	.96	.96	-.78	.94
Elasticity Coefficient	.36		.29			
$R^2 = 98.87$	Constant	1.234				

University Revenues, Programme	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}
r	.79	-.75	-.80	-.89	.90
Elasticity Coefficient	.61				.56
$R^2 = 90.27$	Constant	9.720			

IX. SASKATCHEWAN

Income and Expenditure

The derived income elasticity of operating expenditure (1.09) is a near perfect descriptor of criterion responsiveness to changes in per capita income both before and after 1967. Saskatchewan was the only Canadian province exhibiting some decreases in the annual changes in per capita income. Since its year to year increases in operating expenditures were fairly consistent with those in other provinces, it is the income variable that operated to make the elasticity the lowest in Canada.

Population and Expenditure

Increases in the education level alone account for 96 percent of the variation in per student operating expenditures. The elasticity coefficient of 3.18 conceals an increasing responsiveness of X_1 to increases in education during the last three years of the decade. Since the intercorrelation between increases in the proportion of the 18 to 24 age group in the population and education level is not as high as in most other provinces, it may well be that expenditures were responding to increases in the stock of human capital.

The regression of X_7 and X_8 on the criterion brought about negative coefficients for both variables. This result can be explained by the high intercorrelation (.98) between these independent measures. A more reliable indicator of criterion responsiveness to participation rate (X_8), might be obtained by the computation of an elasticity from yearly percentage increases in both X_1 and X_8 . Keeping in mind that $r_{X_1, X_8} = .91$, the derived unadjusted elasticity

is 1.04. Whereas X_7 (education level) and X_8 (participation rate) are, statistically, measures of the same thing, there is evidence that expenditures were far more responsive to changes in the education level of the population.

In conclusion, the empirical findings suggest that the response of expenditures to population characteristics in Saskatchewan, is comparable with results obtained for most other provinces. Expenditures were responding to education level and participation rates in a similar manner, but participation rates may have been slightly more important indicators of increases in spending than either education levels or growth in the relevant age group.

Fiscal Resources and Expenditure

Saskatchewan is the only province for which the sectoral ability measure (X_{11}) is the leading predictor of change in the criterion variable. Along with X_{13} , the ratio of federal to provincial spending on higher education, 98 percent of the variation in university per student operating expenditures is accounted for. Since none of the variables used thus far in this dimension have had related coefficients approaching unity, the .93 ability-expenditure elasticity in Saskatchewan is a notable exception. An examination of percentage increases in both the ability and expenditure ratios reveals that the ratio of provincial operating grants to net education expenditures grew at rates far surpassing those of per student operating expenditures. This finding immediately makes the .93 coefficient suspect. A closer approximation of the relevant elasticity was obtained by deleting X_{13} from the stepwise regression. Assuming

that all other variables are controlled for, X_{11} accounts for 96 percent of the variation in X_1 and a new elasticity of .64 is derived. An examination of cumulative percentage increases in both X_1 and X_{11} verifies this statistic as a more valid measure of the association between the two variables.

University Revenues, Programme, and Expenditure

The coefficients derived from the application of stepwise regression do not provide a realistic description of criterion responsiveness to increases in any of the independent variables. Since the proportion of graduate students in total full time enrolment increased only once during the entire decade, there is some doubt whether a coefficient based on ten year to year increases in the criterion, and only one increase in the predictor, can be a valid indicator of responsiveness. Under such conditions, the derived elasticity for X_{19} of 1.48 is, in fact, an understatement of the actual value. The accompanying predictor, X_{16} , the proportion of university operating revenues from federal sources, has a much higher negative coefficient than shown in Table 5.16. In conclusion, the frequent fluctuations in both dependent and independent variables, negate the validity of results achieved through a stepwise regression technique.

X. ALBERTA

Income and Expenditure

A very high correlation of .99 indicates the association between per capita income and operating expenditures throughout

Table 5.16

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; Saskatchewan,
1960/61 to 1969/70

Income	X_2					
r	.92					
Elasticity Coefficient	1.02					
$R^2 = 83.87$	Constant	- 0.634				

Population	X_6	X_7	X_8			
r	.91	.98	.93			
Elasticity Coefficient		3.18				
$R^2 = 95.80$	Constant	- 9.457				

Fiscal Resources	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
r	.96	.96	.98	.95	-.88	.98
Elasticity Coefficient			.93		.28	
$R^2 = 98.09$	Constant	9.585				

University Revenues, Programme	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	
r	.87	-.88	-.37	-.92	.92	
Elasticity Coefficient		-.38			1.48	
$R^2 = 94.25$	Constant	11.603				

the decade. The regression of X_2 on X_1 produces an elasticity coefficient of 1.25 and an R^2 of 98 percent. Since cumulative percentage increases in both variables produce elasticities within this range for periods preceeding and following 1967, the coefficient is a good indicator of criterion responsiveness to increases in per capita income

Population and Expenditure

The proxy variable for education level (X_7) correlates at a much higher level with X_1 (.99) than proportion of the 18 to 24 age group in the population (.83). In addition, the intercorrelation between X_6 and X_7 is lower than in any other province (.83) with the exception of Quebec. These statistical indicators suggest that X_7 is a relatively more valid measure of increases in education in Alberta than in most other provinces. The accompanying coefficient of 2.31 is a perfect descriptor of increases over time in both X_7 and X_1 . Thus, the response of per student operating expenditures to a one percent increase in education level is greater than two percent.

Cumulative percentage increases in the participation rate were higher than in all other provinces except Newfoundland. Since these increases were generally larger than annual increases in operating expenditures, the derived elasticity is less than unity (.80), and lowest in Canada. Nonetheless, there is a striking similarity in the relationship between education level and participation rates in both Alberta and Ontario. In both provinces $r_{X_7.X_8} = .99$, suggesting that increases in both variables over time have kept apace.

of expenditure variation is the proportion of undergraduate students in total enrolment. There is almost a perfect negative correlation between these two variables which accounts for the dominance of X_{18} in the stepwise regression. The elasticity coefficient of -11.21 is consistent with the trend of change in both measures throughout the decade.

Table 5.17

Annual Percentage Increases in Net Provincial Education Expenditure
Including and Excluding Provincial Operating Grants to
Universities; Alberta, 1960/61 to 1969/70

	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69
	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70
Incl.	07	21	- 03	09	29	41	06	04	06
Excl.	06	21	- 06	06	30	41	- 03	- 04	02

Since the interaction of X_{18} with all other variables obscures their individual effects, it is difficult to assess the influential factors that may have been associated with increased per student expenditure. The fluctuation in "other source" revenue negate any derived coefficient as a reliable indicator of criterion responsiveness. On the other hand, the high correlation between undergraduate and graduate ratios (.99) implies that the latter variable may have been one factor in raising operating expenditures. The elasticity based on cumulative percentage increases in both X_{19} and X_1 is close to unity.

By comparison with the other provinces, the most important feature of Alberta's revenue sources was the very high ratio of provincial to total operating income. Conversely, ratios of federal

Fiscal Resources and Expenditure

The stepwise regression of two significant variables, X_{10} (effort), and X_{11} (sectoral ability) on X_1 produces a negative coefficient of $-.30$ for the latter and a positive coefficient of $.72$ for the former. Since the inclusion of X_{11} adds only one percent to the cumulative explained variation, it can be excluded from the regression. The effect of deleting X_{11} is the lowering of the X_{10} coefficient to $.46$, which is a much closer approximation of the effort-expenditure elasticity over the ten years. This variable alone explains 98 percent of the variation in X_1 and its coefficient is only slightly above elasticities for periods preceding following 1967.

Though the sectoral ability measure distorts the weights in a stepwise regression, its significance cannot be overlooked. Provincial operating grants to universities made up 9 percent of net education expenditures in 1960/61, 13.6 percent in 1966/67, and 29.5 percent in 1969/70. As shown in Table 5.17, increases in provincial operating grants tended to elevate increases in net provincial expenditures on education, particularly in the last three years of the decade. However, since effort ratios for X_{10} correlate so highly with ability ratios for X_{11} , and since both have similar correlation with X_1 , the effects of the ability measure are obscured in the multiple regression coefficient. In fact, both have similar elasticities with respect to expenditure.

University Revenues, Programme, and Expenditure

Alberta is the only province in which the leading predictor

and other source income to total operating revenues were the lowest in Canada during the decade. It would appear that operating expenditures were very responsive to increases in the proportion of university income from provincial sources, particularly in the years preceding 1967. The overall elasticity for the $X_{15} - X_1$ relationship is 3.30.

XI. BRITISH COLUMBIA

Income and Expenditure

For the decade 1960/61 to 1969/70, university per student operating expenditures rose one and one half percent for every one percent increase in per capita personal income. There was a very slight upward shift in the elasticity after 1967 but, for the most part, the derived coefficient of 1.54 for the entire period gives a suitable description of the income-expenditure relationship.

The inclusion of labour force factors associated with income in the regression equation reduces the income-expenditure coefficient to 1.46. Variables X_3 , X_4 , and X_5 do not increase the proportion of variance accounted for by X_2 , though the "F" ratio test for service sector and unemployment ratios is significant at the .03 level or better. The unemployment coefficient is too low to warrant comment but, controlling for the effects of per capita income, still generates a .48 elasticity for the service sector association with the criterion. There may be some validity to the hypothesis that expenditures on higher education are responsive to increases in service sector employment but, the findings suggest a testing of more refined data.

Table 5.18

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; Alberta, 1960/61 to 1969/70

Income	X ₂					
r	.99					
Elasticity Coefficient	1.25					
R ² = 98.12	Constant	- 1.758				
Population	X ₆	X ₇	X ₈			
r	.83	.99	.98			
Elasticity Coefficient		2.31				
R ² = 98.63	Constant	2.321				
Fiscal Resources	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄
r	.97	.99	.95	.94	-.85	.92
Elasticity Coefficient		.72	-.30			
R ² = 99.08	Constant	10.759				
University Revenues, Programme	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	
r	.87	-.83	-.60	-.97	.94	
Elasticity Coefficient			-.49-11.21			
R ² = 97.77	Constant	6.109				

It should be noted that the inclusion of labour force variables in the income-expenditure equation for Quebec, Ontario, and British Columbia brought about a uniform coefficient for X_2 (1.46 to 1.47). Since the intercorrelation between variables is somewhat different in each province, the derived elasticities may be more than a reflection of their statistical manipulation. However, more reliable provincial labour force data is needed prior to the testing of a possible elasticity regression toward a mean for all Canadian provinces.

Population and Expenditure

Since growth in all three measures of population tended to increase over the decade, and at roughly equivalent rates, the derived coefficient for education level (2.84) should be interpreted with caution. Statistically, there is a closer association between X_7 (education level) and the criterion, but increases in the relevant age group and in the participation rate have a similar association with the dependent variable. In all three cases the derived elasticities are well over two percent. In addition, the trend of annual data suggests that the latter years of the decade witnessed increasing responsiveness of operating expenditures to changes in population measures.

Fiscal Resources and Expenditure

The findings in this part of the empirical analysis are similar to those for Alberta. Controlling for the effects of all other variables produces a coefficient of .74 for X_{10} (effort). This is somewhat higher than the actual elasticity, a consequence of high

intercorrelation with the ability variable, X_{11} . The removal of one or the other variable from the regression results in almost identical coefficients in the area of .50. Whereas the response of expenditures to effort remain constant in periods preceding and following 1967, the response to sectoral ability declined from .83 prior to 1967, to .39 in the remaining years of the decade.

The percentage increases in net provincial expenditure on education including and excluding provincial operating grants to universities are shown in Table 5.19. From 1961/62 to 1966/67 university operating grants raised net provincial expenditure on education by about two percent per annum. The change in fiscal arrangements, beginning in 1967/68, was associated with a 22 percent decline in net provincial expenditure vis-a-vis a seven percent decline if provincial operating grants to universities are included in the net figures. The last two years of the decade were marked by alternating increases, the net exclusive expenditure having been higher in 1968/69 followed by a higher net inclusive figure in 1969/70.

Table 5.19

Annual Percentage Increases in Net Provincial Education Expenditure
Including and Excluding Provincial Operating Grants to
Universities; British Columbia, 1960/61 to 1969/70

	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69
	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70
Incl.	- 08	11	10	12	17	34	- 07	43	12
Excl.	07	10	09	10	13	33	- 22	54	07

University Revenues, Programme, and Expenditure

Provincial grants made up the largest proportion of university operating income throughout the decade. Since cumulative decreases in the other two revenue measures offset slight increases, related revenue-expenditure elasticities are negative. Therefore, the proportion of university operating income from provincial sources, which correlates .96 with the criterion and accounts for 91 percent of variance, is the only significant predictor of changes in expenditure. The related coefficient of 1.21 is slightly lower than derived elasticities for periods preceding and following 1967 (1.55 and 1.42 respectively).

The only other measure showing a positive association with expenditure is X_{19} (proportion of graduate students). Since $r_{X_1.X_{19}}$ is .76, the response of per student expenditures to increases in graduate enrolment is obscured by the influence of other more highly correlated variables. An elasticity of 2.02 based on cumulative percentage increases in both X_1 and X_{19} may not be a very reliable indicator of criterion responsiveness since the association between the two variables is much lower than revenue source and expenditure correlations.

Table 5.20

Coefficients of Simple Correlation and Elasticity Coefficients
Between Independent Variables and University Per Student
Operating Expenditures; British Columbia, 1960/61 to 1969/70

Income	X ₂	X ₃	X ₄	X ₅		
r	.99	-.73	.94	-.60		
Elasticity Coefficient	1.54 (1.46)		.48	.11		
R ² = 99.16	Constant	-	4.314			

Population	X ₆	X ₇	X ₈			
r	.93	.98	.94			
Elasticity Coefficient		2.84				
R ² = 95.73	Constant		1.500			

Fiscal Resources	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄
r	.99	.99	.97	.97	-.92	.98
Elasticity Coefficient		.74	-.33			
R ² = 99.07	Constant		10.999			

University Revenues, Programme	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	
r	.96	-.89	-.91	-.78	.76	
Elasticity Coefficient	1.21					
R ² = 91.39	Constant		8.644			

CHAPTER VI

ELABORATION OF THE MODEL

I. INTRODUCTION

In Chapter I, reference was made to the relatively recent, but developing interest in the economics of higher education. This field of inquiry, in its Canadian context, has been stimulated by the increasing, and often accelerating costs, of all forms of post-secondary education. There is a growing recognition of the need for investigation and development of hypotheses related to the particularly Canadian aspects of this phenomenon (Slater, 1970, p. 1). Insofar as the bulk of higher education studies have dealt with the problems of developing nations, or the financial problems of centralized political jurisdictions, they are of marginal assistance in promoting an understanding of the university-government relationship in this country.

The general pattern of Canadian university expenditures over the past decade has been investigated with remarkably similar approaches by a number of authorities (see Chapter III, pp. 25 - 28). Consensus has it that increased operating expenditures are due to rapid growth of enrolment, higher prices of labour, and inflation (Wright, 1970, p. 6, Economic Council of Canada, Seventh Annual Review, p. 59, Peitchinis, 1972, p. 126) but, there is some disagreement as to whether or not more advanced and specialized programmes (senior, undergraduate and graduate) provoke higher per student expenditures. The economic Council of Canada's conclusion was that student mix was unimportant since more expensive graduate programmes were offset by

a decline in expensive undergraduate programmes (Seventh Annual Review, p. 61). Unfortunately, the only large cost analysis study of Canadian universities ever undertaken did not meet with much success. However, a Joint Steering Committee Report concluded that:

a large proportion of university costs were not directly affected by enrolment levels . . . (and) the costs of offering university courses depend to a very large extent on the policy decisions which have been made regarding the quality of instruction to be offered (Report, 1970, p. 3)

Although concerned with the question of rising expenditures, the present research departs in several significant ways from both the focus and method of investigation used in previous studies. It can be expected that the internal operations of university operations are highly correlated with unit expenditures.

Such internal (to the institution) variables may possess considerable predictive power, and are quite legitimate for prediction, but may be of only marginal assistance in attempting to explain expenditure variation (McIntyre, 1969, p. 263).

This proposition is of particular importance in the Canadian context but appears to have been ignored in most of the studies already reviewed. With the exception of the recent report commissioned by the Council of Ministers of Education, there has been little interest in expenditure variations among provinces associated with factors other than those of an institutional nature. The very nature of the university-government relationship that has developed over the past decade requires more than a one-sided investigation.

A second departure from previous research has to do with methodology. Until 1971, it was very difficult to obtain adequate annual data on university operating income and expenditure. This limitation, coupled with relatively mild increases in university

spending in the 1950's vis-a-vis the 1960's, tended to promote cross-sectional analyses of the few years for which limited data were available. The problem with cross-sectional studies is that it is difficult to make generalizations about economic trends based on information that may be time-specific.

A great act of faith is involved in applying ideas derived from the analysis of differences to situations of change. A cross-section study may be unduly influenced by specific factors acting at the time in which the cross-section is taken . . . More important, there is no reason to expect the weighting given to different units in deriving coefficients from cross-sections to be the same as that suitable for analysis of a change over time (Bird, 1970, p. 216).

Similar criticisms put forward by Morss (1966, pp. 101-102) imply that time-series is superior to cross-sectional analysis for purposes of both prediction and understanding.

. . . expenditure changes for a particular government unit can virtually always be predicted more accurately from its own history than from a collection of current relationships holding in government units with very different political and economic characteristics . . . For the case in which the objective is understanding, use of cross-sectional analysis involves the danger that because of substantial social, economic, and political differences among areas, variables that are important in particular areas might not appear significant.

In that this study is an exploratory analysis of a changing relationship over time, it makes use of time-series analysis.

II. THE CONCEPT OF ELASTICITY

The major statistical procedures used in this study have been described in Chapter III. It is the purpose of this section of the study to interpret the elasticity concept in more than just a statistical sense. Bird (1970, pp. 90 - 91) has noted that the concept of at least one type of elasticity (income-elasticity of public expenditures), as opposed to its statistical fact, is not

clear. The problem lies in the "expenditure base", the complex of factors making up the rise in "expenditure". For instance, it is important to determine changes in each of the expenditure base factors occurring simultaneously with changes in income. Once such an analysis has been conducted on "every particular expenditure category", the concept of elasticity might have greater meaning.

If university operating expenditures be labelled an "expenditure category" there is available data from which the income-expenditure base elasticities can be constructed for the years 1964/65 to 1969/70 (Tu, 1971, Statistical Supplement). There are limitations however, upon any such analysis with present data. In the absence of highly disaggregated cost analysis figures one must rely upon the seven-fold categorization of operating expenditures published annually by Statistics Canada. This classification is apparently too highly aggregated to allow for much interpretation of factors contributing to expenditure variation either among or within provinces. Having analyzed this data, Peitchinis concluded:

There is a remarkable degree of uniformity amongst the provinces, and there appears a considerable degree of stability over the period under examination. Nevertheless, it is significant to note that in the majority of provinces the proportion of operating expenditures allocated to instruction has declined between 1964 and 1969; the proportion allocated to libraries has generally risen in all provinces; whereas the allocation to functions related to assisted research and plant maintenance has remained relatively constant (1972, p. 129).

A second problem relating to the identification of an appropriate expenditure base lies in the location of factors related to expenditure. Sharkansky has noted that the appropriate "base" for public spending might be levels of expenditure in years prior to the period under investigation (1967, p. 168). Under such

circumstances, "the further examination of departures from previous spending patterns, rather than the examination of current expenditures, may provide the greatest pay-off for an understanding of expenditures (1967, p. 179)".

While both Bird and Sharkansky are concerned with the responsiveness of expenditures to increases in income and revenues, their comments suggest a dichotomy that is inappropriate to the study of university spending. Since the funding of university operations, hence the decision-making about expenditure, is not exclusive to either government or university, but is instead part of a growing interactive relationship, the expenditure base includes elements in both government and university realms of decision-making. It has been shown in Chapters IV and V that expenditures vary with both types of variables, and that the "holding power" of an expenditure base reasserting itself after a deviant budget period (Sharkansky, 1967, p. 168), is not a phenomenon particularly relevant to university financing. Nor does it appear that a study of factors internal to expenditure alone (e.g. instructional costs, administrative costs), at least at the present level of aggregation, can bring us any closer to what Bird considers to be the concept of elasticity.

In summary, an adequate notion of elasticity appropriate to variations in university operating expenditures is dependent upon identification of factors that are both internal and external to the institution. The present study may contribute to this task by at least isolating aggregate variables that have both theoretical and empirical interest.

III. THE RELATIONSHIP BETWEEN INCOME AND EXPENDITURE

The income elasticity of university per student operating expenditure used in this study can be interpreted as "a summary of the complex of forces acting on expenditure", or as a proxy for various dimensions of economic growth (Bird, 1970, p. 95). It has already been noted that per capita income compensates for changes in the average level of income owing to population change. However, even this adjustment does not substantiate any collective interpretation of the income-expenditure relationship. To the extent that variables used in other dimensions of the model are, in themselves, contributors to the level of per capita income, their relationship with expenditure further elaborates the income-expenditure elasticity. In this sense, the model in use goes beyond single equation formulations of previous research on higher education expenditures (Gregory, 1967, McIntyre, 1969).

It was shown in Chapters IV and V that the income elasticity of university per student operating expenditure exceeded unity in all provinces for the period 1960/61 to 1969/70. In Newfoundland and Prince Edward Island, provinces in which higher educational facilities were relatively underdeveloped in the early years of the decade, the derived coefficients rose from below to above unity in 1966/67. Their above three percent increases in expenditure as a response to one percent increases in per capita income from 1966/67 to 1969/70 demonstrate the potential elasticity of income in times of rapid growth.

Nova Scotia and New Brunswick were the only provinces whose income-expenditure elasticities showed significant declines in the last three years of the decade though, they still exceeded unity.

By comparison with previous years, percentage increases in per capita income tended to rise while percentage increases in expenditure declined in Nova Scotia, and remained relatively constant in New Brunswick. The resulting decrease in elasticities may have reflected public preferences in other sectors of government activity or, as the data on net provincial spending on education suggests, greater spending on other forms of education may have taken precedence over the university sector.

The elasticities for all other provinces suggest a relatively constant relationship between income and expenditure over time. Slight upward departures from derived coefficients were noted in Quebec and British Columbia in the last three years of the decade but, there is insufficient evidence in only three years of data to warrant speculation about increased demand for higher education.

The empirical findings lend support to the proposition that national cross-sectional or time-series elasticities should not be used to infer regional relationships between income and particular forms of expenditure (Sharkansky, 1967, pp. 9 - 28). Constant, increasing, and declining elasticities were noted throughout Canada but, most particularly, in the Atlantic Provinces. Nor is there any evidence to support the contention that higher ratios of expenditure to income are characteristic of jurisdictions having greater per capita income (Gupta, 1968, pp. 32 - 35). The province with the highest income-expenditure elasticity, Newfoundland, had the lowest per capita income in Canada throughout the decade.

A recent study, the purpose of which was to examine and analyse the effect of changes in economic growth of each province

during the years 1930 to 1966 on per capita educational expenditures, provides income elasticities of educational expenditures derived from the research and other sources (Sharples, 1971). In that the present research is an initial attempt to develop income elasticities of the most recurring portion of higher educational expenditures, the findings presented in Chapters IV and V are not strictly comparable with elasticities of educational expenditure derived from studies of elementary and secondary education finance. Nevertheless, if there is any validity to the contention that income elasticities of greater than unity are characteristic of cultural expenditures, such as education (Bird, 1970, p. 71), a comparison of different expenditure base coefficients within the educational sector is warranted.

Table 6.1 compares various computed income elasticities of education expenditures. Only studies that used measures similar to those in the present research (e.g. per capita personal income, per pupil expenditure) were selected from the literature (For a more extensive treatment of elasticity findings, see Sharples, 1971, pp. 29 - 39).

The studies by Hirsch (1959), Miner (1963), Shapiro (1962), and Paterson (1967) were all cross-sectional and dealt with either national elasticities or a comparison of state/provincial records with mean national elasticities. Keeping in mind the danger of comparing time-specific coefficients with elasticities based on changes over time it still seems safe to conclude that the present findings related to higher educational expenditures are in excess of those derived from the above-mentioned studies.

The time-series results obtained by McLoone (1961), James (1961), and Atherton (1968a and 1968b) are more relevant to the findings presented in Chapters IV and V. Though McLoone found a nationwide (U.S.) elasticity of .99 for the period 1929/30 to 1957/58, a separate study of the years 1943/44 to 1957/58 produced a coefficient of 1.61. This nationwide average compares favourably with the elasticities of five American States reported by James (1.49 to 2.12) in the years 1946 to 1958. Atherton's Canadian findings for the period 1951 to 1962 also tended to exceed unity though the range of elasticities was wider than that observed in American studies.

Previous studies have found that the income-expenditure elasticities for education tend to increase over time. Insufficient data prevents the testing of this observation for higher education expenditures but, there is little doubt of its validity. Rapid enrolment growth was a feature of the post World War II period and, most particularly, of the 1960's. At the same time, university revenues, hence expenditures, remained heavily reliant upon private funds even after the inception of the federal per capita grants programme in 1951. Indeed, it was the enrolment growth and the inability of private sources to support the related expenditure that brought about significant government involvement in the university sector throughout the 1960's.

". . . in moving to more recent times both population and income elasticity coefficients exhibit less divergence in the values from province to province (Sharples, 1971, p. 82)." The derived income-expenditure elasticities for higher education in this study

fall within the range projected by Atherton but do not exhibit the same deviation from the mean, e.g., Atherton calculated a mean of 1.7 and a range of .41 to 2.90. The present findings give a mean of 1.4 and a range of 1.09 to 1.92. It is, however, difficult to compare the two results since the expenditure bases differ. One finding that merits further consideration is the regression toward a mean elasticity of 1.46 for Quebec, Ontario and British Columbia when labour force variables are entered into the $E = f(I_p)$ equation along with per capita personal income.

The interpretation of per capita income as a proxy variable for socio-economic forces at work in the province or nation at large helps to consider the hypothesis advanced by Hickrod (1969, p. 41). that expenditure levels are "much more determined" by socio-economic characteristics in recent vis-a-vis past years. The high R^2 obtained in the first dimension of the model tend to support the hypothesis. The possibility of obtaining a high R^2 by chance, or by the regression of one or more independent variables on a relatively small N of 10, is corroborated by neither the "f" ratio test nor the results of previous Canadian research. In all cases, the p level for the regression of income on expenditure was greater than .0001. Both Sharples (1971) and Paterson (1967), whose studies went as far back as 1930 and 1941 respectively, found that variation in expenditure levels, accounted for by socio-economic variables, increase over time.

The importance of these findings is summarized in one question. To what extent can policy-makers make influential decisions about expenditure levels if, as the data suggest, socio-economic variables

Table 6.1

Comparison of Various Computed Income Elasticities
of Education Expenditures

Study	Year or period selected	Coefficient of elasticity	Independent variable	Dependent variable
Hirsch (1959) U.S.	Selected years 1900 - 1958	1.09	Per capita personal income, nationwide	Current expenditure per pupil nationwide
Miner (1963) U.S.	1959/60	.23	Per capita personal income	Current expenditure per pupil
Shapiro (1962) U.S.	1920 1930 1940 1950	.99 .72 .71 .91	Per capita personal income, nationwide	Current expenditure per pupil, nationwide
Paterson (19 7) Canada	1941 1951 1961	.93 .99 1.12	Per capita personal income, nationwide	Current expenditure per pupil, nationwide
McLoone (1961) U.S.	1929/30 - 1957/58 1943/44 - 1957/58	.99 1.61	Per capita personal income, nationwide	Current expenditure per pupil, nationwide
James (1961) U.S.	1946 - 1958	1.49 to 2.12	Total state personal income, five states	Total state expenditure in five states
Atherton (1968a)	1951 - 1962	0.41 to 2.90	Per capita personal income in each province	Per pupil expenditure in each province
Atherton (1968b)	1957 - 1960 1961 - 1965	3.0 0.9	Per capita personal income in Alberta	Operating expenditure per pupil in Alberta

alone account for more and more of the variation in expenditure? Hickrod (1971) has suggested further analysis of the residuals of wealth related functions as one way of determining the relationship between administrative decisions and expenditure levels (p. 46). However, when the marginal variation is less than ten percent, as is the case in seven of the ten provinces in this study, it is doubtful whether much insight can be gained from such an analysis. A second, and more fruitful approach for future policy-makers, might be to ignore the traditional cleavage of socio-economic and decision-making variables into non-policy and policy factors (Mort, 1954, Miner, 1963, Paterson, 1967).

The acceptance of environmental determinism as a fait accompli implies that administrative decision-making of a short or long-range nature is, for the most part, irrelevant to the attainment of adequate levels of expenditure in relation to income levels of the population. Since per capita income reflects a complex of factors, whose identity and accessibility to manipulation are not yet wholly determined, it seems unwise to accept a fatalistic argument about "fixed determinants" prior to its investigation.

IV. THE RELATIONSHIP BETWEEN POPULATION FACTORS AND EXPENDITURE

The empirical findings indicate that university per student operating expenditures were more responsive to changes in population variables than to changes in any other of the dimensional measures during the decade 1960/61 to 1969/70. This finding is entirely consistent with the observations of Canadian studies of the university

financial crisis in both the 1950's and 1960's (Bissell, 1956, Bladen, 1965, Waines, 1970). Invariably, both the increases in the proportion of population aged 18 to 24, and the rising proportion of the age group attending university, have been cited as the major factors contributing to higher expenditure.

It should be noted that the isolation of an eligible age group factor as a major predictor of expenditures was not the intention of the $E = f(P)$ equation. Although it is important to assess the responsiveness of expenditures to increases in this variable, there is little theoretical framework to explain derived associations. This is so since university attendance is seldom a matter of individual choice, but rather, a product of a number of interrelated factors.

Schaafsma's study of the demand for higher education in Canada speculated that income level of parent (ability), education level of parent, and number of children per family would have a positive influence on the "probability that an eligible will attend university (1969, p. 16)." Similarly, Peitchinis noted social status of parent, parental educational achievements, costs of education, and future lifetime earnings as likely predictors of participation rates (1972, pp. 106-108). Unfortunately, as was indicated by both writers, the relevant data to test complete demand functions does not exist. Therefore, demand can only be studied on the basis of past time trends, or by the substitution of proxy variables for actual data.

The $E = f(P)$ equation used in the present model relates per student expenditure to an eligibility factor interacting with population education levels. Income per capita was omitted from the equation since education and income are usually highly correlated

(greater than .91 in the present study). Therefore, to the extent that levels of education are associated with income, the equation elaborates the $E = f(I)$ function used in the first dimension of the model. In its reduced form, the equation

$$\log X_1 = \log B + e_5 \log X_6 + e_6 \log X_7$$

is an aggregate demand function similar to the individual demand function used by Schaafsma.

It was shown in Chapters IV and V that the interaction of X_6 and X_7 produced coefficients in the 1.47 to 3.74 range for education level, and that increases in the proportion of population aged 18 to 24 were significant in only three provinces. The results do not necessarily indicate greater responsiveness of expenditures to increases in education levels since the two predictor variables were highly correlated in all provinces. However, there is evidence that increases in the stock of human capital were more closely associated with expenditures than the rise in proportions of population aged 18 to 24. The exceptions to these findings were Newfoundland and Prince Edward Island. A second equation, in which participation rate was substituted for the age group measure, resulted in the education level coefficient being the only predictor of expenditure variation in all provinces. Derived coefficients were, for the most part, identical to those produced in the original equation.

The assumptions necessary for the acceptance of X_7 as a proxy for education level were discussed in Chapter III. In a critique of the Harbison and Myers definition one writer noted that the stock of human resources was, perhaps, not a measure of the actual education level but, a measure of the pace at which people were making additions

to the stock (Sen, 1969, p. 71). In other words, X_7 could be a measure of recent educational attainment rather than a proxy for education level of the entire population. Under such conditions, the high correlation between education level and expenditure can be explained as a consumption relationship. Increases in the numbers of eligible students as well as increases in the number of recently "educated" people who: (1) wish to continue their education, or (2) use a portion of their relatively higher incomes to support the education of others, or (3) pay relatively higher taxes as a consequence of increased earnings, generate demands for greater public and private spending on higher education. In the short run,

we can expect the flow of current education will depend very much on this kind of (personal income per capita) consideration than (per capita personal income) itself will depend on the flow of current education (Sen, 1969, p. 71).

An econometric relationship between population variables and public school expenditures formulated by McMahon (1970, p. 251) stated that:

larger percentages of children and larger enrollments lead to larger propensities to spend in lower income states that taper off in the high income states where birth rates decline.

To what extent is this relationship valid in the Canadian provincial context over time if expenditures be defined as university per student operating expenditure?

Table 6.2 contains a comparative rank ordering of three variables in each of three years of the period under study; per student operating expenditure (X_1), participation rate (X_8), and absolute size of enrolment (Enr.). Proportion of the population

aged 18 to 24 (X_6) is entered in percentage form because of the slight variation between provinces in most of the years under study.

Newfoundland, the province with the lowest per capita income, had the lowest participation rate in each of the three years. By contrast, the proportion of the population in the relevant age group was the highest in Canada. Only in the last year of the decade did Newfoundland's expenditure position show a marked improvement.

New Brunswick's expenditure position and participation rate deteriorated over the decade, while its 18 to 24 age group grew as a proportion of the population. Another province with low per capita income, Prince Edward Island, showed no improvement in its participation rates or expenditures in relation to those of other higher income provinces, yet, by 1969/70, it had a high proportion of its population in the 18 to 24 age group. Only Nova Scotia's record offers some justification of the McMahon hypothesis. While the proportion of population in the relevant age group rose over time, the province maintained the second highest participation rate and improved its expenditure position in relation to other provinces. At the same time, its per capita income remained lower than that of Central and Western Provinces.

To the extent that X_6 reflects birth rate increases in the post World War II decade, there is little evidence to support a tapering off in expenditure in high income provinces. The ratio expressed in X_6 increased in all Canadian provinces throughout the decade. Since Nova Scotia's expenditures were the highest in the Maritimes, and tended to improve relative to those of its neighbours in the last years of the decade, a comparison of the expenditure gap

between high and low income provinces can help to validate the "tapering off" proposition. In 1967/68, Ontario's per student expenditures were ten percent higher than those of Nova Scotia, in 1968/69 they were 34 percent higher, and in 1969/70, 31 percent higher. Alberta, the province with the second highest per student expenditure, and the third highest per capita income had expenditures that were eleven, seven, and eleven percent higher than Nova Scotia's in each of the last three years of the decade.

It would appear that financial arrangements made under the Fiscal Arrangements Act (1967) helped Nova Scotia to reduce the expenditure gap with Alberta, and to a much lesser extent, with Ontario. In 1966/67 Alberta's expenditures were 19 and Ontario's 35 percent higher than Nova Scotia's. In addition, during the last four years of the decade, cumulative percentage increases in per student operating expenditures amounted to 61 percent in Nova Scotia, 52 percent in Ontario, and 42 percent in Alberta. Nevertheless, the expenditure gap still remained and, once again, showed signs of increasing toward the end of the decade. Since proportions of population aged 18 to 24 were almost identical in all three provinces, it is difficult to accept this factor as a contributor to the "tapering off" of expenditure in high income provinces. If anything, it was the maintenance of Nova Scotia's high participation rate and associated expenditures that apparently led to a closing in the expenditure gap. This situation may have been only of a temporary nature. The empirical data suggests that in the long run, higher per capita income must accompany increases in absolute numbers of students if the disparity in expenditures is to

Table 6.2

Comparative Rank-Ordering of All Provinces for University Per
Student Operating Expenditure, Participation Rate, Size of
Enrolment, and Proportion of Population Aged 18 to 24
1961/62, 1965/66, and 1969/70

Province	Expenditure rank	Participation rank	Enrolment rank	Prop'n. of pop'n. 18-24
1961/62				
Newfoundland	10	10	9	.10
Prince Edward Is.	9	7	10	.09
Nova Scotia	7	2	6	.10
New Brunswick	8	4	8	.09
Quebec	4	5	1	.10
Ontario	1	9	2	.09
Manitoba	3	3	5	.09
Saskatchewan	6	6	7	.09
Alberta	2	8	4	.09
British Columbia	5	1	3	.08
1965/66				
Newfoundland	10	10	9	.11
Prince Edward Is.	9	8	10	.09
Nova Scotia	7	2	7	.11
New Brunswick	8	7	8	.10
Quebec	6	6	1	.12
Ontario	1	9	2	.10
Manitoba	4	4	6	.10
Saskatchewan	5	3	5	.10
Alberta	2	5	4	.10
British Columbia	3	1	3	.10
1969/70				
Newfoundland	6	10	9	.13
Prince Edward Is.	9	8	10	.13
Nova Scotia	5	2	6	.12
New Brunswick	10	7	8	.13
Quebec	3	9	2	.13
Ontario	1	6	1	.12
Manitoba	7	4	5	.12
Saskatchewan	8	5	7	.12
Alberta	2	1	4	.11
British Columbia	4	3	3	.11

be reduced.⁵

Another method of comparing the response of expenditure to population factors is presented in Table 6.3. The education level measure (X_7) was removed from the $E = f(P)$ equation so that the interaction of proportion of population aged 18 to 24 (X_6) and participation rate (X_8) could be better ascertained. The table includes partial elasticity coefficients derived from the regression of X_6 and X_8 on X_1 , and a rank ordering of provinces based on a ten year average of per student operating expenditures.

The findings suggest that expenditures were more responsive to changes in population measures in low expenditure provinces than in provinces that achieved relatively high levels of per student expenditures. Nonetheless, elasticities in the two to four percent range were not sufficient to overcome the real expenditure gap with higher income provinces whose population-expenditure elasticities approximated unity.

The absence of research dealing with responsiveness of university expenditures to population characteristics leaves the present findings to be validated by future studies. There is some indication, however, that higher education expenditures have responded to population growth in a manner quite different from

⁵The expenditure position of Nova Scotia in relation to Ontario and Alberta was documented in some detail since Nova Scotia was the only "low income" province that improved its relative expenditure position over time. Quebec's figures are not strictly comparable with those of other provinces because of structural changes in that province's system of higher education in the last years of the decade. The position of Newfoundland, Prince Edward Island, and New Brunswick vis-a-vis the expenditure gap was, naturally, even more severe than that of Nova Scotia.

Table 6.3

Elasticity Coefficients Derived from the Stepwise Regression of Proportion of Population Aged 18 to 24 (X_6), and Participation Rate (X_8) on the Dependent Variable; All Provinces, 1960/61 to 1969/70

Province	Expenditure rank	X_6	X_8	R^2	Constant
Nfld.	9	3.87		89.98	15.791
PEI.	10	2.62		83.92	13.203
NS.	7		1.84	91.88	11.616
NB.	8	.98	1.80	96.67	12.275
Que.	5	1.89		65.66	11.717
Ont.	1		1.19	96.93	10.826
Man.	3		1.02	90.66	9.964
Sask.	6		1.37	94.43	.638
Alta.	2		.80	95.63	9.636
BC.	4	1.25	1.04	92.34	12.750

expenditures for public education. Whereas the present analysis is in agreement with that of Sharples with respect to the greater responsiveness of recent expenditures to population vis-a-vis income levels (1971, p. 79), the population expenditure elasticities shown in Table 6.3 are in reverse of the trend exhibited in his findings. In general, the Sharples study noted higher population-expenditure coefficients in relatively high per pupil expenditure provinces during the period 1957 to 1966. Unfortunately, the study provides insufficient data with which to compare age level composition

relationships to per pupil expenditure. Until such data are analyzed, there is little value in speculating about the differing responsiveness of public and higher education expenditures among the Canadian provinces.

V. THE RELATIONSHIP BETWEEN FISCAL RESOURCES AND EXPENDITURE

It is not surprising to find that the relationship between higher education expenditure and government activity in the public sector has been a subject of only recent concern. The characterization of a university-government relationship has not been a feature of the American literature dealing with the economics of higher education. Even in the Canadian context, the growing reliance of universities upon government funds has received hesitant and begrudging recognition (Cameron, 1969, Hurtubise and Rowat, 1970). Indeed, there is ample evidence to suggest that university expenditure is perceived solely as the outcome of the internal operations of universities (Bladen, 1965). The government role is described as simply that of financier, having little or no control over expenditure. Provincial unwillingness and/or inability to support university financing is treated, in this perspective, as a possible manifestation of weakness in financial negotiations with the Federal government.

The perpetuation of this attitude overlooks the reality of university and government roles in the present, and discourages any appraisal of a changing relationship. Any number of policy statements (e.g., Government of Alberta, 1970) testify to the proposition put forward in this study, namely, that university spending

is, and will remain, linked to programmes and priorities identified by both provinces and institutions of higher education. Therefore, the fiscal resources-expenditure dimension of the model is concerned with a most crucial aspect of the relationship; the availability and use of government revenues, and their relationship to expenditure.

The finding that a province's willingness to sacrifice some measure of total personal income for higher education was, in almost all cases, the leading predictor of variation in expenditure, is not without precedent. In the few studies of public or higher education that made use of well-formulated models of expenditure determinants, measures of effort were found to be most influential. The Gregory model, discussed in Chapter III, isolated state effort as the second highest predictor of state appropriations for higher education after the inclusion of an eligibility factor. Other studies, in which various measures of fiscal effort were found to be significantly related to school expenditures, are reported in Hickrod (1971).

The direction of association between effort and expenditure has been a topic of much debate in educational finance since the publication of Dye's finding that higher per pupil expenditures had low or negative correlation with fiscal effort in high income states (1967, p. 34). The present findings show an $r_{X_1.X_{10}}$ greater than .91 in all Canadian provinces, the variation being too small to support any such contention over a ten year period.

It has also been suggested that higher levels of income have a lower correlation with effort than do lower income levels (Gregory, 1967, p. 134). Table 6.4 contains results for the correlation of

of X_2 (income) and X_{10} (effort) in each province over the decade 1960/61 to 1969/70. The provinces are ranked according to average levels of per capita income over the same period. It can be seen that the contention holds little validity for the pattern of income-effort for higher education relationships in Canada during the period under study. In fact, effort and income were generally more closely associated in high income provinces.⁶

Table 6.4

Coefficients of Simple Correlation Between Fiscal Effort (X_{10}) and Per Capita Personal Income (X_2); All Provinces, 1960/61 to 1969/70

	Nfld.	PEI.	NS.	NB.	Que.	Ont.	Man.	Sask.	Alta.	BC.
$r_{X_2.X_{10}}$	.92	.92	.98	.95	.88	.99	.98	.81	.98	.99
Income rank	10	9	7	8	5	1	4	6	3	2

The annual ratios of provincial operating grants to universities to total personal income are presented in Table A10, Appendix A. Of the four provinces that persistently increased their year to year effort ratios, Ontario, British Columbia, and Alberta were in the relatively high income, high expenditure category, while Nova Scotia ranked, on the decade average, as the seventh highest income and expenditure province. All other provinces reduced effort at one or more points

⁶It should be noted that previous research cited in this section was cross-sectional. The longitudinal findings contained herein are not strictly comparable, but do suggest that the pattern of dynamic relationships is considerably different from that established in fixed periods of time.

in time. Therefore, in these cases, the data shows no tendency of higher vs. lower income provinces to reduce effort and still maintain high levels of expenditure. The fact that this could have been accomplished, and indeed was in many cases, does not necessarily validate the proposition that increased income results in a reduction of effort (Dye, 1967, p. 35, McIntyre, 1969, p. 271).

There is, finally, the possibility that relatively low income jurisdictions have, or will, maintain higher effort ratios than high income centres in order to provide comparable educational services. Table 6.5 compares the effort ratios and income and expenditure rankings for all provinces in three years of the decade. Saskatchewan, in 1961/62, exhibited the highest effort ratio and had the seventh highest per capita income. Yet, its per pupil expenditures fell below those of Ontario, British Columbia, Alberta, Manitoba, and Quebec, all of which had higher income but lower effort ratios. By 1965/66, Saskatchewan's effort ratio was second highest and its income position had improved, yet its expenditures still remained behind three higher income provinces that exhibited less effort. In 1969/70, its effort was the lowest in Canada while its income was sixth highest. In that year, Prince Edward Island displayed the greatest effort but ranked ninth in both income and expenditure.

In conclusion, there is little evidence to support a consistent maintenance of higher effort on the part of lower income provinces in relation to their wealthier neighbours. This phenomenon may have emerged in the Atlantic Provinces in the period after 1967 but, only time will tell if it can be maintained.

The partial elasticity coefficients for the effort-expenditure

Table 6.5

Comparative Rank-Ordering of All Provinces for University Per
Student Operating Expenditure, Per Capita Personal Income,
and Effort (in percentages); 1961/62, 1965/66, 1969/70

	Expenditure rank	Income rank	Effort (%)
1961/62			
Newfoundland	10	10	.0010
Prince Edward Island	9	9	.0013
Nova Scotia	7	6	.0015
New Brunswick	8	8	.0025
Quebec	4	5	.0025
Ontario	1	1	.0020
Manitoba	3	4	.0038
Saskatchewan	6	7	.0040
Alberta	2	3	.0038
British Columbia	5	2	.0024
1965/66			
Newfoundland	10	10	.0011
Prince Edward Island	9	9	.0016
Nova Scotia	7	7	.0040
New Brunswick	8	8	.0036
Quebec	6	6	.0034
Ontario	1	1	.0042
Manitoba	4	3	.0050
Saskatchewan	5	5	.0056
Alberta	2	4	.0068
British Columbia	3	2	.0046
1969/70			
Newfoundland	6	10	.0129
Prince Edward Island	9	9	.0178
Nova Scotia	5	7	.0129
New Brunswick	10	8	.0122
Quebec	3	5	.0085
Ontario	1	1	.0123
Manitoba	7	4	.0116
Saskatchewan	8	6	.0112
Alberta	2	3	.0152
British Columbia	4	2	.0107

relationship, which were significant in seven provinces, indicate that expenditures did not grow more than proportionately to the increase in effort. If the purpose of appropriating an increasingly larger share of income for higher educational grants was to raise the level of educational services represented by per student expenditures, the derived elasticities suggest that the Atlantic Provinces, in particular, were not very successful in this regard. This conclusion is warranted by both the empirical findings presented in Chapters IV and V and by the data presented in Table 6.5.

The removal of the other four fiscal measures from the $E = f(F)$ equation permits a more precise investigation of the effort-expenditure relationship. The findings indicate that, over time, expenditures were only slightly more responsive to increases in effort in four Western Provinces than in the Maritimes. Ontario was able to maintain the highest level of per student expenditure with relatively low effort because of its large personal income base. Quebec's .58 coefficient does not necessarily provide an adequate representation of its position because of adjustments in the criterion variable structure accompanying the introduction of the CEGEP (See Table 6.6).

Table 6.6

Effort-Expenditure Elasticities; All Provinces, 1960/61 to 1969/70

Nfld.	P.E.I.	NS.	NB.	Que.	Ont.	Man.	Sask.	Alta.	BC.
.22	.37	.39	.30	.58	.37	.44	.42	.46	.47

To the extent that fiscal resources within a province represent a product of personal income, they can be, and have been, portrayed both totally and proportionally. As has been shown in this dimension of the model, no single characterization of total fiscal resources and their use provides an expenditure elasticity approaching the coefficients derived in the $E = f(I_p)$ dimension. Once the interaction of fiscal variables has taken place there emerges a range of elasticities that are invariably less than unity.

The relationships between particular fiscal resource measures and expenditure were described in Chapter V. Since the purpose underlying the analysis of this dimension is to isolate important relationships between variables, some feature common to the fiscal resources-expenditure relationship in all provinces might be used as a point of reference. The effort variable seems to provide such a starting point because of its leading predictive power in seven of the ten provinces.

Table 6.7 contains elasticities for the effort and three other resource-expenditure functions described in the model. The elasticities are derived from a comparison of annual percentage increases in X_9 (provincial own source revenue), X_{10} (effort), X_{11} (sectoral ability), and X_{12} (federal transfers) with annual percentage increases in the dependent variable. X_{13} , the mix of government spending for higher education, has been omitted from the table since its relationship with the criterion is consistently negative.

The derived elasticities for individual expenditure relationships are not identical with results obtained in the interactive model. This can be explained by the fact that individual

elasticities do not take into consideration the level of intercorrelation between explanatory variables. Nevertheless, the Table 6.7 results imply that the interactive model does not exaggerate the responsiveness of per student operating expenditures to fiscal resource measures. Elasticities tend to remain below unity no matter which method is used for their calculation. The maximum deviation of results in Table 6.7 from findings shown in Table 4.9 (page 64) is one half of one percent, and the modal deviation is one fifth of one percent.

Expenditures were, in general, most responsive to increases in provincial own source revenues in the Atlantic Provinces, the region that exhibited the lowest effort-expenditure elasticities over the decade. This finding is consistent with the observation that low income jurisdictions are unable to improve their per capita (or, in this case, per student) expenditure position vis-a-vis higher income areas even though expenditures are more responsive to revenue increases in lower income areas (Bird, 1970, pp. 117 - 122). For example, while British Columbia and New Brunswick display equal elasticities for the provincial revenue-expenditure computation, the former had a .47 expenditure response to effort, while the latter increased spending only one third of a percent in association with a one percent increase in revenue.

The sectoral ability-expenditure elasticities do not follow any pattern in relation to other measures. Quebec, Manitoba, and New Brunswick had the highest ability-expenditure coefficients but ranged from high to middle to low in their expenditure response to effort in relation to other provinces. It could be that X_{11} was

more representative of policy decision about education spending in these three provinces than in the others. This possibility requires further investigation since present documentation provides little information about the bases upon which provinces choose to allot funds among various educational enterprises.

Expenditure responsiveness to federal transfers for purposes other than higher education was highest in provinces with agriculturally based or extractive economies, namely Prince Edward Island, Newfoundland, and Saskatchewan. While these provinces generally had difficulties financing higher education, the unexpected inclusion of British Columbia, ahead of New Brunswick, as the province with the fourth highest transfer-expenditure elasticity, casts some doubt on the proposition that federal payments might be stimulatory to "other service" expenditures only in relatively low income jurisdictions (Osman, 1966, pp. 371 - 372).

The resources available to a province for the financing of higher education have been studied in both absolute and proportional terms. Total revenues were made up of those derived from "own sources", and from the Federal Government in the form of transfer payments. The use of such revenues was studied in terms of effort, sectoral ability, and relative effort of provincial to federal government spending. The analysis was based on the assumption that resource availability, and its use, cannot be viewed as an additive influence on expenditure. Rather, expenditure is a product of the interaction between the availability of scarce resources and decisions related to their use.

The analysis resulted in the derivation of several significant

Table 6.7

Individual Fiscal Resources-Expenditure Elasticities,
All Provinces, 1960/61 to 1969/70

	X ₉	X ₁₀	X ₁₁	X ₁₂
Newfoundland	.93	.22	.25	1.02
Prince Edward Is.	1.21	.37	.62	1.19
Nova Scotia	.84	.39	.54	.58
New Brunswick	.71	.30	.79	.73
Quebec	.63	.58	.81	.42
Ontario	.52	.37	.65	.50
Manitoba	.47	.44	.78	.53
Saskatchewan	.67	.42	.56	.93
Alberta	.63	.46	.55	.67
British Columbia	.72	.47	.58	.85

Explanation of Symbols:

- X₉ - Provincial own source revenue
X₁₀ - Provincial operating grants to universities as a proportion of total personal income
X₁₁ - Provincial operating grants to universities as a proportion of net provincial expenditure on education
X₁₂ - Federal transfer payments for purposes other than higher education

associations between predictors and the criterion. In general, provincial effort to finance higher education was isolated as the variable most closely associated with changes in expenditure. However, the pattern was not uniform either in its application to all provinces, or in its association with other fiscal measures within provinces.

Nonetheless, while there appeared to have been factors at work within three provinces that created a departure from the general findings, in only one case (New Brunswick), did the total revenue variables appear more closely associated with variations in expenditure than measures of resource use. Future studies might benefit from this finding since, to the extent that use of resources can be characterized as a policy consideration, it departs from the general isolation of fixed amounts of resources as being of prime importance in "determining" levels of expenditure. There is evidence that decisions related to resource distribution will, over time, be more important to the achievement of expenditure levels than simply resource availability.

VI. THE RELATIONSHIP BETWEEN UNIVERSITY REVENUES, PROGRAMME, AND EXPENDITURE

The results obtained in this dimension of the model are similar to those found in an earlier study of university costs (Tu, 1971). A comment on that work is pertinent to the present findings.

In an effort to obtain the most reliable cost projections, a number of models were constructed and tested. Step regression analysis was used, and so was the well known quadratic cost function. But there was no evidence of any uniform patterns . . . The negative findings suggest that historical costs are largely a matter of policy, not the result of any deliberate attempt at maximization or minimization; and economic theories based on such maximization or minimization become largely inoperative (Peitchinis, 1972, p. 142).

Though there is some debate over the specification of variables to be used in studies of "costs" vis-a-vis "expenditures", the development of particular models to explain one or the other function does not guarantee the establishment of generalizable patterns of behaviour (Bahl, 1969, pp. 550-552). This situation is exemplified in the findings of both the present study and the Tu research.

The predictive power of this dimension is fairly reasonable but, it fails to identify uniform associations between expenditure and any one or two of the independent variables. This failure may be a reflection of the way in which programme measures interacted with alternative revenue sources. Whereas the former did not display much variation during the decade 1960/61 to 1969/70, revenues and expenditures showed considerable change in their year to year movements. Aside from the possibility of policy factors having been related to expenditure levels, it would appear that absolute, and not proportional enrolments, were also instrumental in raising operating expenditures.

Though more reliance upon one, as opposed to another income source, was a feature of all provincial systems of higher education, the uniform predominance of provincial revenues was not achieved until 1967/68. Controlling for all other variables, this measure emerged as a significant predictor of changes in expenditure in five provinces. Provincial income-expenditure elasticities based on percentage changes in X_{15} and X_1 are shown in Table 6.8. The results imply that expenditures were far more responsive to increases in the proportion of university operating revenues from provincial sources in Alberta than in any other province. Only two provinces, Newfoundland and New Brunswick, display elasticities well below unity. Since the proportion of operating revenues from provincial sources includes funds transferred under the Fiscal Arrangements Act (1967), a calculation of expenditure response to provincial grants after 1967 is included in Table 6.8. The generally lower elasticities are attributable to a tapering off in both revenue and expenditure

increases in the last two years of the decade. Alberta still displayed the highest elasticity while Newfoundland and New Brunswick retained their previous positions.

Federal grants-expenditure elasticities are shown for the period 1960/61 to 1966/67, a time in which positive elasticities can be expected. The greatest response of expenditures to increases in the proportion of operating income from federal sources was characteristic of provinces having relatively low provincial grant-expenditure elasticities.

A meaningful interpretation of the other source revenue-expenditure association is not possible. Fluctuations in X_{17} discount the computation of directional elasticities. Suffice to say that all coefficients would be less than unity ranging from a high in Prince Edward Island to a low in Ontario and Saskatchewan. Insofar as many of the proportional programme measures are also subject to infrequent variation over time, their comparative associations with expenditures, in the form of elasticities, is not a reliable indicator of interprovincial positions.

In conclusion, the findings give little indication of a generalized behaviour of expenditures in response to alternative revenue sources and programme levels. There is evidence, however, of higher provincial income-expenditure elasticities in Central and Western Provinces, and greater responsiveness of expenditures to federal income in the Atlantic region. Changes in the composition of enrolments had a mixed association with changes in expenditure, greater responsiveness not having been restricted to high income and/or high expenditure jurisdictions.

Table 6.8

Individual University Revenue Source-Expenditure Elasticities,
All Provinces, Selected Periods

	Income sources		
	Provincial 60/61-69/70	Provincial 67/68-69/70	Federal 60/61-66/67
Newfoundland	.46	.30	2.41
Prince Edward Island	1.06	.44	5.38
Nova Scotia	.90	.38	2.63
New Brunswick	.62	.26	1.07
Quebec	.98	.43	.80
Ontario	1.08	.62	-26.00
Manitoba	1.82	.65	1.00
Saskatchewan	1.59	.81	12.50
Alberta	3.30	1.09	.07
British Columbia	1.25	.69	-17.33

CHAPTER VII

SUMMARY AND CONCLUSIONS

I. INTRODUCTION

This study has been concerned with an analysis of factors associated with variations in university per student operating expenditures among and within the provinces of Canada. The analysis was placed within the context of a growing relationship between universities and provincial governments. Therefore, the study has involved (1) the formulation of a theoretical model that specified the nature of the university-government relationship, (2) a systematic statistical analysis of the association between the model's dimensional measures and expenditure, and (3) an elaboration of the findings from the point of view of their generalizability and application to future research. The present chapter will summarize the major findings and suggest areas for additional research.

The multi-dimensional model used as a basis for the empirical analysis of this study had its theoretical origins in studies of the economics of higher education. The form of the model was dictated by the particularly Canadian characteristics of this field of enquiry. The model did not purport to include the necessary and sufficient conditions for a study of the economics of higher education in Canada. Rather, it focused on four dimensions that had been recognized and debated within the literature.

The investigation of the effects of changes in (1) economic

growth, (2) population characteristics, (3) fiscal resources, and (4) university revenues and programme on the most recurring portion of university expenditures required the selection of suitable variables which would be representative of these factors. Such variables were selected from studies related to the analysis of public expenditure or, were constructed on the basis of several critiques of previous research.

Elasticity coefficients were employed to describe the associations between inter-dependent variables. Derived coefficients indicated the relative change of one variable with the corresponding change of an associated variable. Since the analysis dealt with a time-series of data for the period 1960/61 to 1969/70, a modification of stepwise regression analysis was used to isolate significant associations with expenditure over time. The conversion of all variables into logarithms resulted in the estimation of the proportionate change in expenditure associated with a given proportionate change in independent variables. The equations basic to each of the four dimensions were:

$$1. \log X_1 = \log A + e_1 \log X_2$$

where A is a constant, X_1 is the dependent variable, and $e X_2$ indicates the responsiveness of per student operating expenditures to a change in per capita personal income.

$$2. \log X_1 = \log B + e_5 \log X_6 + e_6 \log X_7$$

where B is a constant and $e X_6$ and $e X_7$ are the partial elasticities of expenditure in relation to changes in the proportion of the population aged 18 to 24, and education level respectively.

$$3. \log X_1 = \log C + e_8 \log X_9 + e_9 \log X_{10} + e_{10} \log X_{11} \\ + e_{11} \log X_{12} + e_{12} \log X_{13}$$

where C is a constant and e X is a measure of the responsiveness of expenditures to provincial own source revenue (X_9), effort (X_{10}), sectoral ability (X_{11}), federal transfer payments (X_{12}), and the mix of government operating expenditure on higher education (X_{13}).

$$4. \log X_1 = \log D + e_{14} \log X_{15} + e_{15} \log X_{16} + e_{16} \log X_{17} \\ + e_{17} \log X_{18} + e_{18} \log X_{19}$$

where D is a constant and e X is a measure of the responsiveness of expenditures to (a) proportion of university operating income from provincial sources (X_{15}), federal sources (X_{16}), and other sources (X_{17}), and (b) proportion of undergraduate students (X_{18}) and graduate students (X_{19}) in total full time enrolment. In addition, equations (1), (2), and (3) were modified to test for associations between expenditures and; labour force measures in (1), participation rates in (2), and conditional transfer payments in (3),

The analysis proceeded along the lines of an inter and intra provincial comparison of factors associated with expenditures. Since partial elasticities based on an interactive equation did not always adequately describe associations between interdependent variables various other statistical methods were used in the analysis. These included: (a) the calculation of elasticities for sub-periods of the decade 1960/61 to 1969/70 based on changes in the criterion and only one predictor, and (b) comparison of percentage changes in cross-sectional data.

Finally, an attempt was made to isolate particular associations of importance to some or all provinces. In that this study was an

exploratory analysis of factors associated with variations in higher education expenditure, a comparison of the findings with previous research in the areas of school finance and other public expenditures was conducted. The purpose of such comparison was to assess the validity of previous research findings and propositions in relation to the results obtained in the present study.

II. MAJOR FINDINGS

The major findings of this study are summarized under the following headings: (1) Income and Expenditure, (2) Population and Expenditure, (3) Fiscal Resources and Expenditure, and (4) University Revenue Sources, Programme, and Expenditure.

Income and Expenditure

The analysis of the income elasticities of university expenditure produced a set of coefficients exceeding unity in all provinces. In general, changes in expenditure over time were more responsive to changes in income in the Atlantic Provinces than in Central or Western Provinces. The overall elasticities contained three discernable trends, two of which took place in the Maritimes. Both Newfoundland and Prince Edward Island displayed dramatic upward shifts in their income-expenditure elasticities during the last three or four years of the decade. These late upward movements raised their respective elasticities from levels below unity to expenditure increases of greater than three percent in association with one percent increases in per capita personal income. Nova Scotia and New Brunswick exhibited a downward shift

in their income-expenditure elasticities after 1967, though the decline was far less than corresponding increases in Newfoundland and Prince Edward Island. Finally, the income elasticity coefficients of all other provinces tended to hold constant for changes in expenditure patterns. Slight upward-moving ratios in Quebec and British Columbia came too late in the decade to justify their inclusion with Newfoundland and Prince Edward Island.

Partial income-expenditure elasticities derived from the inclusion of labour force measures along with per capita personal income in Quebec, Ontario, and British Columbia indicated a uniform responsiveness. Both the unemployment and service sector ratios emerged as significant predictors of changes in expenditure in Quebec and British Columbia respectively. Their elasticity coefficients, however, were well below unity. The findings are not suggestive of any general statement about theoretical association between economic growth factors and expenditures but, require further investigation with a more extended range of time-series data in all provinces.

It is evident that on the basis of interprovincial comparisons no single income-expenditure elasticity can be identified as applicable to all provinces. However, despite differences in economic factors among the provinces, the demand for higher education over time, based on elasticity measure, may not be subject to as much variation as demand for other types of education. The possibility of a regression toward a mean demand level does exist, but this tendency cannot be interpreted as a movement leading to similar levels of per student expenditure. The expenditure

gap that existed throughout the 1960's was maintained, and even enlarged, despite the greater sensitivity of expenditures to increases in per capita income in relatively low income provinces. Projections on the basis of elasticities are difficult, but if income per capita were to increase at roughly ten percent per annum, and the responsiveness of expenditure to income were to be maintained at levels prevailing during the last three years of the decade 1960/61 to 1969/70, Ontario's per student expenditures would still exceed those of Prince Edward Island by 45 percent, and those of Nova Scotia by 35 percent in 1974/75.

Population and Expenditure

A major finding relevant to the entire model was that operating expenditures were more sensitive to increases in the proxy measure of education level than to any other set of interdependent factors. In addition, the high R^2 obtained in this dimension of the model attests to the predictive capacity of variables that reflect some portion, or all of the educational attainment of populations. It should be noted that this finding was not unique but, in an aggregate sense, it helps to corroborate a similar finding derived from a study of individual demand schedules for higher education in Canada (Schaafsma, 1968).

There are, however, limitations upon the conclusions to be inferred from the use of an aggregate proxy measure. Though education level may be one of many factors involved in the determination of income levels, and, as such, may help to elaborate the association between income and expenditure, it, too, is subject to the criticism

that a collective "taste" for expenditures is not meaningful unless it can be shown that individual and aggregate demand schedules are highly correlated. Therefore, the present finding is no more than an indicator of a possible association between education level and expenditure.

A second limitation relates to the possibility that increases in the stock of human capital may only reflect recent educational attainment of a portion of the population. In this case, expenditures may be responding to increased ability of governments and individuals to finance higher education through the supposedly higher income of the "recently educated". This interpretation, however, may be far too narrow, since it overlooks the increasing income levels of other sectors of the population. There is also the distinct possibility of a demonstration effect in that individuals and governments might be willing to spend more for higher education if there are signs that increased educational attainment is conducive to the achievement of higher income and economic growth.

A major problem in the economics of Canadian higher education was highlighted in several provinces, namely, that per student operating expenditures rose at rates far exceeding increases in the participation rate. The underlying relationship was undoubtedly between expenditures and absolute numbers of students. Nonetheless, throughout the 1960's the problem remained one of accessibility to university education for larger percentages of the 18 to 24 age group. The accompanying expenditure implications, based on prevailing elasticities, would have been huge increases in the level of per student spending. Faced with limited resources to

support, but increased demand for higher education, many provinces created alternative, and hopefully, less expensive post-secondary options.

Related to this finding was the revelation that expenditures were more closely associated with participation rates than with the proportion of the population eligible for higher education by the end of the decade. It could be that the influence of formula financing underlay the pattern revealed after 1965. Conversely, the association between expenditures and eligibles in the first half of the decade may have been a reflection of the per capita grants scheme then in existence.

Finally, though expenditures tended to be more responsive to changes in population measures in relatively low income provinces, there was no evidence of a decline in birth rate, as expressed in the eligibility measure, as a factor associated with lower population-expenditure elasticities in high income provinces.

Fiscal Resources and Expenditure

The results obtained from the use of an interactive equation suggested that factors related to the fiscal resources of individual provinces were instrumental in changes in per student expenditure levels over time. The lack of uniformity in the association between interdependent variables leads to the conclusion that resource availability, and its use, is dictated by factors particular to each of the provinces, rather than by some common underlying determinant of economic behaviour. These findings re-assert the need for careful case studies of the behaviour patterns of individual

governments and demonstrate the inapplicability of pooled cross-sectional analysis.

Assuming that all other variables were controlled for, the effort variable, defined as the ratio of provincial operating grants to universities to total personal income, emerged as the leading predictor of change in expenditure levels in most provinces. Another proportional measure, the ratio of provincial operating grants to universities to net provincial expenditure on education, was the second most frequently recurring significant predictor of change in the criterion. These variables, in that they reflect some measure of provincial decision-making about the use of resources, may be indicative of the long range influences of policy factors upon the achievement of expenditure levels.

Since all derived interactive coefficients were either equal to or, for the most part, less than unity, it can be concluded that expenditures were not very responsive to changes in the associated independent variables. Though interprovincial variation in elasticity coefficients did exist, all significant fiscal resource-expenditure elasticities fell within the $-.33$ to 1.01 range. The overall results imply that the disparity in provincial fiscal resources was not, in itself, a factor leading to great variation in the responsiveness of expenditures among the provinces.

Investigation of simple correlation coefficients between the criterion and significant independent variables leads to the conclusion that there was a great deal of uniformity in the association between effort and expenditure among the Canadian provinces. Effort and income were most closely associated in

relatively high income provinces. Therefore, the findings suggest a pattern opposite to the one quoted in previous cross-sectional research. Although all provinces increased their effort over time, there was no uniform tendency for low income provinces to surpass the effort ratios of their higher income neighbours.

Independent elasticities for each of the fiscal resource-expenditure associations revealed that expenditures were slightly less responsive to effort in the Atlantic Provinces than in the rest of the country. At the same time, some of the highest own source revenue and federal transfer-expenditure coefficients were found in Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick. The federal transfer-expenditure elasticity also approached unity in Saskatchewan. The only province that tended to break the preceding pattern was British Columbia whose expenditure response to both own source revenue and federal transfers was fourth highest in Canada.

The highest ability-expenditure elasticities were found in high, middle, and low income provinces suggesting that the measure of ability may be a policy factor that is related to decision-making about how much of education expenditures should be devoted to university finance. Unfortunately, net provincial expenditure on education does not account for structural differences among the educational sectors of the provinces. It could well be that one province can devote more of its education budget to universities than another simply because it does not have to support the same number of educational enterprises.

Investigation of the ability measure revealed that net

provincial expenditures on education, including operating grants to universities, had, for the most part, greater rates of increase than exclusive expenditures. After 1967, however, provinces may have used funds transferred under the Fiscal Arrangements Act to increase spending on other forms of education. What has been described as an alternating pattern of expenditures was less evident in Quebec, Manitoba, and New Brunswick, the provinces with the highest ability-expenditure elasticity coefficients.

University Revenue Sources, Programme, and Expenditure

The major finding in this dimension of the model was that there existed no uniformity in the association between interdependent variables within or among provinces. Controlling for the effects of all other variables, proportion of total operating income from provincial sources emerged as significant in five of the ten provinces. Two other revenue measures, and the graduate student proportion of total enrolment were also significantly associated with expenditure. Partial provincial grant-expenditure elasticities in excess of unity were identified in only two provinces, Ontario and British Columbia, while the graduate enrolment-expenditure coefficient exceeded unity only in Saskatchewan. All other partial coefficients were either negative or below unity.

Reliance upon alternative sources of revenue was, over time, a feature of all provincial systems of higher education. However, since the proportion of individual sources of revenue to total operating income tended to increase or decrease more in one province, as opposed to another, derived elasticity coefficients

identify only those revenue sources whose upward or downward movements were most closely associated with the rise in expenditure in any one province. Therefore, it cannot be concluded that provincial revenues were "more important" to the universities of Nova Scotia than they were to the universities of Quebec simply because a significant elasticity was calculated in the former province and not in the latter. From the university point of view all revenue sources were "important". Expenditure, however, tended to be more sensitive to movements in one as opposed to another revenue source both within and among the provinces.

The interaction of revenue sources and programme in the $E = f(R,P)$ equation resulted in the following findings: University per student operating expenditures were most responsive to changes in (1) provincial support in Ontario, British Columbia, Nova Scotia, Manitoba and Prince Edward Island, (2) federal support in Newfoundland, Ontario, and Saskatchewan, and (3) other source revenue in New Brunswick, Quebec, and Alberta. Increases in the proportion of graduate students were associated with expenditure increases in Saskatchewan, Quebec, Manitoba, and New Brunswick, whereas a decline in proportion of undergraduate students was associated with significant expenditure response only in Alberta. The close association between undergraduate enrolment and expenditure in Alberta might be a manifestation of the influence of formula financing which began in 1964.

Calculation of individual associations between revenue sources and expenditure revealed that provincial source income-expenditure elasticities for the entire decade were well in excess

of unity in the Prairie Provinces and British Columbia. A similar calculation for the period after 1967 resulted in much lower coefficients with Ontario and the Western Provinces having higher elasticities than Quebec and the Atlantic Provinces. Expenditure response to changes in federal income prior to 1967 was highest in Saskatchewan followed by Prince Edward Island, Nova Scotia, and New Brunswick. There was too much, and in some cases too little fluctuation in other source income, to permit reliable comparisons but, Prince Edward Island appeared to be the only province in which the elasticity equalled unity.

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The model of university-government relationships developed in this study could be applied to analysis in which higher or post-secondary systems of education would be diversified according to institutional size. Such research would help to validate and elaborate the aggregate findings of the present study, particularly if the results of cost analysis studies of individual institutions were incorporated into a more refined definition of the expenditure base.

The present findings suggest more careful consideration of policy factors. A refinement of the dimensional model, particularly in the areas of fiscal resource use and university revenues and programme, could accomplish this purpose. It is suggested, on the basis of the present findings, that policy factors not be considered as a separate dimension of the relationship between educational institutions and government.

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APPENDICES

APPENDIX A
ANNUAL DATA FOR 19 VARIABLES IN ALL PROVINCES
1960/61 TO 1969/70

Table A1

Variable X₁: University Per Student Operating Expenditures
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	990	1071	1016	1085	1092	1118	1429	1925	2690	3156
Prince Edward Island	941	1097	766	867	900	1315	1588	1633	1922	2632
Nova Scotia	1141	1297	1372	1567	1658	1838	2348	2834	3024	3185
New Brunswick	1094	1190	1208	1366	1396	1641	1900	2113	2255	2588
Quebec	1516	1578	1619	1659	1673	1837	2056	2232	2960	3466
Ontario	1956	1925	2076	2228	2428	2588	3178	3725	4057	4172
Manitoba	1617	1669	1774	1888	2022	1987	2337	2832	2904	3120
Saskatchewan	1393	1438	1529	1627	1743	1927	2289	2581	2927	2932
Alberta	1702	1756	1858	1977	2117	2373	2796	3142	3223	3524
British Columbia	1469	1513	1605	1706	1832	1995	2417	2712	2928	3301

Source: Calculated from data in Tables B1, B2, and B3, Appendix B.

Table A2
Variable X₂: Per Capita Personal Income
Annual Data for All Provinces, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Newfoundland	895	932	951	998	1070	1154	1274	1398	1489	1617
Prince Edward Island	942	943	1047	1056	1165	1248	1367	1514	1691	1827
Nova Scotia	1242	1256	1307	1370	1452	1562	1713	1905	2074	2305
New Brunswick	1104	1099	1147	1217	1311	1416	1571	1739	1910	2088
Quebec	1411	1455	1532	1588	1710	1857	2045	2239	2409	2632
Ontario	1904	1908	2007	2111	2222	2409	2648	2842	3064	3371
Manitoba	1613	1546	1712	1727	1853	1969	2153	2407	2658	2843
Saskatchewan	1461	1146	1604	1788	1616	1879	2154	2089	2396	2517
Alberta	1615	1607	1711	1767	1821	1992	2281	2419	2658	2918
British Columbia	1856	1843	1924	2022	2145	2334	2542	2693	2835	3120

Source: B. Clift, National Income and Expenditure Division, Economic Accounts Branch, Statistics Canada.

Table A3

Variable X_3 : Proportion of Labour Force in the Manufacturing Sector
Annual Data for Quebec, Ontario, and British Columbia, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Quebec	.23	.24	.24	.23	.24	.24	.24	.23	.23	.23
Ontario	.25	.26	.27	.27	.28	.29	.29	.28	.28	.28
British Columbia	.17	.17	.18	.18	.17	.18	.17	.16	.15	.16

Source: Calculated from data in Tables B4 and B7, Appendix B.

Table A4

Variable X_4 : Proportion of Labour Force in the Service Sector
Annual Data for Quebec, Ontario, and British Columbia, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Quebec	.21	.22	.23	.24	.25	.25	.26	.27	.28	.29
Ontario	.25	.26	.27	.28	.28	.29	.30	.30	.32	.33
British Columbia	.24	.26	.27	.27	.27	.28	.29	.30	.30	.31

Source: Calculated from data in Tables B5 and B7, Appendix B.

Tqble A5

Variable X₅: Proportion of Labour Force Unemployed
Annual Data for Québec, Ontario, and British Columbia, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Quebec	.09	.09	.08	.07	.06	.05	.05	.05	.07	.07
Ontario	.05	.05	.04	.04	.03	.03	.03	.03	.04	.03
British Columbia	.08	.09	.07	.06	.05	.04	.05	.05	.06	.05

Source: Calculated from data in Tables B6 and B7, Appendix B.

Table A6

Variable X₆: Proportion of Population Aged 18 - 24
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	.10	.10	.10	.10	.11	.11	.11	.12	.13	.14
Prince Edward Island	.09	.09	.09	.09	.09	.09	.10	.11	.12	.13
Nova Scotia	.10	.10	.10	.10	.11	.11	.11	.11	.12	.12
New Brunswick	.09	.09	.10	.10	.10	.10	.11	.12	.12	.13
Quebec	.10	.10	.11	.09	.11	.12	.12	.12	.13	.13
Ontario	.09	.09	.09	.09	.09	.10	.10	.11	.11	.12
Manitoba	.09	.09	.09	.10	.10	.10	.11	.11	.11	.12
Saskatchewan	.09	.09	.09	.09	.09	.10	.10	.10	.11	.12
Alberta	.10	.09	.10	.10	.10	.10	.10	.11	.11	.11
British Columbia	.09	.08	.09	.09	.09	.10	.10	.11	.11	.11

Source: Calculated from data in Table B8 and B9, Appendix B.

Table A7

Variable X7: Number of Teachers Per 10,000 of Population
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	9.64	9.83	10.23	10.58	11.08	11.36	11.45	11.71	12.24	12.29
Prince Edward Island	9.41	9.65	10.02	10.48	10.70	11.09	12.09	12.82	13.25	13.51
Nova Scotia	9.17	9.43	9.62	9.88	10.12	10.45	10.63	11.21	11.73	12.38
New Brunswick	9.96	10.10	10.36	10.44	10.76	11.08	11.23	11.70	12.08	12.52
Quebec	8.89	9.43	10.03	9.90	10.34	9.97	10.99	12.12	11.30	11.81
Ontario	8.07	8.41	8.78	9.26	9.67	10.11	10.62	11.09	11.61	12.07
Manitoba	8.23	8.75	8.82	8.99	9.36	9.57	9.80	10.31	11.14	12.17
Saskatchewan	9.44	9.73	9.94	10.24	10.61	11.05	11.44	11.60	11.97	12.05
Alberta	9.11	9.32	9.60	9.90	10.29	10.70	11.18	11.74	12.30	12.70
British Columbia	7.41	7.68	8.02	8.28	8.53	8.77	9.05	9.38	9.71	10.07

Source: Calculated from data in Table B7 and Statistics Canada, Salaries and Qualifications of Teachers, 1969/70. Ottawa: Queen's Printer, February, 1971, p. 18.

Table A8

Variable X₈: Proportion of Population Aged 18 - 24 Attending University
Annual Data for All Provinces, 1960/61 to 1969/70

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Newfoundland	.0275	.0385	.0418	.0454	.0521	.0600	.0701	.0748	.0744	.0745
Prince Edward Island	.0593	.0727	.0750	.0761	.0835	.0924	.1035	.1170	.1205	.1119
Nova Scotia	.0803	.0882	.0930	.1004	.1073	.1190	.1191	.1237	.1321	.1502
New Brunswick	.0728	.0805	.0838	.0865	.0946	.1010	.1012	.1107	.1156	.1160
Quebec	.0713	.0794	.0833	.1056	.0945	.1021	.1076	.1141	.0857	.0862
Ontario	.0590	.0654	.0699	.0750	.0812	.0888	.0943	.1035	.1139	.1268
Manitoba	.0742	.0816	.0885	.0972	.0981	.1141	.1218	.1285	.1366	.1422
Saskatchewan	.0676	.0758	.0826	.0905	.1077	.1170	.1200	.1267	.1307	.1337
Alberta	.0588	.0675	.0756	.0821	.0937	.1026	.1109	.1246	.1485	.1597
British Columbia	.0959	.1076	.1099	.1137	.1150	.1334	.1363	.1424	.1445	.1429

Source: Calculated from data in Tables B2, B3, and B8, Appendix B.

Table A9

Variable X₉: Provincial Own Source Revenue (x 1000 of \$)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Newfoundland			44915	47292	61086	70157	80053	94593	122583	124962	
Prince Edward Island	10803	12366	13541	11877	12614	15442	18729	20131	28455	34187	
Nova Scotia	66697	77584	87100	83646	96243	111006	177794	140027	175824	201117	
New Brunswick	67563	64833	69489	70540	79128	83742	108612	149583	178931	214303	
Quebec	582006	699356	798801	882813	1114710	1241737	1387963	1730343	2021499	2194960	
Ontario	866044	949384	1118076	1216278	1395980	1650031	2037716	2431983	3011085	3631033	
Manitoba	103248	117320	126496	133963	153460	183663	208488	273778	323769	395148	
Saskatchewan	139813	156439	197925	224045	242387	276227	292188	335578	385895	414819	
Alberta	251046	277411	300600	341760	402739	481165	499589	550428	742653	756421	
British Columbia	317953	342376	369805	402800	466984	561763	636359	706786	886092	958664	

Source: Calculated from data in Tables B10, Appendix B, and A12, Appendix A.

Table A10

Variable X₁₀: Ratio of Provincial Operating Grants to Universities to Total Personal Income
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	.0007	.0010	.0009	.0011	.0011	.0011	.0014	.0079	.0122	.0129
Prince Edward Island	.0018	.0013	.0010	.0013	.0012	.0016	.0038	.0074	.0107	.0178
Nova Scotia	.0014	.0015	.0018	.0029	.0030	.0040	.0052	.0112	.0124	.0129
New Brunswick	.0016	.0025	.0017	.0030	.0033	.0036	.0034	.0088	.0100	.0122
Quebec	.0031	.0025	.0023	.0025	.0026	.0034	.0028	.0063	.0068	.0085
Ontario	.0019	.0020	.0023	.0027	.0032	.0042	.0054	.0094	.0112	.0123
Manitoba	.0031	.0038	.0039	.0036	.0048	.0050	.0060	.0099	.0101	.0116
Saskatchewan	.0025	.0040	.0031	.0040	.0055	.0056	.0063	.0094	.0097	.0112
Alberta	.0035	.0038	.0042	.0050	.0061	.0068	.0082	.0123	.0145	.0152
British Columbia	.0022	.0024	.0028	.0031	.0037	.0046	.0055	.0089	.0097	.0107

Source: Calculated from data in Tables B11 and B12, Appendix B.

Table A11

Variable X₁₁: Provincial Operating Grants to Universities as a Proportion
of Net Provincial Expenditure on Education
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	.0160	.0210	.0170	.0210	.0200	.0210	.0160	.0850	.1500	.1640
Prince Edward Island	.0550	.0370	.0260	.0290	.0300	.0400	.0770	.1520	.2040	.3020
Nova Scotia	.0520	.0550	.0610	.0910	.0910	.1080	.1280	.2630	.2590	.2650
New Brunswick	.0760	.1130	.0660	.1050	.1180	.1450	.0870	.1130	.1170	.1430
Quebec	.1220	.0770	.0650	.0650	.0610	.0780	.0670	.1620	.1520	.1860
Ontario	.0940	.0860	.0800	.0980	.1010	.1180	.1290	.2180	.2370	.2640
Manitoba	.1310	.1510	.1590	.1490	.1960	.1480	.1930	.2580	.2600	.2640
Saskatchewan	.0860	.0980	.0990	.1180	.1390	.1460	.1610	.2600	.2540	.2900
Alberta	.0900	.0930	.0920	.1200	.1420	.1360	.1360	.2080	.2650	.2950
British Columbia	.0880	.0930	.1010	.1090	.1280	.1530	.1570	.2970	.2460	.2760

Source: Calculated from data in Tables B11 and B13, Appendix B.

Table A12

Variable X₁₂: Total Federal Transfer Payments to Provinces Excluding
 Direct Per Capita Grants to Universities, 1960/61 to 1966/67, and
 Funds Transferred Under Section II of the Federal-Provincial Fiscal Arrangements Act (1967),
 1960/61 to 1969/70

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Newfoundland	51664	50143	65584	72155	83922	95559	98804	137086	133960	165324	
Prince Edward Island	10097	10640	12552	15624	16084	18381	19886	28368	26503	34917	
Nova Scotia	54135	53628	61008	63804	73059	89443	68307	169361	160066	192045	
New Brunswick	46935	47944	52269	58367	73886	92617	91804	130766	134293	144523	
Quebec	141486	239600	296440	320010	431818	510664	604012	761112	810271	919063	
Ontario	158852	192305	327598	286296	261563	319036	400236	464500	481783	605741	
Manitoba	42180	44922	54004	59411	71461	80898	108077	117154	110482	136053	
Saskatchewan	52429	53827	68153	64543	68143	73860	96214	97308	91243	109264	
Alberta	52750	60303	84030	78187	74361	83945	104501	109772	118410	145181	
British Columbia	73085	84024	78305	86080	84198	101941	112099	122278	154286	181400	

Source: W. Haney, Federal-Provincial Relations Division, Department of Finance, Ottawa.

Table A13

Variable X₁₃: Ratio of Federal to Provincial Operating Expenditures for Universities (as a percentage)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	2.3480	1.5560	2.3880	1.9580	2.0560	2.1280	3.2590	.1560	.1120	.2260
Prince Edward Island	.9360	1.3970	1.3960	1.3900	1.3900	1.0370	.9980	.0360	.0140	.0000
Nova Scotia	1.3440	1.3500	1.4310	.9690	.9030	.6940	1.0360	.4260	.1740	.1870
New Brunswick	1.0030	.6750	1.2300	.7000	.6030	.5470	1.3310	.1440	.1030	.0830
Quebec	.6430	.7890	.9510	.9260	.8560	.6940	1.4430	.2450	.2610	.2140
Ontario	.7810	.7550	.7480	.6340	.5620	.4420	.5810	.1730	.1550	.1480
Manitoba	.4690	.4560	.4560	.5650	.4560	.4070	.6540	.2210	.2420	.1960
Saskatchewan	.6820	.5550	.6640	.4820	.4210	.4090	.5640	.2180	.2230	.1920
Alberta	.3570	.3640	.4060	.3990	.3000	.2820	.3800	.1230	.1230	.1200
British Columbia	.8630	.7650	.7540	.7140	.5910	.4740	.6650	.2240	.2320	.1940

Source: Calculated from data in Tables B11 and B14, Appendix B.

Table A14

Variable X₁₄: Federal Conditional Grants to Provinces (x 1000 of \$)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1963 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	19074	21644	31740	36818	45150	52977	49329	62431	60921	74079
Prince Edward Island	4234	4425	5522	7592	6403	8176	8463	13563	12228	18353
Nova Scotia	23213	25349	28368	31483	33489	40609	67759	93106	84560	101495
New Brunswick	20225	22600	24470	29603	38660	44652	44386	66103	62481	69029
Quebec	66659	170881	210181	241148	320388	380470	443864	514969	534554	567992
Ontario	154633	187030	322007	280653	255875	313091	394561	458300	471696	592322
Manitoba	25995	30847	36656	43637	47716	53395	73223	73004	70484	93840
Saskatchewan	26556	30430	38365	40010	41951	45050	59789	68409	75523	96594
Alberta	31433	40754	70460	65756	63750	77997	98389	102380	108014	134952
British Columbia	63501	72482	78305	83907	82241	101941	110491	120436	152052	179251

Source: W. Haney, Federal-Provincial Relations Division, Department of Finance, Ottawa.

Table A15

Variable X₁₅: Proportion of Total University Operating Income From Provincial Sources
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	.20	.26	.21	.22	.20	.18	.16	.64	.70	.66
Prince Edward Island	.32	.20	.20	.20	.20	.21	.31	.65	.70	.80
Nova Scotia	.20	.17	.20	.25	.25	.28	.29	.54	.55	.51
New Brunswick	.28	.33	.20	.32	.33	.33	.26	.57	.58	.62
Quebec	.38	.28	.26	.25	.26	.29	.22	.47	.52	.59
Ontario	.35	.34	.35	.38	.39	.46	.45	.64	.66	.67
Manitoba	.47	.46	.46	.41	.46	.44	.42	.60	.59	.63
Saskatchewan	.40	.45	.42	.49	.49	.49	.46	.59	.55	.61
Alberta	.57	.54	.52	.52	.56	.58	.57	.72	.69	.69
British Columbia	.34	.34	.37	.38	.40	.42	.41	.58	.59	.62

Source: Calculated from data in Tables B11 and B15, Appendix B.

Table A16

Variable X₁₆: Proportion of Total University Operating Income from Federal Sources
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	.47	.41	.49	.44	.40	.39	.51	.10	.08	.08
Prince Edward Island	.30	.28	.28	.28	.28	.22	.31	.02	.01	.00
Nova Scotia	.27	.22	.28	.24	.22	.19	.30	.23	.10	.09
New Brunswick	.28	.22	.25	.23	.20	.18	.35	.08	.06	.05
Quebec	.24	.22	.25	.24	.22	.20	.31	.11	.14	.13
Ontario	.28	.25	.26	.24	.22	.20	.26	.11	.10	.10
Manitoba	.22	.21	.21	.23	.21	.18	.28	.13	.14	.12
Saskatchewan	.27	.25	.28	.24	.21	.20	.26	.13	.12	.12
Alberta	.21	.19	.21	.21	.17	.16	.22	.09	.08	.08
British Columbia	.30	.26	.28	.27	.24	.20	.27	.13	.14	.12

Source: Calculated from data in Tables B14 and B15, Appendix B.

Table A17

Variable X17: Proportion of Total University Operating Income
From Sources Other Than Federal and Provincial Governments
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	.34	.33	.30	.34	.40	.43	.33	.26	.22	.26
Prince Edward Island	.38	.51	.51	.51	.51	.57	.38	.32	.29	.20
Nova Scotia	.52	.61	.52	.51	.53	.53	.41	.22	.35	.40
New Brunswick	.45	.45	.55	.45	.48	.49	.38	.35	.36	.33
Quebec	.38	.50	.49	.51	.53	.51	.47	.42	.35	.28
Ontario	.37	.41	.39	.38	.39	.34	.29	.25	.24	.23
Manitoba	.31	.33	.33	.36	.33	.38	.30	.27	.26	.25
Saskatchewan	.32	.31	.31	.28	.31	.31	.28	.28	.33	.27
Alberta	.22	.27	.27	.27	.27	.26	.21	.19	.23	.23
British Columbia	.36	.39	.35	.35	.36	.38	.32	.29	.27	.27

Source: Calculated from data in Tables B11, B14, and B15.

Table A18

Variable X₁₈: Proportion of Full Time Undergraduate Students in Total Full Time Enrolment
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	.97	.99	.98	.98	.98	.98	.98	.97	.95	.95
Prince Edward Island	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Nova Scotia	.97	.97	.97	.97	.95	.95	.95	.94	.94	.93
New Brunswick	.97	.97	.96	.96	.95	.94	.94	.93	.93	.94
Quebec	.95	.95	.94	.93	.92	.91	.91	.91	.91	.90
Ontario	.92	.92	.92	.90	.89	.88	.89	.88	.88	.88
Manitoba	.96	.96	.96	.94	.94	.95	.94	.94	.92	.91
Saskatchewan	.96	.96	.96	.96	.96	.96	.95	.95	.95	.95
Alberta	.95	.94	.93	.93	.92	.91	.91	.90	.90	.89
British Columbia	.93	.95	.96	.95	.94	.94	.94	.93	.91	.91

Source: Calculated from data in Tables B2 and B3, Appendix B.

Table A19

Variable X₁₉: Proportion of Full Time Graduate Students in Total Full Time Enrolment
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	.03	.01	.02	.02	.02	.02	.02	.03	.05	.05
Prince Edward Island	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nova Scotia	.03	.03	.03	.03	.05	.05	.05	.06	.06	.07
New Brunswick	.02	.03	.04	.04	.05	.06	.06	.07	.07	.06
Quebec	.05	.05	.06	.07	.08	.09	.09	.09	.09	.10
Ontario	.08	.08	.08	.10	.11	.12	.11	.12	.12	.12
Manitoba	.04	.04	.04	.06	.06	.05	.06	.06	.08	.09
Saskatchewan	.04	.04	.04	.04	.04	.04	.05	.05	.05	.05
Alberta	.05	.06	.07	.07	.08	.09	.09	.10	.10	.11
British Columbia	.07	.05	.04	.05	.06	.06	.06	.07	.09	.09

Source: Calculated from data in Tables B2 and B3, Appendix B.

APPENDIX B

ANNUAL DATA USED IN VARIABLE CONSTRUCTION: ALL PROVINCES

1960/61 TO 1969/70

Table B1

University Operating Expenditures (x 1000 of \$)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	1225	1881	2030	2435	2895	3542	5563	8611	12864	16274
Prince Edward Island	530	749	540	640	722	1215	1809	2236	2989	4122
Nova Scotia	6632	8311	9648	12103	14105	17386	23024	29759	36004	45579
New Brunswick	4446	5394	5914	7039	8061	10454	13040	16753	20206	24868
Quebec	57388	68022	76639	88952	99353	123679	154338	184418	190628	231643
Ontario	62791	69043	81523	98463	123335	152666	217893	294639	375669	454030
Manitoba	10121	11593	13736	16618	18549	21993	28948	38022	43844	51786
Saskatchewan	7873	9103	10740	12708	16739	20627	26494	32765	40644	43898
Alberta	12370	14924	18277	21899	27473	34997	47476	61868	80321	100620
British Columbia	19192	22250	24968	29074	33990	46173	63710	79797	93684	111377

Source: A. Horvath, Financial Information Section, Education Division, Statistics Canada.

Table B2

Full Time Undergraduate Enrolment
Annual Data For All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	1205	1740	1964	2197	2601	3106	3824	4324	4563	4909
Prince Edward Island	563	683	705	738	803	924	1139	1369	1555	1566
Nova Scotia	5664	6237	6792	7453	8109	8997	9284	9821	11164	13276
New Brunswick	3973	4384	4715	4954	5468	5998	6423	7383	8322	9008
Quebec	35862	40849	44511	49737	54759	61506	68570	74948	58424	60275
Ontario	29501	32968	35941	39990	45369	52124	60862	69307	81091	95367
Manitoba	6008	6653	7445	8238	8641	10469	11702	12631	13928	15133
Saskatchewan	5442	6103	6771	7496	9266	10300	11021	12051	13228	14287
Alberta	6918	8028	9181	10254	11929	13445	15380	17764	22455	25539
British Columbia	12210	13902	14927	16198	17497	21833	24748	27422	29243	30570

Source: Z. Zsigmond, Division of Educational Projections, Education Division, Statistics Canada.

Table B3

Full Time Graduate Enrolment
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	33	17	34	47	51	62	69	149	219	248
Prince Edward Island	0	0	0	0	0	0	0	0	0	0
Nova Scotia	147	172	242	269	400	460	522	680	741	1035
New Brunswick	90	149	181	199	305	383	439	544	639	600
Quebec	1981	2307	2813	3868	4641	5810	6500	7662	5977	6555
Ontario	2599	2903	3328	4201	5424	6859	7727	9782	11498	13458
Manitoba	251	294	296	564	531	600	687	795	1171	1464
Saskatchewan	210	226	253	315	337	407	556	646	656	686
Alberta	350	471	656	825	1048	1304	1603	1924	2467	3012
British Columbia	857	808	633	845	1060	1311	1616	2005	2752	3173

Source: Z. Zsigmond, Division of Educational Projections, Education Division, Statistics Canada.

Table B4

Number of Employees in the Manufacturing Sector (x 100)
Annual Data for Quebec, Ontario, and British Columbia, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Quebec	4164	4299	4428	4464	4599	4753	4973	5070	5155	5270
Ontario	5878	6226	6539	6808	7122	7511	7965	8067	8106	8370
British Columbia	957	1002	1042	1089	1112	1174	1229	1228	1233	1307

Source: Estimates of Employees by Province and Industry, 1961 to 1968. Dominion Bureau of Statistics, 1969, and information provided by W. Campbell, Employment Section, Labour Division, Statistics Canada.

Table B5

Number of Employees in the Service Sector (x 100)
Annual Data for Quebec, Ontario, and British Columbia, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Quebec	3729	4017	4279	4537	4824	5137	5444	5932	6183	6569
Ontario	5827	6208	6535	6879	7261	7624	8112	8595	9272	9964
British Columbia	1362	1488	1564	1629	1730	1897	2078	2253	2394	2591

Source: Estimates of Employees by Province and Industry, 1961 to 1968. Dominion Bureau of Statistics, 1969, and information provided by W. Campbell, Chief, Employment Section, Labour Division, Statistics Canada.

Table B6

Number Unemployed in the Labour Force (x 1000)
Annual Data for Quebec, Ontario, and British Columbia, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Quebec	164	168	139	142	124	109	100	116	145	158
Ontario	128	132	105	94	83	66	69	89	104	95
British Columbia	48	49	39	39	34	28	32	39	47	42

Source: The Labour Force. Statistics Canada, September, 1971, p. 51.

Table B7

The Labour Force (x 1000)
Annual Data for Quebec, Ontario, and British Columbia, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Quebec	1803	1820	1852	1904	1951	2022	2116	2196	2227	2290
Ontario	2377	2401	2422	2476	2556	2614	2719	2834	2934	3032
British Columbia	565	575	590	610	639	666	710	762	797	836

Source: The Labour Force. Statistics Canada, September, 1971, p. 51.

Table B8

The 18 - 24 Year Old Population (x 100)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	451	456	478	494	509	528	555	598	643	692
Prince Edward Island	95	94	94	97	96	100	110	117	129	140
Nova Scotia	724	727	756	769	793	795	823	849	901	953
New Brunswick	558	563	584	596	610	631	678	716	775	828
Quebec	5304	5432	5682	5077	6283	6595	6977	7240	7513	7757
Ontario	5439	5485	5620	5891	6253	6642	7274	7642	8127	8581
Manitoba	844	851	875	906	935	970	1017	1045	1105	1167
Saskatchewan	836	835	850	863	892	915	965	1002	1062	1120
Alberta	1236	1260	1302	1350	1385	1437	1532	1580	1678	1788
British Columbia	1363	1367	1416	1499	1614	1735	1934	2066	2214	2361

Source: Z. Zsigmond, Division of Educational Projections, Education Division, Statistics Canada.

Table B9

Provincial Populations (x 1000)
Annual Data for All Provinces, 1960 to 1969

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Newfoundland	448	458	468	476	483	488	493	500	507	514
Prince Edward Island	103	105	107	108	109	109	109	109	110	110
Nova Scotia	727	737	746	751	755	756	756	757	760	763
New Brunswick	589	598	605	609	611	615	617	620	624	625
Quebec	5142	5259	5371	5481	5584	5685	5781	5868	5927	5984
Ontario	6111	6236	6351	6481	6631	6788	6961	7149	7306	7452
Manitoba	906	922	936	949	959	965	963	963	971	979
Saskatchewan	915	925	930	933	942	950	955	958	960	959
Alberta	1291	1332	1369	1403	1429	1450	1463	1490	1526	1561
British Columbia	1602	1629	1660	1699	1745	1797	1874	1947	2007	2067

Source: B. Clift. National Income and Expenditure Division, Economic Accounts Division, Statistics Canada.

Table B10

Provincial Gross General Revenue (x 1000 of \$)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Nfld.	85760	90973	110499	119447	145008	165716	178857	231679	262543	290286
PEI.	21900	23006	26093	27501	28698	33823	38615	48499	54958	69104
NS.	120832	131212	148108	147450	169302	200449	246101	309388	335890	393162
NB.	224498	112777	121758	128907	153014	176359	200416	280348	313224	358826
Que.	723492	938956	1095241	1202823	1546528	1752402	1991975	2491455	2831771	3114023
Ont.	1024896	1141689	1445675	1502574	1657544	1969068	2437953	2896484	3492868	4236774
Man.	145428	162246	180500	193374	224921	264561	316565	390932	434251	531201
Sask.	192242	210266	266078	288588	310530	350087	388402	432886	477138	524083
Alta.	303796	337714	384630	419947	477100	565110	604090	660200	861063	901602
BC.	391038	426400	448110	488880	551182	663704	748458	829064	1040378	1140064

Source: C. D. P. Bernier. Provincial Government Section, Financial Statistics Division, Statistics Canada.

Table B11

Provincial Operating Grants to Universities (x 1000 of \$)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	293	432	415	530	558	617	883	5557	9202	10758
Prince Edward Island	172	131	111	146	154	216	567	1226	1985	3575
Nova Scotia	1307	1376	1782	2945	3337	4674	6698	16172	19516	22653
New Brunswick	1047	1611	1152	2191	2614	3132	3316	9540	11911	15865
Quebec	22257	19027	19019	21359	24729	35467	32259	83407	96816	134145
Ontario	21984	23284	28686	37395	47726	69497	98959	190282	249675	309334
Manitoba	4510	5421	6317	5841	8536	9593	12359	22869	26039	32409
Saskatchewan	3310	4254	4674	6609	8349	10068	12945	18762	22364	27076
Alberta	7362	8165	9771	12346	15805	19509	27444	44345	58829	69377
British Columbia	6436	7322	8858	10527	13813	19226	26354	46548	55246	69190

Source: A. Horvath, Financial Information Section, Education Division, Statistics Canada.

Table B12

Total Personal Income (x 1,000,000 of \$)
Annual Data for All Provinces, 1960 to 1970

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Newfoundland	401	427	445	475	517	563	628	699	755	831
Prince Edward Island	97	99	112	114	127	136	149	165	186	201
Nova Scotia	903	926	975	1029	1096	1181	1295	1442	1576	1759
New Brunswick	650	657	694	741	801	871	969	1078	1192	1305
Quebec	7257	7654	8226	8702	9547	10555	11820	13140	14276	15750
Ontario	11635	11896	12745	13679	14736	16353	18433	20315	22385	25120
Manitoba	1461	1425	1602	1639	1777	1900	2073	2318	2581	2783
Saskatchewan	1337	1060	1492	1668	1522	1785	2057	2001	2300	2414
Alberta	2085	2141	2343	2479	2602	2888	3337	3604	4056	4555
British Columbia	2973	3003	3194	3436	3743	4195	4763	5244	5689	6449

Source: B. Clift, National Income and Expenditure Division, Economic Accounts Branch, Statistics
Canada.

Table B13

Provincial Net Education Expenditure (x 1000 of \$)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	18180	20739	24306	25305	27420	28987	55651	65269	61366	65538
Prince Edward Island	3125	3525	4205	4984	5113	5363	7360	8042	9713	11836
Nova Scotia	25086	25219	29125	32382	36734	43255	52356	61471	75426	85480
New Brunswick	13838	14272	17447	20773	22233	21528	38193	84066	101767	110970
Quebec	182419	247732	290777	328625	404913	456673	487925	514383	638793	721323
Ontario	234036	269310	359469	381054	474654	591211	769660	873137	1054201	1172424
Manitoba	34546	35982	39796	39194	43459	64667	64190	88725	99958	122584
Saskatchewan	38638	43276	47427	55937	59895	69181	80332	72129	87944	93286
Alberta	82064	87546	105879	102496	111258	143682	202344	213669	222104	235105
British Columbia	73353	79130	87531	96269	108004	125895	168203	156652	224626	250511

Source: A. Horvath, Financial Information Section, Education Division, Statistics Canada.

Table B14

Federal Operating Grants to Universities (x 1000 of \$)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Newfoundland	688	672	991	1038	1147	1313	2878	869	1032	1355
Prince Edward Island	161	183	155	203	214	224	566	44	27	0
Nova Scotia	1757	1858	2518	2854	3013	3246	6940	6888	3398	4229
New Brunswick	1050	1088	1417	1533	1577	1714	4415	1377	1230	1310
Quebec	14311	15018	18090	19787	21167	24597	46982	20451	25303	28754
Ontario	17161	17591	21451	23717	26843	30726	57454	32993	38813	45639
Manitoba	2117	2470	2879	3300	3890	3903	8081	5049	6298	6362
Saskatchewan	2258	2360	3105	3188	2516	4114	7307	4085	4990	5206
Alberta	2627	2968	3969	4931	4734	5494	10441	5433	7254	8306
British Columbia	5556	5603	6683	7518	8157	9108	17524	10404	12798	13418

Source: A. Horvath, Financial Information Section, Education Division, Statistics Canada.

Table B15

Total University Operating Income (x 1000 of \$)
Annual Data for All Provinces, 1960/61 to 1969/70

	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	1966 1967	1967 1968	1968 1969	1969 1970
Newfoundland	1479	1652	2015	2383	2834	3369	5601	8633	13066	16286
Prince Edward Island	540	646	545	716	756	1019	1826	1876	2846	4485
Nova Scotia	6432	8834	8963	11919	13506	16953	23304	29679	35216	44842
New Brunswick	3799	4945	5684	6809	8024	9562	12561	16871	20403	25681
Quebec	58649	67971	73112	84197	96873	121615	151061	178444	187350	226338
Ontario	62177	69234	82350	97801	122896	152100	218790	296874	380898	458410
Manitoba	9574	11792	13742	14351	18567	21870	29375	38284	43834	51692
Saskatchewan	8225	9518	11194	13516	17076	20512	28092	31564	40841	44327
Alberta	12813	15236	18805	23679	28114	33832	48261	61678	85384	100414
British Columbia	18812	21279	23891	27921	34122	45617	64623	79874	93419	112472

Source: A. Horvath, Financial Information Section, Education Division, Statistics Canada.