PRIVATE RETURNS TO EDUCATION AND TRAINING FOR SELECTED TRADE-OCCUPATIONS AND VOCATIONAL TEACHING

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by

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CHAPTER I

INTRODUCTION

Since the I950's there has been an increasing interest in the significance of education to levels of income and economic growth. This interest has generated many empirical studies concerning the economic benefits that accrue to the individual and society by treating education as an investment in 'human capital'. Estimates have been made of the level of investment in, and the rates of return from, education from the viewpoint of both society and the private individual (6. I956), (7. I960), (8, I96I), (9. I962), (I. I964), (2. I965), (IO. I966). As the theoretical framework of the human capital approach to education is discussed later in the study, only a brief summary of the basic information is provided in this section.

The general assumption of the human capital approach is that through the education and training he receives, man acquires the knowledge and skills which enable him to perform effectively and efficiently the complex functions associated with industrial, commercial, and social development. Insofar as they enable an

organization to maintain and increase the value of its operation, the human resources of knowledge and skills become marketable and sought-after commodities. Generally, but not necessarily, the labour market provides higher rewards for higher levels of education and training. Therefore, it is expected that there is a close relationship between an individual's education and training and his total earnings. In addition, because an individual's education contributes to the productivity of the organization, it helps to maintain and further the growth of the economic life of the community and nation. Collectively, the educational stock of a nation is a significant factor in its economic status and growth.

Reference to a passage in the Economic Council of Canada's Seventh Annual Review may partly explain why a growing proportion of the total federal government spending has been allocated to education with the result that it now exceeds six billion dollars, a figure representing over twenty per cent of government spending in Canada. "By almost any measure, education now is Canada's biggest industry" (5. 1970, p. 55).

> Since the beginning of the work of the Council, we have repeatedly emphasized the important role that education can play in furthering the social and economic well-being of Canadians. This role has many elements - some related to the fact that education has intrinsic value, and some

> related to the fact that education can help to promote economic growth and thereby help to satisfy more fully the broader economic and social needs, wants and aspirations of Canadians. One of the principal themes of our earlier analysis is that education, considered as an investment in human beings, tends to improve the employability and the productive capacities of individuals (5. I970, p. 55).

Vocational education is a vital area of education in which the skills and quality of an important section of the labour force is developed. In recognition of this fact, the federal government has allocated a great deal of financial aid to it and its contributions have had a great effect on all phases of public vocational training throughout Canada.

Federal aid has been applied to vocational training since I9II but a much greater interest and activity was generated by the passing of the Technical and Vocational Assistance Act (S.C. I960-6I, c.6), and more specifically by the implementation of the various federal-provincial Technical and Vocational Agreements that became effective on April I, I96I, in which the financial burden of providing facilities for vocational training would be shared by the federal government and the ten provinces.

Under this Act - effective for six years - Ottawa was authorized to enter into agreement with a

province to contribute towards capital and operating costs of vocational education. All the provinces entered into such an agreement. It provided federal money for the building and equipping of vocational training facilities, the training of technicians, vocational teachers, and students in technological programs. It also included the training or retraining of many categories of citizens. By March I967, the federal and provincial governments had accepted projects at more than I,476,000,000 dollars to provide 662 new schools and 439,950 new places for students (Table I).

With the expiry in March, I967, of the federal-provincial agreements under the terms of the Technical and Vocational Training Act of I96I, these agreements were not renewed except that the financing of capital projects was kept in operation until each province will have received the full federal contribution provided by law. In place of the expired agreements, the federal government now pays the full cost of vocational training of adults, including living allowances, under the Adult Occupational Training Act (S.C. I967, c.94). The new Act announced a change of emphasis on the part of the federal government in its policy for training in a way that would be in accord with national economic priorities. When the subject of renewing the original agreements of I96I was being debated, Lester Pearson, then the Prime

TABLE I

TECHNICAL AND VOCATIONAL TRAINING AGREEMENT

Capital Projects Approved For Federal Government's Financial Assistance, April I, I96I to March 3I, I967*

	New Schools				Student places	Total estimated cost (3)	Estimated federal share (3)
	Inst. Tech. (I)	Adult Trg. Sch.	Voc. H.S. (2)	Inst. Tech.			
Nfld.....	I	I2	-	-	3,870	$ 3I,899,769	$ 23,I50,535
P.E.I.....	-	I	I	-	I,486	3,859,066	2,894,287
N.S.....	2	7	II	-	6,0I3	25,23I,782	I7,524,887
N.B.....	2	4	I	-	3,695	I3,999,897	9,6I3,4I7
Que.....	7	3I	III	I3	II3,228	305,430,8I9	I85,09I,560
Ont.....	2	I4	3I9	5	2I9,996	806,772,900	368,537,324
Man.....	I	2	I	-	6,752	27,555,300	20,243,628
Sask.....	I	-	I2	I	I2,634	49,447,69I	27,I68,033
Alta.....	2	5	50	I	35,I42	I30,009,057	80,897,976
B.C.....	I	6	34	-	36,624	80,I9I,236	55,99I,456
Yukon.....	-	I	-	-	482	I,5I2,644	992,593
N.W.T.....	-	-	-	-	30	896,750	I36,5I9
TOTAL	I9	83	540	20	439,952	I,476,779,9II	792,242,2I5

(I) All the institutes of technology listed offer trade training courses with the exception of the institutes in Ontario, the British Columbia Institute of Technology and 6 of the institutes in Quebec.

(2) This list includes Tech. Sec. Schools and Voc. depts. in Composite High Schools.

(3) From April I, I96I.

* Compiled from D.B.S. publications - Survey of Education Finance, No. 81-208 annual, and Survey of Vocational

Minister of Canada, explained the rationale behind federal contributions to training facilities that were oriented to occupations. He stated that, while education is primarily a matter of provincial jurisdiction, it is also a matter of far-reaching importance to the nation as a whole. Thus, the government indicated that it felt responsible for adult retraining in recognition of the fact that this area of education is an essential part of the economic growth of Canada. Occupationally-oriented training facilities influences both labour force and the economy by ensuring greater productivity and individual earnings. Through financial assistance in the form of grants, the provinces have been able to expand their training facilities, increase enrolments, and improve the efficiency of instruction.

The impact of the two Acts on the advancement of technical and provincial education in Newfoundland has been enormous. Since I960, the province has constructed and put into operation eleven new district vocational schools and the College of Trades and Technology at St. John's. The older established College of Fisheries, Navigation, Marine Engineering and Electronics is also situated in St. John's.

According to the Newfoundland Department of Education's Newsletter of January, I97I, these institutions

have now become inadequate to serve the vocational needs of the province. Consequently, it was announced that the provincial government would shortly initiate Phase 2 of the expansion. This would include:

1. The building of thirteen new vocational schools (five of them in the present year, I97I-72) all designed to integrate with the academic Regional High Schools.

2. Expansion and re-equipping of several existing Vocational High Schools and of the College of Trades and Technology.

3. The creation of a polytechnical complex absorbing both the College of Trades and Technology and the College of Fisheries and designed to parallel at the technical level the work done at the University (4. I97I, p.I).

The enrolment in the College of Trades and Technology and the eleven District Vocational Schools (Phase I) in their first year of full operation, I963, was I,660 full-time students and I,I70 part-time students. There was only a slight increase the year after, but in I968 the figures for enrolment had risen to 3,679 full-time students plus 6,479 part-time students. These developments provide evidence that there are increasing investments being made in 'human capital' by society and the individual in the area of education in Newfoundland.

As indicated earlier, speaking purely from the

standpoint of economics, investment in a person's education and training may be expected to result in three related benefits. It is likely to

(a) yield returns to the individual in the form of higher earnings,

(b) yield returns to the organization in the form of higher productivity,

and (c) advance the gross national product of the country.

The investment activity which concerns this study is centered on the first of these related benefits. Its major purpose is to make a systematic analysis of the private returns to investment accruing to individuals who choose to undertake a period of further education and training in order to qualify for entry into a variety of trades occupations and what the effect would be, in monetary terms, if each individual made a specific decision to become a teacher in vocational education. The study will view each individual's decision from the perspective of investment theory in terms of human capital formation. The individual is the investor in that he postpones present consumption in the hope that he may be able to provide an occupational service of greater value in the

future. If his hope is realized, in exchange for the increased value of his services, the investor will receive an increased flow of future earnings relative to the higher level of education and training that he has obtained.

> What draws it all together (the economics of education) is the basic idea that the acquisition of education in a modern economy provides opportunities for individuals to invest in themselves; unlike defence expenditures, public education expenditure is to some extent the outcome of individual choices registered at times other than election times and these private decisions are profoundly influenced by expected economic returns (3. I970, p.xv).

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CHAPTER 2

STATEMENT OF THE PROBLEM

The major research problem in this study was to use cost-benefit analysis in an attempt to answer the three following questions:

I. Within the province of Newfoundland what are the net present values and internal rates of return of the marginal earnings streams for individuals who invest in a period of formal education at a vocational institute together with on-the-job training in specified trades occupations?

2. What will be the net present values and internal rates of return of the marginal earnings streams for these same individuals if they make the decision to become vocational teachers in the province of Newfoundland at various decision points in their careers?

3. What are the net present values and the internal rates of return of the marginal earnings streams

of individuals who invest in a baccalaureate in education and become teachers of academic subjects in vocational schools in Newfoundland?

In reference to problem # 2, the supply of teachers of occupational trades subjects in Newfoundland is circumscribed by the admission requirements. Since I966, the applicants for teaching positions in the vocational subject areas are required to hold a certificate of journeyman's status plus a specified number of years of experience in that trade.

As a result of these requirements, recruitment to the profession of vocational teaching involves a critical decision by each individual applicant. It is described as critical because it requires that the individual make a second choice in his occupational career. Implied in this decision is the fact that his initial investment in education and training is transferred to another source of return. For example, the electrician who makes an investment in technical education with the hope of making a substantial monetary return from a lifetime's career as an electrician, may decide at some point in time to change to a career in vocational education teaching. The question is, will his monetary returns be greater or smaller from the occupation of his second choice?

For the purposes of analysis and comparison, the three major questions were subdivided into a number of sub-problems as follows:

I. What are the estimated private costs of investment in a course of formal education and on-the-job training for persons in selected trades occupations?

2. What are the estimated private costs of investment for individuals who undertake a course of formal education and on-the-job training in selected trades occupations and then decide to become vocational education teachers in trades subjects?

3. What are the estimated costs of investment for individuals who undertake a course of study leading to a baccalaureate degree and then become vocational teachers in academic subjects?

4. When comparisons are made with the estimated earnings of high school graduates, what are:
   (a) the marginal earnings streams of individuals who have undertaken a course of formal education and on-the-job training in selected trades occupations;

   (b) the net present values of each of the marginal

earnings streams;

(c) the internal rates of return for each of the three marginal earnings streams;

and, (d) how much do the marginal earnings streams, the net present values, and the internal rates of return of the marginal earnings streams vary with the type of trades occupations and how much do they vary between the sexes?

5. When comparisons are made with the estimated earnings of individuals who have undertaken a course of formal education and on-the-job training in order to qualify for trades occupations, what are

(a) the marginal earnings streams of these same individuals who decide to become vocational education teachers at various decision points in their career;

(b) the net present values of each of the marginal earnings streams;

(c) the internal rates of return for each of the marginal earnings streams;

and, (d) how much do the marginal earnings streams, the net present values and internal rates of return

of the marginal earnings streams vary with the type of vocational subject taught, and how much do they vary between the sexes?

6. When comparisons are made with the estimated earnings of high school graduates, what are

   (a) the marginal earnings streams of individuals who have undertaken a course of study leading to a baccalaureate degree and on completion of the degree become teachers of academic subjects in vocational schools,

   (b) the present values of each of the marginal earnings streams,

   (c) the internal rates of return for each of the marginal earnings streams,

and, (d) how much do the marginal earnings streams, the net present values, and the internal rates of return of the marginal earnings streams vary between the sexes?

7. How do the marginal earnings streams, the net present values, and the internal rates of return accruing to those who engage in a course of study leading to a baccalaureate degree and become teachers of academic

subjects in vocational schools compare with those individuals who become teachers of trades subjects in vocational schools?

DELIMITATIONS

The research problems were delimited in the following manner:

I. The cost-benefit data were based on economic conditions prevailing in Newfoundland in March, I97I.

2. The cost-benefit analyses of the selected trades occupations were restricted to individuals who participated in formal education courses at vocational schools and on-the-job apprenticeship training in Newfoundland.

3. The cost-benefit analyses of the selected trades occupations were restricted to individuals who participated in formal education and on-the-job training in the following trades occupations:

(a) Two male trades occupations - electrician and carpenter.

(b) Two female occupations - stenographer and beautician.

4. The occupational earnings were viewed as average wages earned by employees and were not concerned with own-business operations.

5. The calculations relating to teachers' salaries excluded teachers who gained promotion to administrative positions.

6. The earnings streams data took no account of unemployment, tax deductions, morbidity, or mortality.

7. The decision points at which individuals in trades occupations entered vocational teaching were delimited to three. For the electrician, carpenter, and beautician, the decision points were located at ages 25, 30, and 40. For the senior stenographer they were located at ages 24, 30, and 40.

8. The study was concerned only with measured private costs and benefits in monetary terms. Any other costs and benefits associated with education and training were excluded from consideration.

THE SIGNIFICANCE OF THE STUDY

Previous studies of human capital have contributed to present knowledge of rates of return on various types of investments. Many studies have been conducted in recent years to estimate rates of return to investments in elementary, secondary, and college education. However, information is still lacking on the monetary benefits accruing to individuals who undertake a period of education at the intermediate level of education together with on-the-job training. Four of the subjects of this study - electrician, carpenter, beautician, and stenographer - are of this type.

To this writer's knowledge there are no recent rate of return studies relating to education in the province of Newfoundland. The Eighth Annual Review of the Economic Council of Canada, I97I, reports proxy measures of rates of return for five regions of Canada. (2, I97I). For the purpose of that report, Newfoundland is incorporated into the Atlantic Region and only two measures of internal rates of return are given, those for high school graduates and those for university graduates. These figures reveal information from which limited conclusions only can be drawn mainly because all subjects have been relegated to two homogeneous classes

with a uniform marginal benefits stream. Therefore, they are of no great value to the individual decision-maker. A more precise disaggregation of private returns than is shown in the report is called for before they can be of any real value to an individual in making a choice concerning his or her education and training.

In recognition of the above fact, the approach used in this study focuses on specific areas of education and training. In doing so it assumes that if criteria regarding monetary costs and benefits are explicitly listed, and if an analysis of the present worth and rate of return of the alternatives is conducted, it is presumed that the resultant decision can be more rational. While it is recognized that a number of factors are viewed before a career decision is made, the economic information provided by studies of the kind reported here may influence the individual's choice. The information on which students base their choice of career is generally inadequate. This has been investigated quite recently by Dodge and Swan (I.I97I) who found that "students do possess a substantial amount of misinformation about salaries" (I. p.33). These authors also found that

> (a) they (students) overestimate lifetime earnings in their first choice of career and (b) that they underestimate the cost of becoming qualified at university for that career, mainly because they neglect

> to count foregone earnings as a cost. These two findings in conjunction with our findings that only half of the students discount future earnings at a positive rate, imply that students are likely to overinvest in university training (I. p.34).

Most rate of return studies have viewed the decision to undertake further education at some point which is termed "completion of high school". This study, too, takes this approach. However, as described on page I2, it analyzes what the effect would be, in monetary terms, if certain individuals transferred their initial investment in education and training to another source of return at various decision points in their career. It is hoped that the findings of this study may provide some information by which these individuals can arrive at this second decision and at which point it proves to be the most profitable.

Estimates of the returns from education are of value in the examination of policies and programs in education. Various financial policy alternatives need to be considered as more findings are brought to light about the nature and distribution of returns from various levels of education and training. Cases may arise in which the returns to certain individuals far exceed the returns that accrue to society. This suggests the possibility that these same individuals should

contribute more towards their own education and training. More specifically, this study may be of some use to those policy-makers who are responsible for varying the allocation of subsistence support, allowances, and student loans to individuals who choose different forms of education and training.

The information provided here may be of value for purposes of comparison with other studies that have been carried out in Canada, though these, up to date, are few in number. For example, a comparison of the rates of return to vocational teachers in Newfoundland with teachers investigated by Wallace in Alberta could be of interest to policy-makers.(3. I970). The findings may have implications for vocational teaching regarding the policy of recruitment, entrance requirements, and length of courses. Finally, the results may be useful for analyzing the imperfections of wage and salary structures.

ASSUMPTIONS

In order to carry out the study, the following assumptions were made:

I. It was assumed that human capital conceptually resembles physical capital. An important part

of human capital is the stock (assets) of knowledge and skills produced through the process of education. In order to acquire these assets some cost is involved or some investment made.

2. It was assumed that individuals respond to economic incentives when making decisions about their education and career and from whatever information they have at their disposal these same individuals will form some perception of the present and future costs and benefits of acquiring that education and training.

3. It was assumed that education and training is a measure of productivity in the economic sense and therefore of earnings potential.

4. It was further assumed that cross-sectional data provide a reliable basis for estimating earnings streams of individuals over a lifetime.

All the above assumptions are discussed in greater detail in Chapter 3 of this study.

EXPLANATION OF THE TERMS USED IN THE STUDY

Earnings

The money income which individuals receive for labour or services rendered in their chosen occupation.

It excludes rent, gifts, loans, interest, dividends, ownership or sale of property, and money acquired from extra-occupational labour or services.

Marginal Earnings

The additional earnings which are a result of increases in levels of education and training.

Foregone Earnings

The earnings an individual would have received had he not engaged in further education.

Lifetime Earnings Stream

This refers to the year-by-year earnings of an individual from the time at which he enters the labour force until he retires at the age of sixty-five.

Opportunity Costs

The opportunity-cost of anything is the alternative that has been foregone. In this study it represents foregone earnings.

Private Educational Costs

These are the financial costs incurred by individuals who choose to undertake a period of further education and training. These costs include foregone

earnings, tuition fees, and other academic expenses.

Private Benefits

The total of the marginal earnings stream that an individual receives as a result of acquiring further education and training.

Discount Rate

The compound rate of interest used to calculate the present value of money due at a future date.

Internal Rate of Return

The discount rate which makes the costs equal to benefits at the decision point. In this study it is the rate at which the present value of the extra lifetime earnings from extra education and training equals the cost of undertaking that extra education.

Net Present Value

The present value of a sum of money receivable at some time in the future. This is calculated by applying a selected compound interest rate and discounting each annual income back to the present time.

External Rate of Return

A selected interest rate used for purposes of comparison to judge the relative profitability of alternative kinds of investment.

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CHAPTER III

THEORETICAL FRAMEWORK

The main objective of this study was to calculate the private monetary costs and benefits that accrue to individuals who make an investment in a period of post-secondary education and training. To a great extent, the techniques used in the investigation and the resultant conclusions depended upon the methodology and assumptions basic to the analysis of human capital formation. Therefore, in order to set the study in its theoretical perspective a discussion of the nature and assumptions of human capital theory is proposed at this stage.

In an intuitive sense, it has long been held that education in some way makes a valuable contribution to the improvement of society. But in recent times, as the improvement of society has become subject to more precise measurement, especially in the economic field, intuition has been replaced by scholarly research and analysis in an attempt to formulate reliable generalizations concerning the relationship between education and economic growth and development. Substantial interest in this field is reflected in the way that such terms as "human capital" and "human resources" have been adopted and incorporated into the vocabulary of disciplines other than that of economics. The increased interest in the subject is

demonstrated by the large and extensive bibliographies provided by Alexander-Frutschi (2.I967), Deitch and McLoone (20.I966), and Blaug (IO.I967). The latter bibliography contains approximately eight hundred items the greatest proportion of which refer to studies and literature produced after I960.

However, the concept of human capital is not entirely a recent phenomenon. Adam Smith, for example, made references to the importance of education at various points in his treatise "An Inquiry Into The Nature And Causes Of The Wealth Of Nations." At one point he says:

> The acquisition of such talents by the maintenance of the acquirer during his education, study, or apprenticeship, always costs a real expense which is a capital fixed and realized, as it were, in his person. Those talents, as they make a part of his fortune, so do they likewise of that of the society to which he belongs. (I. pp. 265-66).

Karl Marx and the classical economists gave a great deal of attention to the concept of human capital (67.I962), and Miller, in his survey of the English classicists, discusses the work of J.S. Mill, Nassau Senior, Chadwick, Malthus, Bentham, Lowe, the Fawcetts and other economists in the field of education. (45.I966).

Even so, modern economists have not paid much attention to human resources in relation to the economy as did the classical economists. Poduluk (48.I968) observes that:

> To a considerable extent this may have been due to a lack of data with which to work but it may also have reflected a reluctance to attempt to put human beings on the same basis as physical assets in the study of wealth, capital, or economic growth. (48.p.95).

Many economists have traditionally tended to avoid major inquiry into the economics of education because of the deep-rooted philosophical and moral notion that man is a free agent not to be equated with goods bought or sold in the market. Alfred Marshall was sharply conscious of this viewpoint. Even though he wrote that "the most valuable of all capital is that invested in human beings" (42.p.564) and went on to apply some of the tools of economic analysis to human capital development through education and training, Marshall pointed out that "human agents of production are not bought and sold as machinery as other material agents of production are" (42.p.560). Marshall's view was that while human beings can be thought of as human capital in an abstract sense, it would not be proper to consider them as such in a practical sense. Marshall concludes in his appendix "Definitions of Capital" that ".... we are seeking a definition that will keep realistic economists in touch with the market place" (42.p.790). Like most economists of his time, instead of developing and using a concept that includes human capital, Marshall generally used a concept restricted to classes of wealth that are bought and sold.

Another reason why modern economists were reluctant to pursue in-depth studies of the relationship of education to the economy was probably due to the fact that physical capital was relatively easy to measure and a capital-output relationship could be quantified thus making it scientifically respectable. (34.1964). But in recent years a number of economists have called attention to the importance of human resources and to the nature of investments in education. Schultz states:

> The failure to treat human resources explicitly as a form of capital, as a produced means of production, as the product of investment, has fostered the retention of the classical notion of labour as a capacity to do manual work requiring little knowledge and skill, a capacity with which, according to this notion, labourers are endowed about equally. Counting individuals who can and want to work and treating such count as a measure of the quantity of an economic factor is no more meaningful than it would be to count the number of all manner of machines to determine their economic importance either as a stock of capital or a flow of productive services. (57.p.3).

Schultz also discusses how inherited and acquired abilities are related to capital formation. Adam Smith had included all useful abilities of individuals in a country, whether inherited or acquired, as part of capital. However, these two abilities have important differences regarding the formation of human capital. The inherited abilities of a population can be likened to the original attribute of land. They are "natural givens" at any one

time and the changes in inherited endowments occur so slowly that they are unlikely to be meaningful for economic analysis. It may be true, too, that the distribution of inherited abilities in large populations remain constant over time. But when we look at the relationship of acquired abilities to economic value, the factors involved are quite different. Acquired abilities are formed and maintained in ways that are similar to the formation and maintenance of material capital. And what is of great importance, these abilities can be altered and improved in ways that have an impact on the development of a society's economy. Some abilities are acquired through the learning experiences of everyday life in unorganized and informal activities. Others are acquired from learning experiences that are formal and organized such as those obtained through schooling, on-the-job training, and various specialized programs designed to improve skills.

> The formation of human capital, especially through those activities which have become organized and specialized in a modern economy, is of a magnitude to alter radically the conventional estimates of savings and capital formation. These forms of human capital are the source of many additional income streams contributing to economic growth. They also alter wages and salaries, in both absolute and relative terms, and the share of the national income from earnings relative to that from property over time. (60.p.279).

The body of research bearing on the field of human capital and human resources has been well summarized by Benson (6. I967), Bowen (I7. I964), Eckaus (25. I962), Rivlin (5I. I962), Schultz (58. I963) (6I. I967), and Woodhall (74. I967). Bowman has focused much of her work on a discussion of the concepts of human capital formation in relation to education and the problems of their empirical evaluation. The whole field of analyses in human capital is, in her view, so significant a development that she describes it as the human investment revolution in economic thought. (I4. I962)(I5. I966).

Education As Capital Formation

Hanson (33. I967) states that capital is "wealth used in the production of further wealth" (p.42). This means that capital is any stock existing at a given instant that yields a stream of benefits over time. Therefore, all flows of income are the product of some item of capital whose value is calculated by capitalizing the income flow at an appropriate discount rate. In many respects the costs of human capital are analogous to expenditures on physical capital such as machinery, plant, and equipment.

> The basic idea of human capital is simple enough: like a machine, a human agent of

> production is produced by an application of resources to a pre-existing entity; in this case, "raw labour." The result of this particular application is a trained human agent - worker - whose enhanced production is manifested in a stream of services of enhanced value. Because the training process requires time to complete, and because its benefits derive over a considerable time period, the value of the resources used in training may be considered an investment, and the imputed increment in earning power that results from the training may be treated as its yield. (50. p.97).

Both physical and human capital formation involve the use of goods and services that could have been used for other purposes. We are therefore concerned with the application of scarce resources to alternative goals and whichever goal is chosen we apply the scarce resources to it with maximum efficiency. In the case of both human and physical capital formation the owner invests in his goods and services in the hope of receiving a return over some future period of time. However, in certain respects, human capital formation is different from physical capital formation. Unlike physical capital, human capital resides in the individual and is not transferable. Regardless of who finances the human capital formation, it can be utilized only if the holder wills it so.

Eckaus (25. p.104) maintains that expenditures on human capital formation often discovers existing skills as well as creating and developing new ones.

This results in an increase in the quantity of talent. Human capital, too, has more flexibility with respect to different jobs than are most kinds of physical capital.

Another way in which physical capital and human capital are claimed to be different is that while the net rent yielded by an item of physical capital usually diminishes as the item of capital ages (for example, the maintenance costs tend to increase with the age of a machine or piece of equipment) the returns to older trained and skilled workers are often greater than those to younger workers, reflecting an accumulation of experience to supplement formal education. However, this may be only partly true. It can be maintained that training and skill depreciate or become obsolete. Probably the decline in age-earnings profiles in the last decade or so of working life are a manifestation of this.

> Clearly, the most convincing explanation for this shape (the convexity of earnings profiles) is the idea that "learning by doing" is subject to diminishing returns supplemented by the tendency of formal education itself to be subject to obsolescence after the passage of two or three decades. (II. p.29).

The new-found interest in education as a major source of human capital has generated investigations into several areas. The major approaches being followed

at the present time are outlined below.

The Residual Approach

Economists have long been interested in the conditions which contribute to economic growth but only recently have they sought to identify and quantify the variables that influence growth rates. In previous decades, economic expansion was attributed to the effective and efficient use of physical resources such as machinery, plant, equipment, and minerals. It is now seen that a growth in the physical stock and a parallel growth in the size of the labour force cannot explain fully the continued growth of the gross national product.

An attempt to analyze this phenomenon is to use the "residual" approach. The investigator identifies a set of inputs which are considered responsible for an observed output. He then seeks to discover what each input has contributed to the total increase in output. Residual contributions for which no particular input is identified are attributed to unidentified inputs. Education and knowledge are claimed to be responsible for the greater proportion of the "residual."

Kendrick (39. I96I) in his study for the National Bureau of Economic Research on the relationship between

labour and capital inputs and real national output found a residual increase in labour value of about I.3 per cent per annum between I889 and I957. He attributed this to qualitative factors affecting inputs but he he did not attempt to determine the reasons for labour's high productivity.

Denison (2I. I962) extended the analysis introduced by Kendrick. He estimated the various factors that had contributed to American economic growth in the recent past, I929 to I957. He arrived at the following conclusion: there was (a) 34 per cent increase in persons employed; (b) 20 per cent advances in knowledge; (c) 9 per cent increase in returns to scale. According to Denison's figures, 47 per cent of the increase in output per man-hour between I929 and I957 was caused by the improved quality of the labour force, 27 per cent was a result of technological change, I6 per cent from economies of scale and I0 per cent from various other factors. (2I. Chapter 23).

The work of Schultz (58.I963) produced evidence consistent with that of Kendrick and Denison. He attempted to determine how much of the unexplained portion of growth in the national product was attributable to human capital in the form of education for the years between I929 and I957 expressed in I956 dollars. He

claims that "additional schooling in the labour force accounts for I6.5 or 20 per cent of the total growth" depending upon whether the 9 or II per cent rate of return is employed." (58. pp.45-46).

Bertram (6. I966) in his study of Canadian economic growth, concluded that educational improvements accounted for nearly one quarter of the rise in employees' productivity between I9II and I96I. (6. p.55).

> By far the most important factor of production is the human factor, the labour force, which includes all types of manpower employed in the economy, i.e. workers, farmers, owner-operators and other own-account workers, supervisors, and managers. Roughly three fourths of all income in the economy accrues to the labour force, reflecting the contributions of all human resources to production; the balance arises out of the ownership of property, i.e., capital and natural resources. Consequently, the quality of the labour force as determined by education, training, skill, managerial competence, and the application of effort, plays a very large role in improving the productivity of the economy. A mounting volume of evidence points to education as a crucially important factor. (26. p.I70).

Many problems are encountered in trying to estimate the economic contribution of education to the residual factor in economic growth. There is the possibility that education's effect is overemphasized. The residual is a combination of many factors which includes improvement in the health of the labour force, improvements in industrial relations, improvements in

the quality of capital assets, and changes in the informal as well as the formal process of education (I7. I963). If the identification of the residual is to be used for economic planning it suffers from the difficulty that no evidence of what would be the effect of alternative combinations of human capital and physical capital nor on the kind of interplay that exists between education, research, and innovation. Abromovitz has called the residual "a measure of our ignorance." (Quoted by Bowen I7. p.80).

> However, the size of the residual certainly does serve as a mandate to explore in detail the economic effects of activities often neglected. It seems clear that the simple accumulation of physical capital, in and of itself, has not played the dominant role in economic growth sometimes ascribed to it. (I7. p.80).

Correlation Analysis

This approach is an attempt to quantify the variables of educational activity and correlate them with factors which indicate economic performance. The assumption underlying this approach is that the degree of correlation will reflect the relationship between education and the state of the economy. Examples of measures of educational activity are literacy rates,

pupil-teacher ratios, enrolment ratios, expenditures on education as a percentage of the national income, expenditures per pupil, capital outlay on educational institutions, and percentages of various levels of education in the population. The variables measuring economic performance are Gross National Product, rate of economic growth, and per capita income. The data may be used for inter-country, inter-region and inter-temporal comparisons.

Comparisons may be useful in enabling a country to see its own efforts in education with those of other countries. The comparison may be between countries at a similar level of economic development or between countries having dissimilar economic circumstances. But, of course, there are many practical problems to overcome before meaningful correlations can be established. Apart from the problem of obtaining comparable G.N.P. figures, finding comparable indices of educational activity is a difficult task because of the great inter-country variations in educational systems (I7. p.74). Regarding the difficulties that differences in educational systems introduce in international comparisons, Denison says:

> It is only too painfully obvious that the curriculum, pace of work, attitudes of parents and students, pre-school

> preparation age at which instruction starts, qualifications of teachers, size of classes, physical school facilities, prevalence of part-time education and other possibly significant characteristics may often and do vary. (22. p. 243).

The most basic problem, however, is to establish a cause and effect relationship in the education-G.N.P. correlation. Where a positive correlation is found in these two it might be thought that by increasing the expenditure on education, a rise in the country's G.N.P. would ensue. But the same correlation can also be viewed as evidence in support of the proposition that education is an important consumer good on which countries elect to spend more as their G.N.P. rises (I7. p.75). Both these propositions may be true to some extent, but how to apportion the two is problematical.

Manpower Planning

The acceptance of the belief that investment in education contributes substantially to economic growth has forced governments to construct detailed projections of the necessary developments of the education system. Educational planning ranges from comparatively simple extrapolations of the private

demand for education with its implications for new courses, higher enrolments and teacher supply, to large-scale target projections directed to wider social and economic aims. The relationship between education and training and the occupational structure of the labour force has been emphasized so strongly that detailed estimates of future manpower requirements are made in order to plan the rate of expansion of secondary, vocational, and higher education. This aspect of manpower policy in Canada is discussed at some length in the Eighth Annual Review of the Economic Council of Canada, September I97I (28). The Review also briefly discusses how systematic evaluation of the Canada Manpower Training Program is carried out by the Department of Labour using cost-benefit analysis which includes the estimation of the costs flow and benefits flow of training. Comparisons are made through the use of a discount rate. The cost-benefit model used in the calculation of the discount rates is essentially the same as the one used in this study.

There is a growing literature on the conceptual and technical problems of manpower forecasting and its implications for policy-making in the field of education and training. (I2. I965), (37. I966), (62. I965), (4I. I966), (34. I965), (47. I962), (66. I970). Attempts have been

made to forecast trained labour requirements using national income forecasts, using demographic information, by analyzing anticipated shifts in the relative importance of different industries, and by extrapolating the trend of past productivity. The collection of this data is an enormous task and must be obtained from a great variety of sources. Cumulative errors in the collection and processing of such data inevitably creates cumulative errors in the projection of the whole range of manpower needs and can ultimately sum up to a gross misallocation of scarce resources. In certain sectors dysfunctional shortfalls may occur while in other areas surpluses may be produced. And, as Phillips observes, "The preferences of parents and pupils in the end govern entry into the different educational sectors and subjects of study." (47. p.706).

> So long as freedom of choice of profession exists and academic freedom in respect of subjects of study, plans cannot be based on the hypothesis that educational supply and economic and social demand be identical. (47. p.707)

There is, too, the fact that education is both "production" and "consumption" (this distinction is discussed later in this study). How much of the educational process should be allocated to the "production" side in relation to manpower requirements constitutes

a great problem.

Manpower forecasting is apt to concern itself almost exclusively with training "workers" and ignore the wider social, cultural, and human objectives of comprehensive education. Precise forecasting of requirements is a relatively short-term issue whereas education, especially academic education, is a long term one. If an attempt is made to obtain precision in the long term, forecasting must make allowances for probable technological and economic changes which calls for constant correction and adjustment; it presupposes a permanent mechanism operating between the population, industry, and the various government ministries - social, economic, and education. Added to these problems there is the danger that manpower forecasting either ignores or cannot anticipate the possibilities of substitution between different types of manpower, or between manpower and physical capital. The ratio of output to manpower is not a constant and in many cases manpower may be replaced by equipment. It is also true to say that forecasting of manpower requirements, though it may go a long way towards disclosing the likely development of employment, cannot itself guarantee the desired distribution of labour. Therefore, forecasting, if it is to be useful, must be accompanied by the promotion

of vocational guidance and effective information services. In addition, these must be supplemented by a wages policy or, more fully, by a general planning of human resources. (66. p.II7).

> Where certain types of employment attract too many applicants, while other types seem unduly neglected, wage adjustments would seem to be required. In theory at any rate, the government has power to make all such adjustments in the public sector. Adapting the development of human resources to the foreseeable requirements of the economy is not necessarily a one-way process. The terms could be reversed and an attempt made to adapt economic development to the development of human resources, or at least to combine the two approaches. (66. p. II7).

Regarding the first part of the above quotation, some studies were carried out by a number of researchers who sought to compare earnings patterns by rates of returns in order to analyze whether there are surpluses of various types of educated manpower. (I6. I963), (73. I966), (7. I957), (32. I957). Implicit in these studies is that when rates of return are high or low in a particular field, it would indicate whether a particular skill was scarce or not. However, two caveats immediately suggest themselves. First, the labour market may be imperfect. For example, there is always the possibility that entry into a certain type of occupation is deliberately restricted in accordance

with policies governing over-recruitment. Secondly, there is the distinct possibility that the availability of a skill may create conditions for economic expansion which in turn creates greater demand in that field. In other words, supply of skill may create its own demand.

The Investment View of Education

While a knowledge of the sources of economic growth, as outlined earlier, is of great value for analytical purposes, the approach does not determine the underlying costs and returns of the investments that produced the additional sources that account for economic growth. The investment approach to human capital attempts to fill this gap.

The applicability of this approach to a great number of economic problems is discussed by Schultz (57. I96I). The analysis of many forms of human capital is central in a number of quite recent studies. These include a theoretical analysis on education (4. I962), health as investment (46. I962), and information about the labour market (65. I962). Because of its importance to this study, the discussion that follows is confined to education and training as an investment in human capital.

Once we accept the argument that it is possible to study man as a form of capital, we can attempt to apply the tools of investment analysis to human capital formation. Rivlin, in her discussion of the general laws of investment in education says:

> There are a great many motives for getting an education, but clearly, when people take resources away from present consumption to devote them to training and education that enable them to earn more income in the future, they are, whether they plan to or not, making an investment in themselves ... one that has many similarities to an investment in a factory or a machine.(51. p.360).

Innes makes the point that if education is accepted as a form of investment, it will have to compete with other forms of investments.

> What we are suggesting is that an individual who is considering an expenditure now which will yield future income ought to consider education as one of the alternatives. (38. p.3).

Individuals no less than industrial concerns, commercial agencies, and governments are forced to make a choice because capital is not unlimited. What is invested in education cannot be invested in other things. And, of course, investment means that people have to choose between immediate and future consumption.

> ... an investment is not an end in itself but rather a process for distributing

> consumption over time ... the attainment of an optimum through balancing consumption over time. (35. p. 329).

In his discussion of investment in education, Becker makes the following statement which demonstrates a prime assumption of the investment approach to education, i.e. man makes rational economic decisions.

> An informed, rational person would invest only if the expected rate of return was greater than the sum of the interest rate on riskless assets and the liquidity and risk premiums associated with the investment. (3. p.4I).

Nevertheless, there is always the question of uncertainty in any investment. No matter how carefully the costs and benefits are computed and compared there is the element of risk as to the outcome. We can never completely know all the factors on which to base a true forecast.

> ... Ignorance and uncertainty are of the essence of certain important observable characteristics of investment decision behavior. (35. p.330).

If it were possible that rationality prevailed most of the time, what would be the criterion by which certain educational investments would be made? Dryden states that:

> In the theoretical literature the chief

> rivals to the claim of being the correct criterion are the internal rate-of-return (defined as the rate of interest which makes the net discounted value of the project equal to zero) and the present value criterion (defined as the net value of the project's returns when discounted to the present at a pre-determined rate of interest). (24. p.237).

Put simply, the proposition raised by the investment approach is that the decision to invest in education requires a flow of costs which could have been put to alternative uses. From such an investment it is anticipated that a flow of benefits will be produced which will serve to satisfy man's social and economic needs. It must be recognized that flows of costs and benefits do not appear at a given time but are projected over a number of specified periods - the time element must be taken into account (this is explained more fully later in the study). The flows can be analyzed from the viewpoint of private individual costs and returns and the costs and returns to society. Further, the investment approach seeks to provide the investor or investors with criteria in order that a rational choice among alternatives is more likely to be made.

Cost-benefit Analysis

Cost-benefit analysis can provide a logical

framework for the evaluation of one or more courses of educational activity. It is a method whereby the right questions may be asked and answers produced in such a way as to identify the means for more intelligent decision-making. Generally cost-benefit analysis is defined as a measurement technique in which the total costs of a given project are compared with the probable total benefits. If it can be shown that the total benefits of a given project exceeds its total costs, it may be said to have passed the minimum test of economic feasibility.

Education and Earnings

Cost-benefit analysis can be used simply to estimate what extra earnings a person will derive by reason of his undertaking a period of further education. It is partly in their additional earnings over the earnings of persons similar in other respects but having less education, that education pays for those who have chosen to engage in extra amounts of it.

Education and Annual Earnings

Miller, in a widely cited study using U.S.A. census data, indicated that a man with a college degree

TABLE 2

AVERAGE ANNUAL INCOME FROM EMPLOYMENT
BY LEVELS OF EDUCATION
MALE NONFARM LABOUR FORCE
CANADA, 1961

	dollars	index 0-8 years = 100
0 - 8 years elementary	3,526	100
1 - 3 years high school	4,478	127
4 - 5 years high school	5,493	156
Some university	6,130	174
University degree	9,188	261

Source: Based on data from 1961 Census of Canada. The Second Annual Review, Economic Council of Canada. 1965. p.86.

received on the average about one hundred thousand dollars more income during his lifetime than a man with only a high school diploma. In the year 1958, in the age category 25 to 34 years, the average annual earnings was $3,663 for elementary school graduates, $4,909 for high school graduates, and $7,152 for college graduates. In the age category 45 to 55 years, which was the peak years of earning power, the average annual earnings for elementary school graduates was $4,337, for high school graduates it was $ 6,295, and for college graduates $12,009. (44. pp.962-86). Miller also noted that the association of high income and higher levels of education had persisted despite the fact that the educational attainment of the population had increased considerably in the past generation.

The same kind of relationship between level of education and annual earnings appears to hold for Canada, too. Table 2 is reproduced from the Second Annual Review of the Economic Council of Canada and shows the average annual income by levels of education for the non-farm labour force (26. p.86).

Education and Lifetime Earnings

Studies have also been carried out on the relationship between education and lifetime earnings.

Miller's study (44. I960) indicates that those individuals with the most education have the greatest advantage. Average lifetime earnings in the U.S.A show that elementary school graduates could expect $ I79,000, high school graduates could expect $240,000, and college graduates $420,000.

Again, for Canada, the same sort of picture emerges from the data collected by the Dominion Bureau of Statistics. Table 3 is taken from the I96I Census Monograph illustrating the lifetime earnings of males for selected ages and levels of schooling. (48.p.I06).

Blaug has made a cross-sectional comparison of eighteen countries including Canada, Britain, the United States, and the Soviet Union to determine the correlation of earnings to education. From his findings he states:

> In short, within a few years after leaving school, if not immediately, better educated people earn more than less educated ones; their advantage continues to widen with age and although they lose some of their gain after reaching their peak, the favourable differential persists until retirement. (II. p.27).

TABLE 3

LIFETIME EARNINGS OF MALES FOR SELECTED AGES AND SELECTED LEVELS OF SCHOOLING CANADA, 1961

schooling	Age group		
	15-64	19-64	25-64
	$	$	$
Elementary 5 - 8	151,820	148,449	137,230
High school 4 - 5	221,700	222,676	209,484
University degree	356,108	357,675	353,624

Source: Incomes of Canadians. Poduluk, J.R. 1961 Census Monograph, Dominion Bureau of Statistics. p.106.

Estimating the Private Monetary Costs and Benefits

Evidence has been provided in the foregoing section to show that people who remain at school or college after they have attained the legal leaving age do, on the average, receive higher lifetime earnings than people of a similar background who enter the labour force as soon as they can. The figures, of course, have not taken into account the costs of education. It is not easily recognized that by accepting some costs in the present, the student can generate equivalent or greater returns in the future. For example, at the end of the final year of compulsory attendance a student faces the decision to engage in further education or seek employment. He will arrive at his decision by analyzing the advantages and disadvantages of each course of action. Whether the choice is made by using sophisticated analysis or through a number of "what if" questions the approach is the same. If the student chooses to take a job rather than continue with his education, he immediately makes a contribution to the labour force and obtains from his employment an amount of income which he can translate into satisfactions of his wants. If he chooses to stay at school for an extra year or years, he incurs costs both to himself

and society. He will have none of the satisfactions he could get from the income he foregoes and the extra costs of his tuition. In addition, society provides resources that are consumed in helping the student undertake an extra period of education.

From the socio-economic point of view, the costs to the student and the costs to society are investment expenditures on human capital. On the one hand the student receives higher education and training which will likely enhance his level of future benefits and on the other hand, society is provided with a more productive individual.

The Costs of Education

Much has been done recently to clarify the cost components of education. Hansen (31.1963) makes a distinction between private resource costs and total resource costs.

I. Private resource costs consist of:

(a) Indirect Costs. These include opportunity costs or earnings foregone. This means that the student sacrifices the wages he might have earned over the period of his study. Foregone earnings can be measured

by comparing the earnings of two similar persons one of whom has entered the work force and one of whom has chosen to continue his education.These can be large, especially for mature students. Schultz states that earnings foregone account for fully half to three-fifths of the total costs of high school and higher education in the United States. Because of this, education beyond the elementary level is far from free to students (60.I963). In Canada it is possible that for schooling beyond the elementary level "opportunity costs in the form of earnings foregone are also the largest element" (48.p.I02).

(b) Direct Costs. These are the private resource costs which are directly related to the private investment decision. They include tuition fees and any additional related costs incurred by the investor such as expenditures on academic supplies, books, and perhaps extra travel expense. It must be noted that any expenditures which are not directly related to the educational decision should not be counted. For example, accommodation, food,clothing, and entertainment cannot be included because they are items which would be consumed anyway unless, of course, there is an excess of expenditures on these items which would not occur under normal circumstances.

2. Total resource costs or social costs are the total costs incurred by society which includes all those private costs already mentioned above plus institutional expenditures, teachers salaries, capital expenditures, and interest and depreciation on capital. These can be measured and rates of return on them computed.

The Benefits of Education

The benefits of education can be considered from two points of view. They accrue in part to the student and in part to others in society. Weisbrod (70. I962) has contributed a great deal to clarifying the distinction between these two.

First, there are the monetary benefits that are likely to accrue to the student in the form of higher earnings plus the personal, non-monetary, psychic benefits which are likely to result from his investment in education. The psychic benefits are the intangible rewards which a person continues to enjoy as a result of his education such as the ability to enjoy leisure, appreciate the arts and such like. These latter benefits are not generally measurable in monetary terms.

Secondly, there are additional benefits which are external to the student.

> ..... a benefit of education will refer to anything that pushes outward the utility possibility function of society. Included would be (I) anything which increases production possibilities, such as increased labour productivity; (2) anything which reduces costs and thereby makes resources available for more productive uses, such as increased employment opportunities, which may release resources from law enforcement by cutting crime rates; and (3) anything which increases welfare possibilities directly, such as development of public-spiritedness or social consciousness of one's neighbour (70. p.I08).

In addition to those pointed out by Weisbrod, there are benefits to society arising from increased knowledge and the dissemination of that knowledge, a better informed electorate, and more culturally alive neighbourhoods. (I7. p.86). These additional external benefits are significant factors which add to the complexity of analyzing rates of return to education and as most investigators admit, there has, as yet, been little empirical success in estimating the value of the benefits from schooling that accrue to the wider society.

THE METHODOLOGY USED IN ESTIMATING PRIVATE MONETARY RATES OF RETURNS TO INDIVIDUALS INVESTING IN EDUCATION

We have seen that education is one way that individuals can invest in themselves. By accepting some monetary costs in the present they can generate equivalent or greater monetary returns in the future. But, of course, before we can accept the statement that education is investment, there ought to be some method by which we can calculate the rates of return on transforming present into future income by means of such investment.

The following is a description of the method that is used for estimating the returns from alternative investments in education. The calculative procedures given here are common to all private monetary rate-of-return studies and were used to estimate the returns to those individuals who are the subjects of this present study.

The Cost-benefit Calculations

Used as a tool for estimating the respective profitability of alternative investments, cost-benefit analysis expresses the relationship between flows of

costs and benefits materializing over time. This can be carried out by calculating the difference between costs and benefits over a given number of periods.(In this study, each period was considered to be one year in length).

In order to estimate the private monetary costs and benefits accruing to an individual who decides to invest in extra education, the investigator uses the following data:

I. The year by year earnings up to the normal age of retirement made by the individual who chose not to undertake any extra education but entered the labour force on completion of the final year of high school.

2. The year by year earnings up to the normal age of retirement made by the individual who chose to undertake a further period of education and training before entering employment.

3. The private costs incurred by the individual who chose to undertake extra education and training.

From this data the calculation of the marginal earnings stream involves finding the difference between

the costs (outflows) and benefits (inflows) for each period. The summation of this flow is the net worth of the investment if the time value of money is omitted. The formula for expressing the marginal benefits or earnings is:

$$ME = \sum_{t=I}^{n} (E_t - C_t)$$

Where:

ME = the undiscounted marginal earnings stream

E_t = earnings for the period t

C_t = costs for the period t

t = the period, ranging from I,2,3,4, ... n

n = length of the marginal earnings stream in years

The result of the above calculation provides a useful way for viewing the investment as a summation of the undiscounted value of the flow of costs and benefits and may be adequate as a comparison with other similarly calculated investments. But it does not take into account the time value of money. Money

received now and money received later do not have the same value for the individual who views it from a given point in time. Therefore, from an investment point of view, if a person is to choose a project which includes some postponement in income, it must represent a sufficient quantity of attractiveness over the "income now" alternative. The attractiveness is presented in the form of interest which compensates the investor for the postponement of his present resources and this can be expressed by the factor $(I+r)^t$ in the compound interest formula. This denotes for the interest rate the value at a future date of money received in the present. When estimating the present value of future income, the relationship is reversed. A sum of money earned tomorrow is less valuable than the same sum earned today. The discounting factor $\frac{1}{(I+r)^t}$ gives the value now of a future payment, with due account of time.

The discounted net present value is the present worth of the total benefits attributed to the investment minus the total cost of the investment both discounted at an appropriate rate to a common year.

The net present value used in this study is computed by using the following formula:

$$PV = \sum_{t-I}^{n} \frac{E_t - C_t}{(I+r)^t}$$

Where: PV = the present value of the marginal earnings stream

r = the discount rate

t = the period extending from period I,2,3, ... n

n = the length of the earnings stream

E_t = earnings for period t

C_t = costs for period t

Before proceeding with the calculation of the above, it is necessary to select a rate of interest which is considered "appropriate" for discounting the the costs and benefits streams. How is an appropriate rate determined? This depends on the "reservation" rate that an individual puts on the investment and this largely depends upon:

I. The subjective time preference of the individual.

2. The rates of returns on the alternative investments.

3. The interest rates the individual would have to pay if he borrowed funds for such an investment.

The individual choice of a discount rate is both subjective and arbitrary and for this reason it is always informative to solve the present value equation for several interest rates. Accordingly, a range of discount rates was used for the present study. These rates are reported in chapter 4.

The determination of the net present value is related to the concept of internal rate of return. The internal rate of return can be defined as the rate of discount necessary to reduce the present value of the returns stream to the present value of its costs stream or, alternatively, it may be defined as the discount rate which makes the present value of the marginal earnings stream equal to zero. In this case an "external" rate is not predetermined as in the net present value calculations. Thus, in the following equation the net present value is set equal to zero.

$$PV = \sum_{t-I}^{n} \frac{E_t - C_t}{(I - r)^t} = 0$$

The result of the equation indicates the rate of interest an investor will make on his investment

if he recovers his capital in a specified number of periods.

All the above methods for estimating net earnings streams, net present values, and internal rates of returns have been applied to the problems central to this study. It was decided to use all three methods because the results are likely to be more informative to the investor when he is making a decision regarding alternative investments. For example, in Wilson's study (reported on page 72 and Table 7), if the investor was to base his decision solely on the internal rate of return it appears that the three-year B.A. or B.Sc. program would be a better investment than program 2, but when a comparison is made with net present values the opposite appears to be true. This indicates that the net present value figure is probably more useful if the investor is interested in obtaining the maximum absolute value of his investment, but on the other hand if his funds are limited, he may want to invest in a project where returns are highest as shown by the internal rate of return.

Rate of Return Studies: Some Selected Research

It is intended at this stage to review briefly a selected number of research studies relating to

private rates of return to various levels of education. While it is emphasized that studies of this kind have been conducted in many countries throughout the world, the following review is confined to a few Canadian studies of recent origin. The selection has been drawn from studies using the present value and/or rate of return approach not for purposes of comparison with the present study, but mainly to exemplify the levels and kinds of education that has been investigated and to illustrate the importance of the investment approach to these kinds of studies.

I. Poduluk (48.1965) calculated the present values of the lifetime earnings of males for selected ages and selected levels of schooling. The data on which the calculations were based were obtained from the Census of Canada, 1961. After estimating the lifetime earnings between the ages of 19 to 64, Poduluk then found the present values using discount factors of 3 per cent, 5 per cent, and 8 per cent. Similar data is presented for present values in the 15 to 64 age range (Table 4). The rates used are low interest rates.

> .... three per cent, which is approximately the current rate of return on bank deposits; five per cent, which is approximately the current rate on Canada Savings Bonds; and eight per cent, which is the rate of return that could be obtained on somewhat riskier investments such as mortgages. (48. p.110).

TABLE 4

DISCOUNTED LIFETIME EARNINGS

	Discount rate			
	0	3 p.c.	5 p.c.	8 p.c.
	Males aged 19-64			
Elementary 5-8	$148,449	$74,725	$54,524	$35,330
High school 4-5	222,676	108,626	78,114	49,321
University deg.	357,675	164,115	112,100	65,187
	Males aged 15-64			
Elementary 5-8	152,473	72,720	48,424	29,301
High school 4-5	221,700	100,671	64,264	36,252
University deg.	356,108	151,852	92,225	47,914

Source: Poduluk (48. p.III)

The earnings and level of education data used by Poduluk refers to the general male population of Canada as a whole.

2. Wilkinson (73. I966) examined rates of returns for several specific occupations and for various levels of education within those occupations. The occupations he selected for his study were: labourers, carpenters, draftsmen, science and engineering technicians, and engineers.

Using data from the I96I Census of Canada he found that returns to different levels of education within occupations were roughly similar. For example, draftsmen with no high school, with some high school, and with four years high school, could count on their present value of earnings discounted at eight per cent as being 36,500, 36,600, and 34,900 dollars respectively. Generally, Wilkinson found that it is by no means always true that additional amounts of education within a single occupation will result in higher discounted earnings. However, when comparisons of discounted earnings are made for given amounts of education for different occupations there are significant variations. The discounted earnings for an engineer with four years of high school are double those of a labourer with the same level of education.

3. Wallace's study (68. I970) was concerned with evaluating the private monetary returns to investment in vocational education teacher training in Alberta. This investigation focussed on the educational investment alternative open to candidates for the vocational education teacher training program, Route I, in the University of Alberta. The study was limited to candidates from two male trades occupations - automotive mechanics and construction electricians, and two female occupations - senior stenographers and beauticians.

In order to estimate investment alternatives, Wallace developed forty two cost-benefit problems taking into account such variables as age, sex, years of teacher training, alternative university programs, and direct, indirect, and negative costs. The costs and benefits data were subjected to marginal lifetime earnings, net present value, and internal rate of return calculations.

Most studies on private returns to education have viewed the process of formal education as a continuous process which terminates at the end of high school or at some level of post-secondary education. From the point of termination, the marginal earnings streams are usually projected to normal retirement age. Wallace's study, however, took a different approach. In the case

of Alberta tradesmen who decide to become vocational teachers, the continuity of education does not apply. Entry requirements dictate that a tradesman should have experience for a number of years in his chosen field before he can enter a course of formal education in order to qualify as a teacher. The study investigated the implications, in monetary terms, of tradesmen who make the decision to become teachers at various decision points in their career.

Candidates who were admitted to the four-year Bachelor of Education (Route I) course of study were granted credit for the first year and upon completion of a year of study they could claim certification as teachers with two years of university training. A significant feature of the program was that candidates for teaching received subsidies for the first year of study in the form of remission of tuition fees, subsistence allowances from Canada Manpower, and bursaries from school boards (Wallace refers to these as "negative cost components"). The total subsidy varied according to the marital status of the applicant and upon the number of dependents he had. The investigator limited the inquiry to two categories - single persons, and persons with three dependents. The calculated average of subsidy for the former category was $3,347, and $5,663

TABLE 5

PRIVATE MONETARY RETURNS TO INVESTMENT IN VOCATIONAL EDUCATION TEACHER TRAINING AS VIEWED AT AGE 37 MALES, CONSTRUCTION ELECTRICIANS, ALBERTA, 1968 (28 periods)

Years at University	Additional Lifetime Earnings	Present Value of Additional Earnings at:				Internal Rate of Return
		4%	6%	8%	10%	(%)
	(1)	(2)	(3)	(4)	(5)	(6)
Route I[a] - Single - with subsidy						
One	$ 2,262	$-1,155	$-2,050	$-2,646	$-3,044	2.2
Two	19,902	5,873	2,084	-514	-2,318	7.5
Three	69,599	29,804	18,954	11,440	6,155	13.7
Route I[a] - Three dependents - with subsidy						
One	4,588	1,081	144	493	-930	6.4
Two	22,218	8,100	4,269	1,630	-212	9.7
Three	71,915	32,031	21,139	13, 584	8,260	15.6
Route I[a] - Without subsidy						
One	-1,485	-4,785	-5,585	-6,116	-6,451	0.0
Academic teacher training option						
Three	-3,842	-13,999	-16,201	-17,404	-17,976	0.0
Engineering training option						
Four	44,470	10,888	1,199	-4,683	-8,591	5.0

Source: Wallace (68. p.124).

[a] Route I is the special instructional program provided by the University of Alberta for education teacher training to the B.Ed. level for prospective vocational education teachers who have had both trades training and work experience.

TABLE 6

PRIVATE MONETARY RETURNS TO INVESTMENT IN VOCATIONAL EDUCATION TEACHER TRAINING, AS VIEWED AT AGE 34, FEMALES, BEAUTICIANS, ALBERTA, I968
(3I periods)

Years at University	Additional Lifetime Earnings (I)	Present Value of Additional Earnings at: 4% (2)	6% (3)	8% (4)	I0% (5)	internal rate of return (%) (6)
Route I - Single - with subsidy						
One	$ 69,929	$36,942	$28,039	$2I,8I9	$I7,357	89.0
Two	90,730	44,993	32,777	24,320	I8,3I7	34.6
Three	I47,876	7I,333	50,946	37,0I6	27,2I8	30.3
Route I - Three dependents - with subsidy						
One	72,245	39,I69	30,224	23,964	I9,462	
Two	93,046	47,220	34,962	26,465	20,422	55.0
Three	I50,I92	73,449	53,I30	39,I6I	29,608	38.I
Route I - without subsidy						
One	66,I82	33,339	24,504	I8,350	I3,950	34.0
Academic teacher training option						
Three	66,983	25,093	I4,465	7,406	2,638	II.6

Source: Wallace (68. p.II2).

for the latter. In some cases, these figures were found to be in excess of both the direct and the indirect costs to the student. These subsidies, coupled with the fact that salary agreements accommodated for past trades experience, served to make the investment a profitable one, but if either of these two factors were excluded, it would appear that the "degree in vocational education would not be so financially attractive for many tradesmen" (68. p. I5I). Tables 5 and 6 illustrate two examples of the rates of return that accrue to an electrician who makes an investment decision at age 37 and a beautician who makes the decision at age 34.

4. Wilson (7I. I970) calculated the monetary rates of returns to individuals who invest in particular forms of baccalaureate education for Alberta males. The university programs chosen for the cost-benefit analysis were a four-year degree in Engineering, a four-year program consisting of a three-year degree in Arts or Science plus a year of teacher education, and a three-year degree in Arts or Science.

The study made an appraisal of the investment decision by persons who chose to re-enter a program of formal education after spending varying periods of time in the labour force. The report, therefore, focussed on

TABLE 7

COMPARISON OF PRIVATE ECONOMIC RETURNS TO INVESTMENT IN A THREE-YEAR BACHELOR OF ARTS OR SCIENCE PROGRAM, A FOUR-YEAR TEACHER EDUCATION PROGRAM AND A FOUR-YEAR ENGINEERING PROGRAM AT VARIOUS AGES, ALBERTA, MALES, 1968

Age at which program commenced	Type of program*	Additional lifetime earnings (1)	Present value of additional earnings at 6% (2)	8% (3)	10% (4)	Internal rate of return (5)
18 years	1	$131,097	$26,877	$16,922	$10,739	19.4%
18	2	151,044	31,796	19,884	12,360	17.9
18	3	161,707	37,757	24,896	16,603	21.1
20	1	116,077	21,102	12,023	6,458	14.6
20	2	135,079	25,952	14,953	8,063	14.5
20	3	145,714	31,920	19,972	12,312	17.2
22	1	102,123	15,810	7,520	2,502	11.5
22	2	120,297	20,594	10,420	4,092	12.0
22	3	130,784	26,515	15,404	8,315	14.4
24	1	89,106	11,034	3,463	-1,073	9.4
24	2	106,702	15,779	6,348	512	10.2
24	3	117,306	21,780	11,397	4,788	12.3
26	1	77,365	6,882	-52	-4,174	8.0
26	2	94,248	11,562	2,804	-2,600	8.9
26	3	104,709	17,505	7,808	1,638	10.7
28	1	66,576	3,390	-2,955	-6,711	6.9
28	2	82,943	8,009	-131	-5,156	8.0
28	3	93,366	13,954	4,877	-913	9.6

*Program 1 is a three year B.A. or B.Sc.

Program 2 is a three year B.A. or B.Sc. plus one year of teacher education.

Program 3 is a four year B.Eng.

Source: Wilson (71. p.91).

the following variables: the type of educational program, the length of the program, and the age at which the individual chose to undertake such a program.

As a basis for an investment evaluation, Wilson calculated marginal lifetime earnings, net present values, and internal rates of return. He found that when an external rate of 8% was chosen as the minimum acceptable return, an individual entering a four-year engineering program would have to begin at or before the age of 33, an individual undertaking a four-year teacher education program would have to begin at or before age 28, and a person who chose to do a three-year arts and science degree would have to begin at or before the age of 26.

5. Stager (64. I968) makes the point that most economic studies of education have considered higher or post-secondary education as a homogeneous activity and have estimated the returns to investment in the level of education from only one or two general points of view. Accordingly, his study was concerned with calculating the social and private rates of return from all kinds of post-secondary education in Ontario, taking in different university faculties, institutes of technology, private business schools, nursing schools,

TABLE 8

Private Returns To Education Beyond High School
In Ontario

	Net Present Values 5%	Internal Rates of Return
Males: University		
Dentistry	80,900	30.2
Law	42,800	I4.7
Arts and Science	28,600	I7,4
Engineering	25,000	I6.8
Pharmacy	24,400	I7.9
Education	II,I00	I0.3
Social Work	-5,300	0.9
Males: Non-degree		
Insts. of Technology	8,700	I2.9
Teachers Colleges	5,I00	78.6
Females: University		
Household Science	9,700	I6.7
Social Work	2,900	8.0
Females: Non-degree		
Teachers Colleges	I7,700	I73.5
Nursing Schools	5,400	29.5

Source: Stager (64. I968) Table IV:3 pp.169-70.

and teachers colleges.

The results of some of Stager's findings are shown in Table 8. It can be seen that private rates of return are extremely varied ranging from 78.6% for teacher colleges, 30.2% for dentists, to 0.9% for social work. These figures seem to underline the danger of looking at post-secondary education without disaggregating the different areas of investigation, especially if the cost-benefit findings influence policy-making.

6. Dibski (23. I970) investigated the private monetary returns to teacher education in the University of Alberta. The subjects of the study consisted of men and women of various ages and teaching experience who had the opportunity to acquire a certain level of teacher qualification up to, and including, the Bachelor of Education degree.

The attainment of different levels of training was viewed as human capital investment problems that could be analyzed for profitability by using marginal earnings, net present value, and internal rate of return calculations. All marginal earnings streams were discounted at 6%, 8%, and I2%. The 8% rate was set as the minimum acceptable return.

TABLE 9

MARGINAL LIFETIME BENEFITS OF INITIAL TEACHER TRAINING FOR FEMALE SUBJECTS IN ALBERTA

	Age at start of training	Rate of return	Present value of net earnings
			At 8%
3 years training			
	Under 25	31.8%	$ 36,000
	25 - 34	24.4	30,298
	35 - 44	23.4	29,012
	45 - 54	20.9	18,398
	Over 54	15.0	5,441
4 years training			
	Under 25	29.0	46,535
	25 - 34	23.6	40,580
	35 - 44	22.9	35,369
	45 - 54	20.9	25,755
	Over 54	15.7	8,542

Source: Dibski (23. p.148).

TABLE IO

MARGINAL LIFETIME BENEFITS OF INITIAL TEACHER TRAINING FOR MALE SUBJECTS IN ALBERTA

	Age at start of training	Rate of return	Present value of net earnings
			At 8%
3 years training			
	Under 25	I6.4%	$ 9,647
	25 - 34	4.0	-I0,53I
	35 - 44	2.5	-I4,545
	45 - 54	I.0	-I3,527
	Over 54	(-)	-I4,435
4 years training			
	Under 25	I8.0	20,I27
	25 - 34	7.9	- 332
	35 - 44	6.5	- 5,365
	45 - 54	5.6	- 6,545
	Over 54	(-)	-I2,I55

Source: Dibski (23. p.I48).

Dibski found that the three or four year program of teacher education proved to be the most profitable for males provided they commenced their studies before the age of twenty five (Table IO). In the case of females, teacher education was found to be profitable under all the conditions studied. All rates of return were high but declined with age (Table 9). The large differences in profitability in teacher training between the sexes was ascribed mainly to lower opportunity costs for women.

7. The Eighth Annual Review of the Economic Council of Canada (28. I97I) analyzes returns from education in terms of those that accrue to society and those that accrue to the individual. The figures are presented as internal rates of return.

Chart I shows returns to individuals and society from completion of high school education. The chart illustrates the returns for Canada as a whole and for certain regions and provinces. In calculating the private returns, the cost figures represented expenses incurred by the individual student, i.e. tuition fees, books, travel, foregone earnings, and incidental expenses. The social costs represented all the costs to the individual plus operating costs, capital consumption allowances,

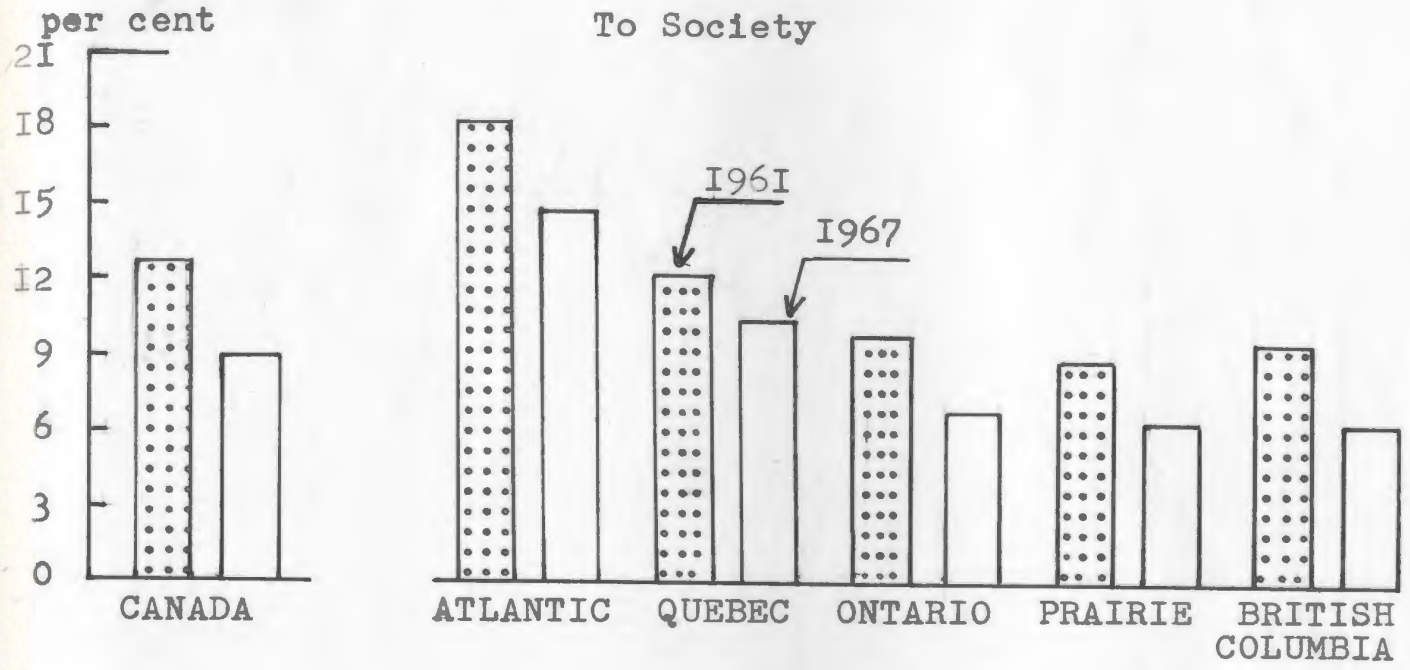
interest on capital, and the costs of providing services to educational institutions. The chart indicates that the highest rates of returns to both society and the individual occurred in the Atlantic Region. Private returns were greater than social returns throughout Canada. Also, both social and private returns were greater in I96I than in I967. "In other words, secondary education appeared as a better investment in I96I than in I967." (28. p.208). This change may be due partially to (a) the recent increases in the costs per student in secondary education and (b) the increase in the proportion of the labour force with post-secondary education and thus "creating a displacement of those with a secondary education to lower positions in the labour force." (28. p.208).

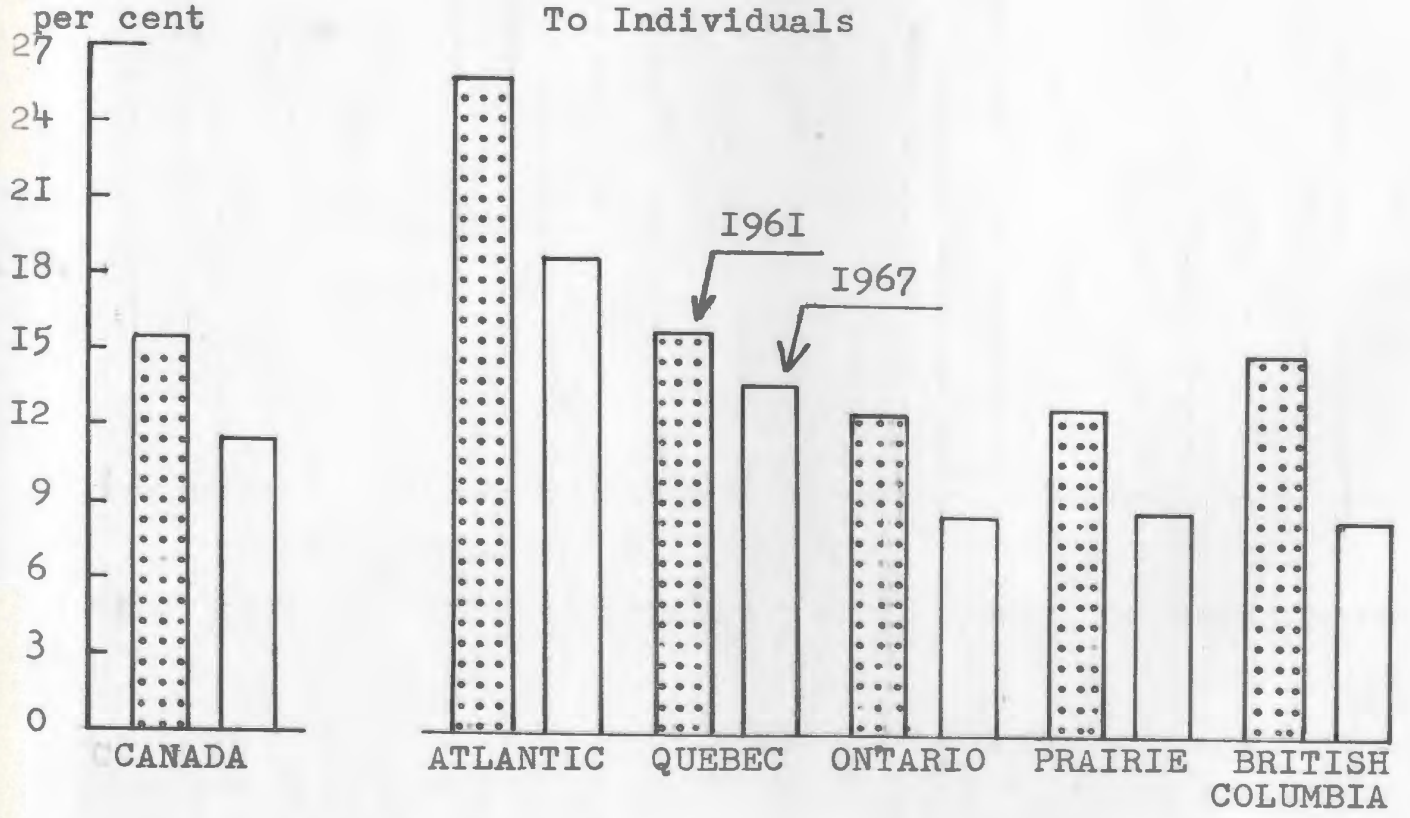
Chart 2 presents rates of returns to both society and to individuals from university education. Again, as in secondary education, the private returns were greater than the social returns. Also, differences in the returns from university education were not as great between I96I and I967 as the differences in returns from secondary education.

Chart 2 provides evidence that:

CHART I

INTERNAL RATES OF RETURN FROM HIGH SCHOOL EDUCATION, MALES, BY REGION

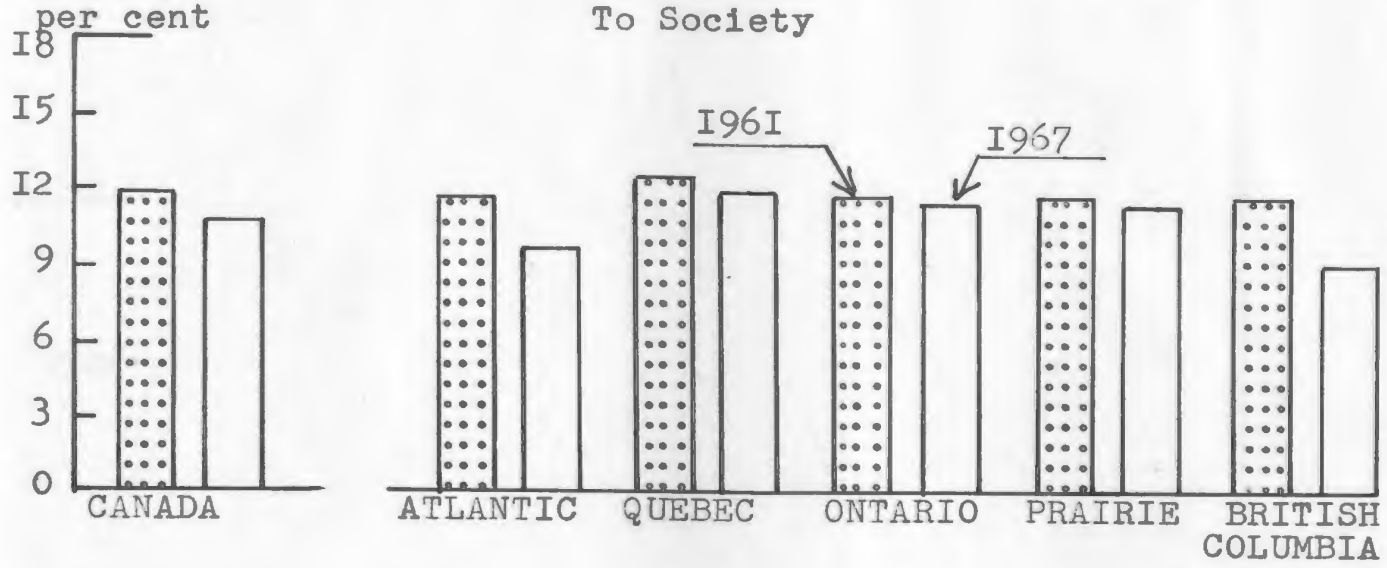


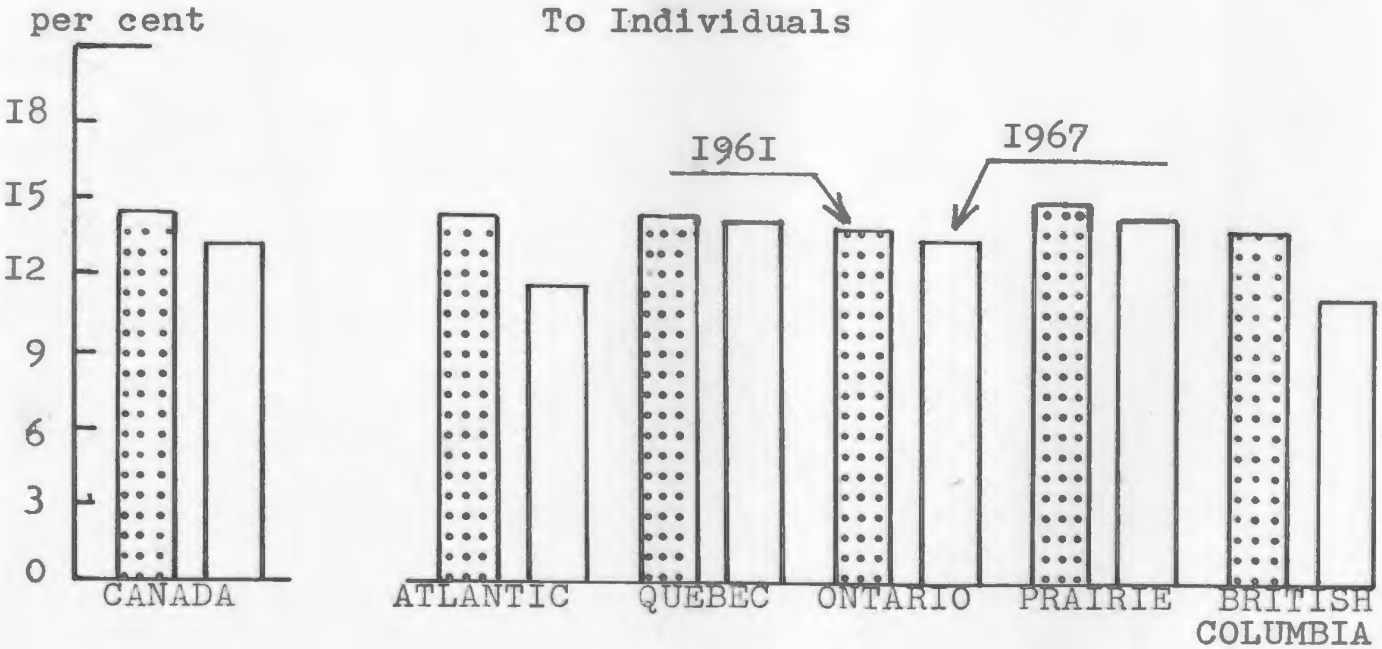


Source: Economic Council of Canada. Design for Decision-making: An Application to Human Resources Policies. Eighth Annual Review, Ottawa, 1971

CHART 2

INTERNAL RATES OF RETURN FROM UNIVERSITY EDUCATION, MALES, BY REGION





Source: Economic Council of Canada. Design for Decision-making: An Application to Human Resources Policies. Eighth Annual Review, Ottawa, I97I

> With the exception of the Atlantic Region, the rates of returns to society from a university degree were higher in all parts of Canada than the rates of return from high school completion in I967. This suggests that the Atlantic Region may have over-emphasized post-secondary education relative to secondary education during the I960's. (28. p.2II).

LIMITATIONS OF RATE OF RETURN STUDIES

Most investigators recognize that the estimation of private rates of return to education raises certain difficulties. These have been discussed at some length by Blaug (8.pp. 62-92), Bowen (I7. pp.I3-38), and Wiseman (72. pp. I-I2).

One of the main difficulties is that the economic returns between levels and types of education described earlier can only partially be ascribed to those marketable skills which have been developed through the process of formal education. Ability, class, race, home environment, informal education and motivation are also factors which affect the earnings differentials.

Some investigators have tried to isolate and assess the "pure" portion of the earnings associated with the skills and knowledge resulting from the process

of formal education. Becker (4. I962) and Denison (2I. I962) have conducted research in this area. Both of these writers have attempted to make certain adjustments based on sound assumptions but much more work needs to be done before reliable measurements can be taken. However, there seems to be a consensus of opinion supported by evidence that education is related to earnings.

> .... the amount of education that an individual possesses is, in all modern economies of which we have knowledge, positively correlated with personal earnings. This is not true for each and every individual - the correlation is far from perfect - but it is true for the average person and indeed for most. Age, sex, race, native ability, social class background, place of residence, branch of employment, occupation and on-the-job training are important determinants of personal earnings, but none of them are as powerful in their influence on earnings as the numbers of years of schooling completed. In short, additional education can be more or less confidently expected to raise lifetime earnings and, in this sense, the acquisition of education is of the nature of a private investment decision geared to future earnings. (II. p.22).

One other comment needs to be made here. It has already been pointed out that most investigators recognize the problem of isolating the education component from various other components in relation to earnings. It is contended that these "other components"

have a lower relevance to the vocational trades aspirants of this study i.e. carpenters, electricians, beauticians, and stenographers, though they may operate to a greater extent in relation to the other subjects of this study, - the academic teachers.

A second criticism levelled at the rate of return studies is that they assume that individuals are motivated solely by financial benefits. Many doubt that students, in fact, estimate the benefits of education in the same way that this study suggests, that is, by analyzing the benefits that accrue to individuals from undertaking a period of further education. This may be partly true. It can be argued that most students do not go to the extent of calculating rates of return mainly because of inadequate career information. Nevertheless, they enter into further education with some expectations of future profit. It is worth noting that during the preliminary stages of collecting the data for this study, by far the most-frequently mentioned reason for engaging in extra education and training by interviewees was the earnings factor. This is consistent with the findings of many inquiries in this area (Crowther.I9.pp.25-26), Furneaux.29. pp.58-62),(Robbins.52. pp.I67-89), (Cole. I8. pp.I45-6), (Holinshead.36. pp.I35-85), (Lansing, Lorimer, and Moriguchi. 40.pp.II9-46), (Rosenberg.54. pp.II-I6), (Roper.53.p.xxi).

> Social surveys of the attitudes of parents and students reveal a keen awareness of the vocational opportunities opened up by additional education; job expectations are almost always ranked above all the other motives in the decision to stay at school beyond the compulsory leaving age. In other words, education is regarded as an investment good, because everyone recognizes the fact that financial benefits are generated by extra education. (II.p.I70)

A third objection stems from the fact that differences in earnings are not necessarily related to productivity and consequently education. However, this objection is less readily acceptable if the study is confined to individual rates of return.

> The question of whether differences in relative earnings reflect differences in productivity does not arise so long as one looks at returns to education solely from the personal profit point of view. But, if we wish to interpret rates of return on education as indicative of over- or under-investment in education from the national productivity point of view, this question becomes very important indeed. (I7.p.82).

Another difficulty often mentioned is that cross-sectional income data generally used as a basis for the kind of analysis employed in this study do not always represent a true picture of reality. The cross-sectional data are obtained at one point in time and therefore they cannot reflect the true life-cycle

earnings in a changing economy. Income differentials at one period may not be good indicators of income differentials in a future period. Blaug does not wholly share this view.

> There are drawbacks to the use of cross-section data, but there are also advantages: unlike time series, cross-section data are free from the influence of the business cycle and implicitly provide estimates of earnings in money of constant purchasing power. Furthermore, they have the additional advantage of reflecting the ways in which private educational choices are actually made: the average student forms his expectations of the financial benefits of additional years of schooling by comparing the present earnings of adults with various amounts of education, that is, by cross-section comparisons of the relationship between earnings and education. (II. pp.25-26).

The only empirical evidence on longitudinal comparisons of earnings appears to be those of Miller. He found that variations in income with age based on cross-section data for a period of fifteen years had been quite stable. "The relationship does not appear to be affected by cyclical changes in economic activity" (43. p.840). The evidence indicated that the earnings differentials had changed only at the rate of one or two per cent per year. Compounding such changes over fifty years would alter the rate of return by only about one per cent ...."since earnings expected several years hence are discounted so heavily". (64. p.66).

> In any case, failure to take account of such changes in the past few decades has resulted in a slight underestimating, rather than overestimating, of the rates of return to educational investment. (64. p.66).

The earnings figures of individuals in the first few years have most bearing on the calculations of rates of return. Therefore, providing the earnings are carefully calculated in relation to contemporary earnings for those years close to the focal date, underestimation or overestimation after the first ten years have only slight effect.

Another source of difficulty arises when we try to assess the indirect benefits which derive from the educational process in addition to the direct benefits. Blaug infers that many critics have maintained that the direct benefits are quantitatively less important than the indirect spill-over benefits. But the critics give no indication of how they arrived at that conclusion.

> ..... The direct economic benefits remain at present the only ones capable of fairly accurate measurement and this is the chief, if not the only, justification for concentrating on them. (II. p.204).

Blaug goes on to say that it may be true that rate of return analysis takes no account of spill-over

benefits but neither do other approaches such as the manpower requirements approach. Up to the present there is no viable way of quantifying the external effects of education, or for that matter many other forms of public investment such as health and housing.

> ... rate of return analysis has the virtue of posing the issue sharply and thus opening the door to its successful resolution, whereas the other approaches virtually preclude, by their very formulation, the quantification of spill-over benefits. (II. p.204).

In reference to the individual choice between alternative forms of investment, it can be said that ".... indirect economic benefits by definition do not determine individual choice" (8. pp.2II-2I2). As this study is concerned solely with individual choice, the problem of indirect benefits does not arise.

Education as Investment and Consumption

Conceptual difficulties are presented when attempts are made to estimate what proportion of educational expenditures should be viewed as consumption and what part as investment. In fact, education is almost always both of these.

Regarding the benefits that may be gained through schooling, Schultz places them in three "conceptual boxes." The first box is labelled "present

consumption value' and in it is contained the current benefits (satisfactions) gained by students engaging in education. The second bears the label "future consumption" and contains the long-term stream of satisfactions gained by the educated person who, it is assumed, is able to enjoy pleasures that are denied others (these are the psychic benefits referred to on page 56 of this study). The third box contains "future producer capability" and inside we find the lifetime streams of earnings that accrue to the educated worker. If we could apportion educational expenditures exactly between the three boxes, outlays in the first could be labelled consumption. In the the second and third boxes, expenditures could be classified as investment because they yield a stream of benefits over time, whether measurable (as in the case of lifetime earnings) or those that cannot be measured (as in the case of long-term consumer satisfactions). (58. p.38).

However, it is not possible to apportion educational costs between consumption and investment in any satisfactory way. Bowen, discussing the complementary nature of these two aspects of education, states that society does not really have the option of ceasing to make expenditures on the consumption aspect of education "....without simultaneously

curtailing expenditures on the investment aspect." This is because efforts to separate the two encounter a joint cost problem in which essentially the same inputs are "transmuted simultaneously into two-end products (professional preparation and pleasure). (I7. p.89).

A Response To The Criticism

It can be seen that the rate of return approach is not a perfect tool of analysis and an attempt has been made in the foregoing section to outline the many limitations and difficulties that beset the approach. But, it can be said once more, all serious researchers in the field have recognized these difficulties.

> It would be folly to pretend that the rate of return approach is free of troublesome difficulties or that it can be relied on to prove conclusively to a staunch unbeliever that investing resources in education makes good economic sense. But this approach does have three rather important appeals: (I) it enables us obtain results in a form which permits comparisons of costs with benefits; (2) it permits us, in making calculations, to examine the quantitative effect on our results of alternative assumptions about such things as the proper discount rate and the effect of ability differentials; and (3) as I hope ... this approach is susceptible to further refinements and does hold out the possibility that further research will remedy some of the present difficulties. (I7. p.93).

Essentially cost-benefit analysis attempts to do, in a more methodical way, what people are doing every day when they make a decision about the future.

> An important advantage of cost-benefit study is that it forces those responsible to quantify costs and benefits as far as possible rather than rest content with vague qualitative judgements or personal hunches. This is obviously a good thing in itself; some information is better than none ... it has the very valuable by-product of causing questions to be asked which would otherwise not have been raised. (49. p.730).

The authors of the above quotation point out the advantages of cost-benefit studies to planning. It is ... "a practical way of assessing the desirability of projects where it is important to take a wide and long-term view" (49. p.683).

It is claimed that "rationality" and "objectivity" in decision-making stems from the rate of return approach and among all other approaches to the analysis of investment in education it is regarded as the most effective and by far the most fully developed than any other with which "economists have approached problems in the economics of education. (14. p.III).

> The most embracing and refined theoretical construct applicable to economic analysis in investment in education is represented by the rate of return approach. Though its rigorous application is normally frustrated by inadequate data, the basic propositions and techniques are pervasive and indispensable for any rational analysis ... Rate of return analysis is the major tool among several in this endeavor. It provides a more precise and refined guide to direction of adjustment than any other yet available to us. (I4. p. III-II3).

Bowman, in addition to emphasizing the advantages of the approach, indicates that it is the one that "most clearly illuminates the zones within which the concerns of the economist and educator converge." (I4. p.III).

The rate of return approach provides information and assistance to individuals, groups and policy-makers who are concerned with the establishing of scales of priorities and choosing between alternatives in accordance with limited resources that are available. The greatest problem is that the validity of these judgements can only be tested by the passage of time. And, as indicated earlier, besides the hazards of forecasting, there are the problems of measurement. Certain benefits, though they may be recognized, are not normally measured in monetary terms, and the same applies to costs. But these same problems are not

peculiar to the economics of education. They apply in most other areas of social and economic activity which have to do with planning, programming, and budgeting. Who would maintain that that which lends itself to measurment should not be measured? This is a basic function of economics. Knowledge and understanding in any field of inquiry is an additive progression and the rate of return approach to education can be seen from this viewpoint. In reference to the limitations of the approach, Wallace says:

> In the final analysis, there is no foolproof defence for the assumptions of the rate of return studies .... Their validity resides in their usefulness as a basis from which to work in attempting to explain empirical phenomena. Given the antecedent nature and inherent limitations of assumptions, the researcher must function within these constraints and control his conclusions accordingly. (68. p.50).

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CHAPTER 4

THE DECISION-MAKERS AND THE DATA: PROBLEMS I, 2, and 3

The central problem of the study was to make an analysis of the private monetary returns to investments in education and training for three types of decision-makers. The analysis was circumscribed by the form of the sub-problems as stated under the major research problems in Chapter 2 and in all cases the calculations were made within the limitations imposed by the entrance requirements for trades training, vocational teaching in trades occupations, and vocational teaching in academic subjects. The private investor's point of view was maintained throughout the study.

This chapter gives a description of the decision-makers referred to in problems I, 2, and 3, the kinds of costs data attributed to their investment, the earnings of the decision-makers, and the calculative procedures for estimating the marginal earnings, the net present values, and the internal rates of return which accrue to those different forms of private investment relating to the sub-problems of the study.

The Trades Occupation Decision-makers

Some indication of the rapid expansion of vocational education in Newfoundland was given in Chapter I. Out of the many courses that are now listed as being offered in the vocational schools, four were chosen for the purposes of this study: two male occupations - electrician and carpenter, and two predominantly female occupations - beautician and senior stenographer. The first three fall into the category of designated trades, while the fourth - senior stenographer - falls within the area of commerce and is a non-designated trade. The reasons for choosing these four trades were:

1. These four trades types represented dominant enrolments in courses and therefore indicated the investment demand in those areas.

2. These four trades types reflect the larger demand for vocational teachers in their respective courses.

3. The introduction of the sex variable may lead to useful information regarding comparisons between male investors and female investors.

Any individual who wishes to pursue a given trades occupation in Newfoundland must fulfil certain requirements before being granted a certificate of journeyman's

status by the Department of Labour. Generally, the requirements can be fulfilled in one of two ways. The individual can either (a) undertake all his period of apprenticeship within industry or commerce or (b) he may take a pre-employment course at a vocational school for which he is awarded one year's credit on his term of apprenticeship. This study analyzed the private monetary benefits accruing to decision-makers who chose the latter alternative route to certification.

The journeyman's certification requirements for the four decision-makers were:

Electrician: One year pre-employment education and three years apprenticeship.

Carpenter: One year pre-employment education and three years apprenticeship.

Beautician: One year pre-employment education and one year Apprenticeship.

Stenographer: One year pre-employment course.

The Vocational Teacher Decision-maker

An applicant for the position of trades vocational teacher in the province of Newfoundland must satisfy the minimum requirements of eligibility. These

requirements have been stated explicitly in the recent agreement between the Treasury Board and the Newfoundland Government Employees Association on conditions of employment and salaries of employees in vocational institutes (6. I97I).

According to the Technical and Vocational Instructors Classification Plan on page 20 of the Agreement, the vocational teachers in the electrical, carpentry, and beauty culture courses referred to in problem 2 and sub-problems 3, 6, and 8 of this study are in the Class 3 category, and the vocational teacher in stenography is in Class 2. The entrance requirements for these two categories are as follows:

I. Electrical, Carpentry, and Beauty Culture

Instructor Class 3, Level B	Grade XI plus journeyman status with a minimum of six years combined apprenticeship training and related experience.

The applicant, however, is required to take additional training which consists of three summer schools at Moncton, New Brunswick, in order to obtain a vocational teacher certificate. Therefore, the applicant must be

prepared to enter at Class 3, Level A, stay at the salary rate for that class for three years after which he becomes eligible for Instructor Class 3, Level B. The classification then becomes:

Instructor Class 3, Level B	Qualifications for Class 3 Level A, plus completion of program of vocational teacher training, or the equivalent as approved by the Minister of Education.

Two additional levels, C and D, have been incorporated into the classification but the additional post-secondary courses that an individual must take before qualifying for these two levels have not yet been finalized. As the courses necessary for obtaining levels C and D will not normally be taken by instructors, this study is confined to instructor levels A and B.

2. Stenographer

The classification of the instructor in stenography is one class below that of carpentry, electrical, and beauty culture instructors. The minimum requirements for entry are as follows:

Instructor Class 2 Level A	Grade XI plus completion of one year craft, commercial, or occupational course, or equivalent, with a minimum of five years of related experience.

The additional training courses which must be taken by Class 3 entrants to vocational teaching, applies to Class 2 also. Therefore, the requirements become:

Instructor Class 2, Level B	Qualification for Class 2, Level A, plus completion of a program of vocational teacher training, or the equivalent, as approved by the Minister of Education.

Academic Teachers In Vocational Schools

The third class of investors with whom we were concerned in this study were individuals who had decided to invest in a period of formal education leading to a baccalaureate degree at Memorial University of Newfoundland and on completion of their course of study would enter vocational schools as academic instructors.

Applicants who undertake a four-year program leading to a baccalaureate degree are generally required to have passed the Grade XI Public Examinations of Newfoundland with an overall average mark of not less than 60% in selected subjects listed by the university, although in certain cases individuals who do not meet these requirements may be admitted on the recommendation of the Committee of Admissions.

While it is possible to complete some undergraduate degrees with less than full-time attendance, all the subjects of this study were assumed to be in full-time attendance for the whole four years. As in the case of the trades occupations and the vocational teachers, the sex variable was introduced into the academic class of investors.

The Age Variable

Data regarding the ages at which the decision-makers entered their period of education and training were essential for estimating the lifetime earnings streams. For entrants to the baccalaureate studies, the age was set at I8 - the normal age of matriculation. In the case of the three designated trades of carpenter, electrician, and beautician, the minimum age for entering the pre-employment courses was I6. However,

there were only a few applicants admitted at that age. According to information obtained from the registrar of the College of Trades and Technology, the average age was I7½. For the purposes of this study, the age was set at I8 rather than I7 so that information for the decision-maker regarding the estimated returns on his investment would be biassed downwards. The average age of entry for the non-designated trade of stenographer was I7.

The lifetime earnings profiles of the four trades types who enter vocational teaching differ according to the year when each individual makes the decision to become a vocational teacher. The profile alters at the decision point because of the difference in salaries between journeyman tradesman and vocational teacher. For the designated trades of electrician, carpenter, and beautician who enter on their period of education and training at the age of I8, the minimum age at which they can become vocational teachers is at the age of 24. However, it was considered unrealistic to set the first decision point at this age because there may be inconsistencies between the chronological age of the individual and the date of his examination for certification. There may be delays for the applicant, too, in the processing of the necessary

forms of application, interviews, and the eventual placement of the applicant if he were selected. Therefore, the first point of entry into vocational teaching for these three trades was located at the age of 25. The other decision points were located at ages 30 and 40.

In the case of the undesignated trade of stenographer who began her training at 17, the minimum age at which she can take up vocational teaching was 23. The first decision point was located at 24, the second decision point at 30, and the third at 40.

DATA RELATING TO THE EARNINGS PROFILES OF THE DECISION-MAKERS

In order to calculate the monetary benefits resulting from the investments in education and training, an estimate had to be made of the lifetime earnings profiles of high school graduates who had entered the labour force, and then, by relating the estimated earnings profiles of the various decision-makers described in the last section, calculate the year by year earnings differentials.

TABLE II

Average Income From Wages and Salaries For Newfoundland Wage Earners With Completed Secondary Schooling, I96I

Age interval	Average annual wage or salary	
years of age	Male wage earners	Female wage earners
I5 - I9	$ I,II2	$ 875
20 - 24	2,3I6	I,578
25 - 34	3,482	I,950
35 - 44	4,032	I,906
45 - 54	4,042	I,769
55 - 64	4,226	I,8I4

Source: Dominion Bureau of Statistics. Earnings of Wage Earners By Schooling and Age. Catalogue 94 - 537. Vol. III. Part 3. I96I. Ottawa

The Earnings Of High School Graduates

The I96I Census of Canada provided the basis on which the earnings data for high school graduates were calculated. Table II shows the earnings for six intervals ranging from I5 to 64 for males and females in Newfoundland. The earnings reported in the Census were for averages over ten-year age intervals with the exception of the first two intervals which were five years. In order that no distortion would occur in the present value and rate of return calculations, it was necessary to interpolate a year-by-year earnings profile. This was carried out by following the same method used by Stager (8. p.I4I) and Dibski (2. pp.I09-II0). The method produces a linear interpolation from the five and ten year intervals by using the average figures given in Table II as the midpoints of those intervals.

The next problem was to convert the I96I earnings profile of high school graduates in Newfoundland to that which would be likely to prevail in March, I97I. Adopting the same procedure as Dibski (8. p.I06) and Wilson (II. p.58) used in their studies relating to Alberta, an index number was calculated by making use of the average wage and salary increases that have occurred between I96I and March, I97I, in Newfoundland. The data relating to the occupations were obtained from several sources including the Newfoundland Department of Labour,

Canadian National Railways, St. John's Transportation Commission, Newfoundland Telephone Company, and a number of manufacturing and service organizations. The list of occupations is shown in Appendix A. With the index for I96I set at I00, the conversion index for males was calculated as I.4652 and I.4650 for females in Newfoundland.

The lifetime earnings profiles for male and female high school graduates for the base year I97I were estimated by using the conversion indexes. The results, showing the estimated annual earnings for males and females from the age of I7 to 64 inclusive, are contained in Tables I2 and I3. It can be seen that there is a great difference between male earnings and female earnings.

Earnings of Electricians

The data relating to the year by year earnings of electricians were obtained from the Newfoundland Department of Labour and The International Brotherhood of Electrical Workers. The wage classification was based on an hourly rate and the normal working week was one of forty hours. The figure of $7,84I per annum was derived from Table I4 and used as the basis for estimating the income profile of the electrician.

During the period of on-the-job training, the

TABLE I2

INTERPOLATED I96I AND ESTIMATED I97I AVERAGE ANNUAL INCOME FROM WAGES AND SALARIES BY YEARS OF AGE FOR MALE WAGE EARNERS IN NEWFOUNDLAND WITH COMPLETED SECONDARY SCHOOLING

Age	Annual earnings		Age	Annual earnings	
	I96I	I97I		I96I	I97I
I7	$I,II2[a]	$I,629	40	$4,032	$5,907
I8	I,353	I,982	4I	4,033	5,909
I9	I,594	2,336	42	4,034	5,9I0
20	I,835	2,688	43	4,035	5,9I2
2I	2,075	3,040	44	4,036	5,9I3
			45	4,037	5,9I5
22	2,3I6[a]	3,393[b]	46	4,038	5,9I6
			47	4,039	5,9I7
23	2,47I	3,620	48	4,040	5,9I9
24	2,627	3,849	49	4,04I	5,920
25	2,782	4,076			
26	2,937	4,303	49.5	4,042[a]	5,922[b]
27	3,093	4,53I			
28	3,248	4,758	50	4,05I	5,935
29	3,403	4,986	5I	4,069	5,96I
			52	4,088	5,989
29.5	3,482[a]	5,I0I[b]	53	4,I06	6,0I6
			54	4,I24	6,042
30	3,509	5,I4I	55	4,I44	6,07I
3I	3,564	5,I74	56	4,I62	6,098
32	3,6I9	5,302	57	4,I8I	6,I26
33	3,674	5,383	58	4,I99	6,I52
34	3,729	5,463	59	4,2I7	6,I78
35	3,784	5,544			
36	3,839	5,624	59.5	4,226[a]	6,I9I[b]
37	3,894	5,705			
38	3,949	5,786	60	4,I56	6,089
39	4,004	5,866	6I	4,086	5,984
			62	4,0I6	5,884
39.5	4,032[a]	5,907[b]	63	3,946	5,78I
			64	4,876	5,679

[a] Source from Table II.

[b] Estimated by multiplying interpolated I96I figures by conversion factor I.4652

TABLE I3

INTERPOLATED I96I AND ESTIMATED I97I AVERAGE ANNUAL INCOME FROM WAGES AND SALARIES BY YEARS OF AGE FOR FEMALE WAGE EARNERS IN NEWFOUNDLAND WITH COMPLETED SECONDARY SCHOOLING

Age	Annual earnings		Age	Annual earnings	
	I96I	I97I		I96I	I97I
I7	$ 875[a]	$I,28I	40	$I,900	$2,783
I8	I,0I6	I,488	4I	I,889	2,783
I9	I,I56	I,693	42	I,87I	2,74I
20	I,297	I,900	43	I,863	2,729
2I	I,438	2,I06	44	I,849	2,708
			45	I,834	2,686
22	I,578[a]	2,3II[b]	46	I,820	2,666
			47	I,805	2,644
23	I,628	2,385	48	I,790	2,622
24	I,678	2,458	49	I,776	2,60I
25	I,728	2,53I			
26	I,778	2,604	49.5	I,769[a]	2,59I[b]
27	I,828	2,678			
28	I,878	2,75I	50	I,77I	2,594
29	I,925	2,820	5I	I,776	2,60I
			52	I,780	2,607
29.5	I,950[a]	2,856[b]	53	I,784	2,6I3
			54	I,789	2,620
30	I,948	2,853	55	I,793	2,626
3I	I,943	2,846	56	I,798	2,632
32	I,938	2,839	57	I,803	2,640
33	I,934	2,833	58	I,807	2,647
34	I,930	2,827	59	I,8I2	2,654
35	I,926	2,82I			
36	I,92I	2,8I4	59.5	I,8I4[a]	2,657[b]
37	I,9I6	2,806			
38	I,9I2	2,80I	60	I,792	2,625
39	I,908	2,795	6I	I,770	2,593
			62	I,748	2,560
39.5	I,906[a]	2,792[b]	63	I,726	2,528
			64	I,70I	2,496

[a] Source from Table II.

[b] Estimated by multiplying interpolated I96I figures by conversion factor I.4650.

apprentice electrician received 40% of the full journeyman rate of pay for the first year after the pre-employment course, 55% in the second year, and 75% in the final year of apprenticeship.

TABLE I4

Wage Rate, Weekly, of Journeyman Electrician

Average rate per hour	Number of hours per week	Wage per week
$ 3.77	40	$ I50.00

Earnings of Carpenters

Information regarding the earnings of carpenters was obtained from the Newfoundland Department of Labour. The wage classification for this designated trade was based on an hourly rate and the normal working week consisted of forty hours. A year-by-year earnings figure of $6,864 was derived from Table I5.

As in the case of the trainee electrician, the apprentice carpenter was paid a percentage of the full rate of journeyman during his years of apprenticeship. He received 55% of the full rate in the first year following pre-employment education, 85% in the second year, and 95% in the final year.

TABLE I5

Wage Rate, Weekly, of Journeyman Carpenter

Average rate per hour	Number of hours per week	Wage per week
$ 3.30	40	$ I32.00

Earnings of Beauticians

The data on which an estimate of the earnings of beauticians were based were derived from information provided by Mr. Mondou, College of Trades and Technology, and Mr. Carter, head of the Apprenticeship Board of Newfoundland. The Newfoundland Department of Labour and

Canada Manpower had no listing of the earnings of beauticians. With the exception of a statutory rule which states that they must not be paid less than forty dollars per week, there are no regulations in force to standardize the wages of beauticians. Nevertheless, it was possible to arrive at a figure of earnings for this trade.

For the year of apprenticeship following the year of pre-employment education, the beautician would be paid $40 per week. Then this figure would rise during the next two years to an average of $70 per week. In addition, the beautician could be paid a commission according to her sales which would bring her to a top wage of $II0 per week. However, because of the fluctuating nature of sales and the fact that payment of commission varies, it would be unrealistic to set this figure of $II0 as the normal wage. $95 was judged to be a fair estimate. Table I6 shows the average basic wage, the average commission, and the total earnings per week of the beautician. A figure of $4,940 per annum was used to produce the lifetime earnings.

TABLE I6

Wage Rate, Weekly, of Qualified Beautician

Average basic wage	Average commission	Total earnings per week
$ 75.00	$ 20.00	$ 95.00

Senior Stenographers

As in the case of the electricians and carpenters, the information relating to the earnings of senior stenographers was obtained from the Newfoundland Department of Labour. From the data provided, the year-by-year earnings profile was based on a wage of $87 per week which produced a figure of $4,524 per annum. However, the stenographer is not normally paid this figure until she has had about five years experience at different levels of clerical work. In the first two years following her pre-employment training, she would be paid $63 per week as a clerk. As a clerk stenographer, her earnings would rise to $67 in the third year, then to $7I in the fourth year.

The Earnings of Vocational Teachers

The data relating to the earnings of vocational teachers were obtained from the Newfoundland Division of Technical and Vocational Education. (Tables I7 and I8).

TABLE I7

SALARY SCALE FOR TECHNICAL AND VOCATIONAL INSTRUCTORS (Class 3) IN ELECTRICAL, CARPENTRY, AND BEAUTY CULTURE COURSES

Yearly pay steps	I	2	3	4	5	6	7	8
Salary $'s	6,662	6,996	7,345	7,7I2	8,098	8,503	8,928	9,I46
				8,3I2	8,698	9,I03	9,528	9,746

For the above three trades' teachers, it would be normal to start at step I at age 25, step 4 at age 30, and step 5 at age 40. There would then follow yearly increments up to step 8 and from that point the salary remains static. To the amounts shown in the table, $600 would be added after three successive summer schools at Moncton (bottom line of table).

TABLE I8

SALARY SCALE FOR TECHNICAL AND VOCATIONAL INSTRUCTORS (Class 2) IN STENOGRAPHY

Yearly pay steps	I	2	3	4	5	6	7
Salary $'s	6,047	6,350	6,668	7,00I	7,352	7,720	7,908
				7,60I	7,952	8,320	8,508

For the above trades teacher, it would be normal to start at step I at age 25, step 2 at age 30, and step 3 at age 40. There would then be yearly increments up to step 7 and from that point the salary remains static. To the amounts shown in the table, $600 would be added after three successive summer schools at Moncton (bottom line of table).

The Earnings Profile of Baccalaureate Graduates

The data on which the earnings profile of baccalaureate graduates were calculated were obtained from the Newfoundland Division of Technical and Vocational Education. The salary scale was basically the same as

that for teachers in all areas of education throughout the province plus an increase of 6% on each salary figure. The baccalaureate graduate would be situated on the grade 4 level of the academic scale. (Table I9).

TABLE I9

PAY SCALE FOR BACCALAUREATE GRADUATE

Yearly pay steps	I	2	3	4	5	6	7	8
Salary $'s	6,767	7,I23	7,479	7,836	8,072	8,3I0	8,547	8,666

In the first year of employment, the academic instructor would receive the salary figure shown in year I. The teacher then receives an increment each year until he reaches the 8th year. From that point onwards, the salary remains stationary.

INVESTMENT-RELATED COSTS

A desciption of what constitutes private investment costs has been given in Chapter 3. A distinction

was made between total annual expenditures by investors and those expenditures which are directly related to their investment decisions. Costs of the latter kind are part of the annual sum invested, while expenditures assigned to such items as food and clothing, accommodation, entertainment, and travel, cannot be included in the investment costs unless there is an excess of expenditure on these items which would not occur under ordinary circumstances. With this in mind the investment costs to the decision-makers were determined.

Direct Investment Costs For Trades Occupation Decision-makers

The annual direct costs for individuals investing in education and training in the trades occupations were made up of $5.00 registration fee, $5.00 laboratory fee, $I.00 accident insurance premium, and an estimated additional cost of $I05.00 for books and course equipment. (Table 20). The tuition fees of $250.00 per semester for full-time courses are not a charge to residents of Newfoundland and Labrador and therefore are not calculated in the costs. A resident of Newfoundland and Labrador is defined as:

(a) an individual born in Newfoundland and Labrador who has lived in the province

TABLE 20

Private Academic Costs of One-year Pre-employment Course for Carpenters, Electricians, Stenographers, and Beauticians at Vocational Schools, Newfoundland

Cost Source	Amount
Registration Fee	$ 5.00
Laboratory and Shop Fee	5.00
Accident Insurance	I.00
Academic Expenses (books and course equipment)	I05.00
Total	II6.00

Sources: College of Trades and Technology Prospectus, I970. p.5

District Vocational Schools Prospectus, I970.p.3

Post-secondary Student Population, I968-69. Dominion Bureau of Statistics. Catalogue 8I - 2I9 (I970)

Information from Registrar, College of Trades and Technology, St. John's.

for three of the last five years,

and (b) a Canadian citizen or landed immigrant who has lived in the province for at least thirty-six consecutive months immediately preceding enrolment. (I. p.I8).

Direct Investment Costs For Vocational Teachers

The direct costs for individuals who have fulfilled the requirements of eligibility for vocational teaching are exactly the same as the trades-type decision-makers already described. No costs are incurred by the vocational teacher for attending the three summer schools at Moncton. The salaries of these people are not affected while they are in attendance at summer school and the costs of tuition plus living expenses are paid by the provincial government.

Direct Investment Costs For The Baccalaureate Decision-makers

The annual costs for individuals investing in a course of study leading to a baccalaureate degree at Memorial University were made up of $30 application

TABLE 2I

Private Academic Costs Four-year Baccalaureate Degree at Memorial University of Newfoundland

Cost Source	Amount per Year
Application Fee	$ 30.00
Undergraduate Union Fee	I6.00
Other Academic Expenses	I55.00
Total	20I.00

Sources: Memorial University of Newfoundland Calendar, I970. p. I4.

Post-secondary Population, I968-69. Dominion Bureau of Statistics. Catalogue 8I-543 (I970) Table 4, p.3I.

Information from Registrar, Memorial University of Newfoundland.

fee, $I6 undergraduate union fee, and an estimated $I55 for other academic expenses (Table 2I). In regard to course fees, the rule applying to the pre-employment courses at the vocational schools apply also to the baccalaureate courses. "Tuition fees for full-time students who are regularly resident in Newfoundland are paid by the Newfoundland government" (9.p.5).

Indirect Costs For All Decision-makers In This Study

Indirect costs are distinguished from direct costs in that the former do not involve the investor in the actual use of money for the purchase of goods and/or services. For this study, the indirect costs of investing in education and training were taken to be the foregone earnings due to the loss of employment income by the investor while he was engaged in furthering his education and training. The earnings foregone by each investor in this study can be read from Tables I2 and I3.

Summary of the Characteristics of the Decision-makers

The following is a summary of the characteristics of the hypothetical decision-makers relating to problems I,2,and 3:

I. Trades Occupations

(a) Electrician: male, designated trade, one year pre-employment course plus 3 years apprenticeship. Age of entry - I8. Earnings period to retirement - 47 years.

(b) Carpenter: male, designated trade, one year pre-employment course plus 3 years apprenticeship. Age of entry - I8. Earnings period to retirement - 47 years.

(c) Beautician: female, designated trade, one year pre-employment course plus one year apprenticeship. Age of entry - I8. Earnings period to retirement - 47 years.

(d) Senior Stenographer: female, non-designated, one year pre-employment course. Age of entry - I7. Earnings period to retirement - 48 years.

2. Vocational Teachers (Trades)

(a) Electrical (Male), Carpentry (Male), and Beautician (Female): Instructor Class 3, designated trades, journeyman qualifications with a minimum of 6 years combined apprenticeship training and related experience.

Earnings period (first decision point at age 25) - 7 years apprenticeship and related experience plus 40 years vocational teaching.

Earnings period (second decision point at age 30) - I2 years apprenticeship and related experience plus 35 years vocational teaching.

Earnings period (third decision point at age 40) - 22 years apprenticeship and related experience plus 25 years vocational teaching.

(b) Senior Stenographer: Instructor Class 2, female, un-designated trade, completion of one year commercial course with a minimum of 5 years related experience.

Earnings Period (first decision point at age 24) - 7 years combined commercial course and related experience plus 4I years vocational teaching.

Earnings period (second decision point at age 30) - I3 years combined commercial course and related experience plus 35 years vocational teaching.

Earnings period (third decision point at age 40) - 23 years combined commercial course and related experience plus 25 years vocational teaching.

3. Vocational Teachers (Academic)

(a) B.A. or B.Sc., male, matriculation at 18. Period of study - 4 years. Earnings period to retirement 47.

(b) B.A. or B.Sc., female, matriculation at 18. Period of study - 4 years. Earnings period to retirement - 47.

THE CALCULATIVE PROCEDURES

An explanation of the methods for calculating the monetary returns to private investments in education was given in Chapter 3. Exactly the same formulae was used in this study.

As described in the previous section, the sub-problems involved the measuring of the costs and earnings related to the various decision-makers and the

various programs in which they were engaged. It was then necessary to project the costs and earnings streams over the earnings period for each individual to the normal age of retirement at 65. A statement of the marginal lifetime earnings for each decision-maker was derived by totalling the cost-benefit differences for each year. An example of how this process was carried out is provided in Table 22. The table shows the net earnings streams for male subjects who, at the age of I8, decided to invest in a period of study leading to a baccalaureate degree. After completing the degree they may expect to have a teaching lifetime of 43 years if they do not retire before the age of 65. To show the full earnings period of 43 years would be too unwieldy, therefore, the example shown in Table 22 gives the figures for the period of study plus I5 years of the earnings period.

The second column identifies the total academic costs for each year of study and the third column shows the earnings foregone by the individual while he is engaged in furthering his education. The foregone earnings figures were taken from Table I2 of this study. The academic costs were added to the foregone earnings to give the total cost outflow in column 4 and column 5 identifies the earnings inflows after the completion

TABLE 22

DETERMINING THE MARGINAL EARNINGS STREAM FOR MALE VOCATIONAL TEACHERS (ACADEMIC)

	(I) Year	(2) Total academic costs	(3) Oppor-tunity costs	(4) Total cost outflows C_t	(5) Earnings inflows E_t	(6) Marginal earnings stream $E_t - C_t$
	I	$ 20I	$I,982	$2,I83	$ 0	$ - 2,I83
Period of	2	20I	2,335	2,536	0	- 2,536
study	3	20I	2,688	2,889	0	- 2,889
	4	20I	3,040	3,24I	0	- 3,24I
	5		3,393	3,393	6,767	3,374
	6		3,620	3,620	7,I23	3,503
	7		3,849	3,849	7,479	3,630
	8		4,076	4,076	7,836	3,760
Period	9		4,303	4,303	8,073	3,770
of	I0		4,53I	4,53I	8,3I0	3,779
employ-	II		4,758	4,758	8,548	3,790
ment	I2		4,986	4,986	8,667	3,68I
	I3		5,I4I	5,I4I	8,667	3,526
	I4		5,I74	5,I74	8,667	3,493
	I5		5,302	5,302	8,667	3,365

of the period of study. The marginal earnings stream was derived by subtracting the cost flows from the earnings inflows (column 6).

The marginal lifetime earnings were then discounted back to the investment decision point. Using compound discount rates of 4 per cent, 6 per cent, 8 per cent, I0 per cent, and I2 per cent, a quantitative estimate of the net present value of the marginal earnings of each investor was obtained. The selection of the above discount rates was based on an analysis of data regarding interest on federal government bonds, bank interest rates, and returns from selected stock-holdings. A rate of 8% (the rate of return on Canada Savings Bonds) was considered the most appropriate figure of acceptability on investments in education relating to this study although it must be said that the choice is an arbitrary one. A rate of 6%, or even 4%, may be satisfactory to some individuals if the investment appears to be fairly "risk free." The calculation of the I0% and I2% rate may be useful to those who view the investment as not being "risk free" or if the investor has to borrow money to finance his education.

In order to show how the net present values were estimated, the marginal lifetime earnings

in column 6 of Table 22 is used. For the purpose of illustration, I5 years of the earnings stream has been reproduced in column 2 of Table 23. In the third column, the earnings have been cumulated without discounting. In column 4 they have been discounted at 8% and cumulated at this discount rate in column 5. Thus, column 5 gives the net present values for any year. For example, the present value to the male Baccalaureate graduate of his marginal earnings stream I5 years in length discounted at 8% is $I0,054 (column 5). Column 3 shows the net present value of his marginal earnings discounted at 0% for the same year.

The above examples were confined to illustrating the first I5 years of the investor's marginal earnings stream. However, the period in years of any individual's earnings stream depends upon how long a productive lifetime his investment has. This study set out to report the net present values and rates of return of the marginal earnings of decision-makers who expected to remain in their chosen field of employment until the age of retirement. But, of course, it is possible that an individual who wishes to stay in the occupation of his choice for only a limited period of years would like to know what the present value of his investment would be at the end of that period. This may be

TABLE 23

DETERMINING THE PRESENT VALUE OF THE MARGINAL EARNINGS STREAM FOR MALE VOCATIONAL TEACHERS (ACADEMIC)

(I)	(2)	(3)	(4)	(5)
	Marginal earnings stream discounted at 0%	Present value at 0%	Marginal earnings stream discounted at 8%	Present value at 0%
(t)	$(E_t - C_t)$	$\sum(E_t - C_t)$	$\frac{(E_t - C_t)}{(I.08)^t}$	$\sum\frac{(E_t - C_t)}{(I.08)^t}$
I	$ -2,I83	$ -2,I83	$ -2,02I	$ -2,02I
2	-2,536	-4,7I9	-2,I74	-4,I95
3	-2,889	-7,608	-2,293	-6,488
4	-3,24I	-I0,849	-2,382	-8,87I
5	3,374	-7,475	2,296	-6,574
6	3,503	-3,972	2,207	-4,367
7	3,630	- 342	2,II8	-2,249
8	3,760	3,4I8	2,03I	- 2I7
9	3,770	7,I88	I,885	I,668
I0	3,779	I0,967	I,750	3,4I8
II	3,790	I4,757	I,625	5,043
I2	3,68I	I8,438	I,46I	6,504
I3	3,526	2I,964	I,298	7,802
I4	3,493	25,462	I,I9I	8,993
I5	3,365	28,827	I,06I	I0,054

particularly important to the female decision-makers. The average female expects to spend less time in the labour force than males. She has a high probability of withdrawing from paid employment for prolonged periods of child bearing and child-rearing after only a short time of service in her chosen trade. In order to provide data for individuals who seek this kind of information, the present values of earnings streams are presented for seven intervals starting at the end of the first 7 years and then at 5-year intervals over the entire lifetime of the earnings streams (Tables 24 to 41).

A calculation of the internal rates of return was then undertaken in order to discover the discount rates at which the costs and benefits of each investment would become equal (the calculative formula for obtaining these rates has been given on page 62 of this study). Here again, 8% was considered to be an appropriate external rate on which the relative merit of the internal rate of return could be judged.

As outlined above, this study used marginal lifetime earnings, net present values, and internal rate of return as measures to evaluate the various investment projects. The purpose of estimating all three measures was to give an overall view of the investment alternatives. The marginal lifetime earnings provides

a simple and quickly measured view of the additional earnings without taking into account the time value of money. Both the net present value and the internal rate of return measure the time value of the investment. The former is useful for showing the absolute gains to be made on the investment, the latter provides a figure for comparing the returns with other investment projects.

Manual Calculations and Use of Computer

The first steps in calculating the private monetary returns to investors were carried out by manual operation. This involved estimating the cost flows and the benefit flows for each type of investor associated with the problems stated in Chapter 2 and projecting these flows over the lifetime earnings period. It was then necessary to estimate the year by year differences between costs and benefits in order to obtain the marginal earnings stream for each investor.

As the manual calculation of the present values and rates of return from the marginal earnings streams is an extremely lengthy process and is subject to human error, especially if there are a large number

of problems involved, the marginal earnings streams were transferred to IBM cards for computer processing using a program written for the 360/67 computer. The program was obtained from Dr. K.W. Wallace, Memorial University of Newfoundland.

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CHAPTER 5

ANALYSIS AND DISCUSSION OF THE FINDINGS

The findings reported in this chapter are examined in accordance with the statement of the research problems contained in Chapter 2. The data presented in Tables 24 to 4I provided the basis for evaluating the relative profitability of the different investment opportunities that were available to the hypothetical decision-makers.

As indicated in the last chapter, the attractiveness of an investment was assessed by the use of a reservation rate of 8%. This means that 8% was considered the minimum acceptable rate of return and if the analysis showed a net earnings stream discounted at 8% as having a present value that was zero or positive, then the investment was deemed to be attractive; if the present value showed a negative figure, then it would be considered economically unattractive. If the cash flow analysis revealed an internal rate of return greater than 8%, it was considered profitable. On the other hand, if the investment yielded less than 8%, it was considered unprofitable.

Monetary Returns To Trades Occupation Decision-makers (Problem # I)

The present values of the marginal earnings streams of individuals who invested in a pre-employment course and apprenticeship training in order to qualify for journeyman status were found by discounting at 4%, 6%, 8%, I0%, and I2%. The results of the calculations relating to these investors are shown in Tables 22, 23, 24, and 25.

It can be seen that when the reservation rate of 8% was applied, the marginal earnings showed rank order figures of $28,025 in the case of the electrician, $2I,600 for the carpenter, $20,968 for the beautician, and $I7,960 (the lowest figure) for the senior stenographer. At the end of the first reported payoff period - 7 years - all of the trades types show a good profit on their investment, the rank order at the 8% discount rate remaining the same throughout the entire lifetime earnings period. The fact that the investment proves profitable within the first 7 years is of particular significance to the female investor. The end of that period coincides with the high probability that she may withdraw from the labour force for marriage and child-bearing.

The difference in the marginal earnings between the electrician and the carpenter, both of whom

engage in the same amount of education and training, indicates a small measure of support for one of Wilkinson's findings (4. I966). He investigated (a) the net present values for several specific occupations and (b) the net present values for various levels of education within those occupations. Generally, Wilkinson found that additional amounts of education within a single occupation does not greatly increase discounted earnings, but the same amount of education and training applied to different occupations (as in the case of the electrician and carpenter) results in significant variations. However, a larger number of occupations would have to be surveyed before any such firm generalization could be made regarding the position in Newfoundland.

An important point must be made at this stage. In reporting the relative profitability of the various programs by the net present value method, it was noted that the results obtained by this method showed a sensitivity to the different discount rates used. Wallace (3. I970) found many examples of this sensitivity effect in the net present value figures reported in his study. When the 4% discount rate was used to determine the net present values of the marginal earnings of the investors relating to Problem # I, the rank ordering of the profitability of the investments was different from that given above when the discount rate of 8% was

used. In descending order of profitability, the ranking becomes - electrician, beautician, senior stenographer, and carpenter. The presence of this sensitivity effect "underscores the need for a range of discount rates in calculating the net present values" (3. p. I33). From this range, it is up to the individual investor to choose his own "acceptable rate."

An inspection of the internal rates of return relating to the above investors reveals that for all investments, the figures are extremely high with a range of 70% for beauticians at the end of the full payoff period of 47 years, 86% for electricians, 95.I% for senior stenographers, and a figure of 98.3% for that of carpenter. For each one of these selected trades, pre-employment education and training must rank high as investment opportunities in the province of Newfoundland.

Monetary Returns To Vocational Teacher Decision-makers (Trades) Problem # 2

The characteristics of the vocational teacher decision-makers have been described on pages I28 to I3I, Chapter 4. For each type of teacher, three marginal earnings streams had to be estimated in accordance with the three decision points of entry into vocational

teaching. Each marginal earnings stream was discounted at 4%, 6%, 8%, 10%, and 12% to produce the net present values. The results of these and the internal rates of interest are presented fully in Tables 28 to 39 and summarized below.

Electrician. For the first two decision points, the marginal earnings discounted at 8% were similar - $35,784 at the age of 25, and $35,078 at the age of 30. The third decision point at the age of 40 showed marginal earnings of $31,097. The figures resulting from these three decision points show an increase on the net present value of the marginal earnings of the qualified electrician who did not become a vocational teacher. On the first decision, the increase is $7,759, on the second decision it is $7,053, and on the third it is $3,072. The calculation of the internal rate of return for the three decision points revealed similarly high figures ranging from 85.4% to 86.0%.

Carpenter. As in the case of the electrician, the 8% discounted marginal earnings streams resulting from the first and second decision points were similar; namely, $36,160 at age 25 and $33,177 at age 30. At the same rate of discount, the estimated figure for the carpenter who entered vocational teaching at the age of 40 was

somewhat lower at $26,666. The rate of return proved to be 98.3%, 98.4%, and 98.5% respectively.

As the Tables 25, 3I, 32, and 33 indicate, the net present value of the marginal earnings of those individuals who chose to enter vocational teaching are greater than those of the individual who remained a journeyman carpenter. If he enters vocational teaching at the age of 25, the carpenter adds $I4,560 to his marginal earnings discounted at 8%. If he enters at age 30 he gains $II,89I, and gains a lower figure of $5,066 if he enters at age 40.

Beautician. For the beautician who enters vocational teaching, her marginal earnings discounted at 8% would be $48,9I8 at the first decision point, $4I,453 at the second decision point, and $29,042 at the third. This means that the monetary gains arising from the beautician's change of occupation at age 25 would be $27,950, at age 30 it would be $20,485, and at the age of 40 she would gain the much lower sum of $8,074.

As can be seen from Tables 34, 35, and 36, the internal rates of return were extremely high ranging from 70.I% to 73.7%. Overall, the beautician's decision to become a vocational teacher is a highly profitable one.

Senior Stenographer. With the exception of the carpenter, the internal rates of return to the senior stenographer who becomes a vocational teacher proves to be the highest with a range of 95.1% to 97.1% (Tables 37, 38, and 39). The 8% discounted marginal earnings showed lower figures than those for the beautician. If the senior stenographer chooses to enter vocational teaching at the age of 24 she is likely to gain $23,781 in excess of the marginal earnings she is paid if she had remained a senior stenographer. If she enters vocational teaching at age 30 she gains $16,331 and if she enters at age 40 she gains $8,548.

The evidence relating to the four types of decision-makers presented above supports the view that it pays these individuals to enter vocational teaching. The proposition is true in all trades whether the individual enters teaching at the age of 25 (in the case of the senior stenographer it is 24) or at the age of 30, or at the comparatively late age of 40. But, of course, the figures suggest that the earlier the individual decides to enter teaching, the greater his monetary returns. It is also apparent that the carpenter has a greater incentive, in monetary terms, than the electrician to become a vocational teacher. This is mainly because he is in a lower salary scale than the electrician if

he remains in his occupation of journeyman.

In the case of females whose occupations are beauty culture and senior stenography, the incentive to become vocational teachers is much greater than male electricians and carpenters. Their entry into vocational teaching at any of the three decision points assures them of exceptionally high monetary returns, especially at the first and second decision points. At these two points of entry, the 8% discounted marginal earnings of the beautician and the senior stenographer are double what they could claim by following their previous occupations.

The internal rates of return from vocational teaching are very high ranging from 70.5% to 97%. It is worth noting, too, that the estimated internal rate of return to the stenographer who enters vocational teaching at the age of forty shows the high figure of 95.I% yet this investor's 8% discounted marginal earnings are the lowest of all the subjects relating to Problem # 2. In contrast, the beautician who becomes a vocational teacher at the age of 40 shows the highest 8% discounted marginal earnings of all the subjects relating to Problem # 2 yet shows the lowest internal rate of return. This is the same kind of effect noted by Wilson in his study (5. I970). He found that a three-year B.A. program with an internal rate of return of I9.7% appeared to

be a better investment than a four-year combined B.A. and teacher education program at 17.9% but when comarisons were made of the net present value measures, the opposite appeared to be true. This underlines the value of using both measures for assessing the relative merits of alternative investments.

As the costs components and the periods of study proved to be so different in each case, it was difficult to compare the results of the calculations respecting Problem # 2 with the results obtained by Wallace in his investigations into vocational teaching in Alberta. However, one thing is fairly clear in both studies. The investments in both cases were made more attractive as a result of policies that made subsidies available to investors in Alberta (see page 69) and provided for the remission of tuition fees of investors in Newfoundland. Another important factor regarding the latter was the defraying of expenses for individuals attending the teacher training establishment at Moncton.

Monetary Returns To Vocational Teacher Decision-makers (Academic) Problem # 3

Tables 40 and 41 display the data relating to the monetary returns accruing to individuals who engage in a period of study leading to a baccalaureate

degree and who, on completion of the degree program, enter vocational schools as teachers of academic subjects.

In the case of the male decision-makers, the 8% discounted marginal earnings of $20,425 (Table 40) is the lowest figure for all the subjects of this study with the exception of the senior stenographer at $I7,960 (Table 27). In contrast, the female decision-maker's marginal earnings discounted at 8% are the second highest of all the subjects of this study at $42,75I (Table 27) and is more than twice the figure of her male counterpart who undertook the same baccalaureate program. The difference in the results may be attributed to two main factors. First, the opportunity costs for women were very much lower than those for men. A comparison between Tables I2 and I3 shows that females forego less income while they are engaged in a period of education. Secondly, the female vocational teacher who has the same qualifications and experience as men can claim parity of salary. Hence, from a monetary point of view based on the net present value of marginal earnings, teaching ranks high as an investment opportunity for women in Newfoundland. Dibski (I. I970), too, found a great disparity between the marginal earnings of male investors and those of female investors in Alberta. Basing his calculations on interpolated I96I census

data, Dibski estimated that a four-year teacher degree program undertaken in 1968 by male and female subjects on completion of high school in Alberta produced marginal earnings, discounted at 8%, of $20,127 and $ 46,535 respectively (Tables 9 and 10).

Dibski's estimates of the marginal earnings accruing to male investors in four-year degree programs given above, can be compared with estimates made by Wilkinson (4. 1966), Wilson (6. 1970), and the present study. Wilkinson, using an 8% discount rate, estimated a net present value of $18,300 for males undertaking the four-year program for the base year of 1961. However, this investigator included in the earnings part-time and summer earnings of $725 per year. When the discounted value of these "extra" earnings were subtracted from the estimated earnings and the result converted to 1968 dollars, the figure came to approximately $21,600 (I. 1970). Wilson calculated the marginal earnings of males who undertook a combined four-year B.A. and teacher education program in Alberta. At the 8% discount rate he found the net present value of the investment to be $19,884. When the figures are updated to 1971 dollars, the net present value of the marginal earnings of the male subjects relating to Dibski's study become approximately $21,700, in Wilkinson's study they become $23,300 and

in Wilson's, $2I,500. All of them show an amount in excess of the present study's calculation of $20,425.

The estimated internal rates of return for male academic vocational teachers (23.8%) and female academic vocational teachers (37.9%) are much lower than the internal rates of return to the other investors relating to Problems # I and # 2. Nevertheless, they are very high indeed if we bear in mind the reservation rate of 8%. The investment in the four-year teacher program studied by Dibski, yielded an internal rate of return of I8.0% for males and 29.0% for females. The male investors in Wilson's study could expect a rate of I7.9%. Wilkinson did not estimate the internal rate of returns for investors simply because he rejects this method of assessing return to education.

A further comment needs to be made regarding the internal rates of return that were calculated for every investor relating to this study. An inspection of the figures displayed in Tables 24 to 4I shows that rates of return for any of the investment problems ascends, reaches a plateau between the I2th and I7th payoff period, then remains constant throughout the lifetime earnings stream. In other words, the internal rate of return is not sensitive to the full length of the total earnings period. Generally, this can be ascribed to the fact that the costs of the program of education and

training are recovered in the first few years of the investment period (4. 1970). It also means that if the cash flow of an investment is accurately computed for the first fifteen or so years, any errors which may occur during the succeeding years will not have a significant effect on the results. This suggests that " little additional information is acquired by projecting earnings beyond twenty-five or thirty years" (I. 1970). Because of the low total costs of engaging in extra education and training, all the subjects of this study, with the exception of the vocational teachers (academic), quickly recover their initial investment costs. This results in a high internal rate of return figure.

TABLE 24

PRIVATE MONETARY RETURNS TO INVESTMENT IN PRE-EMPLOYMENT EDUCATION AND APPRENTICESHIP, DESIGNATED TRADE OF ELECTRICIAN, NEWFOUNDLAND, 1971

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	10%	12%
7	82.9	$15,828	$12,620	$11,301	$10,137	$9,107	$8,194
12	85.9	32,379	23,878	20,648	17,930	15,630	13,675
17	86.0	45,121	30,983	26,004	21,991	18,728	16,051
22	86.0	55,801	35,879	29,360	24,310	20,342	17,182
27	86.0	65,455	39,507	31,617	25,728	21,241	17,757
32	86.0	75,073	42,477	33,298	26,690	21,797	18,082
37	86.0	84,335	44,830	34,509	27,321	22,131	18,261
42	86.0	92,917	46,622	35,348	27,719	22,323	18,354
47	86.0	102,701	48,298	36,057	28,025	22,457	18,414

TABLE 25

PRIVATE MONETARY RETURNS TO INVESTMENT IN PRE-EMPLOYMENT EDUCATION AND APPRENTICESHIP, DESIGNATED TRADE OF CARPENTER, NEWFOUNDLAND, I97I

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	I0%	I2%
7	92.I	$I5,694	$I2,790	$II,583	$I0,5I0	$9,554	$8,700
I2	96.2	27,360	20,743	I8,I93	I6,027	I4,I77	I2,588
I7	98.3	35,2I7	25,I3I	2I,504	I8,539	I6,)94	I4,060
22	98.3	4I,0I2	27,793	23,33I	I9,803	I6,975	I4,678
27	98.3	45,78I	29,587	24,447	20,504	I7,420	I4,962
32	98.3	50,5I4	3I,048	25,274	20,977	I7,693	I5,I22
37	98.3	54,89I	32,I62	25,847	2I,277	I7,85I	I5,207
42	98.3	58,585	32,935	26,209	2I,449	I7,934	I5,247
47	98.3	63,483	33,768	26,562	2I,600	I8,00I	I5,277

TABLE 26

PRIVATE MONETARY RETURNS TO INVESTMENT IN PRE-EMPLOYMENT EDUCATION AND APPRENTICESHIP, DESIGNATED TRADE OF BEAUTICIAN, NEWFOUNDLAND, 1971

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	10%	12%
7	65.4	$ 8,943	$ 7,046	$ 6,268	$ 5,583	$ 4,978	$ 4,443
12	69.8	20,259	14,722	10,882	10,882	9,408	8,160
17	70.1	30,761	20,561	17,028	14,211	11,943	10,102
22	70.1	41,424	25,433	20,363	16,511	13,542	11,221
27	70.1	52,402	29,555	22,927	18,121	14,563	11,874
32	70.1	63,883	33,098	24,930	19,267	15,226	12,261
37	70.1	75,548	36,059	26,454	20,061	15,645	12,485
42	70.1	87,059	38,459	27,576	20,594	15,901	12,610
47	70.1	98,947	40,497	28,442	20,968	16,065	12,684

TABLE 27

PRIVATE MONETARY RETURNS TO INVESTMENT IN PRE-EMPLOYMENT EDUCATION, UNDESIGNATED TRADE OF SENIOR STENOGRAPHER, NEWFOUNDLAND, I97I

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	I0%	I2%
7	92.8	$ 8,3I9	$ 6,7I8	$ 6,056	$ 5,470	$ 4,950	$ 4,486
I2	95.0	I7,555	I2,986	II,254	9,799	8,570	7,525
I7	95.I	25,977	I7,668	I4,779	I2,469	I0,603	9,082
22	95.I	34,560	2I,590	I7,463	I4,320	II,889	9,983
27	95.I	43,458	24,930	I9,54I	I5,625	I2,7I7	I0,5I2
32	95.I	52,859	27,83I	2I,I8I	I6,563	I3,259	I0,829
37	95.I	62,444	30,264	22,433	I7,2I5	I3,603	II,0I3
42	95.I	7I,865	32,230	23,353	I7,652	I3,8I4	II,II5
48	95.I	8I,683	33,9I2	24,067	I7,960	I3,949	II,I76

TABLE 28

PRIVATE MONETARY RETURNS TO THE ELECTRICIAN WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 25

Length of payment period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	10%	12%
7	82.9	$15,828	$12,620	$11,301	$10,137	$ 9,107	$ 8,194
12	85.3	31,187	22,929	19,805	17,183	14,969	13,090
17	85.4	52,593	34,819	28,751	23,954	20,124	17,036
22	85.4	72,798	44,069	35,087	28,328	23,166	19,167
27	85.4	91,977	51,275	39,572	31,146	24,953	20,310
32	85.4	111,120	57,186	42,916	33,059	26,060	20,957
37	85.4	129,907	61,957	45,371	34,339	26,735	21,318
42	85.4	148,012	65,737	47,139	35,178	27,140	21,516
47	85.4	167,323	69,041	48,542	35,784	27,406	21,634

TABLE 29

PRIVATE MONETARY RETURNS TO THE ELECTRICIAN WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 30

Length of payment period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	I0%	I2%
7	82.9	$I5,828	$I2,620	$II,30I	$I0,I37	$ 9,I07	$ 8,I94
I2	85.9	32,379	23,878	20,648	I7,930	I5,630	I3,675
I7	86.0	49,503	33,300	27,705	23,247	I9,66I	I6,747
22	86.0	69,708	42,550	34,04I	27,62I	22,703	I8,878
27	86.0	88,887	49,756	38,525	30,439	24,490	20,02I
32	86.0	I08,030	55,668	4I,870	32,353	25,597	20,669
37	86.0	I26,8I7	60,439	44,325	33,632	26,272	2I,030
42	86.0	I44,922	64,2I8	46,092	34,47I	26,677	2I,227
47	86.0	I64,233	67,522	47,496	35,078	26,943	2I,346

TABLE 30

PRIVATE MONETARY RETURNS TO THE ELECTRICIAN WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 40

Length of payment period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	10%	12%
7	82.9	$15,828	$12,620	$11,301	$10,137	$ 9,107	$ 8,194
12	85.9	32,379	23,878	20,648	17,930	15,630	13,675
17	86.0	45,121	30,983	26,004	21,991	18,728	16,051
22	86.0	55,801	35,879	29,360	24,310	20,342	17,182
27	86.0	71,271	41,625	32,915	26,531	21,742	18,073
32	86.0	90,414	47,536	36,260	28,445	22,849	18,720
37	86.0	108,201	52,044	38,577	29,651	23,486	19,060
42	86.0	126,306	55,823	40,344	30,491	23,890	19,257
47	86.0	145,617	59,127	41,748	31,097	24,156	19,376

TABLE 32

PRIVATE MONETARY RETURNS TO THE CARPENTER WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 30

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at:					
		0%	4%	6%	8%	10%	12%
7	92.1	$15,698	$12,793	$11,586	$10,513	$ 9,556	$ 8,702
12	96.2	27,364	20,747	18,196	16,030	14,178	12,590
17	98.4	44,488	30,168	25,254	21,347	18,210	15,662
22	98.4	64,693	39,418	31,589	25,721	21,252	17,794
27	98.4	83,872	46,624	36,073	28,538	23,038	18,936
32	98.4	103,015	52,536	39,416	30,452	24,145	19,584
37	98.4	121,802	57,307	41,872	31,732	24,821	19,945
42	98.4	139,907	61,086	43,640	32,571	25,225	20,142
47	98.4	159,218	64,390	45,044	33,177	25,491	20,261

TABLE 31

PRIVATE MONETARY RETURNS TO THE CARPENTER WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 25

Length of payment period (years)	Rate of return (%)	Present value of net earnings streams discounted at: 0%	4%	6%	8%	10%	12%
7	92.1	$15,698	$12,793	$11,586	$10,513	$ 9,556	$ 8,702
12	96.0	31,057	23,103	20,090	17,559	15,418	13,598
17	98.5	52,463	34,992	29,036	24,330	20,573	17,544
22	98.5	72,668	44,243	35,372	28,704	23,615	19,676
27	98.5	91,847	51,448	39,857	31,521	25,402	20,818
32	98.5	110,990	57,360	43,201	33,435	26,504	21,466
37	98.5	129,777	62,131	45,656	34,715	27,185	21,827
42	98.5	147,882	65,910	47,424	35,554	27,589	22,024
47	98.5	167,193	69,214	48,827	36,160	27,855	22,143

TABLE 33

PRIVATE MONETARY RETURNS TO THE CARPENTER WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 40

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	10%	12%
7	92.1	$15,698	$12,793	$11,586	$10,513	$ 9,556	$ 8,702
12	96.2	27,364	20,747	18,196	16,030	14,179	12,590
17	98.3	35,221	25,135	21,507	18,542	16,097	14,062
22	98.3	41,016	27,798	23,334	19,806	16,977	14,680
27	98.3	56,486	33,543	26,889	22,027	18,378	15,571
32	98.3	75,629	39,455	30,234	23,941	19,485	16,218
37	98.3	94,416	44,326	32,689	25,221	20,161	16,579
42	98.3	112,521	48,005	34,456	26,060	20,565	16,777
47	98.3	131,832	51,309	35,860	26,666	20,831	16,895

TABLE 34

PRIVATE MONETARY RETURNS TO THE BEAUTICIAN WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 25

Length of payoff period (years)	Rate of return (5)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	10%	12%
7	65.4	$ 8,943	$ 7,046	$ 6,268	$ 5,583	$ 4,978	$ 4,443
12	73.1	33,572	23,587	19,917	16,893	14,390	12,305
17	73.6	67,243	42,277	33,975	27,532	22,487	18,502
22	73.7	101,936	58,134	44,828	35,018	27,690	22,144
27	73.7	136,989	71,300	53,020	40,164	30,952	24,231
32	73.7	172,500	82,263	59,222	43,712	33,004	25,431
37	73.7	208,195	91,323	63,882	46,141	34,286	26,116
42	73.7	243,726	98,736	67,349	47,787	35,079	26,503
47	73.7	279,654	104,894	69,967	48,918	35,576	26,724

TABLE 35

PRIVATE MONETARY RETURNS TO THE BEAUTICIAN WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 30

Length of payment period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	I0%	I2%
7	65.4	$ 8,943	$ 7,046	$ 6,268	$ 5,583	$ 4,978	$ 4,443
I2	69.8	20,259	I4,722	I2,632	I0,882	9,408	8,I60
I7	70.4	49,648	30,944	24,803	20,066	I6,380	I3,483
22	70.5	84,34I	46,80I	35,655	27,553	2I,583	I7,I25
27	70.5	II9,394	59,967	43,847	32,699	24,846	I9,2I2
32	70.5	I54,905	70,930	50,048	36,247	26,898	20,4I2
37	70.5	I90,600	79,990	54,709	38,676	28,I80	2I,096
42	70.5	226,I3I	87,403	58,I76	40,32I	28,973	2I,483
47	70.5	262,059	93,56I	60,793	4I,453	29,470	2I,705

TABLE 36

PRIVATE MONETARY RETURNS TO THE BEAUTICIAN WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 40

Length of payoff period (years)	Rate of return (%)	Present value of net earnings streams discounted at: 0%	4%	6%	8%	10%	12%
7	65.4	$ 8,943	$ 7,046	$ 6,268	$ 5,583	$ 4,978	$ 4,443
12	69.8	20,259	14,722	12,632	10,882	9,408	8,160
17	70.1	30,761	20,561	17,028	14,211	11,943	10,102
22	70.1	41,424	25,433	20,363	16,511	13,542	11,221
27	70.1	72,768	37,138	27,625	21,060	16,419	13,056
32	70.1	108,279	48,102	33,827	24,609	18,471	14,256
37	70.1	143,974	57,162	38,488	27,038	19,753	14,941
42	70.1	179,505	64,575	41,954	28,683	20,545	15,328
47	70.1	215,433	70,733	44,572	29,815	21,042	15,549

TABLE 37

PRIVATE MONETARY RETURNS TO THE SENIOR STENOGRAPHER WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 24

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at:					
		0%	4%	6%	8%	10%	12%
7	92.8	$ 8,319	$ 6,718	$ 6,056	$ 5,470	$ 4,950	$ 4,486
12	96.9	29,553	20,970	17,813	15,210	13,052	11,253
17	97.1	57,707	36,617	29,589	24,127	19,843	11,454
22	97.1	86,210	49,645	38,506	30,277	24,117	19,446
27	97.1	115,028	60,469	45,241	34,508	26,800	21,162
32	97.1	144,348	69,520	50,361	37,438	28,494	22,152
37	97.1	173,857	77,010	54,214	39,446	29,554	22,718
42	97.1	203,193	83,132	57,077	40,805	30,209	23,038
48	97.1	232,936	88,229	59,244	41,741	30,620	23,221

TABLE 38

PRIVATE MONETARY RETURNS TO THE SENIOR STENOGRAPHER WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 30

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at:					
		0%	4%	6%	8%	I0%	I2%
7	92.8	$ 8,3I9	$ 6,7I8	$ 6,056	$ 5,470	$ 4,950	$ 4,486
I2	95.0	I7,555	I2,986	II,254	9,799	8,570	7,525
I7	95.2	39,648	25,I57	20,376	I6,677	I3,786	II,504
22	95.2	68,I5I	38,I85	29,293	22,828	I8,06I	I4,496
27	95.2	96,969	49,009	36,028	27,059	20,743	I6,2I2
32	95.2	I26,290	58,06I	4I,I48	29,988	22,438	I7,202
37	95.2	I55,795	65,550	45,00I	3I,996	23,498	I7,769
42	95.2	I85,I36	7I,67I	47,863	33,355	24,I52	I8,088
48	95.2	2I4,874	76,768	50,030	34,29I	24,563	I8,272

TABLE 39

PRIVATE MONETARY RETURNS TO THE SENIOR STENOGRAPHER WHO ENTERS VOCATIONAL TEACHING (TRADES) AT THE AGE OF 40

Length of payoff period (years)	Rate of return (%)	Present value of net earnings stream discounted at:					
		0%	4%	6%	8%	10%	12%
7	92.8	$ 8,319	$ 6,718	$ 6,056	$ 5,470	$ 4,950	$ 4,486
12	95.0	17,555	12,986	11,254	9,799	8,570	7,525
17	95.1	25,977	17,668	14,779	12,469	10,603	9,082
22	95.1	37,770	22,945	18,354	14,910	12,284	10,248
27	95.1	67,669	34,144	25,313	19,276	15,048	12,013
32	95.1	92,990	43,196	30,433	22,205	16,742	13,004
37	95.1	126,495	50,685	34,286	24,213	17,806	13,570
42	95.1	155,836	56,807	37,149	25,572	18,456	13,890
48	95.1	185,574	61,904	39,315	26,508	18,867	14,073

TABLE 40

PRIVATE MONETARY RETURNS TO INVESTMENT IN A FOUR-YEAR B.A OR B.Sc. PROGRAM, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO ENTRY INTO VOCATIONAL TEACHING (ACADEMIC).

MALE

Length of payment period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	10%	12%
7	18.9	$ - 342	$ -1,482	$ -1,904	$ -2,249	$ -2,529	$ -2,755
12	19.5	18,438	11,227	8,622	6,505	4,781	2,373
17	22.7	35,315	20,632	15,709	11,878	8,878	6,514
22	23.5	50.125	27,416	20,357	15,088	11,111	8,079
27	23.7	63,909	32,595	23,580	17,113	12,395	8,900
32	23.8	77,657	36,840	25,982	18,487	13,190	9,365
37	23.8	91,049	40,242	27,732	19,400	13,672	9,622
42	23.8	103,759	42,896	28,974	19,989	13,956	9,761
47	23.8	117,675	45,275	29,984	20,425	14,147	9,846

TABLE 4I

PRIVATE MONETARY RETURNS TO INVESTMENT IN A FOUR-YEAR B.A. OR B.Sc. PROGRAM, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO ENTRY INTO VOCATIONAL TEACHING (ACADEMIC)

FEMALE

Length of payment period (years)	Rate of return (%)	Present value of net earnings stream discounted at: 0%	4%	6%	8%	I0%	I2%
7	I8.I	$ 6,224	$ 4,007	$ 3,I38	$ 2,396	$ I,762	$ I,220
I2	35.4	34,274	22,948	I8,808	I5,4I5	I2,623	I0,3I6
I7	37.5	63,4II	39,I5I	3I,006	24,654	I9,660	I5,706
22	37.8	92,709	52,542	40,I7I	30,976	24,054	I8,782
27	37.9	I22,322	63,664	47,092	35,323	26,8I0	20,545
32	37.9	I52,438	72,962	52,352	38,332	28,55I	2I,562
37	37.9	I82,738	80,653	56,308	40,394	29,639	22,I44
42	37.9	2I2,874	86,940	59,248	4I,790	30,3II	22,472
47	37.9	243,407	92,I73	6I,473	42,75I	30,734	22,660

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CHAPTER 6

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

The prime purpose of this study was to make an analysis of the private monetary costs and benefits to Newfoundland males and females who invested in particular forms of training and/or education in order to qualify for selected trades or a profession and what the effect would be, in monetary terms, if each individual when qualified, made a decision to become a teacher in vocational education. The study viewed each individual from the perspective of investment theory in terms of human capital formation. The assumption was that the investor postpones present consumption in order to invest in further education and training and thus may be able to provide an occupational service of greater value in the future. In exchange for the increased value of his services, the investor would receive an increased flow of future earnings.

Specifically, the research problems were to estimate the monetary costs and benefits in the form of net present values and internal rates of return of the marginal earnings streams of (a) individuals who invest

in an extra period of pre-employment education and apprenticeship training in specified trades occupations, (b) these same individuals if they decided to become vocational teachers (trades) at various points in their career, and (c) individuals who invest in extra education in the form of a four-year baccalaureate program and become teachers (academic) in vocational schools.

The subjects of the study were composed of members or potential members of the Newfoundland labour force and delimited to investors in two male trades' occupations - electrician and carpenter, two female trades' occupations - beautician and senior stenographer, and investors (male and female) in a baccalaureate degree program. It was assumed that all the subjects made the decision to enter upon their various programs of education and training at the age of 18 with the exception of the stenographer who entered at 17. The decision points at which the electrician, carpenter, and beautician became vocational teachers were located at ages 25, 30, and 40; in the case of the senior stenographer the decision points were located at ages 24, 30, and 40. Once the investment decision-points of entry into the various programs had been established, it was then possible to calculate the marginal earnings stream to the age of 65 for each investor.

The marginal earnings streams for each type of investor and for different lengths of payoff periods were estimated by determining the difference between money inflows and money outflows. The outflows consisted of the private academic-related costs incurred by the investors plus the earnings stream foregone through choosing to engage in extra education. Money inflows were estimated by finding the marginal difference between a high school graduate's earnings stream and the earnings streams of investors in their respective chosen occupations. In order to find the net present values of the various investments, all marginal earnings streams were discounted at 4%, 6%, 8%, I0%, and I2%. The 8% rate was set as the minimum acceptable rate. Internal rates of return were calculated for each investment problem and these, together with the net present values, constituted the main findings of the study.

March I97I was used as the focal date for all cash flow data. Cost data were obtained from the registrar office at Memorial University, the Registrar's office at the College of Trades and Technology, St. John's, and from publications of the Dominion Bureau of Statistics on student income and expenditure. The earnings data were provided by the Newfoundland Department of Labour, trades associations, manufacturing and service organ-

izations, and the salary agreement between the Treasury Board of Newfoundland and the Newfoundland Association of Public Employees. Earnings profiles for male and female high school graduates in Newfoundland for I97I had to be estimated by updating I96I Census of Canada earnings data. No adjustments were made to the earnings data for tax deductions, unemployment, morbidity, or mortality.

CONCLUSIONS

The returns resulting from investment in any one of the education and training programs treated in this study are shown to more than justify the costs incurred by the various investors.

From an appraisal of the data, it seems reasonable to suggest that the estimated internal rates of return figures were of less value for assessing the respective profitability of each of the different investment programs in this study than were the net present values. This is especially true of Problems # I and 2. The high figures were a result of the rapid recovery of the initial investment costs and, apart from saying that all of the investments are extremely profitable as

judged by the internal rate of return, we cannot rank the relative investment priorities according to the magnitudes of the rates of return with any certainty.

A better assessment of the respective programs can be made by using the net present value figures. Here, again, the most significant conclusion that can be drawn from Tables 24 to 4I is that all of the private investment opportunities analyzed in the study proved to be highly attractive. Even at the end of the first 7-year payoff interval, all the investments yielded a positive return at the reservation rate with the exception of the male vocational teacher (academic) who showed a negative net present value of $-2,249. Thereafter, the profitability of each investment increased with the length of the payoff period.

From the two male trades' occupations of electrician and carpenter, it would pay the high school graduate to choose that of electrician whose marginal earnings discounted at 8% are considerably higher than those of the carpenter. For the same reason, the occupation of beautician is a more attractive proposition to the female high school graduate than that of senior stenographer.

On the basis of the evidence, the prospective vocational teacher(trades) is best advised to enter

teaching at as early an age as entry requirements allow. This advice applies to all trades' occupation decision-makers. In the case of the beautician and the senior stenographer, the financial incentive to become vocational teachers is much greater than the male trades' investors. Their entry into vocational teaching at any of the three decision points assures them of high monetary returns particularly at the first and second decision points. At these two points of entry, the 8% discounted marginal earnings of the beautician and senior stenographer are double what they could claim by following their previous occupations. In the male trades, the carpenter has a greater financial incentive to become a vocational teacher than the electrician, mainly because the latter receives a higher wage in his trades occupation than does the former. In the case of the two female occupations, however, the reverse is true. The beautician receives a greater return on her investment both as a journeyman and as a vocational teacher than the senior stenographer. This is because, as a vocational teacher, she is placed on a higher salary grade level than the senior stenographer.

The findings relating to the vocational teachers (academic) show that, with the exception of the senior stenographer, the male investor can expect the lowest marginal earnings discounted at 8% than any other subject

in this study. In contrast, at the same rate of discount, the female investor's marginal earnings are more than twice the figure of the male who took the same program. The difference in the amount of earnings may be attributed to the fact that women have lower opportunity costs and claim parity of salary with men in vocational teaching.

Implications For Further Study

The findings of the study suggest that further research could be profitably undertaken in several areas. Investigations could be extended into other kinds of post-secondary education such as rates of return analyses of a larger selection of trades types, on individuals (both male and female) who decide to engage in education and training in order to become journeymen in later life, and on different university programs.

Perhaps another direction that could be taken is one that would be in line with the study undertaken by Dodge and Swan (I. I97I). Such a study would raise the following questions: (a) Why do individuals choose a particular trade in preference to others? (b) Do they, in fact, rationalize their decisions in monetary terms

and if they do, how close are their estimates to those calculated by the rates of return methods of the kind used in this study? (c) When persons are making the first decision to become tradesmen, are they aware that, besides increasing their labour mobility, they are also expanding their career opportunities in that the education and training they receive does not confine them to one firm, company, province, or region? Further, are they aware that the initial education and training that they receive can be used for other career opportunities, for example, vocational teaching?

The Eighth Annual Review of the Economic Council of Canada (2. I97I) suggests that there is an "overinvestment" by individuals in university education in the Atlantic Region and the present study lends a measure of support to this view, especially in the case of males. In other words, the monetary returns are greater for high school graduates than university graduates. Conceivably, a study could be undertaken to discover what value individuals place on the non-monetary benefits of engaging in prolonged periods of education. This question would be highly relevant to university programs of academic standing which extend over three, four, or five years and the findings may provide a basis for comparing the "consumption" aspects of this type of education with

trades education and training.

Another area which bears further investigation regarding the present study is the relationship between the costs and benefits of the investment analysis. The cost stream can be varied by introducing an hypothetical situation in which each student is required to pay his own tuition fees. The question is, what quantifiable effect would this have on the student's investment in the Newfoundland context? Wallace (3. I970), in his Alberta study, analyzed the rates of return to investments both with and without subsidies and he concluded that if the subsidy factor was eliminated, the degree program would not be so very attractive to tradesmen entering vocational teaching. Also, the withdrawal of subsidies or the extension of subsidies have significance for social and economic policies designed to increase or decrease the supply of teachers or tradesmen in relation to the demand at any given time within the province.

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APPENDIX

TABLE A

INDEXES OF MEAN WAGE AND SALARY RATE INCREASES FOR MALES IN SELECTED OCCUPATIONS IN NEWFOUNDLAND FOR THE PERIOD I96I to MARCH I97I
(Index for I96I = I00)

Occupation	Mean monthly rates		I97I index (males)
	Males, I96I	Males, I97I	
I. Order clerk	$290	$4I2	I.420
2. Draughtsman, senior	354	536	I.5I4
3. Machinist	338	5I0	I.509
4. Tailors	258	372	I.442
5. Mechanic	320	464	I.450
6. Junior clerk	I84	270	I.467
7. Painter	302	455	I.506
8. Senior bookkeeper	328	480	I.463
9. Butcher	375	525	I.400
I0. Office appliance operator	248	352	I.4I9
II. Intermediate clerk	235	402	I.7I0
I2. Welder	304	428	I.407
I3. Millwright	3I8	465	I.462
I4. Shipping and receiving clerk	236	355	I.505
I5. Accounting clerk, junior	2I6	328	I.5I8
I6. Pipefitter	365	560	I.534

TABLE A (continued)

Occupation	Mean monthly rates Males, 1961	Males, 1971	1971 Index (males)
17. Accounting clerk, senior	$320	$480	I.500
18. Stationary fireman	228	360	I.578
19. Locksmith	364	505	I.387
20. Cost accounting clerk, senior	308	460	I.493
21. Baker	264	394	I.492
22. Menswear salesman	225	318	I.414
23. Bricklayers	312	422	I.353
24. Warehouse checkers	218	306	I.403
25. Truck driver	230	345	I.500
26. Delivery man	230	330	I.434
27. Senior clerk	340	476	I.400
28. Diesel mechanic	338	455	I.346
Mean of indexes (males)			I.4652

TABLE B

INDEXES OF MEAN WAGE AND SALARY RATE INCREASES FOR FEMALES IN SELECTED OCCUPATIONS IN NEWFOUNDLAND FOR THE PERIOD I96I to March I97I
(Index for I96I = I00)

Occupations	Mean monthly rates		I97I index (females)
	females I96I	females I97I	
I. Senior clerk	$278	$438	I.575
2. Tabulating machine operator	2I5	275	I.279
3. Order clerk	206	256	I.242
4. Tailoress	205	290	I.4I4
5. Junior secretary	I80	276	I.533
6. Switchboard operator	I68	264	I.57I
7. Clerk stenographer	I88	268	I.425
8. Junior key punch operator	222	305	I.373
9. Shoe saleswoman	I85	245	I.324
I0. Junior accounting clerk	I72	272	I.58I
II. Billing machine operator	I76	268	I.522
I2. Junior clerk	I56	272	I.743
I3. Senior bookkeeper	28I	395	I.405
I4. Calculating machine operator	I96	284	I.448
I5. Womenswear sales	I95	260	I.333

TABLE B (continued)

Occupation		Mean monthly rates		I97I
		Females I96I	Females I97I	index (females)
I6.	Intermediate clerk	$2I6	$348	I.6II
I7.	Bookkeeping machine operator	I90	285	I.500
I8.	Senior key punch operator	254	350	I.377
I9.	Record clerk	I75	258	I.474
20.	Filing clerk	I58	270	I.708
2I.	Cost accounting clerk	237	3I2	I.3I6
22.	Senior stenographer	242	348	I.438
23.	Sales clerk	I95	260	I.337
24.	Senior accounting clerk	236	390	I.652
25.	Senior secretary	252	364	I.444
	Mean of indexes (females)			I.4650