UNIVERSITÉ D'OTTAWA ÉCOLE DES GRADUÉS

THE ECONOMIC VALUE OF EDUCATION IN CANADA

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CURRICULUM STUDIORUM

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INTRODUCTION

The contemporary interest in the economics of education, and more broadly in the economics of all the activities connected with the enhancement of human capabilities, e.g., health and research, represents a confluence of interests derived from concerns with various issues.

The concern with the economics of education is likely to appear before much time has passed as "a transient stage in the evolution towards a more comprehensive formulation of economic development problems in terms of a broadly conceived concept of capital accumulation".[1]

However, the development of an adequate conceptual model within which the analysis of the economics of education is possible has started only recently although the fundamental characteristics of the economic value of education were described with clarity and remarkable insight by Adam Smith. However various factors, not the least of which being the sharp distinction between physical capital and a generally uneducated labour power, contributed to the lack of concern for the analysis of the economic value of human factors.

In the meantime, the progress of technology, the replacement of human strength by mechanical power, the increasing

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1 Harry G. Johnson, "Towards a Generalized Capital Accumulation Approach to Economic Development", in The Residual Factor and Economic Growth, Paris, 1964, pp. 219-220.

importance of skill and scientific knowledge on the part of the labour force, led economists to revise the traditional distinction between labour as an original factor of economic production and physical capital as a produced factor.

It was recognized that conventional measures of labour input fail to take account of improvements in the quality of labour. On the other hand, some evidence of rates of return from improved education embodied in individuals suggested that there was probably some underinvestment in education, or at least in some sectors of educational activity. It was also discovered that the conventional measures of economic growth left out a large unexplained residual.

All these puzzling and unanswered questions led economists to consider the possible contribution of such human resources as education, health and research to general economic activity and to the economic value of individuals. A host of studies followed, mostly in the last twenty years. These studies have been mainly concerned with the analysis of the conceptual aspects of investment in human resources for the creation of human capital. Also many studies have presented extensive empirical analyses in which the costs of education and health as well as their economic profitability have been assessed.

In this context, this study will be an attempt to analyse, both conceptually and empirically, the various

elements of the economic value of education with special emphasis being placed on the Canadian situation.

To begin with, some of the main conceptual aspects of education will be described and analysed. This conceptual framework is essential to a better understanding of the empirical aspects of the problem that will be studied in the rest of the study.

This analysis of the conceptual framework will be followed by a detailed examination of the costs of formal education, i.e., elementary and secondary schools, colleges and universities, in Canada over a ten year period. This will permit an assessment of the magnitude of financial outlays being invested in the educational sector in Canada. This analysis will be followed by an assessment of the economic returns to be expected from investment in education. This aspect of the economics of education will be analysed from two different points of view. The economic returns to individuals will be studied first. This will be followed by an analysis of the contribution of education to economic growth. The results obtained in both cases are discussed and evaluated considering limitations inherent both to the data used and the concepts employed.

In conclusion, the main findings of the study are appraised and suggestions for subsequent research are presented.

CHAPTER I

THE CONCEPTUAL FRAMEWORK

The study of the economic value of education is of relatively recent origin. Until very recently, the concept of education was restricted mostly to its intellectual and moral attributes, contributing to the mental well-being of human beings.

Most of the studies made in the economics of education originated mainly after the Second World War, although some studies were produced before that particular period.[1] But these pre-war studies were not integrated into any major streams of economic theory. However, in the post-war period, particularly since the early nineteen fifties, a host of studies dealing with the conceptual as well as with the empirical aspects of the economic value of education and of the human capital formation factor in the process of economic growth have been published.

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1 Some examples of the work done during the inter-war period are the studies of: J.R. Walsh, "Capital Concept Applied to Man", in the Quarterly Journal of Economics, February 1935, pp. 255-285. The author estimates the net discounted lifetime earnings of high school students, college graduates and of other professional occupations involving university education and the book of L. Louis Dublin, Alfred J. Lotka, in collaboration with Mortimer Spiegelman, The Money Value of a Man, New York, Ronald Press, originally published in 1930, revised and reedited in 1947. The authors were merely interested in the application of the value of man in relation to the life insurance business. Their limited approach does not permit a broad introspection into the numerous theoretical problems inherent to the development of a comprehensive concept of human capital.

It is important to note, at the outset, that this concern for a more comprehensive definition of capital formation, comprising both real and human capitals and involving particularly a reassessment of the educational factor in the light of its economic characteristics represents only one of the many aspects under which the educational factor could be studied.

In this respect T.W. Schultz was very clear when he stated:

> The fact that there is some attributes of education that can be treated by economics does not mean that they are necessarily important. Nor does it imply that those which economic theory "puts aside" are unimportant. Surely the findings that emerge out of the work of economists in this area are by no means all of the educational story. Yet this is not inconsistent with the belief that economic knowledge about education is both real and relevant in making private and public decisions with regard to education.2

This is essentially the position that has been taken in this study, namely that although it limits itself to the economic aspects of education, it also considers education to be a complex and many-faced phenomenon with some economic characteristics.

In this respect, an analysis of the historical evolution of the concept of capital is significant.

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2 T.W. Schultz, The Economic Value of Education, Columbia University Press, New York, 1963, pp. 2-3.

1. The Definition of Capital: Its Historical Evolution

Up until recently, most economists emphasized the importance of physical capital formation, i.e., capital formation defined in terms of investment in durable goods only. However, this is not a correct reflection of the historical thinking in this particular sector of economic theory. Actually, a great deal of what is now being termed human capital formation and the economic value of education had been already clearly described in some earlier economists' thinking.

In this respect, one of the most important contribution to a more comprehensive definition of capital was made by Adam Smith.

In his definition of capital which he divides into four main elements,[3] Adam Smith analyses with remarkable insight the economic importance of the development of human skills which he describes in his fourth element of capital as consisting of:

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3 Adam Smith views fixed capital whose main characteristics is to yield a revenue or a profit as consisting of four articles: (a) of all useful machines and instruments of trade which facilitate and abridge labour; (b) of all those profitable buildings which are the means of procuring a revenue; (c) of the improvements of land; (d) of the acquired and useful abilities of all the inhabitants or members of the society. See Adam Smith, An Inquiry Into the Nature and Causes of the Wealth of Nations, New York, E.D. Dutton and Co., 1910, pp. 246-247.

> ... the acquired and useful abilities of all the inhabitants or members of society. 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 fixed and realised, 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. The improved dexterity of a workman may be considered in the same light as a machine or instrument of trade which facilitates and abridges labour, and which, though it costs a certain expense, repays that expense with a profit.4

Later, Irving Fisher attempted to introduce a broader concept of capital which he defines succinctly as "a stock of wealth existing at an instant of time",[5] one of its essential characteristics being to yield a stream of income over time. From this point of view, all categories of income can be expressed as rates of interest or return on the corresponding items of capital.

It would thus mean that all forms of income-yielding assets can be given an equivalent capital value by capitalising the income they yield at an appropriate rate of interest. It can then be argued that:

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4 Ibid., p. 247.

5 I. Fisher, The Nature of Capital and Income, Reprints of Economic Classics, Augustus M. Kelley, Publisher, New York, 1965, p. 52.

> ...the growth of income that defines economic development is necessarily the result of the accumulation of capital, or of investment; but investment in this context must be defined to include such diverse activities as adding to material capital, increasing the health, discipline, skill and education of the human population, moving labour into more productive occupations and locations, and applying existing knowledge or discovering and applying new knowledge to increase the efficiency of productive processes.6

However, Fisher's definition and the implications of his broader concept of capital formation were not accepted by most economists. Following Alfred Marshall's criticism of this broader approach to capital, they employed a narrower concept of capital that identifies capital with material capital goods and equipment used in the production process, distinguishing it clearly from labour.

> ...the overwhelming majority of economists, following Alfred Marshall have shown a tendency to use the concept of capital as applicable only to that portion of the non-human, material, man-made stock of wealth which is utilized directly in further production.7

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6 Harry G. Johnson, "Towards a Generalised Capital Accumulation Approach to Economic Development" in The Residual Factor and Economic Growth, Organisation for Economic Co-operation and Development, Paris, 1964, p. 221.

7 Harry Schaffer, "Investment in Human Capital: Comment", in the American Economic Review, Vol. LI, No. 5 December 1961, p. 1026.

Theoretically, however, Alfred Marshall was not opposed to a more comprehensive definition of the term capital. As he pointed out himself:

> The writings of Professor Fisher contain a masterly argument rich in fertile suggestion in favour of a comprehensive use of the term. Regarded from the abstract and mathematical point of view, his position is incontestable. But he seems to take too little account of the necessity for keeping realistic discussions in touch with the language of the market-place.8

Marshall's position seems to have developed in response to the early stages of the industrial revolution when there existed a sharp distinction between capital goods and raw labour power and "when the distinction between wages, profit and rent corresponded to a meaningful division of society into politico-economic classes".[9] Marshall defines capital as "consisting of these goods which a person uses in his trade, either holding them to be sold for money or applying them to produce things that are to be sold for money".[10] He also introduces the concept of consumption capital which "consists of goods in a form to satisfy wants directly"[11] and

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8 Alfred Marshall, Principles of Economics, New York, The Macmillan Company, 1930, pp. 71-72.

9 Harry G. Johnson, loc. cit., pp. 221-222.

10 Alfred Marshall, loc. cit., pp. 71-72.

11 Ibid. p. 75.

the concept of auxiliary or instrumental capital which consists of "all the goods that aid labour in production".[12]

However, an American economist, T.W. Schultz, argues[13] that Marshall's view on capital could have been broadened in order to include investments in man in the scope of his definition since obviously labour is in touch with the market place as wages and salaries represent income streams which like income streams from property, may also be discounted and may be imputed appropriate capital values. And inasmuch as income streams originating from investments in man could be quantified in terms of specific rates of returns, it would appear that such a definition would fall within the scope of Marshall's realistic approach. It is also interesting to note that although Marshall limits the concept of capital to real or physical capital, he seems to be aware of the importance of education and training for potential higher earnings and future economic benefits for society as a whole. For example when he analyses the role of the agricultural laborer, he notes:

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12 Ibid., p. 75.

13 T.W. Schultz, "Investment in Human Capital: An Economist's View" in the Social Economic Review, University of Chicago Press, Chicago, Vol. XXXIII, 1959, p. 112.

> Those who are left behind in the fields have received a better education than was to be had in earlier times; and, though having perhaps less than average share of natural ability, they earn much higher real wages than their fathers.14

However, Marshall never developed further this aspect of education and he never incorporated it in his definition of capital. His approach was to influence decisively the next generations of economists. This was further reinforced "by the impact of Keynes' General Theory with its emphasis on fixed capital formation as the key variable in the economic system".15

Thus the treatment of capital as consisting solely of physical or reproducible goods was assumed "to embody improvements in the productive arts and the labour force somewhat tags along". 16

Another important factor responsible for the utilization of a narrow concept of capital in economic analysis and for the exclusion of investment in human resources, particularly in education, seems to have been a narrow interpretation of the concept of education.

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14 Alfred Marshall, loc. cit., p. 684.

15 Harry G. Johnson, loc. cit., p. 222.

16 J. Bonner and D.S. Lees, "Consumption and Investment", in the Journal of Political Economy, February 1963, p. 68.

Education is influenced by the socio-economic environment in which it is developed and in this respect the meaning of education can differ substantially from one community to another. However, education can be envisaged as consisting of learning and teaching and in that sense it is a common concept to most societies.

Etymologically education means:

> ... to educe or draw out of a person something potential and latent; it means to develop a person morally and mentally so that he is sensitive to individual and social choices and able to act on them; ...; and it means to train, discipline, or form abilities, as, for example, to educate the taste of a person. The act or process of achieving one or more of these objectives is, as a first approximation, what education is about.17

Education is essentially then, a developmental process through which individuals can, theoretically, develop the many aspects of their mental faculties which, in a social environment, are influenced by political, sociological, cultural and economic factors.

However, for a long time, it was believed that an analysis of the economic value of education implied that it was something essentially material. It is true that education does not possess some of the conventional characteristics of other economic factors like physical capital or

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17 T.W. Schultz, The Economic Value of Education, Columbia University Press, New York and London 1963, p. 3.

natural resources. For example, as a general rule, educational establishments are not run for profits and even if we accept the assumption that resources entering into the development of human beings through education can produce capital, this capital cannot be bought or sold as real or physical capital.

But this does not mean that education does not possess economic values and does not contribute directly or indirectly to economic progress.

For example, the treatment of consumption and production in economic analysis can very well be integrated into a general and comprehensive concept of education. The way individuals and societies earn their living, assimilate industrial and technological advances and allocate their resources is in fact closely related to the development of cultural activities.

> ...it is misleading to treat culture as if it had no economic implications: expenditures for moral purposes or refinement of taste are not beyond economic analysis.18

The analysis of the economic value of education and, ultimately, of its contribution to economic growth does not in any way imply a negation of the cultural and intellectual

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18 T.W. Schultz, The Economic Value of Education, New York, Columbia University Press, 1963, p. 7.

contributions of education to individuals and nations. These contributions are of major importance and could conceivably be of greater importance in the final analysis. The aim of this study is simply to determine whether there are also economic benefits to be derived from educational outlays treated as investments and as factors in human capital formation, and to explain why, for example, it is that by measuring the rate of economic growth with conventional methods, i.e., using capital in his narrow sense, it is not possible to measure satisfactorily and adequately the contribution of capital to economic growth[19] and why "the concept of labour force, or of man-hours worked, fails to take into account the improvements in the capabilities of man"?[20]

2. Education as an Economic Value

It is then assumed that the process of education, in addition to achieve important purposes of cultural and

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19 In the United States, between 1919 and 1957, by adding only 1 per cent to the total input, the economy as a whole experienced an increase of more than 3 per cent. See T.W. Schultz, "Education and Economic Growth", in Social Forces Influencing American Education, Chicago: University of Chicago Press, Nelson B. Henry ed., 1961, p. 50, Table 1.

20 T.W. Schultz, "Reflections on Investment in Man", in the Journal of Political Economy, October 1962, p. 2.

intellectual nature, is also instrumental in improving the capabilities of people and in generating an increase in the national income and thus contributing to a higher rate of economic growth.

This assumption presupposes that education possesses some definite economic properties from which an analytical framework can be derived and used, ultimately, in a quantitative assessment of costs and benefits.

3. The Demand for and the Supply of Education

First, it is logical to presume that the economic value of educational services is influenced by demand and supply which, theoretically, should lead to a rational and balanced allocation of educational resources between what is demanded and what can be supplied.

In an economic sense, then, educational institutions that provide educational services can be considered as enterprises which, in order to function efficiently, require the services of teachers, school administrators, librarians as well as buildings and various other types of material equipment, all of which are essential for the production of educational services provided.

Furthermore, the amount and the type of educational services provided by these institutions are directly related to the demand for education as well as to its supply.

The demand for education could be defined most succinctly as "the demand for authorization to attend a specific educational institution, on a given level, and for certain subject matter".[21] The demand for educational services may be influenced by various social, political, cultural, economic and financial factors such as the level of education of parents, the family income and family size, the availability and accessibility of educational services and on the distribution of income in the economy as a whole. In turn, the supply of education that could be defined as "the supply of time available in educational institutions"[22] can influence the demand for educational services and their quality in terms of competent and knowledgeable teachers and students. It is, in the final analysis, a major factor in the determination of the efficiency with which the demand for education will be met and satisfied.

4. Consumption and/or Investment

For the purpose of economic analysis, goods and services are usually divided into two broad categories. There are goods and services from which individuals and families

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21 H. Correa, The Economics of Human Resources, North-Holland Publishing Company, Amsterdam, 1963, p. 56.

22 Ibid., p. 91.

derive immediate satisfaction. They are consumption goods and services. Other goods and services are used to provide consumption and to yield some economic benefits at some future date. They are investment goods and services from which we expect to derive some satisfaction in a near or distant future and which by being a major factor in the process of capital formation become a strategic factor in the process of economic growth. The investment nature of goods and services is not altered by the extent of the waiting period between the initial investment and the expected yield, i.e., the nature of investment is not directly function of a definite period of time. This must be carefully kept in mind when the investment nature of human capital and particularly of education is considered.

In fact, the time of maturing required by human capital would be, as a rule, much longer than that of physical capital. On the one hand, the purchase of a new machine results in an almost immediate expansion of production while, on the other hand, the improved training and education of young people usually extends over many years and would not necessarily lead to a rapid expansion of production in a short-term period.[23]

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23 W.G. Hoffman, "Expenditures on Education and Research in the Process of Economic Growth" in the German Economic Review, Vol. 2, No. 3, 1964, p. 215.

Thus, if resources entering into the development of human beings, e.g., education, are regarded solely as consumption, they would not contribute to the process of human capital formation and would not contribute directly to economic growth since they "would show up only in what people consumed as they responded to changes, including the rise in their income associated with economic growth".[24] If, however, this allocation of resources is regarded as an investment, at least partially, then education would become an investment component in the process of human capital formation and as such a factor in economic growth.

Actually, education can be regarded as partly current consumption since it satisfies the current needs of the individuals and as such is an alternative to other types of current consumption chosen according to the preferences of each individual. It thus contributes to present satisfaction e.g., absorption of new ideas and the possibility of associating with people of similar interests.

It can also be regarded as a durable consumer good which yields satisfaction and intellectual initiative over most of the life of the individual in terms of refinements and broader cultural interests within a particular social environment.

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24 T.W. Schultz, The Economic Value of Education, New York, Columbia University Press, 1963, p. 38.

And finally, outlays in education may be regarded as an investment in the production of a durable asset through the enhancement of the capabilities of human beings both as producers and as consumers and through an increase in the stock of knowledge of the society as a whole.

However, it is practically impossible at this time to allocate precisely and to differentiate objectively resources entering into education between consumption and investment, when the economic value of formal education including elementary, secondary, college and university education is analysed. For example, how can it be decided if elementary education possesses an investment component or is only pure consumption? As yet, no logical basis for such an allocation has been devised and it would be arbitrary to do so now. Thus in measuring the total costs of formal education for example, it will be necessary to treat all costs as investments except for one component, i.e., opportunity costs of students at the elementary level, the reasons for which will be explained in Chapter 2. Clearly, this assumption enlarges somewhat the magnitude of the investment component in education if we consider for example that at the elementary level, educational attainment can be considered to be mostly consumption. On the other hand, it can be argued that what is learned at the elementary level is a basic requirement for further education and that it will presumably continue to satisfy individuals in the future.

5. Incentives to Invest in Human Capital

In deciding whether or not resources should be invested in education for the production of human capital, it is important to recognize some of the particular characteristics of human capital formation and some of the factors influencing the process of investment in human resources.

It seems that three main factors should be considered:

(i) The number of periods.

(ii) Risk and liquidity.

(iii) Capital markets.[25]

(i) Number of Periods

The number of periods are affected mainly by mortality and morbidity and "the longer is the expected lifespan, the larger is the fraction of a lifetime that can be spent at any activity."[26]

Thus, the main explanation why younger persons are pursuing in greater number educational activities may not be purely because they want to absorb new ideas for themselves

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25 Gary S. Becker, Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education, Columbia University Press, New York and London, 1964, pp. 49-58.

26 Ibid., p. 49.

but partly because they recognize that education and related activities are investment in human capital and that the younger they chose to invest, the greater could be the economic benefits.

In another respect, the number of periods spent on any activity could determine more or less the degree of investment in education. This would seem to be particularly true of women which, to the extent that they expect to spend less time in the labour force would tend to invest less in more specialized, but highly productive, educational activities.

> A woman wants her investment to be useful both as a housewife and as a participant in the labour force ... Such investments would be less readily available than more specialized ones - after all, an investment increasing productivity in two activities also increases it in either one alone, extreme complementarity aside, while the converse does not hold.26

(ii) Risk and Liquidity

In general practice, investment takes place only if the expected rate of return is greater than the sum of the interest rate on riskless assets and the liquidity and risk premiums associated with the investment.

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26 Ibid., p. 52.

However, human capital, e.g., investment in education is a very illiquid asset. It cannot be sold and it is a rather poor collateral on loan. Also, investment in human capital is risky because of the very nature of the return on such capital which varies around the expected return because of uncertainty about several factors:

> There has always been considerable uncertainty about the length of life, one important determinant of the return. People are also uncertain about their ability, especially younger persons who do most of the investing ... The long time required to collect the return on an investment in human capital reduces the knowledge available ...,and the longer the average period between investment and return, the less such knowledge is available.27

Thus, investment in human capital involves much uncertainty about future return. And the reaction of a typical investor in human capital will be determined by the nature of this uncertainty as he sees it and by the tastes and attitudes of each individual.

(iii) Capital Markets

As noted above, human capital can be a highly uncertain type of capital, at least as regarding the rate of

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27 Ibid., p. 55.

return. This would tend to make it more difficult to borrow funds in order to invest in education.

Some implications of the difficulties found in the capital market due to the uncertainty inherent to human capital formation are described below:

(1) Since large expenditures would be more difficult to finance, investment in a university education would be more affected than investment in a secondary education.

(2) The difficulty of obtaining funds would make internal financing common and, as a consequence, wealthy families would tend to invest more than poorer ones.

On the other hand, although it is undeniably difficult to use the capital market to finance investments in human capital, it must be recognized that investment in physical capital can be sometimes very difficult to finance and:

> Although the difficulties of financing investments in human capital have usually been related to special properties of human capital, in large measure they also seem to beset comparable investments in physical capital. 28

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28 Ibid., p. 58.

To this difficulty of obtaining funds for human capital formation is added the particular problem of investors in education, which, being younger, could be especially prone to be ignorant of their abilities and of the investment opportunities available and as such more likely to err than investors in physical capital. Besides, the problem of investing as early as possible so that the return will create a real incentive to invest makes it more difficult for the typical human investor to postpone his investment in order to acquire additional knowledge about return or alternatives. In other words, the lack of knowledge of the average investor in human capital, presumably young, is really inherent to the nature of human capital formation itself:

> ... investors in human capital may not have less knowledge because of their age; rather both might be a joint product of the incentive not to delay investing.29

These various characteristics of investment in human capital do not limit the usefulness and the importance of this concept. They simply point out to some of the difficulties with which one is faced when deciding whether or not he should invest, or continue to invest, in educational activity. In this sense, human capital formation is in itself a complex process, sometimes very similar to physical capital formation, sometimes quite different.

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29 Ibid., p. 58.

6. Capital Formation and Investment in Education

Human capital formation generated by investment in human resources is, like real capital formation, closely related to the process of economic growth. Up until now, capital formation has been defined strictly in terms of physical capital without considering improvement in human capabilities. In Canada, Gross Fixed Capital Formation includes new construction, new machinery and equipment, changes in inventories in private and government business enterprises and of private non-commercial institutions. It also includes expenditures on new housing including major improvements and alterations. Conceptually, net capital formation which is distinguished from gross capital formation in that it is measured after allowances are made for depreciation, obsolescence and accidental damage to fixed capital, represents the addition to fixed capital like buildings, other construction and works, equipment and machinery and to working capital available for future production.[30]

This definition, restricted to investments resulting in the production of fixed capital, excludes explicitly investment in human beings. However, future production is

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30 United Nations, Concepts and Definitions of Capital Formation, New York, Statistical Office of the United Nations, July 1953, p. 7.

also facilitated by net additions to a country's stock of capital by increases in technical training and knowledge of the population, improvement in health and living conditions. Thus, depending on the purpose for which the statistics are to be used, the range of items included in capital formation may vary from a narrow one, as for example physical plant and equipment, to one which includes also current expenditures for research, health and education which improve technology and increase productivity of the labour force.[31]

Education, viewed as a component of human capital could be broadly defined as the acquisition and maintenance of knowledge, skills and ability. The individual acquiring those skills and abilities becomes in fact an item of capital equipment:

> His knowledge and skill... are the product of a capital investment in his education, in the general capacities of communication and calculation required for participation in the production process, and the specific investment which is variously financed by the state, the worker himself and the employer. Thus the labourer is himself a produced means of production, an item of capital equipment.32

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31 Ibid., p. 8.

32 Harry G. Johnson, "The Political Economy of Opulence" in the Canadian Journal of Economics and Political Science, November 1960, p. 562.

Furthermore, investment in education to produce human capital involves an alternative allocation of resources as an investment in physical equipment that entails some real costs.

Also human capital like physical capital suffers from depreciation and obsolescence, particularly in a dynamic economy although human capital seems to be relatively less specialized than physical capital. On the other hand, human capital which is embodied in an individual may appreciate with time and experience and an educated individual may be considered, ceteris paribus, more mobile and more flexible than a machine or a piece of equipment. However, although a unit of human capital may not deteriorate as fast in terms of economic capabilities as a unit of physical capital it eventually becomes obsolete because of such factors as age, ill health and rapid changes in technology experienced in a dynamic economy like ours.

On the other hand, in the measurement of human capital embodied in human beings through education, one very important distinction has to be made when the contribution of the education factor between capital viewed as a stock and as a flow is considered. For example as a stock, a new college graduate with a 35 years earning life ahead of him possesses more capital potential than a 60 years old college graduate.

While, if the contribution of both men in terms of production for a specific year is appraised, i.e., a flow, then there is no difference in their capital potential.

Thus, as more people get educated, the stock of education embodied in human beings is increasing and at the same time so does the future productive capacities of a society since both the level of education of the population as a whole rises and a larger share of the total education is embodied in the younger age groups than formerly.

And if more young people attain higher levels of education and thus a greater potential economic value, it also increases the flow of productive services of the society as a whole.

7. Conclusion

The above general description of the theoretical framework within which it is possible to envisage the incorporation of educational activity in the process of economic activity and of the general economic properties inherent to education was only intended as a basis for further theoretical as well as empirical analysis.

In the following chapters, various other concepts will be developed in connection with some empirical evidence, e.g., the concept of opportunity costs of students receiving an education in Chapter II, the concept of private returns to

education in Chapter III and the conceptual framework within which it will be possible to analyse the contribution of education to the rate of economic growth in Chapter IV.

In this perspective, the next Chapter will be concerned with a theoretical analysis and an estimate of the costs of education in Canada. This will permit an appraisal of the extent with which economic resources are being allocated in the educational sector in Canada.

CHAPTER II

THE COSTS OF EDUCATION IN CANADA

This chapter will consist essentially in the presentation and the analysis of basic estimates determining the costs of the major sectors of education in Canada over a period of ten years. In the preceding chapter, it was demonstrated conceptually that there is an economic factor inherent to educational activity. The purpose of this chapter is to measure the amount of economic resources allocated in the educational sector in Canada.

This involves the measurement of all the annual costs of education in order to evaluate the real factor costs of educational activity and to express in dollar terms the capital value of education in Canada.

1. Scope of the Quantitative Analysis

In attempting to define or rather to describe the process of education, it was pointed out that, among other things, education "means to train, discipline, or form abilities..."[1]. These objectives can be achieved in many different ways. In a formal sense, it consists of a formal system through which it is possible to receive an education going from one level of education to another and from one sector to another. In Canada, the

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1 Supra., p. 9

process of formal education, a provincial responsibility, is divided into three main levels of education, i.e., an elementary level, a secondary level and a higher educational level (the latter including both education in colleges and universities). The following analysis will be limited essentially to these three main levels of education under provincial responsibility. However, it does not include all the institutions of education in Canada, nor does it include all the expenditures made for educational purposes in Canada. Such educational activities as Adult Education, Fine Arts, Libraries, schools under federal jurisdiction, schools for the Blind and the Deaf and training in vocational schools are excluded. Teacher training outside universities was also excluded since no adequate financial data were available. Besides, the majority of students in this sector are studying in the Faculties of Education universities and the few normal schools remaining outside universities are rapidly disappearing. These various educational activities are undoubtedly contributing to an increase in the stock of education of the Canadian population and in this respect the approach used in this study is neither an exhaustive nor a sufficient measure of the economic contribution of education since these various other educational activities, as well as on-the-job training also contribute to the enhancement of human capabilities and to a more productive use of human resources. However, since

they include only a minimal part of the enrolment and cost relatively little[2] and since on-the-job training requires an analysis by itself, their exclusion should not influence significantly the conclusions of this research.

2. Methods of Measurement

Various approaches have been used in the recent past to measure the capital value of education.[3] They could be summarized under three general headings:

(a) The Years of Schooling of the labour force arrived at by adding the years of education after determining the relative importance of the average levels of education of the various educational groups.

(b) The Discounted Value of future earnings arrived at by calculating the relative values of potential

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2 The enrolment in these various educational activities is less than 2 per cent of the total (See Appendix A, Table A-1). On the other hand, relative to total expenditures for education in Canada, only 5.7 per cent in 1954 and 8.7 per cent in 1963 were for these various educational activities. See Survey of Education Finance, 1954-56, Dominion Bureau of Statistics (Catalogue No. 81-208), Ottawa July 1960, p. 16, Table 1 and Survey of Education Finance, 1963 Dominion Bureau of Statistics (Catalogue No. 81-208), Ottawa, May 1967, p. 16, Table 1.

3 See Bruce Wilkinson, Studies in the Economics of Education, Economics and Research Branch, Department of Labour, (Occasional Paper No. 4), Ottawa, July 1965, pp. 9-19.

income levels due to differences in educational attainment or training by applying a rate of discount to the actual value of expected earnings over a definite period of time.

(c) The Cost of Production approach that prices the human capital component in education at the cost of resources used in a year or over a number of years when production occurs.

In this chapter, the Cost of Production approach will be used for two main reasons. First, this method has the advantage of using the same general approach as in the valuation of the stock of physical capital. Economic comparisons between the two types of capital and with other major economic sectors are more easily done. Secondly, the availability of financial data on school expenditures in Canada can be more easily reconciled with that approach.

The Cost of Production method to estimate the capital value of education was originally developed by T.W. Schultz.[4] Four main elements must be considered:

(1) The costs of services provided by schools. It includes the operating costs consisting of the services of teachers, librarians, school

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4 T.W. Schultz, "Capital Formation by Education", Journal of Political Economy, Vol. LXVIII, Dec. 1960, pp.571-593.

administrators and other personnel as well as the costs of maintenance and operation of the school plants.

(2) The annual costs of depreciation and an implicit interest for lands, buildings and equipment used for educational activities.

(3) The value of annual earnings foregone by students at the secondary, college and university levels.

(4) Incidental expenses of attending school such as books, supplies, and additional transportation.

Another cost component that could conceivably be included in an estimate of the capital value of education is the value of services given free of charge to educational institutions by government, e.g., roads, police protection. However, there is not as yet any known or acceptable procedure to calculate the money value of those services benefiting to numerous educational institutions and to integrate them in an estimate of the total capital value of education.

It should be pointed out that these four components described above, aggregated, give the value of the education invested in individuals from the society's viewpoint. If one was estimating costs from the individual's viewpoint, tuition charges would replace the allowances for teachers' salaries and operating costs of the physical plant.

3. Costs of Services Provided by Schools

A) Elementary and Secondary Schools

At the elementary and secondary levels including both public and private schools the costs of educational services from 1954 to 1963, shown in Table I, consist mostly of teachers' salaries, other operating expenditures being divided between the expenditures for school administrators, librarians, books, audio-visual equipment and for the maintenance and operation of school plants. Most of the revenue of the public school boards come from provincial grants and local taxation, while in the private sector, the bulk of revenue comes from fees received from students.

Teachers' salaries account for nearly 70 per cent of total operating expenditures, at least in the public sector, over the entire period. The situation is somewhat different in the private sector where teachers' salaries account for a lesser proportion of total operating expenditures. This is due to the fact that members of religious orders which control most of these private schools and do most of the teaching receive little or no cash salaries. On the other hand, teachers' salaries in the private sector tend to be lower than in the public sector since their salaries are often supplemented by board, lodging and some other privileges which are not accounted for in salary. However their salaries in aggre-

TABLE I.-

Annual Operating Costs(a) of Elementary and Secondary Schools, Public and Private Sectors, Canada(b), 1954 to 1963, in Current Dollars

Year(c)	Teachers' Salaries (1)	Other Operating Costs (2)	Sub Total: Public Sector (3)	Teachers' Salaries (4)	Other Salaries and Wages(d) (5)	Other Operating Costs (6)	Sub Total: Private Sector (7)	Total: Public and Private Sectors (8)
	Millions of Dollars							
1954	286.8	136.5	423.3	6.1	3.0	9.8	18.9	442.2
1955	321.0	153.4	474.4	6.4	3.1	10.4	19.9	494.3
1956	360.5	173.6	534.1	7.0	3.3	11.2	21.5	555.6
1957	411.3	195.5	606.8	13.1	4.3	16.3	33.7	640.5
1958	473.3	221.9	695.2	14.9	5.1	19.9	39.9	735.1
1959	549.7	248.1	797.8	16.1	5.3	20.6	42.0	839.8
1960	625.4	275.8	901.2	18.7	6.3	21.9	46.9	948.1
1961	702.6	305.8	1,008.4	23.4	7.0	23.2	53.6	1,062.0
1962	782.3	342.2	1,124.5	24.9	7.3	24.2	56.4	1,180.9
1963	882.7	381.7	1,264.4	28.1	8.3	27.5	63.9	1,328.3

(a) Excludes Debt Charges.

(b) Includes Ten Provinces Only; Excludes Territories and Costs of Schools Under Federal Jurisdiction.

(c) Calendar Year.

(d) Imputed Salaries and Wages of Non-Salaried Teachers (Members of Religious Orders).

Source: See Appendix B, Explanatory notes to Table I.

gate terms, seem to be increasing at a more rapid rate than in the public sector with an increase of 208 per cent, compared with an increase of 361 per cent in private schools. This might be due to the fact that better salaries must now be offered to teachers in order to persuade them to teach in private schools.

B) Colleges and Universities

In this sector are included colleges and universities offering one or more years of work beyond the most advanced high school grade.[5] However, not all of the institutions as defined above report their total annual costs of services. The reports showing the annual operating expenditures of colleges and universities as published by the Dominion Bureau of Statistics are based on reports provided by institutions of higher education which enrol from 90 to 95 per cent of all college and university students. Estimates are included for the remaining institutions.[6]

In colleges and universities, annual current operating expenditures include professors' salaries, salaries for educational personnel such as administrators and librarians, expenditures for the maintenance and operation of plants and equipment for research. Expenditures for scholarships and other forms of similar financial aids to students are excluded since they are essentially transfer payments.[7]

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5 Survey of Education Finance 1961, Dominion Bureau of Statistics (Catalogue No. 81-208), Ottawa, August 1964, p. 26.

6 Survey of Education Finance 1954-1956, Dominion Bureau of Statistics (Catalogue No. 81-208), Ottawa, July 1960, p. 38.

7 Transfer payments are payments which are not made in exchange of services and they are excluded from the National Income in Canada. See National Accounts, Income and Expenditures 1926-1956, Dominion Bureau of Statistics (Catalogue No. 13-502F), Ottawa, 1962, p. 110.

Most of the revenue of colleges and universities in Canada come from provincial and federal governments and from the fees paid by students.

Table 2 summarizes annual total operating expenditures for colleges and universities for a ten year period, and as in the case of public elementary and secondary schools, expenditures for instruction, i.e. professors' salaries represent the greater share of total operating expenditures. For the years for which an itemized report of operating expenditures was available, i.e., from 1955 to 1963, professors' salaries represent more than 50 per cent of total operating costs, having increased by 246 per cent from 1955 to 1963. The item Other Costs includes grants to students' associations and to other organizations connected closely with academic activities. On the other hand, expenditures for research, a particular feature of higher education, represent about 13 per cent of total operating expenditures.

TABLE II.-

Annual Operating Costs of Colleges and Universities, Canada, 1953-54 to 1962-63, in Current Dollars

Year*	Instruction	Administration	Maintenance	Research	Other Costs	Total
	(1)	(2)	(3)	(4)	(5)	(6)
			Millions of Dollars			
1953-54	----	---	----	---	---	62.1
1954-55	42.9	6.3	10.5	9.4	6.1	75.2
1955-56	45.4	5.6	11.6	10.3	6.7	79.7
1956-57	50.3	5.9	12.4	10.1	6.8	85.6
1957-58	62.5	7.3	13.9	11.1	7.1	101.9
1958-59	74.6	8.0	18.4	14.6	4.3	119.9
1959-60	88.4	8.7	15.9	18.3	10.3	141.6
1960-61	109.7	11.5	19.0	20.9	12.8	174.0
1961-62	129.5	11.5	23.4	26.3	12.4	203.1
1962-63	148.3	14.9	27.3	30.6	14.8	235.9

* Academic year basis: Expenditures for colleges and universities are estimated on an academic year basis contrary to expenditures in the elementary and secondary sectors which are estimated on a calendar year basis. For purposes of financial comparisons, the Dominion Bureau of Statistics suggests that the part of the academic year in which there is more months of schooling should be compared with the equivalent calendar year, e.g., 1954 and 1953-54.

Source: Preliminary Statistics of Education, 1952-53 and 1953-54, Dominion Bureau of Statistics, Ottawa 1957, p. 30, Table 25;

Survey of Education Finance, 1963, Dominion Bureau of Statistics (Catalogue 81-208), Education Division, p. 46, Table 26.

4. Annual Costs of Depreciation and Implicit Interest on School Properties

The second major cost item to take into consideration in measuring the total capital value of education is annual outlays for plant and equipment. In this chapter, this was arrived at by computing an implicit rate of interest and depreciation and obsolescence upon the stock of physical capital existing in any given year, the implicit rate of interest being that rate that represents the return which funds could earn if they were invested in other outlets involving comparable risk.

One of the major advantage of using this particular approach, is that it avoids the possibility of wide annual fluctuations in costs per student since it distributes the capital value of physical facilities over their useful life through depreciation allowances.[8]

Since no accurate distribution of physical assets of schools were available for Canada, the distribution used by T.W. Schultz in his study, Capital Formation by Education[9] was used as a starting point.

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8 Bruce Wilkinson, loc. cit., p. 14.

9 T.W. Schultz made use of the findings of an unpublished study by Robert Rude, Assets of Private Non Profit Institutions in the United States, 1890,1948, National Bureau of Economic Research, April 1954. See T.W. Schultz, "Capital Formation by Education", in the Journal of Political Economy, Vol. LXVIII, December 1960, p. 578, Table 3, Footnote 5 and p. 579, Table 4, Footnote 6.

However, one major change was made concerning the implicit rate of interest to be used. In his study, Schultz used a rate of interest of 5.1 per cent. In view of the fact that the rate of interest in Canada is usually slightly higher than in the United States, a rate of 5.1 per cent may be too low to reflect accurately the opportunity cost of expenditure upon educational facilities in Canada. For the purpose of this study, a rate of interest of 6.1 per cent will be used.

A) Elementary and Secondary Schools

The value of property for public and private elementary and secondary schools had to be estimated since no adequate data are available for Canada. The detailed estimation procedure is explained in the explanatory notes to Table III in Appendix B. The result of this estimate is presented in Table III, column 1.

In order to arrive at the value of depreciation and of the implicit rate of interest, the distribution of physical assets is placed at 15 per cent land, 77 per cent buildings and 8 per cent for equipment. With no depreciation or obsolescence on land, 4 per cent on buildings and 10 per cent on equipment, and with an implicit interest rate of 6.1 per cent, we have a 10 per cent rate.[10] This rate was applied to

10 T.W. Schultz, "Capital Formation by Education" in the Journal of Political Economy, Vol. LXVIII, December 1960, p. 578, Table 3, Footnote 5.

TABLE III.- 40

Estimated Value of Implicit Interest and Depreciation of Properties of Elementary and Secondary Schools, Canada, 1954 to 1963, in Current Dollars.

Year	Estimated Value of Property* (1)	Implicit Interest and Depreciation (2)
	Millions of Dollars	
1954	1,307.7	130.8
1955	1,491.0	149.1
1956	1,676.4	167.6
1957	1,866.6	186.7
1958	2,087.9	208.8
1959	2,372.0	237.2
1960	2,653.2	265.3
1961	2,978.5	297.9
1962	3,331.5	333.1
1963	3,708.8	370.9

* Land, building and equipment.

Source: See Appendix B, Explanatory Notes to Table III.

Column 1 of Table III and the result is shown in Column 2. Note however that the distribution of land and buildings have been altered slightly. T.W. Schultz uses a percentage distribution of 20 per cent for land, 72 per cent buildings and 8 per cent for equipment. However, some informal investigation[11] shows a slightly lower percentage distribution for land in Canada, closer to 15 per cent of total value of physical assets. The additional 5 per cent thus was arbitrarily added to the value of buildings for a new total of 77 per cent.

B) Colleges and Universities

As in the case of elementary and secondary schools, the value of property had to be estimated since no adequate data were available for Canada. The estimate is explained in detail in the explanatory notes to Table IV in Appendix B. The result is shown in Table IV, Column 1. The distribution of physical assets, following T.W. Schultz,[12] was placed at

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11 This informal investigation was conducted with the Collegiate Institute Board of Ottawa, Separate School Board and the Public School Board. Although they could not provide any definite estimate, they felt that a 15 per cent figure would be more accurate than 20 per cent. However, in view of the lack of supporting statistical evidence, this 15 per cent figure should be considered, at best, an approximate figure.

12 T.W. Schultz, "Capital Formation by Education" in the Journal of Political Economy, Vol. LXVIII, December 1960, p. 579, Table 4, Footnote 6.

15 per cent land, 70 per cent buildings and 15 per cent equipment. With no depreciation or obsolescence on land, 2 per cent on buildings (less obsolescence than for elementary and secondary schools since they must adjust more frequently to changing local and community populations), and 10 per cent on equipment, and with an implicit interest rate of 6.1 per cent, we have a 9 per cent rate. This rate was applied to Column 1 of Table IV. The result is shown in Column 2.

TABLE IV.-

Estimated Implicit Interest and Depreciation of Properties of Colleges and Universities, Canada, 1953-54 to 1962-63, in Current Dollars

Year	Estimated Value of Property* (1)	Implicit Interest and Depreciation (2)
	Millions of Dollars	
1953-54	198.3	17.8
1954-55	227.1	20.4
1955-56	257.0	23.1
1956-57	306.4	27.6
1957-58	378.2	34.1
1958-59	473.2	42.6
1959-60	573.2	51.6
1960-61	702.0	63.2
1961-62	834.3	75.1
1962-63	993.0	89.4

*Land, building and equipment.

Source: See Appendix B, Explanatory Notes to Table IV.

C) Total Value of Services Provided by Schools

The total estimated value of all school properties, i.e., elementary and secondary schools, colleges and universities, increased from 1,506 million in 1954 to 4.702 million in 1963, a percentage increase of 212 per cent while the estimated value of implicit interest and depreciation increased by 210 per cent from 148.6 million in 1954 to 460.3 million in 1963, a substantial addition to the capital value of formal education in Canada. From this point of view, it is interesting to compare the total value of school properties with the gross value of the stock of social capital in Canada, even though data for the value of social capital are available for earlier years only.

In Canada, the gross stock of social capital, i.e. the stock of equipment used by society at large, rather than by particular enterprises, such as transport facilities, public utilities, schools and hospitals, was estimated for the years 1945 to 1955 in a study published by the Royal Commission on Canada's Economic Prospects[13]. For the years 1954 and 1955 they estimated the value (in 1949 Constant Dollars) of the stock of social capital at $35,301 million and $36,762 million

13 Wm C. Hood, and Anthony Scott, Output, Labour and Capital in the Canadian Economy, Royal Commission on Canada's Economic Prospect, Ottawa, February 1957, p. 448.

respectively. The estimated value of the stock of social capital was arrived at by taking an initial capital stock figure to which was added new investments as they took place and from which was subtracted the value of those capital goods purchased earlier and which are assumed to be in the process of discard.[14] This estimated value of social capital is thus comparable with the value of school property that represents the undepreciated book value of original cost of acquisition.

In order to compare the stock of social capital with the value of school properties in Canada for the years 1954 and 1955, the stock of social capital, estimated in 1949 dollars was adjusted accordingly and converted into 1954 and 1955 dollars, using the Business Gross Fixed Capital Formation implicit (1949) price index. The adjusted stock of social capital was thus estimated at $45,327 million in 1954 dollars and $48,195 million in 1955 dollars.

On the other hand, the total value of school properties, i.e., elementary and secondary (public and private) schools and colleges and universities, for the years 1954 and 1955 has been estimated at $1,506 million and $1,719 million respectively (see Tables III and IV). However, as pointed out

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14 Ibid., p. 235.

before, these estimates of the value of school properties include schools that have less than 100 per cent of the enrolment of students in Canada. For the years 1954 and 1955, using data available from Table A-1, Appendix A, it can be estimated that in 1954, these schools had an enrolment of 98.3 per cent and 98.4 per cent in 1955.

Thus in order to estimate the total value of all school properties, an adjustment factor of 1.7 per cent in 1954 and 1.6 per cent in 1955 was added. This adjustment increased the value of school properties to $1,532 million in 1954 and to $1,746 million in 1955.

Using the adjusted value of the stock of social capital and the adjusted value of school properties, the percentage value of school properties relative to the stock of social capital can be calculated. In 1954, the value of school properties was 3.38 per cent relative to the total value of the stock of social capital and in 1955, the proportion had increased slightly to 3.62 per cent.

On the other hand, when comparing the gross capital value of institutions only, which include schools, universities, churches and hospitals, estimated (in constant (1949) dollars) at $3,817 million in 1954 and at $4,071 million in 1955,[15] converted in 1954 and 1955 dollars to $4,911 million

15 Ibid., p. 448.

and $5,337 million respectively, the percentage share of educational properties is 31 per cent of the total value of institutional capital in 1954 and 33 per cent in 1955.

These comparisons point out to the increasing significance of educational facilities in relation to the stock of institutional capital and to the stock of social capital in general.

Thus, while investment in educational activities are creating an increasing stock of human capital, it also influences significantly the growth of physical capital through the construction and the furnishing of schools and education related institutions.

5. The Value of Annual Earnings Foregone by Students

The third major cost item in estimating the capital value of education is the earnings foregone by students while they attend school. One of the basic assumption in calculating those earnings foregone is that no opportunity costs will be imputed to students at the elementary level.

Moreover, our estimation of earnings foregone is based on the following assumptions:[16]

16 T.W. Schultz, "Capital Formation by Education, in the Journal of Political Economy, Vol. LXVIII, December 1960, p. 573.

(i) Students study, which is work, and this work, among other things, helps create human capital. Students are not enjoying leisure when they study, nor are they engaged wholly in consumption; they are here viewed as self-employed producers of capital.

(ii) Assume, then, that if they were not in school, they would be employed producing other products and services of value to the economy for which they would be paid; there is, then, an opportunity cost in going to school.

One major problem however in estimating the magnitude of those foregone earnings is to decide what value should be assigned to them. The method used in this chapter was originally developed by T.W. Schultz.[17]

The derivation of earnings foregone is based on the average earnings per week of those young men and women with a comparable age-sex distribution and educational levels who are not attending school as a measure of the alternative value productivity of the students' time and effort in secondary schools, colleges and universities. The year 1961 was taken as a base year in determining the earnings per week of young people both males and females, for each of two age groups, i.e., 15-19, 20-24.

Students' foregone earnings were then calculated on the assumption that they forego, on the average 40 weeks (average academic year) of such earnings and their estimated

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17 Ibid., pp. 573-576.

annual earnings were ultimately expressed in week by earnings-equivalent of workers in all industries in Canada. The annual foregone earnings of individuals students at each educational level can then be easily calculated.

Some may argue that such an approach is an overstatement of the value of the opportunity costs of attending school since they reason that a major shift of students from schools to the labour market would result in considerable unemployment and the opportunity cost component would be negligible. However, such an argument is not relevant in this case since analysing the effect of such a major shift of manpower on the elasticity of the demand in the short-run or in the long-run is not at issue. This analysis is concerned essentially with an estimate of the earnings that a typical student in a normal situation could expect to forego at the margin.

The details of the estimation method are outlined in the explanatory notes to Table V in Appendix B. The result, summarized in Table V, indicates that secondary students forego the equivalent of 16 weeks and college and university students 22 weeks. These 1961 earnings-equivalent ratios were applied from 1954 to 1963 to the average weekly earnings in all industries in Canada to estimate the annual earnings foregone by students in secondary schools and in colleges and universities. These estimated annual earnings foregone were

then further adjusted for unemployment in order to eliminate, to a degree, the possible distortion due to unemployment in the total labour force. The results are shown in Table VI.

TABLE V.-

Number of Weeks of Earnings Foregone for Students in Secondary Schools and in Colleges and Universities, Canada, 1961

Secondary level	16 weeks
University and College	22 weeks

Source: See Appendix B, Explanatory Notes to Table V.

TABLE VI.-

Annual Foregone Earnings by Students in Secondary Schools and in Colleges and Universities, Canada, 1954 to 1963, in Current Dollars

ear	Average Weekly Earnings in All Industries, Canada (1) $	Secondary Level		College and University	
		Unadjusted (2) $	Adjusted for Unemployment (3) $	Unadjusted (4) $	Adjusted for Unemployment (5) $
1954	59.04	945	902	1,299	1,239
1955	61.05	977	934	1,343	1,284
1956	64.44	1,031	996	1,418	1,370
1957	67.93	1,087	1,037	1,494	1,425
1958	70.43	1,127	1,048	1,549	1,441
1959	73.47	1,176	1,105	1,616	1,519
1960	75.83	1,213	1,128	1,668	1,551
1961	78.17	1,251	1,162	1,720	1,598
1962	80.59	1,289	1,213	1,773	1,668
1963	83.43	1,335	1,262	1,835	1,734

Source: See Appendix B, Explanatory Notes to Table VI.

The annual earnings foregone by each student adjusted for unemployment is then used to calculate the total value of earnings foregone for secondary, college and university students in Canada from 1954 to 1963 (Table VII).

However, certain limitations must be kept in mind when analysing and interpreting these estimates. Actually, to the extent that the 1961 Census, on which this estimate is based, includes all persons, 15 years of age and over, who were reported as having a job of any kind either part-time or full-time during the week prior to enumeration, could have been employed for only a few weeks during the year, it seems plausible that their earnings would be below those of workers of equivalent abilities who worked most of the year. To this extent, this estimate is too low. Also it might be that students assuming to have greater ability could command higher salaries than those of people already in the labour force. Again, this estimate may be too low. On the other hand, some students work during the academic year. Since there were no adequate data available and an estimate would have been highly arbitrary, we did not subtract those part-time earnings from this estimate and to that extent, it may be too high.

TABLE VII.-

Total Foregone Earnings of Students in Secondary Schools and in Colleges and Universities, Canada, 1954 to 1963, in Current Dollars

Year	SECONDARY SECTOR Total Earnings Foregone (1)	COLLEGE AND UNIVERSITY Total Earnings Foregone (2)
	Millions of Dollars	
1954	327.5	79.5
1955	365.6	87.7
1956	422.4	99.6
1957	465.7	111.9
1958	511.4	125.0
1959	772.0	144.3
1960	850.0	158.1
1961	969.3	181.9
1962	1,151.0	215.0
1963	1,314.1	245.2

Source: Column 1 was calculated by multiplying Column 3 of Table 5 by the number of students in public and private secondary schools in Canada, from Column 6, Table A-1, Appendix A.; Column 2 was calculated by multiplying Column 5 of Table 5 by the number of students in colleges and universities in Canada, from Column 8, Table A-1, Appendix A.

Also, even though the utilization of a week-equivalent concept based on 1961 data may have overstated slightly the number of weeks equivalent for the years 1954 to 1960, the distortion can be assumed to be minimal.

Thus of the four factors mentioned above, two would tend to overstate the estimated foregone earnings and the other two would tend to understate them. Therefore, it is assumed that a compensating effect takes place between the two sets of factors, so that the estimated earnings foregone may be viewed as an adequate approximation of the opportunity costs of attending schools.

However, these estimates differ somewhat from a recent set of estimate produced by J.R. Podoluk in her study entitled Earnings and Education.[18] A comparison between both sets[19] of estimates is relatively difficult since her estimate, for 1961 only, based on wages and salaries earned by wage-earners by age and schooling in the 15 to 19 and 20 to 24 age groups, is an interpolation showing estimates for

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18 J.R. Podoluk, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa, December 1965, p. 53, Tables 17 and 18.

19 In Studies in the Economics of Education, by Bruce W. Wilkinson, estimated earnings foregone were also used. However, the author uses estimates calculated by T.W. Schultz for the United States and any comparison concerning Canada would be pointless.

individual years from 15 to 24 and it does not correspond to the estimate used in this study,[20] based on a week-equivalent concept, related to the average weekly earnings in all Canadian industries and also estimated from wages and salaries earned by wage-earners, in 1961, distributed by age and schooling corresponding to students of the same age and education level.

However, assuming that each individual year of earnings foregone as estimated by J.R. Podoluk, has the same weight in terms of the number of students attending school, it is possible to derive the average earnings foregone for 1961 from her basic estimate that can be compared with the 1961 estimate arrived at in this study.

The result shows that Podoluk's estimates are lower, i.e., $1,002 and $1,401 for students at the secondary and higher education levels respectively compared with $1,162 and $1,598 estimated in this chapter.

The main reason for this difference seems to be the utilization by Podoluk of wages and salaries earned by wage-

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20 Note that while Podoluk's estimates are for males only, the estimates for this study took into account both male and female students. However since further calculations showed that the number of weeks foregone by male students only was also 16 and 22 weeks for secondary and college and university male students respectively, the estimates from Table VI are comparable with Podoluk's estimates.

earners with an elementary education as a basis for her estimate of earnings foregone by students with a secondary education and wage-earners with a secondary education to estimate earnings foregone by college and university students. This approach is based on the hypothesis that an average student with a complete or partial secondary education would forego the earnings of an individual in the labour force with elementary education only and that an average college and university education would forego the earnings of an individual with a secondary education. However, there seems to be little justification for this since essentially, the aim of estimating earnings foregone is to relate educational activity to an economically productive action being renumerated at a rate equivalent to what is received by an individual in the labour force. The estimate should not reflect what would be the earnings of a drop-out, a corollary to Podoluk's hypothesis since obviously an individual having completed his secondary education could expect to earn what is being earned by an individual with the same level of education and of the same age-group, and the same being true of a college or university graduate, an inaccuracy avoided in the method used in this study.

On the other hand, the estimated earnings foregone in this study are closely connected with the average weekly earnings in all Canadian industries that can be assumed to

be an accurate indicator of the economic condition prevailing in the labour force at a point of time as well as over a period of time.

6. Additional School Expenditures

The fourth component of the costs of educational services includes the costs of books and other related school supplies and in the case of college and university students, the cost of travelling to and from institutions other than local. It is assumed here that there are no such costs at the elementary level. The great majority of students at the secondary level studying in their own locality, there is no need for travel costs. Table VIII shows the estimated cost per student for additional school expenditures while Table IX presents the aggregate cost.

TABLE VIII

Additional School Expenditures per Student in Secondary Schools and in Colleges and Universities, Canada, 1954 to 1963

Year	College and University (1)	Secondary (2)
1953-54	120	30.00
1954-55	125	31.25
1955-56	130	32.50
1956-57	135	33.75
1957-58	141	35.25
1958-59	146	36.50
1959-60	152	38.00
1960-61	159	39.75
1961-62	165	41.25
1962-63	172	43.00

Source: See Appendix B, Explanatory Notes to Table VIII.

TABLE IX.-

Total Additional School Expenditures for Students in Secondary Schools and in Colleges and Universities, Canada, 1954 to 1963, in Current Dollars

Year	SECONDARY SECTOR Total Additional School Expenditures (1)	COLLEGE AND UNIVERSITY Total Additional School Expenditures (2)
	Millions of Dollars	
1954	10,9	7,7
1955	12,2	8,5
1956	13,8	9,5
1957	15,2	10,6
1958	17,2	12,2
1959	25,5	13,9
1960	28,6	15,5
1961	33,2	18,1
1962	39,1	21,3
1963	44,8	24,3

Source: Column 1; Column 1 of Table VIII multiplied by the number of students in secondary schools (Table A-1, Appendix A); Column 2 - Column 2 of Table VIII multiplied by the number of students in colleges and universities (Table A-1, Appendix A).

7. Total Costs of Formal Education and Their Implications

Table X summarizes by levels of education and by major sectors within each level the main components entering into the aggregate cost of formal education in Canada from 1954 to 1963. During that period, the cost of all educational services increased by 239 per cent from just over one billion dollar to more than three billion and a half. This considerable increase over a relatively short period of time, i.e., ten years, was shared unequally between an increase of 326 per cent in the secondary sector, an increase of 256 per cent in higher education (i.e. college and university) and a relatively low percentage increase of 137 per cent[21] at the elementary level. When these costs are expressed in cost per student (see Table XI), the result is somewhat different.

In cost per student the percentage increase at the elementary level was 71 per cent, 49 per cent at the secondary level and 61 per cent in colleges and universities. This

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21 Note that since the statistical data for operating costs and for the value of school property could not be obtained separately for elementary and secondary schools, their distribution between both levels was estimated on the basis of the differences between teachers' salaries at each level and between the number of students per teacher at each level. See explanatory notes to Table IX, Appendix B, for a detailed explanation.

TABLE X.-

Total Costs of Education at the Elementary, Secondary, College and University Levels, Canada, 1954 to 1963, in Current Dollars

Year	ELEMENTARY		SECONDARY			COLLEGE AND UNIVERSITY					Total
	Total Operating Costs Plus Implicit Interest and Depreciation	Total Operating Costs Plus Implicit Interest and Depreciation	Total Earnings Foregone	Additional Expenditures	Total: Secondary	Total Operating Costs	Total Implicit Interest and Depreciation	Total Earnings Foregone	Additional School Expenditures	Total University and College	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Millions of Dollars										
1954	437.1	135.8	327.5	10.9	474.3	62.1	17.8	79.5	7.7	167.1	1,078.5
1955	492.9	150.3	365.6	12.2	528.1	75.2	20.4	87.7	8.5	191.8	1,212.8
1956	549.3	173.9	422.4	13.8	610.1	79.7	23.1	99.6	9.5	211.9	1,371.3
1957	624.6	202.6	465.7	15.2	683.5	85.6	27.6	111.9	10.6	235.7	1,543.8
1958	703.8	240.1	511.4	17.2	768.7	101.9	34.1	125.0	12.2	273.2	1,745.7
1959	722.2	354.8	772.0	25.5	1,152.3	119.9	42.6	144.3	13.9	320.7	2,195.2
1960	805.1	408.3	850.0	28.6	1,286.9	141.6	51.6	158.1	15.5	366.8	2,458.8
1961	882.7	477.1	969.3	33.2	1,479.6	174.0	63.2	181.9	18.1	437.2	2,799.5
1962	948.5	565.5	1,151.0	39.1	1,755.6	203.1	75.1	215.0	21.3	514.5	3,218.6
1963	1,035.8	663.3	1,314.1	44.8	2,022.2	235.9	89.4	245.2	24.3	594.8	3,652.8

Source: See ExplanatoNotes to Table 10, Appendix B.

TABLE XI.-

Total Cost Per Student: Elementary, Secondary, College and University Students, Canada, 1954 to 1963, in Current Dollars

Year	Elementary (1)	Secondary (2)	College and University (3)
	$	$	$
1954	173	1,306	2,606
1955	178	1,349	2,809
1956	190	1,439	2,914
1957	209	1,522	3,002
1958	228	1,575	3,150
1959	235	1,650	3,376
1960	251	1,708	3,598
1961	265	1,774	3,840
1962	276	1,850	3,992
1963	295	1,942	4,207

Source: From Table 8 and Table A1, Appendix A. The total cost in each sector is divided by the number of students at each level for each year.

would seem to be due mainly to a relatively more considerable increase in enrolment in colleges and universities, 121 per cent from 64,140 students in 1954 to 141,388 in 1963, and in secondary schools, 187 per cent from 363,115 in 1954 to 1,041,314 in 1963, than in elementary schools where the increase was only 31 per cent.[22] This considerable increase in enrolment in secondary schools and in colleges and universities seem to have risen relatively faster than expenditures.

One interesting aspect of the cost per student approach is that assuming 8 years of elementary education and 4 years each for secondary and higher education, it can be estimated that the cost for one student going through 16 years of education has more than doubled over ten years from $17,032 in 1954 to $34,724 in 1963, with the highest percentage increase in cost per student having been experienced by students in elementary schools. To the extent that the increase in the cost of elementary schooling is warranted, it would then be possible to assume that society as a whole could afford to allocate more of its available economic resources to the secondary and higher education sectors in future years.

Table XII summarizes the principal components entering into the costs of high school and college and university

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22 See Appendix A, Table A 1.

students. It shows at once the importance of earnings foregone per student at each level. At the secondary level, earnings foregone as a percentage of total cost per student vary between 69.1 per cent in 1954 to 65 per cent in 1963, decreasing progressively from year to year. At the university level, although the proportion is relatively less than at the secondary level, it varies between 47.5 per cent in 1954 and 41.2 per cent in 1963.

One surprising aspect of these findings is the higher proportion of cost per student at the secondary level being due to earnings foregone than in college and university. Apart from the fact that the estimate of earnings foregone at the higher education level may have been understated, it would seem that a more logical observation is that the other components of the cost in higher education are relatively more important than in the case of secondary levels. The facts, for example, that college and university spend significant amounts for research and that college and university professors receive, on the average, higher salaries than secondary teachers would tend to diminish proportionately the importance of earnings foregone.[23]

23 The median salaries of full-time teaching staffs at 17 universities and colleges was $8,894 in 1962-63 while the median salaries of secondary teachers ranged from $6,929 in Ontario to $3,775 in Prince Edward Island for the same academic year. See Survey of Elementary and Secondary Education, 1962-63, Dominion Bureau of Statistics,(Catalogue No. 81-210), April 1966, p. 31, Table 2-05 and Preliminary Statistics of Education, 1962-63, Dominion Bureau of Statistics (Catalogue No. 81-201), June 1963, p. 28, Table 10.

TABLE XII.-

Earnings Foregone Per Student as a Percentage of Total Cost Per Student: Secondary, College and University Students, 1954 to 1963, in Current Dollars

	Secondary Schools			Colleges and Universities		
	Total Cost Per Student	Total Earnings Foregone Per Student	Earnings Foregone as a Percentage of Total Cost Per Student	Total Cost Per Student	Total Earnings Foregone Per Student	Earnings Foregone as a Percentage of Total Cost Per Student
	(1)	(2)	(3)	(4)	(5)	(6)
	$	$	%	$	$	%
1954	1,306	902	69.07	2,606	1,239	47.54
1955	1,349	934	69.24	2,809	1,284	45.71
1956	1,439	996	69.21	2,914	1,370	47.01
1957	1,522	1,037	68.13	3,002	1,425	47.47
1958	1,575	1,048	66.54	3,150	1,441	45.75
1959	1,650	1,105	66.97	3,376	1,519	44.99
1960	1,708	1,128	66.04	3,598	1,551	43.11
1961	1,774	1,162	65.50	3,840	1,598	41.61
1962	1,850	1,213	65.57	3,992	1,668	41.78
1963	1,942	1,262	64.98	4,207	1,734	41.22

Source: The total cost per student is from Table 9, and earnings foregone per student are from Table 5.

On the other hand, the progressive decline in the proportion of earnings foregone in the total cost per student may be due to the relatively greater share of expenditures being devoted to other operating costs. In the case of college and university, while total operating costs increased by 280 per cent from 1954 to 1963, the increase in earnings foregone was 208 per cent. (See Table X, columns 6 and 8).

Since operating costs include mostly expenditures for professors' salaries and in the case of colleges and universities, research, it is logical to assume that these costs are increasing at a faster rate relative to foregone earnings. This seems to be supported by the fact that while the total cost per student experiences a 49 per cent and 61 per cent increase for secondary and higher education students respectively, the earnings foregone component has been increasing in both cases by 40 per cent.

However, even if foregone earnings tend to decline in relative terms, they still remain a very important component of the cost of education and their implications are significant.

It is possible to assume, for example, that in the case of students whose families are relatively poor, the importance of earnings foregone becomes essential in deciding whether or not some students can afford to attend school. T.W. Schultz mentions that it has been widely observed that

although tuition is free, or scholarships are provided to cover tuition or more, many talented children from low income homes do not avail themselves of the additional educational opportunities.[24]

Also, one of the major issue in the development of the concept of earnings foregone is the possible adjustment of the concept of national income to include this cost component. Its importance in the total cost of education is significant enough and to the extent that they are not included in a broader national income concept, the value of the Gross National Product tends to be underestimated.

In this respect an attempt, shown in Table XIII, has been made to consider the costs of education in relation to some major economic indicators. Note that the relation of the Gross National Product and the total costs of education, which include earnings foregone, is being done for its indicative value only since it has already been recognized that earnings foregone are not included in the GNP and as such a comparison with the costs of education tends to overestimate their importance.

In all cases, each sector has been converted in constant (1957) dollars. The current dollar figures have been converted into constant dollars on the basis of general

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24 T.W. Schultz, The Economic Value of Education, Columbia University Press, New York and London, 1963, p. 30.

price trends. Thus the constant dollar figures allow for changes in the general purchasing power of the current dollars However, they do not reflect changes of education costs. To the extent that changes in education costs may have risen more rapidly than the general price indices used, the constant dollar figures would involve a certain amount of overstatement in terms of the physical volume undertaken if current dollar figures are deflated by a price index of education cost, which index is not available at the present time. The Gross National Expenditure implicit price index was used to deflate the operating expenditures of educational institutions; the Business Gross Fixed Capital Formation implicit price index was used to deflate the estimated annual value of implicit interest and depreciation while earnings foregone and additional school expenditures were deflated with the Personal Expenditure on Consumer Goods and Services implicit price index.

The results as shown in Table XIII indicate that the annual percentage growth rate of the costs of education over ten years as well as the annual growth rates of each levels of education were much higher than the annual growth rates of the Gross National Product and the Gross Fixed Capital Formation. The total costs of education had an annual average growth rate, 12.43 per cent, almost three times as much as the average growth rate of the GNP, 4.40 per cent,

and almost four times as much as Gross Fixed Capital Formation, 3.21 per cent.

Furthermore, when the costs of education are considered relative to the Gross National Product and the Gross Fixed Capital Formation, it is found that relative to the GNP, the costs of education have increased from 4.33 per cent in 1954 to 8.43 per cent in 1963, almost double. However, as was pointed out earlier, this comparison is purely indicative and less meaningful than a comparison with Gross Fixed Capital Formation. In this case, the relation is much more significant. While, in percentage terms, the costs of education was, in 1954, 18.20 per cent relative to Gross Fixed Capital Formation, the proportion had increased to 39.29 per cent in 1963. Assuming further that resources entering into education were actually investment, this is not inconsistent with the hypothesis that the rates of return to education were relatively attractive. In other words, it would seem that these rates of return were larger than the rate of return to investments in physical capital and as such, induced the larger rate of growth of education viewed as a form of human capital.

TABLE XIII.-

Costs of Education Related to Some Major Economic Indicators in Canada, 1954 to 1963, in Constant (1957) Dollars

SECTORS	1954	5	1956	1957	1958	1959	1960	1961	1962	1963	Total Percentage Increase	Annual Percentage Growth Rate
	(1)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11) %	(12) %
A) Gross National Product ($,000,000)	26,714	218	31,508	31,909	32,284	33,398	34,200	35,081	37,479	39,352	47.31	4.40
B) Gross Fixed Capital Formation ($,000,000)	6,352	17	8,333	8,717	8,332	8,144	7,858	7,802	8,108	8,442	32.90	3.21
C) Costs of Education ($,000,000)	1,156	92	1,415	1,544	1,708	2,102	2,323	2,626	2,973	3,317	186.94	12.43
i Elementary	474	29	566	625	690	690	756	822	868	931	96.41	7.79
ii Secondary	503	59	630	683	751	1,105	1,220	1,394	1,630	1,847	267.20	15.55
iii Coll. and Univ.	179	04	219	236	267	307	347	410	475	540	201.68	13.15
% Line C of Line A	4.33	45	4.49	4.84	5.29	6.29	6.79	7.49	7.93	8.43	----	----
% Line C of Line B	18.20	95	16.98	17.71	20.50	25.81	29.56	33.66	36.67	39.29	----	----

Source: See Explanat Notes to Table XIII, Appendix B.

This hypothesis seems to be consistent with the relationship existing between the cost experience of secondary and higher education levels and Gross Fixed Capital Formation in constant (1957) dollars. In the secondary sector, the percentage share of costs to Gross Fixed Capital Formation increased from 7.92 per cent in 1954 to 21.88 per cent in 1963, almost three times as much in absolute terms and, in 1963 only, more than one-fifth of total investment in physical capital. In colleges and universities, the percentage share more than doubled, increasing from 2.82 per cent in 1954 to 6.40 per cent in 1963.

Since these two levels of education are assumed to comprise mainly investment outlays, it seems significant that their rates of growth both in absolute terms and in proportion to Gross Fixed Capital Formation have been considerable. Also, assuming that invidivuals are generally aware of the opportunity costs of attending school, the increasing importance of investments in education at these levels would denote an obvious propensity to keep on investing in further education.

8. Conclusion

The above analysis, supported by some extensive empirical evidence, has demonstrated quite clearly the increasing significance of the allocation of economic

resources in some of the major educational sectors. It indicates the possibility of increasing further the share of resources being allocated to secondary schools and to colleges and universities. It has also attempted, for the first time, to evaluate the value of foregone earnings over a period of time of students receiving an education and to combine these earnings foregone with the other major cost components, thus permitting a more objective evaluation of the significance of opportunity costs of schooling and of its implications, e.g. limiting the opportunity of children from poor families to pursue their education.

The possibility of including in the Gross National Product the value of earnings foregone was also mentioned.

All these questions and problems already mentioned, as well as various others related to the scope and the substance of the issues as well as to the data used indicate the importance of the unfinished search, both in terms of the implications for policy decisions and for every individuals living in a highly technological and competitive world. This is especially true when the allocation of the costs of education between consumption and investment is envisaged. So far, such allocations have been inherently arbitrary due to a lack of logical basis for such allocations, although for the individual and for the society at large, it is important to be able to know these facts when measuring the

rate of return to be expected from investment in education. The economic importance of the rate of return to individuals, analysed in the following chapter, demonstrates the urgency of a better understanding of the various factors affecting investment in education.

CHAPTER III

RETURNS TO INDIVIDUALS

This chapter will be concerned essentially with an analysis of the rates of return accruing to individuals or groups of individuals with a secondary, college and university levels of education. The rising interest in viewing education as an investment and in attempting to assess the role of education in economic productivity and economic growth has made it necessary to consider four basic questions:

1. What have been the total human-capital inputs into the productive system, and how have these affected natural outputs, that is, gross national product, over a period of time?
2. How large a part of society's productive resources has been put into formation of human capital over the past, and how has this compared with what has gone into investment in physical capital?
3. What rates of return have been realized from investments in human capital (in college education, high-school education, and so forth)?
4. Looking ahead, how may past, present and prospective aggregate investments in formation of human capital be expected to affect the stream of national product in the future?

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1 Mary Jean Bowman, Human Capital: Concepts and Measures", in the Economics of Higher Education, Selma J. Mushkin (ed.) Department of Health, Education and Welfare, Office of Education, Washington, 1962, pp. 69-70.

The second question has already been answered in Chapter II with an analysis of the costs of education over a ten year period and a comparison with investment in physical capital from 1954 to 1963. The first question will be analysed in Chapter IV that will study the role of education in Canadian economic growth.

This chapter will attempt to answer the third question, i.e., what rates of return have been realized from investments in human capital by individuals and by groups of individuals with different levels of education.[2]

The calculation of these rates of returns involve essentially a comparison between the private costs of education and the benefits received by individuals in the form of higher earnings which are likely to accrue to the individual as a result of more education. This approach should not be mistaken with an analysis of the variations of earnings due to differences in educational attainment although some of the reasons for as well as the implications of these variations will be described below. Rather it is assumed here that such variations do occur and can be used as an adequate measure of the economic benefits accruing to an individual with more education.

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2 Although this study is not exploring the changing emphasis on education in Canada or analyzing the shifts in the educational attainments of the population (the second question) it is interesting to observe that this will be studied in a monograph published by the Dominion Bureau of Statistics as part of the census monograph series.

Accordingly, some of the main concepts underlying the origin and distribution of income will be described and analysed in the following section.

1. Some Notions of National Income Theory

In economic theory, national income is defined "as an expression in monetary terms, of the current achievements of the national economy".[3] It enables the economist to isolate and study the determinants of the level and behaviour of a nation's income, i.e. the money value of all the final goods and services produced during a given period of time,[4] and to examine the flow of money incomes from producing units to the participants in production.

National income is a circular flow of goods and services and of money incomes which begins by the production units that engage capital and labour to produce goods and services. Then a distribution of money incomes to the participants in production takes place who, in turn, spend these incomes for the acquisition of goods and services.

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3 Paul Studenski, The Income of Nations, Part Two: Theory and Methodology, New York University Press, 1961, p. 3.

4 M.L. Greenhut and Frank H. Jackson, Intermediate Income and Growth Theory, Prentice-Hall, Inc., 1961, p. 3.

This analysis will be concerned essentially with the distribution of money incomes to individuals as participants in the production process.

Various considerations can influence the distribution of income among individuals such as the relation of income distribution to the problem of optional resources allocation, to the determination of aggregate consumption or to a search into the factors influencing the distribution itself among individuals with different characteristics.

2. The Main Components of Individuals' Income in Canada

This chapter will be concerned with the analysis of some of the main factors influencing the incomes of individuals, and more specifically with the role of education in measuring the rates of return accruing to individuals with different levels of education.

The distribution of income to individuals originates in Canada through the following main sources:

a) income arising from the participation of individuals in the current production;

b) income redistributed among individuals through government transfer payments which are not made in exchange for the services of a factor of production.

In Canada, the National Accounts described the major components of income accruing to individuals participating in the current production as:

> (i) Wages, salaries and supplementary labour income, (ii) military pay and allowances, (iii) corporation profits before taxes, (iv) rent, interest, and miscellaneous investment income, (v) accrued net income of farm operations from farm production, and (vi) net income of non-farm unincorporated business.5

To this must be added, as noted earlier, the income flow originating from transfer payments that are not included in National Income since they do not represent payment in exchange for the services of a factor of production.

In this chapter, the analysis will be restricted to income receipts from employment, i.e., amounts received as gross cash wages and salaries, and to net income from self employment either from operating a business or carrying on a professional practice. The most significant component has consistently been income earned from employment, i.e., 59 per cent for the period 1926-29, 62 per cent for the period 1952-53 and 69 per cent 1962-65.[6] Because of its importance in the determination of incomes

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5 National Account, Income and Expenditures, 1926-56, Dominion Bureau of Statistics (Catalogue No. 13-502), Ottawa, 1962, p. 116, para. 54.

6 Economic Council of Canada, Prices Productivity and Employment, Third Annual Review, Ottawa, November 1965, p. 137 Table 4-12.

distributed among individuals, it is important to study the forces that determine market wage rates.

> We can understand the economic question of distribution primarily by focussing on the markets where factors of production get priced.[7]

Thus, it is essential to present in some details the main economic reasons explaining the determination of wages and salaries so that the analysis of the economic returns to education will be more fully understood.

Theoretically and according to the marginal productivity theory of wages, the income of an individual will be equal to the value of the marginal contribution of one unit of the labour factor. This permits a maximization of the allocation of resources and, theoretically provides an equitable distribution of incomes among individuals since they receive an income equivalent to their contribution to economic production.

The marginal productivity theory approach to an explanation of the distribution of income among individuals has been criticized on the ground that, in reality, there is no close interrelation between the remunerations received by resource owners and the values of marginal product.

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7 Paul A. Samuelson and Anthony Scott, Economics, An Introductory Analysis, McGraw-Hill Company of Canada Limited, Toronto, 1966, p. 557.

However, in the following analysis, it will be assumed that it is logical to presume that a maximum and efficient allocation of resources implies that what is paid to a factor of production, in this case labour, is closely related to the contribution of that factor of production to the economy although it must be recognized that, in reality, remuneration might understate or overstate the real contribution of one unit of labour to production. However, in an ideal situation, it would be logical to expect that "the market will tend toward that equilibrium pattern of wage differentials at which the total demand for each category of labour exactly matches its competitive supply".[8]

3. Main Reasons of Differentials in Income of Individual

The differences in income among individuals may arise from two basic sources.

(a) Differences in the kinds and quantities of resources owned by different individuals.

(b) Differences in prices paid in different employment for units of any given resource.[9]

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8 Ibid., p. 605.

9 Richard H. Leftwhich, The Price System and Resource Allocation, Rinehart and Company Inc., New York, 1956, p.334.

In the latter case, differences in the levels of income among individuals arise frequently due to imperfections in the labour market such as wage stickiness, wage policy of firms, trade unionism which can theoretically restrict the labour supply, raise standard wage rates in a leading industry, forcing others to follow suit, or also for an imperfect knowledge of job opportunities, thus limiting labour mobility. These factors are mostly due to the economic conditions and can be considered to be mostly short-runs when compared with the more fundamental factors influencing levels of income based on differences in the kinds and quantities of resources owned by individuals. Describing the differences in labour resources owned, Leftwhich had a very meaningful expression: "These have one common characteristic: they are human".[10]

The most significant factors influencing the levels of incomes among individuals would be the following:

(i) Age and sex characteristics,
(ii) Level of education,
(iii) Occupation,
(iv) Place of residence, such as urban and rural areas and provinces.

Other important factors that are difficult to measure may be quite significant. They include the ability and intelligence of individuals.

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10 Ibid., p. 335.

The present study is limited to the relationship existing between education and income earned from employment. More specifically it is assumed, at the outset, that more education improves in some measure the productivity of individuals and their levels of earnings.

The following section will present some empirical evidence of variations in earnings among individuals having various levels of education.

4. Some Statistical Evidence of Income Differentials in Relation to Education, Canada, 1961

Very few statistical data are available on the relation existing between income earned from employment and the level of educational attainment. However, the data available from a survey of the 1961 Census, showing income by some labour characteristics, provide a few insights in this area of the economy of human resources.

The following table showing income for male in the non-farm labour force, indicates that income tend to vary positively with the level of education attained.

At every levels of education, the younger age groups are earning relatively low incomes. It is explainable by the fact that this age category includes many new entrants in the labour force and a relatively greater share of the part-time workers. Otherwise, the correlation between both

TABLE XIV.-

Average Income from Employment by Age and Level of Education, Males in the Non-Farm Labour Force, Canada, 1961

Age Groups	Levels of Education				
	Elementary Only	Secondary 1-3 Years	Secondary 4-5 Years	Some University	University Degree
	$	$	$	$	$
5-24	1,928	2,206	2,497	1,868	3,408
5-34	3,311	4,147	4,760	5,108	6,909
5-44	3,653	4,629	5,779	6,608	9,966
5-54	3,648	4,756	6,130	6,882	10,821
5-64	3,480	4,588	5,944	6,731	10,609

Sources: From Incomes of Individuals, Census Report 98-502, 961 Census of Canada, Table B.6, p. B.6-1 and J.R. Podoluk Earnings nd Education, Dominion Bureau of Statistics (Catalogue No. 91-510), tawa, December 1965, p. 43.

factors, i.e., income and education tends to confirm the view that they are closely related.

One interesting aspect of this relationship is that the differentials between age groups are much wider and financially much more attractive at the higher education levels. While income from employment with an elementary education remains almost the same over the years, income in the higher level of education tend to increase much more considerably over time and apparently much more at higher levels of education. This would tend to acknowledge that formal education, as compared with on-the-job training, is essential to obtain higher levels of income earned from employment so that to the extent that individuals with a higher level of education receive training on the job, their higher educational base becomes relatively more important than for individuals with lower level of education, since in the latter case, income barely increases over time. It is also possible to presume that the type of training that individuals with lower levels of education are prepared to receive is not sufficient to increase significantly the level of their income.

On the other hand, at all levels of education, the average income earned tend to decrease in the 55-64 age group, although at the elementary level, the decrease occurs one age group ahead of the other. This phenomenon might be

due more to a relatively higher increase in income of the preceding age group than a decrease in the other age group.

Other statistical data available showing average income from employment for males and females show the same relationship between education and income, but with considerably less income received by female recipients due in part to the greater number of women in part-time work and to the fact that re-entry in the labour force after marriage might be possible at a far lower salary than their level of education might indicate.

The female labour force represents special problems in studies of the contribution of education to economic growth or in estimates of the stock of human capital. One solution in growth studies has been to weight women workers as the equivalent of some fraction of male workers, the weight assigned being based on the relationship of female to male earnings. Women wage-earners have been a rising proportion of the total labour force and their inclusion in estimates of the gross value of the stock of human capital may present problems of interpretation of such data.[11]

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11 J.R. Podoluk, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa, December 1965, p. 50.

Moreover, it must be noted that this relationship between the levels of income and education is actually profitable to society as well as to the individual, because there are certain external economies in education:

> ... if a young scientist obtains a high income not only because of unusual ability and education but also because important gains for his country have resulted from his basic research, then obviously the total gains exceed those accruing to the individual...[12]

On the other hand, in a study of the rates of return from educational investment, Gary S. Becker estimated that the social rate of return for white male college graduates to be between 10 to 13[13] per cent while the private rate of return was estimated to be more than 12 per cent[14]. These estimates tend to indicate that both the rates of social and private returns to be almost the same. However, they could differ if education had different effects on earnings and productivity. For example, if earnings received by a college graduate are overestimating his social productivity or contribution to the economy as a whole, then private returns would tend to be

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12 William G. Bowen, "Assessing the Economic Contribution of Education: An Appraisal of Alternative Approaches" in Economic Aspects of Higher Education, OECD, Paris, 1964, p. 49.

13 Gary S. Becker, Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education, National Bureau of Economic Research, New York, 1964, p. 120.

14 Ibid., p. 114.

larger than the social ones, and in the case of underestimation of an individual's productivity, the social returns would tend to be larger than private ones.

5. Private Returns to Investment in Education

Estimating the rates of returns to education may be an important factor in influencing the economic decisions taken either by the society as a whole or by individuals.

> At the societal level, for example, we might be interested in determining whether to allocate more funds to reduce the number of dropouts from high school or to stimulate an increased flow of college graduates. As individuals, we would more likely be concerned with deciding whether to continue or to terminate our schooling on the basis of the relative costs that will be incurred and the benefits that will accrue...15

These policy decisions, by societies or individuals, are a few examples of the possible utilization of the analysis of economic returns from investments in education. It is important to note, however, that the measurement of economic returns excludes other types of benefits although it is acknowledged that such benefits, e.g., a better cultural outlook, are also important benefits from further investment in education:

> The cultural and social advantages associated with more schooling may well be worth their cost in time, money and effort, even if the economic advantages cease to exist.16

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15 W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling", Journal of Political Economy, Vol LXXI, issue of April 1963, pp. 128-129.

16 H.P. Miller, "Income in Relation to Education", in the American Economic Review, Volume L, No. 5, December 1960, p. 962.

It must also be remembered that the total real income earned by an individual includes to a degree some psychic income, i.e. satisfactions, other than material ones, derived from economic activity. It is plausible to assume that for some individuals, the nature, place or conditions of work may offer such satisfactions.

In the analysis and measurement of economic returns to education, the financial outlays for educational purposes must be identified either as an investment or as consumption, or both.

In Chapter I, it was concluded that educational outlays can be considered as partly consumption and partly investment. For the purpose of the following analysis and measurement of private economic returns, it has been assumed that elementary school education is entirely a consumption outlay while secondary and higher education levels will be considered as an investment.

Furthermore, since there is little or no private cost for the individual at the elementary level the private returns to elementary education would be close to infinity and therefore meaningless. In reality, however, the situation is more complex. Presumably, to the extent that elementary education is a prerequisite for further educational attainment, it is also partly an investment and the fact that a university education permits the current appreciation of art and littera-

ture, makes it partly a consumption expenditure. However, for measurement purposes, it would be impossible, at this stage, to identify separately that portion of elementary education which is an investment and that portion of secondary and higher education which is consumption. Thus, it is important to keep in mind that economic returns calculated on that basis are likely to underestimate the economic contribution of elementary school education and overestimate slightly the economic returns of secondary and higher educational levels.

6. Measurement of Income Returns: The Analytical Framework

This section of the chapter will attempt to describe and measure the economic returns expected from educational investment on the basis of differences in income earned from employment between individuals having different levels of education. Two main approaches have been used in the last few years to attempt a measurement of these economic returns. They could be described as:

a) The Lifetime Income Approach which consists essentially in estimating the value of lifetime income streams for individuals with different levels of schooling.

b) The Private Rates of Return Approach which consists in estimating the returns to various levels of education by comparing the costs incurred in

obtaining an education, i.e. the investment, with the income benefits accruing to better educated individuals.

The original analytical and empirical contributions in this area of the economics of education originated in the United States with H.P. Miller and H.S. Houthakker developing estimates of lifetime income streams for individuals having attained various levels of education and W. Lee Hansen and G. S. Becker, estimating the rates of return of individuals at different levels of education.[17]

Borrowing from these original contributions and adjusting the measurement to Canadian characteristics and available data, J.R. Podoluk[18] produced, for Canada, estimates of income returns based on the two main approaches described above.

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17 See Herman P. Miller, "Income in Relation to Education", in the American Economic Review, issue of December 1960, Volume 2, No. 5, pp. 962-986 and "Lifetime Income and Economic Growth", in the American Economic Review, issue of September 1965, Volume LV, No. 4, pp. 834-844; H.S. Houthakker, "Educational Income", in the Review of Economics and Statistics, issue of February 1959, Vol. XLI, No. 1, pp. 24-28; W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling" in The Journal of Political Economy, issue of February - December 1963, Volume LXXI, pp. 128-140; Gary S. Becker, Human Capital: A theoretical and Empirical Analysis with Special Reference to Education, Columbia University Press, New York and London, 1964, xvi-186.

18 J.R. Podoluk, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa (Queen's Printer), December 1965, 82p.

The remainder of this chapter will be concerned with a detailed presentation of the analytical framework within which the measurement of economic returns based on the lifetime income streams and rates of return methods is possible and with the presentation of Podoluk's Canadian estimates and with a critical assessment of the differences between Podoluk's rates of return and the new rates of return arrived at in this study.

(a) Lifetime Income Streams Approach

The purpose of calculating lifetime income streams is to provide a summary measure of the financial returns associated with education.

Lifetime income streams are calculated on the assumption that a cohort of persons of a certain age with certain educational and occupational characteristics enters the labour force. The attrition from this group is assumed to occur only because of deaths of the original members and the survivors remaining in the labour force receive, as they age, the average earnings shown by cross-sectional data for that age and education category.[19]

Such estimates, based on cross sectional data by age and education category are not influenced by such factors as

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19 Ibid., pp. 54-55.

economic depression or economic opulence which in turn might influence employment opportunities and the levels of wages during the lifespan of an individual since they are based on variations in the earnings of individuals of different age and education groups at a point of time.

However, it is evident that such a procedure "tends to produce underestimates because of the failure to take future growth into account"[20] and that estimates based on cohort analyses, e.g., men 25 to 34 in 1950 and 35 to 44 in 1960, could produce quite different results since "income measures obtained ten years apart reflect economic growth which is entirely excluded from the cross-section surveys".[21]

By comparing the incomes of college graduates 25-34 years old in 1949 with those of college graduates 35-44 years old in 1959, Herman P. Miller estimated that, in the United States, out of an annual percentage gain of 12.7 per cent, 5.1 per cent could be due "changes in productivity, in the industrial and occupational run of the labour force, in the geographic distribution of the labour force, and similar factors that are associated with changes in the economy as a whole".[22]

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20 Herman P. Miller, "Lifetime Income and Economic Growth", in the American Economic Review, September 1965, Vol. LV, No. 4, p. 834.

21 Ibid., p. 834.

22 Ibid., p. 840.

No adequate data are available in Canada for that type of analysis. But to the extent that the findings of H.P. Miller for the United States are indicative of a similar situation in Canada, it is logical to assume that the Canadian estimates will be understated.

For Canada, estimates, based on cross-sectional data, of the lifetime income streams for three different lifespans, i.e., 15-64, 19-64 and 25-64 were calculated for various levels of education. The results are shown in the Table XV.

These estimates indicate that, in absolute terms, the lifetime income streams of individuals with higher levels of education is always considerably higher than for those individuals with less education. For instance, an individual with a university degree would expect to earn $216,394 more than an individual with an elementary education and $144,140 more than somebody with a secondary education while the latter could expect to earn $72,254 more than somebody with only an elementary education. However, the estimates indicate also that the larger the lifespan under consideration the lesser is the difference between individuals with less education and those with more education.

This is due mostly to the fact that the lower the level of education, the lower the age at which full-time labour force participation starts and at which regular income

TABLE XV.-

Undiscounted Lifetime Income Streams, by Levels of Schooling, Various Age Groups, Canada, 1961

Level of Education	AGE 15-64 $	19-64 $	25-64 $
Elementary 5-8	151,820	148,449	137,230
Secondary 4-5	221,700	222,676	209,484
University degree	356,108	357,675	353,624

Source: J.R. Podoluk, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa (Queen's Printer), December 1965, p. 59, Table 21.

begin to accrue.[23] Accordingly, while the lifetime income streams of individuals with an elementary education, estimated from 25 years of age to 64 is 39 per cent of individuals possessing a university degree, it increases to 43 per cent when it is estimated from 15 years of age instead of 25.

However, individuals with low levels of education have a much flatter income profile than individuals with higher levels of education which experience wider differentials between age groups since an individual with less education might expect to attain his peak earnings earlier than an individual with a higher level of education that might have to work for many more years before reaching his peak income earning potential.

On the other hand, the comparison of lifetime income streams based on absolute differences between individuals with different levels of education can be highly misleading.

It has to be recognized that the monetary benefits of education accruing over time to an individual should be adjusted to take account of the fact that a dollar earned tomorrow is less valuable than a dollar earned today. In other words, the present value of the lifetime income streams should be discounted. This will give a more objective outlook of what can be expected from further investment in education at

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23 See Podoluk, loc. cit., p. 55.

different age and at different levels of education. The rates of discount chosen, in this case have been 5 per cent and 8 per cent with the probability that the reality might be between these two rates. These rates are arbitrary although a 5 per cent rate is approximately the average rate of return in Canada Savings Bond while 8 per cent represents a possible rate of return in riskier investments. The result of this adjustment is shown in Table XVI.

The results show that the present value of the lifetime income streams diminishes somewhat the differentials between individuals with different levels of education. Also, the discounting technique makes the lifetime income streams very sensitive to the rates used.

Although this approach of discounting lifetime income streams is valuable conceptually, it is nevertheless the source of a downward bias:

> The discounting procedures used to convert estimated lifetime income to present value attach greater weight to incomes expected early in life than to those expected later on.24

This explains the relatively smaller differentials between individuals with less education and others with higher levels of education.

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24 Miller, loc. cit., p. 834.

TABLE XVI.-

Present Value of Lifetime Income Streams, Canada, 1961

Level of Education	Undiscounted Lifetime Income Streams	Discount Rate	
		5%	8%
	(1)	(2)	(3)
	$	$	$
Males 15-64			
Elementary 5-8	151,820	48,424	29,301
Secondary 4-5	221,700	64,264	36,252
University Degree	356,108	92,225	47,914
Males 19-64			
Elementary 5-8	148,449	45,524	35,330
Secondary 4-5	222,676	78,114	49,321
University Degree	357,675	112,100	65,187
Males 25-64			
Elementary 5-8	137,230	54,362	35,726
Secondary 4-5	209,484	80,614	52,217
University Degree	353,624	131,840	83,607

Source: J.R. Podoluk, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa (Queen's Printer), December 1965, p. 59, Table 22.

Another shortcoming of that approach is to ignore the private costs, or investment outlays, necessary to attain higher level of education. The value of foregone earnings are reflected in the figures additional lifetime income inasmuch as the income of the person in school is set at zero while his income-earning counterpart receives a positive income. Thus the difference appears in the return stream and measures the opportunity costs. However, other private costs such as tuition, books, travel expenses to and from schools were not taken into account. Although this item might be of minor importance at the secondary level since no tuition is paid by the student himself, at the university level this could make a slight difference.

If the returns, discounted at 8 per cent, for a student at the university degree with a working lifespan of 25 to 64 is considered relative to the lifetime income stream of a student at the secondary level, but without deducting for private costs, the individual with a university degree may expect to earn $31,390 more than the secondary student or 60 per cent more.

If the added private costs for tuition books and transportation for a period of four years, i.e. $2,111[25] were deducted, the difference would be lowered to $29,279 and the

25 See Table XIX.

percentage difference 56 per cent. Although the inclusion of private costs has only a very minor effect on the expected financial returns, it is important to keep in mind that conceptually, they should be included, since they are really additional investment outlays.

Another major shortcoming of this approach is that it assumes the same rate of discount for all socio-economic groups.

> This procedure may be valid if the purpose is to provide a single estimate of lifetime from an over-all standpoint. If however, the purpose is to show the estimate that individuals or particular groups may be considering when they make their decisions, different discount rates for different socio-economic groups may be appropriate.26

This would be of particular importance when considering the decision of relatively poor people to insist for further education. While a higher rate of discount could be of secondary importance to a wealthy person or to an individual who has wealthy parents, it could limit the entry of poor people.

(b) Private Rates of Return

The second approach for an analysis of economic returns to investment in education consists essentially in calculating a rate of return by comparing the additional cost

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26 Miller, loc. cit., p. 835.

of investment needed to pursue one's education with the expected additional income earned because of a higher level of education. The rate of return, so calculated, can be defined as "that rate of discount that equates the present value of the cost outlays with the present value of the additional income flows".[27]

This approach implies that the cost of outlays to obtain more education are treated as investment in human capital. Thus the rate of return will be expected economic return to educational investment. Another alternative method, used by Becker,[28] considers the costs outlays as negative income. Although it is essentially the same approach as the one defined above and originally developed by Hansen, it seems preferable, as a matter of conceptual and theoretical convenience to use the Hansen method of calculation with what seems to be a more positive approach to investment.

Using both the Becker and Hansen methods, J.R. Podoluk estimated the rates of return to educational investment for secondary and university students in Canada. However, new estimates calculated in this study showed slightly different results. The following section will describe in details

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27 W. Lee Hansen, loc. cit., p. 129.

28 Gary Becker, Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, Columbia University Press, New York and London, 1904, pp. 37-39.

the analytical framework of this study's estimates and ultimately compare them with Miss Podoluk's estimates and explain the reasons for the differences.

7. Investment Outlays of Secondary and University Students

It has already been assumed,for measurement purposes, that investment in education is taking place at the secondary and higher (college and university) education levels while outlays for elementary school education are considered to be consumption expenditures.

In order to estimate the amount of investment at the secondary, college and university levels, the following assumptions will be made:

(a) Attendance in secondary schools occurs during the age of 15 to 18 inclusive.

(b) Attendance in college and university occurs, for the average student, from the age of 19 to 22 inclusive.

(c) The present value of the investment flow has been estimated by assuming that the individual with a secondary education would enter the labour force in 1961 at age 19 and that the individual with a university degree would enter the labour force at age 23.

(a) Investment in Secondary Education

An individual completing his secondary school will invest the equivalent of what it will cost over and above an elementary education. Note that these are private outlays.

The main components of this investment would be:

(a) The opportunity costs, i.e., the amount of earnings foregone in order to attend school.

(b) The costs of books needed at the secondary level and directly related to the curriculum.

No tuition or other fees have been added to the estimated value of an individual's private investment. However in an estimate of the social costs and of the social benefits of investment education at the secondary level, the costs to the public would have to be added.

Also, since the opportunity costs of students were estimated by assuming 40 weeks of school attendance, there is no need to deduct what a student might have earned during summer employment, i.e., after the academic year is over.

Thus an individual completing his secondary education would have to invest $4,587, i.e., up to 1961, date at which he would have entered the labour force.

If we compare this additional investment, i.e., additional relative to an elementary education with the additional income accruing to secondary school graduates over what individuals with an elementary education would receive,

TABLE XVII.-

Value of Investment of a Student at the Secondary Level, from 1957-58 to 1960-61, Canada

Academic Years	Earnings Foregone	Books	Total Value
	(1)	(2)	(3)
	$	$	$
1957-58	1,048	34	1,082
1958-59	1,105	35	1,140
1959-60	1,128	37	1,165
1960-61	1,162	38	1,200
Total	4,443	144	4,587

Sources: Column (1), Table 5, Chapter 2;
Column (2) Explanatory Notes to Table 7, Appendix B.

it is possible to estimate the rate of return of a secondary education, i.e., a rate of interest which will make the present value of the investment equal to the present value of the additional income stream. The result of this calculation is shown in Table XVIII.

The rate of return to a secondary education is estimated at 15.0 per cent.

(b) Investment in Higher Education

At the higher education level, the cost of tuition has to be added to the cost of books, transportation (other than local) and opportunity costs (see Table XIX). It has been suggested that the value of scholarships should be deducted from the total of earnings foregone, in order to arrive at a more accurate value of the cost to the individual of further investment in higher education.[29] This would seem, considering the present state of affairs in Canada, to be an overstatement and thus an underestimation of the value of investment if we consider that according to a recent survey,[30] 65.3 per cent of male students and 63.7 per cent of the female students did not receive any scholarships for the academic

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29 Podoluk, loc. cit., p. 53.

30 University Student Expenditure and Income in Canada, 1961-62, Dominion Bureau of Statistics, (Catalogue No. 81-520), Ottawa, (Queen's Printer), August 1963, p. 48, Table 50.

TABLE XVIII.-

Rate of Return of Secondary Graduates from Completion of Elementary School to Completion of Secondary School, Canada, 1961

Age	Investment	Additional Income
	(1) $	(2) $
15	1,082	-
16	1,140	-
17	1,165	-
18	1,200	-
19	-	50
20	-	200
21	-	399
22	-	597
23	-	671
24	-	843
25-34	-	1,316
35-44	-	1,896
45-54	-	2,101
55-64	-	1,824
Rate of Return	15.0 per cent	

Sources: Column (1), from Table XVII above and Column (2) from J.R. Podoluk, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa (Queen's Printer), December 1965, p. 69.

year 1961-62. However, since some students do receive scholarships, their exclusion from the following cost estimates will overestimate slightly the value of individual's investment at the college and university levels, and therefore, their rates of return.

Thus the value of investment to a student pursuing his education above the secondary level would be $8,220.

When the value of this investment is compared with the additional income accruing to a university graduate over what is received, on the average, by a secondary school graduate, the rate of return to investment in education is 18.2 per cent as shown in Table XX.

Then, it is relatively easy to estimate the rate of return of an individual completing his university education compared with an individual having completed his elementary education. The rate of return in this case would be 16.0 per cent as shown in Table XXI.

These estimated rates of return differ slightly from the rates of return produced by J.R. Podoluk in her study, Earnings and Education, as shown in Table XXII. In all cases, Podoluk's rates of return are slightly higher than those estimated in this study.

The variation between the two sets of rates is due essentially to different estimates in the value of individuals private investment in both secondary schools and in colleges and universities.

TABLE XIX.-

Value of Investment of a Student in College and University, 1957-58 to 1960-61, Canada

Academic Year	Earnings Foregone	Tuition	Books and Transportation	Total
	(1)	(2)	(3)	(4)
	$	$	$	$
1957-58	1,441	353	141	1,935
1958-59	1,519	356	146	2,021
1959-60	1,551	400	152	2,103
1960-61	1,598	404	159	2,161
Total	6,109	1,513	598	8,220

Sources: Column 1, Table 5, Chapter 2;
Column 2, the average cost of tuition was estimated by dividing what colleges and universities receive in tuition by the total number of students in colleges and universities;
Column 3; Explanatory notes to Table 7, Appendix B.

TABLE XX.-

Rate of Return of University and College Graduates from Completion of Secondary School to Completion of University and College, Canada, 1961

Age	Investment	Additional Income
	(1)	(2)
	$	$
19	1,935	-
20	2,021	-
21	2,103	-
22	2,161	-
23	-	447
24	-	694
25-34	-	2,117
35-44	-	4,040
45-54	-	4,423
55-64	-	3,798
Rate of Return	18.2 per cent	

Sources: Column (1) from Table XIX;
Column (2) from J.R. Podoluk, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa (Queen's Printer), December 1965, p. 69.

TABLE XXI.-

Rate of Return of University and College Graduates from Completion of Elementary School to Completion of University, Canada, 1961

Age	Investment	Additional Income
	(1)	(2)
	$	$
15	1,082	-
16	1,140	-
17	1,165	-
18	1,200	-
19	1,935	-
20	2,021	-
21	2,103	-
22	2,161	-
23	-	1,118
24	-	1,537
25-34	-	3,433
35-44	-	5,936
45-54	-	6,524
55-64	-	5,622
Rate of Return	16.0 per cent	

Sources: Column 1, from Tables XVII and XIX; Column 2 from J.R. Podoluk, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa (Queen's Printer), December 1965, p. 69.

TABLE XXII.-

Estimated Rates of Return for Students at the Secondary and University Levels, Canada, 1961

Levels of Education	J.R. Podoluk's Estimates	New Estimates
	%	%
Secondary	16.3	15.0
University	19.7	18.2
Total	17.1	16.0

Sources: J.R. Podoluk's estimates from Earnings and Education, Dominion Bureau of Statistics, (Catalogue No. 91-510), Ottawa (Queen's Printer), December 1965, pp. 61-62, Tables 23 and 24; New Estimates from Tables XVIII and XX above.

The estimated investment outlays are higher in this study than Podoluk's estimates. It has already been explained in some details[31] that the estimated earnings foregone in this study are higher than those estimated by Podoluk. Likewise, outlays for additional school expenditures, i.e., books and transportation (other than local), are also higher in this study than in the case of Podoluk's similar estimates.

The reason for these higher estimates is essentially due to a basic difference in approach. While Podoluk's estimates are calculated at a point of time, the estimates arrived at in this study were based on the assumption that, over a period of time, the average cost of an individual's investment will tend to increase over the years. Accordingly, the opportunity costs were closely related on the average weekly earnings of wage-earners in all Canadian industries and the additional school expenditures were assumed to increase steadily over the years.

While this approach produces slightly lower rates of return, it is believed that they are more accurate since they take into consideration, at least to a degree, the increase in investment outlays.

It would seem, then, that the economic benefits accruing to an individual having completed his college or

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31 Supra, pp. 55-57.

university would be slightly higher than the economic returns received by individual with only a secondary education. This is especially evident when going from a secondary education to a college or university. When the entire period is considered however, i.e., from completion of elementary schooling to university graduation, the percentage difference diminishes somewhat although it still indicates a higher rate of return, 16.0 per cent, than the estimated rate of return from completion of secondary education only.

However certain limitations should be kept in mind when these estimates are being expounded. In the first place these estimates were made from gross earnings before taxes. Since the higher level of earnings have tax rates and higher marginal tax rates applicable to additional income increments estimates on an after tax basis would show a lower yield rates and it is conceivable that the profitability of investment in university education would on a net basis, be somewhat lower since, as was shown above, individuals with a university degree receive higher earnings.

Another limitation of the above empirical analysis is that it is based on cross-sectional data showing earnings at a point of time. It has already been pointed out[32] that using cross-sectional data at a point of time tends to produce under-

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32 Supra, p. 93.

estimates because of the failure to take future growth into account. Adjustments for secular growth in earnings would likely result in estimates of higher rates of return.

Another weakness of utilization of cross sectional data at a point of time is the implicit assumption that differentials existing between the earnings of different education groups will remain unchanged. Over a period of time, this assumption could turn out to be inaccurate. An increasing supply of university graduates in the future could result in lower salary rate relative to individuals with less education and differentials in earnings could narrow.

However, the rate of return approach proves to be somewhat superior to the lifetime income approach when it comes to estimate the direct economic returns to education when education is treated as a type of investment since the latter ignores the additional costs of education. Even,as it was pointed out earlier,[33] if this exclusion does not seem to affect significantly the value of the economic returns, it still remains a conceptual weakness.

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33 Supra, pp. 99-100.

8. Conclusion

It was observed above[34] that rates of return could be used to determine whether or not an individual should pursue his education in order to obtain greater economic benefits.

Assuming that further investment in education is decided essentially on economic grounds, it would then be possible to contend, on the basis of the estimated rates of return above, that the higher is an individual's educational attainment, the greater will be the economic benefits accruing to him.

However, the utilization of individual's rates of return in determining future investment in educational activity should be done with circumspection. Some of the major limitations inherent to the methodology used in estimating returns have already been described in some details. In addition, the implicit assumption that differentials in levels of earnings from which returns have been estimated are due entirely to various levels of education is obviously an overstatement, although it could be argued that education is one of the major factor influencing earnings potential and that ability, father's occupation and social environment only facilitate the access to more and better education.

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34 Supra, p. 88.

Furthermore, it may well be that in deciding whether to go to college, such factor as attitudes toward higher intellectual activity can be relevant as well as the additional earnings. This may be particularly true when the difference between the typical college and secondary school graduate is examined. It is conceivable that some secondary school graduates do not pursue further their education because they do not value the psychic and monetary gains to be received to be worth further investment in terms of monetary and psychic costs.

On the other hand, the rates of return estimated in this chapter concur with the findings, described in Chapter II,[35] that indicated that investments in secondary, college and university education were increasing at a much faster rate than investments in physical capital. On the assumption that an increasing total investment in these sectors represent an expectation of higher economic returns, it is conceivable to assume that the growing economic benefits likely to accrue from these investments, are going to be distributed among individuals in each sector. Therefore, the estimated economic returns in the form of lifetime income streams and rates of return would seem to be a relatively accurate estimate of the economic profitability of investment in education as experienced by individuals and societies.

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35 See Table XIII, p. 71.

The value of the economic profitability of growing investment in education to society as a whole will be analysed in the following chapter where the contribution of education to the rate economic growth will be analysed.

CHAPTER IV

EDUCATION AND ECONOMIC GROWTH

This chapter will attempt to analyse and measure the role and the importance of economic returns to education for society as a whole.

It will involve, firstly, an analysis of the conceptual framework within which such a study is possible, and, secondly, the presentation of some preliminary estimates for Canada as well as a critical assessment of their significance.

In Chapter III, estimates of the rates of return to individuals from investment in education at the university level indicated an economic rate of return of 18.2[1] per cent while investment in education up to the completion of the secondary level indicated an estimated rate of return of 15.0 per cent[2]. These estimates were based on differentials in the levels of earnings of individuals or groups of individuals with various levels of education. In this chapter, the theoretical framework as well as the presentation of some Canadian estimates will be discussed and assessed in relation to economic growth.

1. Economic Growth: A Search for Explanations

For a variety of reasons, such as the increased awareness for the economic and social development of underdeveloped

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1 See Table XX, p. 109 in Chapter III.

2 See Table XVIII, p. 106 in Chapter III.

countries and in order to insure the economic progress and well-being of more advanced countries, economists have been searching for explanations in the causes or forces which might explain and measure the process of economic growth in developing and highly developed economies.

In a broad sense, economic development could be considered as an economic phenomenon antecedent to economic growth involving "the widening and diversification of the industrial pattern of a nation, accompanied by a rise in the standard of living and an increasing variegation in the choice of goods and services available to the public",[3] while economic growth refers more specifically to an "expansion of output, or of output in relation to population or to labour input".[4]

In their efforts to enunciate a comprehensive and satisfactory definition of the process of economic growth, economists attempt essentially to identify the relative importance of and the interconnections among some determining factors in order to build a theoretical framework based, ideally, on a body of empirical observations from which a comprehensive theory would be derived and from which it could be tested.

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3 T.M. Brown, Canadian Economic Growth, Royal Commission on Health Services, Queen's Printer, Ottawa, 1964, p. 16.

4 Ibid., p. 4.

In a penetrating theoretical study of the various problems inherent to the analysis of the causes of economic growth, Simon Kuznets stated:

> The value of the theory lies not in its promise to yield precise predictions eventually, but in its capacity to bring an ever-growing body of empirical data into analytical relationships which bind together various processes, and thus to provide a continuous revision and extension of our notions concerning the important factors that determine economic growth.5

Thus, economic growth is both a quantitative and a dynamic concept; quantitative, in the sense that it is essentially a measurement of empirically identifiable variables; and dynamic, in that it involves a continuous reformulation of interrelations in the light of additional evidence brought about by new development and further progress.

These characteristics can be observed in Simon Kuznets' approach in which he asserts that economic growth is generated by an epochal innovation which he describes in these terms:

> A major addition to the stock of human knowledge which provides a potential for sustained economic growth - an addition so major that its exploitation and utilization absorb the energies of human societies and dominate their growth for a period long enough to constitute an epoch in economic history.6

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5 Simon Kuznets, "Toward a Theory of Economic Growth", in National Policy for Economic Welfare at Home and Abroad, R. Lekachman (ed.), Doubleday, New York, 1961, p. 75.

6 Simon Kuznets, Modern Economic Growth: Rate Structure and Spread, Yale University Press, New Haven and London, 1966, p. 2.

In turn, this epochal innovation is sustained by the interplay of technological and social changes essential to the process of economic growth taking place within the framework constituted by an epochal innovation.

One major implication of this interplay of technological and social change must be stressed:

> Growth during any epoch is a matter not only of aggregative change but also of structural shifts. Even if the impulse to growth is provided by a major technological innovation the societies that adopt it must modify their pre-existing institutional structure. This means substantial changes in the organization of society - an emergence of new institutions and a diminishing importance of the old.7

The modification of pre-existing institutional structures as well as the emergence of new institutions give rise to new elements of definition, considered as a guide of measurement. This involves a re-evaluation of the significance of the various factors entering into the measurement of the rate of growth in order to provide guides for analysis by delimiting the field of inquiry and specifying the features that characterize economic period in a given epoch.

John W. Kendrick indicates the complexity of this task when he states:

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7 Simon Kuznets, Modern Economic Growth: Rate Structure and Spread, Yale University Press, New Haven and London, 1966, p. 6.

> Economic growth is a many-faced phenomenon. A number of interrelated variables are required to measure the various important aspects of economic growth.[8]

He himself considers the one master measure that most usefully implements the concept of growth as being the real net national product.

He also makes an important distinction between the productive capacity of an economy and the stock of productive resources when he remarks that "it is final output and not capacity as such that men want; (..) they wish to increase actual output and not merely potential output".[9]

The growth of actual output in real terms is, in turn, determined by various factors.

In the forces influencing the process of economic growth, two sets of factors can be distinguished:

(a) Fundamental factors.

(b) Supplementary factors.

The major forces influencing the process of economic growth include:

(i) The quantity and quality of the labour force.

(ii) The quantity and quality of natural resources.

(iii) The quantity and quality of capital formation.

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8 John W. Kendrick, Inflation, Growth and Employment, Commission on Money and Credit, Prentice-Hall, 1964, p. 245.

9 Ibid., p. 246.

(iv) The level of technological attainment of the nation i.e. the efficiency with which the economic resources of a society are combined to bring about a productive process.

The supplementary factors are more likely to influence more indirectly, although sometimes to an important degree, the process of economic growth. Some of them like the attitude of society toward work by women might influence the quantity and the quality of the labour force, others like the business organizations might affect positively and negatively the allocation of economic resources, or others that might influence the level of aggregate demand and, consequently, the rate of utilization of the productive capacity of the economy.

In this context, maybe one of the best comprehensive definition describing the growth of real national product and joining together these various factors can be found in the following declaration:

> We have defined economic growth as the expansion of a nation's capability to produce the goods and services its people want. Productive capability depends on the amount of available resources and their productivity upon the size of the labour force and the skills and know-how it has acquired through education, training, and experience, upon the physical stock of capital, upon the availability of natural resources, and upon the state of technology.10

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10 Joint Economic Committee, Employment, Growth and Price Levels, U.S. Government Printing Office, 1959, p. 33.

The advantage of this definition is that it attempts to describe a dynamic economic phenomenon in dynamic terms and it makes allowances for both changes in the quantity and in the quality of the factors. This is particularly important when the role and the contribution of education in the process of economic growth is being analyzed.

This definition also makes clear that the process of economic growth also depends on the number and quality of the population and on the skills and quality of the labour force; i.e. on human capital formation. Accordingly, a theoretical as well as an empirical model of economic growth should include the contribution of both human and physical capital. In this context, education could be described as the acquisition and maintenance of knowledge, skills and ability.

The individual which acquires those skills, abilities and that knowledge becomes in fact an item of capital equipment, "a produced means of production"[11] and as such contributes to output and becomes an economic resource. Note also as evidenced by the estimates of the costs of education in Chapter II, that investment in education entails some real economic costs and that it involves an alternative allocation of economic resources which by adding to a society's stock of

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11 Henry G. Johnson, "The Political Economy of Opulence" in the Canadian Journal of Economics and Political Science, issue of November 1960, p. 522.

capital facilitates actual and future production by improving the productivity of the labour force and the state and extent of technological applications.

Some attempts have already been made to measure the contribution of some of the intangible factors, particularly education, affecting the rate of growth.

The approach used in this chapter to illustrate both the theoretical and empirical aspects of a measurement of the contribution of educational investment to economic growth is the residual approach. The next section will deal with some of the underlying assumptions and findings of that particular approach.

2. The Residual Factor in Economic Growth

In the research for a measurement of the variables contributing to economic growth and of their relative magnitudes, one of the most comprehensive approach used so far has been what is now called "the residual approach".

In general terms, it consists "in taking the total increase in economic output of a country over a given period of time, identifying as much of the total increase as possible with measurable inputs (capital and labour being the two

measurable inputs usually chosen) and then saying that the residual attributable to unspecified inputs"[12].

The most important contributions in this field were produced in the United States by Robert Solow, John W. Kendrick and Edward F. Denison, while partial and preliminary estimates, following the Denison's approach, were produced in Canada by Gordon Bertram in a study entitled "The Contribution of Education to Economic Growth" prepared for the Economic Council of Canada.

Since each one of these contributions differ even if only in a small way, and since a knowledge of their main findings and basic assumptions will facilitate the assessment of the Canadian estimates, a summary of each one's findings is in order.

3. Robert Solow's Findings

In an article published in 1957,[13] Robert Solow, using an aggregate function approach which assumes that the factors of production are paid their marginal products,

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12 William G. Bowen, "Assessing the Economic Contribution of Education". An Appraisal of Alternative Approaches", in Economic Aspects of Higher Education, OECD, Paris 1964, p. 18.

13 Robert Solow, "Technical Change and the Aggregate Production Function", in the Review of Economics and Statistics, August 1957, pp. 312-320.

attempted to segregate "variations in output due to technical change and those due to changes in the availability of capital per head"[14]. In his model, Solow uses the term "technical change" as a shorthand expression "for any kind of shift in the production functions. Thus boundaries, speed-ups, improvements in education and all sorts of things will appear as technical change"[15].

Using this relatively simple model, Solow estimated, that over a period of forty years, from 1915 to 1955, the gross output per man in the United States had doubled and that 87.5 per cent or seven-eights of the total increase in output was attributable to technical change, i.e. partly to improvements in education according to Solow's own definition and 12.5 per cent or one-eight was traceable to increased capital per man-hour.[16]

Although Solow mentions specifically "improvements in education" as an important element of technical change, he did not attempt to estimate the contribution of this particular factor in the total "residual" estimated at 87.5 per

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14 Ibid., p. 312.

15 Ibid., p. 312.

16 Ibid., pp. 316-320.

cent of the total increase in output. Thus his main contribution is to have demonstrated the considerable importance of technical change, including education, in contributing to an increase in output.

4. John W. Kendrick's Findings

In a study on the measurement of productivity, J.W. Kendrick[17] found out that over the period 1889-1957 in the United States, productivity had increased at a rate of 1.7 per cent in the private domestic economy. However, since the real private domestic product grew at an average annual rate of 3.5 per cent over the same period, Kendrick believes that about half of the growth rate in output was accounted for by additions to real labour and capital inputs, and half was contributed by increases in the efficiency with which the inputs were utilized, i.e. in productivity[18], which he called himself an increase in total factor productivity.

This total factor productivity is believed to reflect to an important degree the excluded input of the intangible capital accumulated in order to increase the productive

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17 John W. Kendrick, Productivity Trends in the United States, National Bureau of Economic Research New York, Princeton University Press, Princeton, 1961, Lii-630.

18 Ibid., p. 60.

capabilities, i.e. the efficiency of tangible factors.[19] Accordingly, Kendrick attaches a great importance to outlays in human beings to explain the increase in the average productivity of the labour force. He states:

> It seems inevitable that striking advance in the education attainments of the American people should have increased the skills, efficiency and inventive potential of the labour force.20

However, although, like Solow, he recognizes explicitly the growing and fundamental importance of educational outlays for increasing the productivity of the labour force and of the economy as a whole, he does not attempt to demonstrate the quantitative importance of educational inputs in his estimate of total factor productivity.

5. Edward Denison's Contribution and Findings

It was for Edward Denison, a few years later, to attempt such a measurement of the educational inputs in one of the major study[21] in this area of economic analysis. It is an exhaustive analytical and empirical study of the past sources of economic growth in the United States and of their

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19 Ibid., p. 7.

20 Ibid., p. 106.

21 Edward F. Denison, The Source of Economic Growth and the Alternative Before Us, Committee for Economic Development, Supplementary Paper No. 13, January 1962, 297 p.

relationships. His model which Moses Abramovitz calls "a minor miracle of lucidity and persuasiveness which calls for the most serious study by economists..."[22] was used to prepare estimates demonstrating the contribution of education to the rate of Canadian economic growth.

In describing the main purposes of his study, Denison stated that the most important of these purposes was "to examine various possible ways to affect the growth rate, their probable costs and their probable contribution to growth".[23]

The author adopts the conventional procedure of dividing the sources of growth among changes in inputs, i.e., the labour, capital, and land used in production, and changes in output per unit of input (productivity). However, Denison includes the changes in the quality as well as in the quantity of labour and therefore introduces a basic modification in the measurement of the sources of growth.

The following table (Table XXXIII) shows the various sources of economic growth and presents the contribution of each source to real national income per person employed for the period 1929-57.

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22 Moses Abramovitz, "Economic Growth in the United States, A Review Article", in the American Economic Review, Vol. 52, 1962, p. 762.

23 Denison, Loc. cit., p. 15.

TABLE XXIII.-

Contribution of Various Sources to the Growth Rate of Real National Income Per Person Employed, United States, 1929-57

Sources	Percentage Points in Growth Rate 1929-57
Real national income per person employed	1.60
1) Increase in total inputs per person employed	.67
a) Labour, adjusted for quality change	.57
(i) Effect of shorter hours on quality of a man-year's work	-.20
(ii) Annual hours	-.53
(iii) Effect of shorter hours on quality of a man-hour's work	.33
(iv) Education	.67
(v) Increased experience and better utilization of women workers	.11
(vi) Changes in age-sex composition of the labour force	-.01
b) Land	-.05
c) Capital	.15
(i) Non-farm residential structure	.01
(ii) Other structures and equipment	.10
(iii) Inventories	.03
(iv) U.S.-owned assets abroad	.01
(v) Foreign assets in U.S.	.00
2) Increase in output per unit of input	.93

Source: Edward F. Denison, The Sources of Economic Growth in the United States and the Alternatives Before Us, Committee for Economic Development (Supplementary Paper No. 13), New York, January 1962, p. 270, Table 33.

This table shows that education contributed 0.67 percentage points to the growth rate of national income per person employed, or 42 per cent of the growth rate itself, making it a major source of economic growth.

The analysis and the measurement of these various sources involve a number of basic assumptions. Denison explicitly assumes that, under competitive conditions and in equilibrium, each unit of any factor of production of uniform quality will receive the same income. Moreover, according to the marginal productivity theory of wages, the amount of this income will be equal to the value of the marginal contribution to production of one unit of the factor. Regarding the marginal productivity theory of wages, Denison stated:

> The chief requirement for its validity is that firms tend to employ each factor up to the point where its marginal value product equals the price of its services (however that price may be established) and that departures from this practice tend to be offsetting.24

In other words, the assumption underlying this statement is that employees will tend to set wages and salaries so as to maximize their profits. To the extent that they would refrain from doing so, the link between relative wages and marginal productivities would be distorted.

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24 Denison, loc. cit., p. 31.

It is also implied that the economy operates under constant returns to scale[25] since, theoretically, the elasticity of substitution between capital and labour is unity, i.e., an increase of all inputs by 1 per cent will bring about a proportional increase of 1 per cent in total output.

It follows that, other inputs being held constant, and labour being the only factor of production increasing, labour inputs would increase by the elasticity of output with respect to the input of labour and the sum of the other inputs elasticities would be equal to one. This, by itself, does not mean that any one input is in any sense more productive than the others. It simply points out to the fact that certain inputs are quantitatively more or less important than others.

It is also very important to bear in mind that Denison makes a distinction between the contribution of education and the contribution of advance in knowledge and he estimated that both factors contributed to growth in their own way:

> The fact that human knowledge has increased, providing more or better information to be imparted in school, is viewed as part of the effect of the

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25 Note that Denison, in his own study, believes that the United States economy operates under increasing returns to scale and he consequently adjusts for this factor in his residual category which he describes as an increase in output per unit of input.

> 'advance of knowledge' in growth rather than of increased education. Conversely, the beneficial effect of a better-educated population on the rate at which knowledge advances will be classified as a contribution of the "advance of knowledge" rather than allocated back to education.26

Thus, the contribution of education in Denison's model is limited specifically to formal education. This also applies to Bertram's calculations.

In order to measure this contribution, two main steps are involved. First, it must be determined how much of the growth in average labour income per man is due to improved education and second, this contribution of improved education to labour income has to be related to the growth rate in order to measure its effect on this particular growth rate.

6. The Contribution of Education to Labour Income: Denison and Bertram

Using the basic assumptions described above, Denison estimated the value of the contribution of improved education on labour income.

In order to calculate this contribution, Denison assumed that three-fifths of the reported income differentials in individuals with various levels of education represent differences in incomes from work due to differences in education as distinguished from associated characteristics.[27]

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26 Denison, loc. cit., p. 67.

27 Denison, loc. cit., p. 69.

The differentials in income earned by persons of 25 to 64 years of age with different levels of educational attainment for the period 1911 to 1961 were derived by using the 1961 average income earned per man in the male labour force at different levels of education. These 1961 education-income differential weights were then applied to the educational distribution in each decade in order to estimate the contribution of education to increased labour income from decade to decade on the assumption that this calculation shows what the average income per man would have been if no improvements in the educational distribution had taken place in each preceding decades. The results are shown in Table XXIV, Column 1. It was also further assumed that the increasing number of days spent in school per year raises a man's contribution to production just as much as will an equal percentage increase in the number of years spent in school.[28]

The results of both Denison's and Bertram's estimates are summarized in the following table (Table XXIV). The estimating procedures as well as a critical assessment of their findings will follow.

Column (5), showing the rate of change in labour income due to improved education was estimated by multiplying

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28 Denison, loc. cit., p. 71.

TABLE XXIV.-

Effect of Improved Education on Labour Income Per Man, Canada and United States, 1911-1961

	(1)		(2)		Per cent Change (3)		(4)		(5)		Annual rate of Change (per cent) (6)	
	Labou income man cons ering on years o educati		Average number of years of school attended		Average number of days of school attended per year of school completed		Average total number of days of school attended		Labour income per man based on total days of education		Labour income per man based on total days of education	
Period[1]	Can.	S.	Can.	U.S.	Can.	U.S.	Can.	U.S.	Can.	U.S.	Can.	U.S.
1911-21	2.17	.7	6.97	9.0	10.5	6.7	18.18	16.3	5.66	4.9	.56	.48
1921-31	1.62	.3	5.24	8.9	7.8	8.8	13.41	18.4	4.16	6.9	.41	.67
1931-41	2.59	.1	7.94	10.2	8.8	10.8	17.43	22.0	5.70	8.8	.56	.85
1941-51	2.81	.4	7.48	10.4	8.8	10.9	16.96	22.4	6.37	10.4	.62	1.00
1951-61	2.27	.7	6.15	9.8	6.1	9.3	12.59	20.0	4.65	10.3	.45	.99
1911-31	3.83	.1	12.58	18.6	19.05	16.1	34.03	37.8	10.06	12.1	.48	.57
1931-61	7.87	.2	23.15	33.6	25.60	34.2	54.68	79.3	17.66	32.6	.54	.94
1911-61	11.99	.2	38.64	58.5	49.50	55.8	107.27	147.0	29.50	48.6	.52	.79

1 1910-20, et for the United States.

Source: Gordo. Bertram, The Contribution of Education to Economic Growth, Economic Council of Canada (Staff Study No. 12),tawa, June 1966, p. 52, Table 22.

in each decade, the percentage increase in labour income per man considering only years of education (Column (1)) by the ratio of the percentage increase in the average total number of days spent in school (Column (4)) to that in the average number of years spent in school (Column (2)) to obtain the full contribution of the increase in the amount of education to labour output per worker. This means, in effect, that, all other things being equal, if the labour force at the beginning of a decade had been as well as educated as that at the end of the same decade, it would have contributed that much more to production than it actually did, e.g., 4.65 per cent in the 1951 to 1961 period.

The percentage change in labour output per man based on total days of education are then converted in annual percentage rate of change (Column (6)).

Thus, it means that, from 1911 to 1961, the labour income per man has increased by 29.50 per cent or at an average percentage rate of growth 0.52 per cent due to improved education. Estimates for the United States show a much higher total percentage increase, 48.6 per cent, and consequently a higher average percentage rate of growth of income per person employed. This is due to a higher average total number of days spent in school and number of years of school attended.

7. The Effect on the Growth Rate

This annual average rate of change in income earned per man is then used to estimate the contribution of improved education embodied in the labour force to the growth rate.

It was pointed earlier that the Denison model assumed that an additional 1 per cent of all the factors of production would increase the national income by 1 per cent. Now if only one of the factor of production was increased while the others remain unchanged, the national income would presumably increase by the value of the contribution of that particular factor. In this context, the contribution of education embodied in labour can be estimated by further assuming that the marginal value product per unit of a small addition to the supply of any one factor (in this case labour) would be about the same as the actual marginal value product per unit. For example, it was calculated that, in Canada, the share of labour earnings was, for the period 1911-1961, about 76 per cent of national income. It follows that if the quantity of labour employed is increased by 1 per cent, it would result in an increase in national income of 0.76 per cent.

Now it was estimated that the real national income per person employed increased at a compound rate of1.67 per

cent per annum in Canada from 1911 to 1961.[29] It is possible to estimate the contribution of education by multiplying 0.52 per cent by 76 per cent. The result, 0.40 per cent, represents 24 per cent of the compound rate in the real national income per person employed, thus accounting for almost one quarter in the rise of real national income per person employed from 1911 to 1961. When the same method is applied to the growth rate in total national income, 3.3 per cent from 1911 to 1961,[30] the contribution of education is estimated at 12 per cent of the growth rate in national income.

The contribution of improved education embodied in the labour force as estimated above is admittedly considerable, contributing about a quarter of the growth rate in real national income per person and 12 per cent to the growth rate in total national income. Since no estimates are available for Canada of the contribution of the other sources of economic growth, it is impossible to assess the relative contribution of education embodied in the labour force. In the study made by Denison, the author concluded that the contribution of education was more important than any other

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29 Gordon W. Bertram, The Contribution of Education to Economic Growth, Economic Council of Canada (Staff Study No. 12), Ottawa, June 1966, p. 55.

30 Bertram, loc. cit., p. 56.

source of growth. As for Canada, it can certainly be supposed that education, as estimated above, is a major source of economic growth. However, it has been kept in mind that these estimates are based on a number of assumptions. An examination of some alternative assumptions produces some different results that are worthwhile considering, if only to compare critically the various results and to analyse the implications of alternative assumptions. This is what will be attempted in the following section.

8. Implications of Alternative Assumptions

This section will be concerned mainly by two important assumptions, namely that three-fifths of the reported income differentials represent differences in incomes from work due to differences in education as distinguished from associated characteristics and that the number of days spent in school per year raises a man contribution to production just as much as will an equal percentage increase in the number of years spent in school.

Underlying the first assumption is the fact that an individual's education and the utilization of education by individuals are influenced by such associated characteristics as ability, intelligence, personality, father's income and social environment. Some of these factors, e.g., father's income, are more likely to facilitate access to education,

but not the income earned once a level of education has been attained. However, others, like ability and intelligence, can influence to a degree the income earned by various individuals with the same level of education. In his study, Denison assumed arbitrarily that such associated characteristics as ability and intelligence were responsible for 40 per cent of income differentials. In his Canadian estimates, Gordon Bertram also used this same assumption. It is evident that further research in this particular aspect of income differentials among individuals is needed to measure adequately the role of each human characteristics. However, it is important to note that using various other arbitrary assumptions can change considerably the contribution of education to labour income and to the growth rate.

For example, if a figure of 40 per cent were substituted for 60, only 16 per cent of real national income per man employed would be credited to education as compared with the 24 per cent contribution described above. Substituting 80 per cent would raise the contribution of education to more than 30 per cent, or almost a third of real national income per person employed. As can be seen, the contribution of education can vary widely depending on the assumptions used. Thus, these estimates should be used with caution.

This is particularly true of the second assumption concerning the number of days spent in school. This assumption increases considerably the contribution of education to labour income and to the growth rate.

In the words of Moses Abramovitz:

> If I understand it, the procedure carried the absurb implication that a boy who completes eight years of elementary school today, when the number of school days per year is perhaps twice as large as it was on the average in 1910, has received the equivalent of a 1960 college education so far as effect of earning power is concerned.31

Again, as in the case of the previous assumption, it seems logical to assume that an increase in the average of number of days spent in school is likely to raise the quality of education and an individual's contribution to output. However, it is questionable to assume such a considerable increase. This is particularly evident when some alternative assumptions are being considered.

If, for example, it is assumed, as an alternative, that only the increase in the average number of years spent in school contributes to labour income and to the rate of growth, it can be estimated that from 1911 to 1961, improved education embodied in labour would have contributed only .09 per cent per annum to the labour income per man based on years

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31 Abramovitz, loc. cit., pp. 770-771.

of school attended, or 5.4 per cent of the growth rate of real national income per man employed.

If, further, it is assumed that improved education embodied in the labour force is responsible for 80 per cent and 40 per cent respectively for income differentials among individuals, the contribution of education, considering only the increase in the years of school attended, i.e., 0.09 per annum or 5.4 per cent of the growth rate, would be 0.12 per annum or 7.2 per cent of the growth rate and 0.06 per annum or 3.6 per cent of the growth rate.

It is recognized here that these alternative assumptions are also arbitrary since it is likely, for example, that an increase in the average number of days spent in school should raise the quality of education and an individual's contribution to output. However it shows clearly that the contribution of education can vary widely from a low of 3.6 per cent of the growth rate of the real national income per person employed to more than 30 per cent. These considerable differences, if nothing else, establish the necessity of further research in such factors as the determinants of the quality of education and the importance of measuring the real contribution of the various human characteristics embodied in individuals to their economic activity.

9. Conclusion

From the estimates presented above, it would appear that the contribution of improved education embodied in the Canadian labour force has been significant. However, the wide differentials existing between estimates based on alternative assumptions make it impossible, at this stage, to assess precisely the role played by education in economic activity. It also makes it necessary to pursue research activities in order to measure with more accuracy the various determinant factors contributing to the enhancement of the economic capabilities of individuals.

Evidently, to the extent that education is a significant source of economic growth, and even the low estimates described above tend to confirm that, it is important that its measurement be done with greater accuracy, particularly with regards to the introduction of economic policy.

On the other hand, it is important to observe that this chapter has emphasized the contribution of formal education to the rate of economic growth. It did not account for changes in the quantity and quality of on-the-job training and of general training outside institutions of formal education. More importantly, it did not take account of advance in knowledge such as more advanced technological knowledge consisting of knowledge of the physical properties of things and more advanced managerial knowledge consisting

of advances in knowledge concerning the techniques of management and business organization. For the United States, Denison estimated that such advances in knowledge contributed 0.58 per annum to the labour income per man or more than 36 per cent to the real national income per person employed over the period 1929-57. This means that advance in knowledge is a major source of economic growth. Although no such estimates are available for Canada, it is conceivable that it would also be a major source of growth.

This study is an attempt to analyse the value of education as an economic factor. Such an analysis implies a theoretical framework within which it is possible to study the main economic components of educational activity supported by some empirical evidence from which it is possible to draw some conclusions.

In Chapter I, the main concepts describing the economic elements inherent to educational activity are described and analysed. It demonstrates that, among other things, education is an economic factor consisting of an investment in the economic capabilities of individuals and societies. It also makes clear that the economic aspects of education represent only element of the contribution of education to human beings. In this context, it is argued, conceptually, that outlays for education are both investment and consumption expenditures from which it is possible to create human capital.

Chapter II is concerned with the analysis of the costs of education in Canada over a ten year period, i.e. from 1954 to 1963 inclusively. It is limited to the analysis of the costs of formal education, including elementary and secondary schools and colleges and universities.

The current operating costs of education, the value of implicit interest and depreciation of school properties, the value of foregone earnings of students attending school

above the elementary level and as the additional school expenditures due to educational activities are presented for each level of schooling. It shows quite conclusively that the secondary level and to a lesser degree, colleges and universities, are experiencing a higher rate of growth, both in terms of enrolment and in terms of financial outlays. The results of these estimates were then related to some of the major indicators of economic activity in Canada. This comparison tends to confirm the view that expenditures for education increase at a higher rate where the investment component is presumed to be greater. It also shows that investment in formal education as a whole increases at a far higher rate than investment in physical capital.

Chapter III estimates the economic returns accruing to individuals at various levels of education. On the assumption that income differentials between individuals at various levels of education represent an economic gain from investment in education and assuming further that this profitability of education occurs only at the secondary level and at the higher education level, i.e., in colleges and universities, the rates of return from investment in education are estimated for secondary and college and university students. These rates of return are estimated by comparing the additional private costs for individuals pursuing their education, i.e., foregone earnings, tuition costs (except for

students at the secondary level) and other additional school expenditures related directly to educational activities, e.g. books, with the additional income accruing to individuals at various levels of education.

The rates of return estimated, i.e., 15.0 per cent for secondary students and 18.2 per cent for students with college or university education, tend to confirm the initial assumption made in Chapter I that expenditures for education at these levels could be considered as investment expenditures from which economic returns could be expected. However, in the absence of necessary information, the contribution of such factors as ability and intelligence could not be considered in this analysis. Therefore the results estimated in this chapter should be considered as preliminary.

In Chapter IV, an attempt is made to analyse, both theoretically and empirically, the contribution of education embodied in the labour force to the Canadian growth rate. A short summary of the problem involved in trying to arrive at an acceptable definition of growth is presented. Then the findings of three American economists, R. Solow, J. W. Kendrick and Edward Denison are described. Canadian estimates produced by Gordon Bertram for the Economic Council of Canada and based on the model developed by Edward Denison for the United States, are used in this chapter. First, the contribution of education to labour income per man is estimated

and, secondly, the contribution of improved education embodied in the labour force to the real national income per person employed is estimated. Because of the limitations of some of the assumptions used, some alternative assumptions were used, and the alternative findings are compared with the Canadian estimates developed by Bertram.

Concluding Comments

In view of the analysis that has been conducted in this study, it is now possible to draw some general conclusions and to propose some areas where further research would be essential in order to arrive at more meaningful results in the future.

It seems evident that both conceptually and empirically education is a productive and profitable economic activity. Even if the empirical results are, at best, approximations and in some cases fragmentary, they all tend to establish that financial outlays for education are economically profitable for individuals and societies. The costs of education growing considerably more in these sectors where investment, and thus returns, is assumed to take place, the estimated rates of returns to students at the secondary and university levels, the contribution of improved education embodied in labour, are all good examples of the economic value inherent to educational activity.

However, as was pointed out many times in the course of this study, many areas of research in economics of education remain unexplained. Most of the information needed to establish accurately the real costs of education to society, particularly when analyzing the value of earnings foregone by students while attending school, is missing.

Also, the measurement of rates of returns is considerably limited by the absence of information concerning the importance of ability, intelligence and personality in determining income differentials. The quality of education provided in Canadian schools is also a great unknown.

Therefore, further research in some major areas of educational activity is needed if the results of research in this important and growing sector of economic policy are to be meaningful for policy makers and for individuals.

In particular, it will be important to verify if the shift toward increased expenditures in education relative to investment in the other major sectors of economic activity is determined by an expectation of higher economic returns.

The contribution of other forms of education and training to individuals and to the growth of economic activity as a whole will also have to be investigated.

The importance of foregone earnings in determining whether an individual can afford to continue his education will also have to be verified. This is particularly impor-

tant in the case of individuals from low income families. In this respect, it will be essential to study if the capital market functions satisfactorily in providing funds to students wishing to invest in more education.

All these questions and others that are likely to come up in the future seem to be essentials in a search for more meaningful explanations of the role of educational activity in promoting the economic well-being of individuals and societies.

Books:

Becker, Gary S., Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, New York, National Bureau of Economic Research, 1964, xvi-187.

An analysis of the main theoretical factors concerning the economic concepts inherent to educational activity. This theoretical presentation is followed by a detailed presentation of estimates of rates of return for high school and college students. The penetration with which both the theoretical and empirical presentations have been presented makes this book an indispensable source of reference on the economics of education.

Bertram, Gordon W., The Contribution of Education to Economic Growth, Ottawa, Economic Council of Canada (Staff Study No. 12), June 1966, vii-150 p.

This book is essentially an adaptation of Edward F. Denison's model of economic growth (see following) to the Canadian situation. It analyses the contribution of education to the rate of Canadian economic growth. It presents some original estimates of the stock of education in Canada from 1911 to 1961. However, since the author analyses only one aspect of the original model (Denison's), the results of his analysis must be regarded with caution.

Denison, Edward F., The Sources of Economic Growth and the Alternatives Before Us, New York, Committee for Economic Development (Supplementary Paper No. 13), 1962, 297 p.

An analysis, theoretical and empirical, of the various factors influencing the process of economic growth and a measurement of their respective contributions. The author makes one of the most significant contribution to the analysis of the economics of education by measuring the contribution of education to economic growth in the United States. A very important book, essential to the understanding of the process of economic growth in general and indispensable for the study of the economic value of education.

Economic Council of Canada, Economics Goals for Canada to 1970: First Annual Review, Ottawa, December 1964, 213 p.

Economic Council of Canada, Towards Sustained and Balanced Economic Growth: Second Annual Review, Ottawa, December 1965, 204 p.

Economic Council of Canada, Prices, Productivity and Employment: Third Annual Review, Ottawa, November 1966, 276 p.

Morgan, James N., Martin H. David, Wilbur J. Cohen and Harvey S. Brazer, Income and Welfare in the United States, New York, MacGraw-Hill, 1962, p.

A study of the redistribution of income among individuals that takes into account sociological, psychological as well as economic factors. The authors also studied the contribution of education to the distribution of earnings.

Organization for Economic Co-operation and Development, The Residual Factor in Economic Growth, Paris, 1964, 279 p.

A group of articles analysing the contribution of the residual factor, including education, to economic growth. A summary of Denison's book, comments by various economists and a reply by Denison makes this book an important reference. An article by John Vaizey and comments by such economists as John W. Kendrick, Harry G. Johnson and Seymour Harris clarifies some problems of some aspects of economics in the light of human capital.

Organization for Economic Co-operation and Development, Economic Aspects of Higher Education, Paris, 1964, 252 p.

Another group of articles analysing some of the main concepts concerning the economic value of education with particular emphasis on higher education. One article by William G. Bowen appraising the alternative approaches for the assessment of the economic contribution of education is particularly interesting.

Podoluk, J.R., Earnings and Education, Ottawa, Dominion Bureau of Statistics, December 1965, 82 p.

A study on the importance of education as an explanation of variations in earnings among occupations. It also presents some original estimates of the rates of return of secondary and university education in Canada.

Wilkinson, Bruce W., Studies in the Economics of Education, Ottawa, Economics and Research Branch, Department of Labour, July 1965, 148 p.

This book summarizes the main concepts underlying the study of the economics of education. The main value of this study lies in its analysis of human capital values of Canadian Immigration and Emigration and of the requisite levels of education for the Canadian labour force.

Schultz, Theodore W., The Economic Value of Education, New York, Columbia University Press, 1963, xii-92 p.

An essay by T.W. Schultz bringing together the main ideas of the author on the theory and the measurement of the

costs of education and its economic value. The last section is concerned with a description of the main areas of the economics of education. It is an essential reference for the study of this aspect of economics.

Vaizey, John, The Economics of Education, London, Faber and Faber, 1962, 165 p.
This book includes some severe criticism of some of the major concepts of the economics of education. Since it permits a more objective analysis of these concepts, these criticisms are significant. The book also includes a summary of what some economists said about education. An important book to read.

Articles:

Aukrust, O., "Investment and Economic Growth", in the Productivity Measurement Review, Paris, Organisation for Economic Co-operation and Development, No. 16, issue of February 1959,pp. 35-50.

Becker, Gary S., "Investment in Human Capital: A Theoretical Analysis", in the Journal of Political Economy, 70, issue of October 1962 (Supplement),pp. 9-49.

Becker, Gary S.,"Underinvestment in College Education" in the American Economic Review, Vol. 50, No. 2, issue of May 1960, pp. 346-354.

Abramovitz, Moses, "Economic Growth in the United States", in the American Economic Review, Vol. 52, 1962, pp. 762-782.
This article is a critical assessment of Denison's book (see above). It is a very penetrating article. It helps greatly in understanding some of Denison's developments.

Bonner, J. and D.S. Lees, "Consumption and Investment", in the Journal of Political Economy, Vol. 71, No. 2, issue of February 1963, pp. 64-75.

Bowman, Mary Jean, "Human Capital: Concepts and Measures", in the Economic of Higher Education, ed. Selma J. Mushkin, Washington, U.S. Department of Health, Education and Welfare, 1962, pp. 102-128.
This article contains an excellent analysis of some of the main concepts of human capital formation. It is indispensable to any research in this field of economics.

Bowman, Mary Jean, "Educational Shortage and Excess" in the The Canadian Journal of Economics and Political Science, Vol. 29, No. 4, issue of November 1963, pp. 446-461.

Goode, R., "Adding to the Stock of Physical and Human Capital" in the American Economic Review, Vol. XLIX, No. 2, in the issue of May 1959, pp. 147-155.

Hansen, W. Lee, "Total and Private Rates of Return to Investment in Schooling" in the Journal of Political Economy, Vol. 71, issue of April 1963, pp. 128-140.
This article contains a very good analysis of the economic returns accruing to individuals. It compares the returns to individuals as estimated by the lifetime earnings approach and by the rates of return approach.

Houthakker, H. S., "Education and Income", in the Review of Economics and Statistics, Vol. XLI, February 1949, pp. 24-28.
This article describes the lifetime earnings approach in estimating the returns to education.

Johnson, Harry G., "The Political Economy of Opulence", in The Canadian Journal of Economics and Political Science, Vol. 26, No. 4, issue of November 1960, pp. 552-564.

Miller, Herman P., "Annual and Lifetime Income in Relation to Education: 1939-1959", in the American Economic Review, Vol. 50, No. 5, issue of December 1960, pp. 962-986
In this article, the author analyses the returns to individuals as estimated by their lifetime income.

Miller, Herman P., "Lifetime Income and Economic Growth" in the American Economic Review, Vol. 55, No. 4, issue of September 1965, pp. 834-844.
In this case, the author qualifies somewhat his preceding analysis (see above) and makes some preliminary estimates to take into account the secular rate of growth.

Mincer, Jacob, "On-the-Job Training: Costs, Returns, and Some Implications", in the Journal of Political Economy, Vol. 70, No. , issue of October 1963 (Supplement), pp. 50-79.

Morgan, James and Martin David, "Education and Income" in the Quarterly Journal of Economics, Vol. 77, No. 3, issue of August 1963, pp. 423-437.

Schultz, Theodore W., "Capital Formation by Education", in the Journal of Political Economy, Vol. 68, issue of December 1960, pp. 571-583.
This article contains some of the most significant contributions of T.W. Schultz in the field of economics of education. The author estimates in details the main elements of capital formation in education.

Schultz, Theodore W., "Education and Economic Growth" in Social Forces Influencing American Education, ed. Nelson B. Henry, Chicago, University of Chicago Press, 1961, pp. 46-88.
In this article, T.W. Schultz attempts some preliminary estimates of the stock of education in the labour force and of the contribution of education to economic growth.

Schultz, Theodore W., "Investment in Human Capital", in the American Economic Review, Vol. 51, issue of March 1961, pp. 1-17.

Schultz, Theodore W., "Reflections on Investment in Man", in the Journal of Political Economy, Vol. 70, issue of October 1962 (Supplement), pp. 1-8.

Renshaw, E., "Estimating the Returns to Education", in the Review of Economics and Statistics, Vol. 42, issue of August 1960, pp. 318-324.

Shaffer, H.G., "Investment in Human Capital; A Comment", in the American Economic Review, Vol. 51, issue of December 1961, pp. 1026-1034.

Solow, R.M., "Technical Progress, Capital Formation and Economic Growth", in the American Economic Review, Vol. 52, issue of May 1962, pp. 76-86.

Solow, R.M., "Technical Change and the Aggregate Production Function", in the Review of Economics and Statistics, Vol. 39, issue of August 1952, pp. 312-320.
An important article in which the author attempts to segregate variations in output due to such factors as technical change and changes in available capital per head, using aggregate production function's approach.

Weisbrod, Burton A., "The Valuation of Human Capital" in the Journal of Political Economy, Vol. 69, issue of October 1961, pp. 425-431.

Weisbrod, Burton A., "Education and Investment in Human Capital" in the Journal of Political Economy, Vol. 70, issue of October 1962 (Supplement), pp. 106-123.

Welch, Finis, "Measurement of the Quality of Schooling", in the American Economic Review, Vol. VLI, issue of May 1966, pp. 379-392.

Wofle, Dael Lee, "Economics and Educational Values", in the Review of Economics and Statistics, Vol. XLII, issue of August 1960 (Part II), pp. 178-179.

Statistical Data: Government Publications

Dominion Bureau of Statistics, Survey of Education Finance, 1954-56, Education Division, Catalogue No. 81-208, Ottawa (Queen's Printer), July 1960, 62 p.

Dominion Bureau of Statistics, Survey of Education Finance, 1957, Education Division, Catalogue No. 81-208, Ottawa (Queen's Printer), September 1961, 44 p.

Dominion Bureau of Statistics, Survey of Education Finance, 1958, Education Division, Catalogue No. 81-208, Ottawa (Queen's Printer), August 1962, 44 p.

Dominion Bureau of Statistics, Survey of Education Finance, 1959-60, Education Division, Catalogue No. 81-208, Ottawa (Queen's Printer), October 1963, 62 p.

Dominion Bureau of Statistics, Survey of Education Finance, 1961, Education Division, Catalogue No. 81-208, Ottawa (Queen's Printer), August 1964, 51 p.

Dominion Bureau of Statistics, Survey of Education Finance, 1962, Education Division, Catalogue No. 81-208, Ottawa (Queen's Printer), August 1965, 51 p.

Dominion Bureau of Statistics, Preliminary Statistics of Education, 1963-64, Education Division, Catalogue No. 81-201, August 1964, 69 p.

Dominion Bureau of Statistics, Preliminary Statistics of Education, 1964-65, Education Division, Catalogue No. 81-201, Ottawa (Queen's Printer), November 1965, 55 p.

Dominion Bureau of Statistics, "Educational Attainment of the Canadian Population and Labour Force 1960-65", in Special Labour Force Studies, Catalogue No. 71-505, Ottawa (Queen's Printer), October 1966, 40 p.

Dominion Bureau of Statistics, "Educational Levels and School Attendance", in the Census of Canada, 1961, Catalogue No. 99-520, Ottawa (Queen's Printer), 1965.

Dominion Bureau of Statistics, "Incomes of Individuals", in the Census of Canada, 1961, Catalogue No. 98-502, Ottawa (Queen's Printer), 1965.

Dominion Bureau of Statistics, "Earnings of Wage-earners by Schooling and Age", in the Census of Canada, 1961, Catalogue No. 94-537, Ottawa (Queen's Printer), 1964.

Dominion Bureau of Statistics, "Schooling by Age Groups", in the Census of Canada, 1961, Catalogue No. 92-557, Ottawa (Queen's Printer), 1963.

APPENDIX A

School Enrolment, Canada, 1954 to 1963

The following two tables summarize the enrolment in Canadian schools by levels of schooling and by sectors.

Table 1 shows total enrolment in Canadian schools with particular emphasis being placed on the various levels of formal education, e.g., public and private elementary and secondary schools, colleges and universities.

Table 2 shows the enrolment for various other educational institutions such as Teacher Training outside universities, Federal schools and Special Schools for the Deaf and the Blind. These enrolment figures include only the individuals receiving an education on a full-time basis.

APPENDIX A

Table A-1

Enrolment in Canadian Schools, 1954 to 1963

Year	ELEMENTARY			SECONDARY			Total: Elementary plus Secondary	Colleges and Universities	Total Elementary/ Secondary/ College/ Universities (b)	Others(c)	Total: All Schools
	Public	Private(a)	Total: ementary	Public	Private(a)	Total: Secondary					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1954	2,524,902	24,399	,549,301	339,200	23,915	363,115	2,912,416	64,140	2,976,556	51,765	3,028,321
1955	2,689,214	25,629	,714,843	366,355	25,122	391,477	3,106,320	68,320	3,174,640	51,602	3,226,242
1956	2,815,308	28,418	,843,726	396,221	27,856	424,077	3,267,803	72,737	3,340,540	60,447	3,400,987
1957	2,926,540	30,544	,957,084	419,181	29,939	449,120	3,406,204	78,504	3,484,708	59,126	3,543,834
1958	3,040,789	34,225	,075,014	454,450	33,548	487,998	3,563,012	86,754	3,649,766	67,627	3,717,393
1959	3,055,849	34,990	,090,839	663,996	34,375	698,371	3,789,210	94,994	3,884,204	80,015	3,964,219
1960	3,178,310	34,171	,212,481	715,277	38,134	753,411	3,965,892	101,934	4,067,826	111,904	4,179,730
1961	3,282,696	37,282	,319,978	794,900	39,266	834,166	4,154,144	113,857	4,268,001	119,046	4,387,047
1962	3,370,500	41,202	,411,702	907,493	41,385	948,878	4,360,580	128,894	4,489,474	125,963	4,615,437
1963	3,456,379	41,803	,498,182	995,120	46,194	1,041,314	4,539,496	141,388	4,680,884	130,061	4,810,945

(a) The enrolment inivate elementary and secondary schools in Quebec was included in the public sector since these private schools are heavily sidized by the provincial government and would be considered as "public schools" in other provinces.

(b) Full-time enrolm only.

(c) See Table A-2, Cmn 8.

APPENDIX A

Table A-2

Enrolment in Teacher Training Institutions Outside Universities in Special Schools, in Federal Schools and in Institutions of Vocational Education and Training, Canada, 1954 to 1963

Year	SPECIAL SCHOOLS		FEDERAL SCHOOLS					
	Teacher Training[a]	ools the ind	Schools for the Deaf	Indian Schools	Northern Administration[b]	National Defence[c] (Overseas)	Vocational Educational and Training[d]	Total 1+2+3+4+5 +6+7
	(1)	2)	(3)	(4)	(5)	(6)	(7)	(8)
1954	8,176	68	1,545	28,174	3,073	-----	10,229	51,765
1955	8,456	53	1,565	28,448	N.A.	1,711	10,869	51,602
1956	10,406	46	1,562	30,287	4,518	1,883	11,245	60,447
1957	10,054	76	1,667	32,000	N.A.	4,632	10,197	59,126
1958	11,435	84	1,757	31,995	5,357	5,158	11,341	67,627
1959	14,681	24	1,860	32,135	5,719	5,485	19,511	80,015
1960	16,396	71	1,881	32,531	6,978	6,624	46,823	111,904
1961	18,607	15	1,980	33,724	7,128	7,274	49,618	119,046
1962	20,435	38	2,261	34,232	7,671	7,937	52,689	125,963
1963	20,956	50	2,352	33,770	8,222	7,302	56,709	130,061

(a) Outside universit only.

(b) This column inclu enrolment in the elementary and secondary schools of the Yukon, the Northwest Territories and the Arctic. Since it was impossible, foost of the years under analysis, to identify accurately the number of Eskimo, Indian (including half-breeds) and White students, e three groups are included together although Eskimo and Indian students are the responsibility of the Territorial Governments.

(c) School students elementary and secondary schools on the principal National Defence establishments across Canada operate within the framework of thublic schools of the provinces in which they are located and statistics on these schools are included with those of the public sols.

(d) Vocational trainiand education include Post-secondary technical courses, Apprenticeship courses, Privately-sponsored trade schools and business ools although for the years 1954 to 1959, accurate statistics were available for privately-sponsored business schools only. On other hand, enrolment in Vocational high-schools, 151,712 in 1962-63, are already included in enrolment of secondary publs hools.

Sources: Survey of Elementary and Secondary Education, 1950-54 (Catalogue No. 81-401), Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), 1959; Survey of Elementary and Secondary Education, 1954-56, (Catalogue No. 81-401), Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), June 1959; Survey of Elementary and Secondary Education, 1956-58 (Catalogue No. 81-401), Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), September 1959; Survey of Elementary and Secondary Education, 1958-59 (Catalogue No. 81-210), Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), April 1962; Survey of Elementary and Secondary Education, 1959-60 (Catalogue No. 81-210), Education Division, Ottawa, (Queen's Printer), October 1962; Survey of Elementary and Secondary Education, 1960-61 (Catalogue No. 81-210), Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), March 1963; Survey of Elementary and Secondary Education, 1961-62 (Catalogue No. 81-210), Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), May 1964; Survey of Elementary and Secondary Education, 1962-63 (Catalogue No. 81-210), Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), April 1966; Survey of Higher Education, Part I: Fall Enrolment in Universities and Colleges, 1962-63 (Catalogue No. 81-204), Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), August 1963 and unpublished statistics provided by the Education Division of the Dominion Bureau of Statistics and the Department of National Defence.

This Appendix provides additional information relating to sources and the derivation of data as shown in various tables in Chapter II. This information supplements the data of sources and comments contained in footnotes as shown in some of the tables.

Table I: Survey of Education Finance, 1954-56, Dominion Bureau of Statistics (Catalogue 81-208), Education Division, Ottawa, (Queen's Printer), July 1960, p. 53, Table 10 and p. 56, Table 14; Survey of Education Finance, 1957, Dominion Bureau of Statistics (Catalogue 81-208), Education Division, Ottawa, (Queen's Printer), September 1961, p. 53, Table 10 and p. 40, Table 14; Survey of Education Finance, 1958, Dominion Bureau of Statistics (Catalogue 81-208), Education Division, Ottawa, (Queen's Printer), August 1962, p. 33, Table 9 and p. 40, Table 15; Survey of Education Finance, 1959-60, Dominion Bureau of Statistics (Catalogue 81-208), Education Division, Ottawa (Queen's Printer), October 1963, p. 43, Table 9 and p. 50, Table 15; Survey of Education Finance, 1961, Dominion Bureau of Statistics (Catalogue 81-208), Education Division, Ottawa (Queen's Printer), August 1964, p. 31, Table 9 and p. 37, Table 16; Survey of Education Finance, 1962, Dominion Bureau of Statistics (Catalogue 81-208), Ottawa (Queen's Printer), August 1965, p. 31, Table 8 and p. 38, Table 15; Survey of Education Finance, 1963, Dominion Bureau of Statistics (Catalogue 81-208), Education Division, Ottawa, (Queen's Printer), May 1967, p. 31, Table 8 and p. 38, Table 15.

Table III: The value of property of both public and private elementary and secondary schools was estimated for the period 1954 to 1963. It was estimated from data available for four provinces (Quebec, Manitoba, Saskatchewan and Alberta) for the years 1953 and 1961. These two years were used as base years to derive the value of property per student in these four provinces which was estimated at $420.00 for 1953 and $717.00 for 1961 (see Table B-1).

Table B-1

Value of Public Elementary and Secondary School Properties in Quebec, Manitoba, Saskatchewan, Alberta, 1953 and 1961, in Current Dollars

Province	1953 Value of School Properties ($,000)	1953 Number of Students	1961 Value of School Properties ($,000)	1961 Number of Students
Quebec	313,843	715,792	874,988	1,220,662
Manitoba	44,805	139,590	124,058	192,747
Saskatchewan	84,868	189,081	239,416	312,684
Alberta	63,227	163,466	160,338	224,416
T O T A L	506,743	1,207,929	1,398,800	1,950,509
	(1)		(2)	
Total Value of Properties Per Student in Four Provinces	$420.00		$717.00	

Sources: Survey of Elementary and Secondary Education, Dominion Bureau of Statistics, Elementary and Secondary Education Section, Ottawa, (Queen's Printer), 1959, p. 32 and p. 131; Rapport du Surintendant de l'Instruction Publique, 1961-1962, Québec 1962, p. 456, Tableau 3; Department of Education of Saskatchewan, 57th Annual Report, 1961-62, Regina 1962, p. 70 and p. 79; 57th Annual Report of the Department of Education of Alberta, 1962, Edmonton 1963, p. 127 and p. 213; Report of the Department of Education, 1963, Winnipeg 1963, pp. 112-113.

The value of property of these schools covers the undepreciated book value of original cost of acquisition. Then two basic assumptions were made. Firstly, the average annual growth rate of the value of property per student from 1953 to 1961, namely 6.91 per cent per year is assumed to represent the growth rate up to 1963. And secondly, the estimated value of property per student so derived for ten years on the basis of the experience of four provinces is assumed to be representative of the value of property per student in ten provinces at the elementary and secondary levels, both in the public and private sectors.

The results are shown in Table B-2.

Accepting these two basic assumptions, the total value of property of elementary and secondary schools, public and private, was estimated by multiplying the total number of students at each level by the estimated value of property per student as shown in Table B-3.

Table B-2

Estimated Value of Property Per Student in Canada, 1954 to 1963, in Current Dollars

Year	Estimated Value of Property Per Student
	$
1954	449[a]
1955	480
1956	513
1957	548
1958	586
1959	626
1960	669
1961	717
1962	764
1963	817

(a) The estimated value of property per student in 1954 was arrived at by multiplying the value of property per student in 1953, i.e. $420.00 by 106.91 per cent, i.e. the average annual growth rate of the value of property per student. The process was repeated for every other years up to 1963.

Table B-3

Total Estimated Value of Elementary and Secondary School Properties (Public and Private Sectors), Canada, 1954 to 1963, in Current Dollars

Year	Total Number of Students in Elementary and Secondary Schools (Public and Private)	Total Estimated Value of Property of Elementary and Secondary Schools (Public and Private)
	(1)	(2)
1954	2,912,416	1,307,674,800
1955	3,106,320	1,491,033,600
1956	3,267,803	1,676,382,900
1957	3,406,204	1,866,599,800
1958	3,563,012	2,087,925,000
1959	3,789,210	2,372,045,500
1960	3,965,892	2,653,182,000
1961	4,154,144	2,978,521,000
1962	4,360,580	3,331,483,100
1963	4,539,496	3,708,768,200

Sources: Column 1: From Table A-1, Column 7, Appendix A. Column 2: Column 1 multiplied by the estimated value of property per student.

Table IV: The last year for which the total value of fixed assets of colleges and universities is available for Canada is 1954. In order to estimate the total value of property of colleges and universities up to 1963, the value of the gross capital outlays spent during each one of the following years for construction, machinery and equipment plus an estimated value of the cost of land was added to the original 1954 figure that represents the gross value of fixed assets of universities and colleges.

The value of the land was estimated by assuming that land comprised 15 per cent of all physical assets of universities and colleges in Canada. No adequate figure regarding the distribution of physical assets of colleges and universities being available for Canada, we used a percentage distribution of physical assets for Private Nonprofit Institutions in the United States as developed by Robert Rude in his unpublished study "Assets of Private Nonprofit Institutions in the United States, 1890-1948", National Bureau of Economic Research, April 1954, Table II-2a and as cited by T.W. Schultz in Capital Formation by Education, in the Journal of Political Economy, December 1960, LXVIII, p. 578, Table 3, Footnote 5. In this study, Robert Rude placed the distribution of physical assets for colleges and universities in the United States as 15 per cent for Land, 70 per cent for Building and 15 per cent for Equipment.

Also, an informal survey conducted with the Collegiate Institute Board of Ottawa, the Separate School Board and the Public School Board points out to a similar distribution for Canada. However, in view of the lack of supporting statistical evidence for Canada, the distribution used in this estimate should be viewed with caution.

The results are shown in Table B-4.

The estimated value of capital outlays for land, construction and equipment is then added to the gross value of fixed assets of colleges and universities in Canada in 1953-54 (Survey of Higher Education, 1952-54, Dominion Bureau of Statistics, Education Division, Ottawa, (Queen's Printer), 1957, p. 76, Table 18) in order to arrive at an estimated total value of property for each year from 1953-54 to 1962-63 inclusively (see Table B-5).

Table V: In order to evaluate earnings foregone by Canadian students at different levels of education, two main problems had to be solved. First, there was an almost complete lack of adequate data on earnings, cross-classified by sex, age and educational attainment except for the year 1961 when some cross-classified statistics on earnings were made available by the Dominion Bureau of Statistics following the 1961 Census of Canada. The second main problem was to find an adequate measure to estimate the value of earnings foregone by students from 1954 to 1963 which would evaluate

Table B-4

Actual Capital Outlays for Construction and Equipment in Colleges and Universities and the Estimated Value of Land, Canada, 1954 to 1963, in Current Dollars

Year	Capital Outlays[a] for Construction and Equipment (Gross Value)	Plus an Estimated 15 Per Cent for Land
	(1)	(2)
	($,000)	
1954	20,000	23,000
1955	25,000	28,750
1956	26,000	29,900
1957	43,000	49,450
1958	63,000	72,450
1959	82,000	94,300
1960	87,000	100,050
1961	112,000	128,800
1962	115,000	132,250
1963	138,000	158,700

(a) The gross value of the capital outlays for construction and equipment is from Private and Public Investment in Canada, Outlook, 1956, Ottawa (Queen's Printer), 1956, p. 15, Table 5; Ibid. 1957, Ottawa (Queen's Printer), 1957, p. 15, Table 15; Ibid. 1958, Ottawa (Queen's Printer), 1958, p. 15, Table 5; Ibid. 1959, Ottawa (Queen's Printer), 1959, p. 15, Table 5; Ibid. 1960, Ottawa (Queen's Printer), 1960, p. 15, Table 15; Ibid. 1962, Ottawa (Queen's Printer) 1962, p. 15, Table 15; Ibid. 1963, Ottawa (Queen's Printer), 1963, p. 15, Table 5; Ibid. 1964, Ottawa (Queen's Printer), 1964, p. 15, Table 5 and Ibid. 1965, Ottawa (Queen's Printer), 1965, p. 16, Table 6.

Table B-5

Total Estimated Value of Property of Colleges and Universities in Canada, 1954 to 1963, in Current Dollars

Year	Total Estimated Value of Property: Colleges and Universities
	($,000)
1953-54	198,316
1954-55	227,066
1955-56	256,966
1956-57	306,416
1957-58	378,866
1958-59	473,166
1959-60	573,216
1960-61	702,016
1961-62	834,266
1962-63	992,966

accurately the value of earnings foregone for each year without introducing any major structural and statistical inaccuracies. The method used was originally developed by T.W. Schultz in "Capital Formation by Education", in the Journal of Political Economy, Vol. LXVIII, December 1960, pp. 573-577. Two of the main advantages of this method are that it permits the estimation of foregone earnings using one particular year as a base year and the calculation of annual earnings foregone for the years preceding and following that base year by measuring the number of weeks foregone by students in terms of wages paid in all industries. It is relatively easy then to transform for each year those average number of weeks foregone in dollar terms.

First, the average annual earnings of Canadian wage-earners, males and females, with an high school, college or university education and in the age-groups 15-19 and 20-24 in 1961 are used as a basis for the estimate (see Table B-6).

In order to estimate the average weekly earnings of these same wage-earners in 1961, an estimate of the average number of weeks worked by all males and females reporting the total number of weeks worked in 1961 was calculated as shown in Table B-7.

Table B-6

Annual Average Earnings of Males and Females, by Educational Level, Age-Group and Sex, Canada, 1961

Educational Levels and Age-Groups	Sex	Annual Average Earnings
		$
Secondary School:		
15-19	Male	1,178
	Female	1,226
20-24	Male	2,787
	Female	2,108
College and University:		
15-19	Male	755
	Female	862
20-24	Male	2,255
	Female	2,413

Source: Census of Canada, 1961, Dominion Bureau of Statistics, Bulletin 3.3-5, Ottawa (Queen's Printer) 1964, p. 17-1, Table 17.

Table B-7

Average Number of Weeks Worked During 1961 by Male and Female Wage-Earners Reporting Average Number of Weeks Worked, Canada, 1961

Average Number of Weeks Worked	Wage-Earners Reporting Weeks Worked	Per Cent of Total	Weighted Average (Weeks Worked)	Wage-Earners Reporting Weeks Worked	Per Cent of Total	Weighted Average (Weeks Worked)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		%			%	
7 .-13 weeks)	184,762	5.3	.4	129,685	9.1	.6
20 4-26 weeks)	256,651	7.3	1.5	111,806	7.9	1.6
33 27-39 weeks)	301,017	8.6	2.9	121,453	8.5	2.8
46	2,762,220	78.8	36.2	1,059,004	74.5	34.3
TOTAL	3,504,650	100.0	41.0	1,421,948	100.0	39.3

Sources: Columns (1), (2), (3), (5) and (6): Derived from the Census of Canada, 1961, Dominion Bureau of Statistics, Ottawa, (Queen's Printer), 1963, pp. 14-1 and 14-2, Table 14.
Columns (4) and (7): For both male and female, the average number of weeks worked was weighted by the percentage of wage-earners reporting weeks worked of the total number of wage-earners reporting weeks worked for each group.

The estimated average number of weeks worked by male, i.e. 41 weeks, and by females, i.e. 39 weeks, during 1961 was then used to derive the average weekly earnings of both male and female in different age-groups and for different levels of education.

Then, the estimated annual earnings foregone by students in secondary school and in colleges and universities are derived by assuming that they forego 40 weeks of such earnings. These estimated annual earnings foregone are further adjusted for the percentage differences in the number of males and females in each age-group within each educational level and between each educational level. We then arrive at the total average annual earnings foregone by students at the secondary level and in colleges and universities (see Table B-9).

Those annual earnings foregone are then expressed in the average number of weeks foregone by each student at both levels of education using as the denominator the average weekly earnings of wage-earners in all Canadian industries. (See Table B-10).

It is then estimated that students in secondary school forego, on the average, 16 weeks of productive work per year while college and university students forego an average of 22 weeks.

Table B-8

Annual and Weekly Earnings of Male and Female, by Educational Level, Age-Group, and Sex, Canada, 1961

Educational Level and Age-Group	Annual Earnings	Average Number of Weeks Worked	Weekly Earnings
(1)	(2)	(3)	(4)
	$		$
Secondary School:			
15-19 Male	1,178.	41	29.00
Female	1,226.	39	31.00
20-24 Male	2,787.	41	68.00
Female	2,108.	39	54.00
College and University:			
15-19 Male	775.	41	18.00
Female	862.	39	22.00
20-24 Male	2,255.	41	55.00
Female	2,413.	39	62.00

Sources: Columns (1) and (2): From Table B-6.
Column (3): From Table B-7, Columns (4) and (7).
Column (4): Column (2) divided by Column (3).

APPENDIX B

Table B-9

Estimated Annual Earnings Foregone by Students in Secondary School and in College and University, Canada, 1961

ducational Level, by ex and Age-group	Annual Earnings Foregone (1) $	Percentage of School Frequentation by Sex and Age-group (2) %	Adjusted Annual Earnings Foregone (3) $	Percentage of School Frequentation by Educational Level (4) %	Adjusted Annual Earnings Foregone (5) $
Secondary School:					
15-19 Male	1,160.	51	592.	-	-
Female	1,240.	49	608.	-	-
TOTAL	-	100	1,200.	95	1,140.
20-24 Male	2,720.	63	1,714.	-	-
Female	2,160.	37	799.	-	-
TOTAL	-	100	2,513.	5	126.
Secondary School-Total	-	-	-	100	1,266.
College and University:					
15-19 Male	720.	59	425.	-	-
Female	880.	41	361.	-	-
TOTAL	-	100	786.	35	275.
20-24 Male	2,200.	76	1,672.	-	-
Female	2,480.	24	595.	-	-
TOTAL	-	100	2,267.	65	1,474.
College and University Total	-	-	-	100	1,749

Sources: Column (1): Column (4) in Table B-8 multiplied by 40 weeks which is the number of weeks foregone by students in secondary school, college and university in Canada.
Columns (2) and (4): From the Census of Canada, 1961, Dominion Bureau of Statistics, Bulletin 1.3-6, Ottawa, (Queen's Printer), 1963, p. 99-1, Table 99.

Table B-10

Estimated Number of Weeks Foregone by Students in Secondary School and in College and University, Canada, 1961

Educational Level	Adjusted Annual Earnings Foregone	Average Weekly Earnings in All Industries, Canada, 1961	Number of Weeks Equivalent by Educational Level
	(1)	(2)	(3)
	$	$	$
Secondary School	1,266.	78.17	16
College and University	1,749.	78.17	22

Sources: Column (1): From Column 5, Table B-9. Column (2): From Employment and Payrolls, April 1965, Dominion Bureau of Statistics (Catalogue 72-002), Labour Division, Ottawa, (Queen's Printer), July 1965, p. 34, Table 9. Column (3): Column (1) divided by Column (2).

Table VI: The average weekly earnings in all industries in Canada are from Employment and Payrolls, April 1965, Dominion Bureau of Statistics (Catalogue No. 72-002), Labour Division, Ottawa, (Queen's Printer), July 1965, p. 34, Table 9.

The rates of unemployment of the Canadian labour force for 1954 to 1963 used in our estimate of earnings foregone for students at the secondary, college and university levels are from The Labour Force, Estimates for 1946-64, (Supplement to March 1965 Report), Dominion Bureau of Statistics, Ottawa, (Queen's Printer), 1965. The following rates were used: 1954, 4.6 per cent; 1955, 4.4 per cent; 1956, 3.4 per cent; 1957, 4.6 per cent; 1958, 7.0 per cent; 1959, 6.0 per cent; 1960, 7.0 per cent; 1961, 7.1 per cent; 1962, 5.9 per cent; 1963, 5.5 per cent.

Table VIII: There are no data available on the average expenditures of students at the secondary, college and university levels for books, school supplies and for transportation (other than local) except for two surveys, the first one conducted in 1956-57 (University Student Expenditure and Income in Canada, 1956-57, Dominion Bureau of Statistics (Catalogue No. 81-509) Education Division, Ottawa, (Queen's Printer), 1959) and the second one conducted for the academic year 1961-62 (University Student Expenditure and Income, 1961-62: Part II - Canadian Undergraduate Students,

Dominion Bureau of Statistics (Catalogue No. 81-520), Education Division, Ottawa (Queen's Printer), August 1963). These surveys were used to estimate the average expenditures per student for other years.

College and University Students:

The 1956-57 Survey (pp. 38-39) shows that students in college and university were spending 9.9 per cent of their total average expenditures or $133.65 for books, school supplies and transportation (other than local).

In 1961-62, expenditures for the same items were estimated at $165.00 per student (p. 18, Table 1 and p. 38, Table 37 of the 1961-62 Survey). By assuming that the rate of growth from 1956-57 to 1961-62 would have been the same for the period preceding 1956-57 and for the period following 1961-62, i.e. up to 1962-63, the following results were arrived at:

1953-54	$120
1954-55	125
1955-56	130
1956-57	135
1957-58	141
1958-59	146
1959-60	152
1960-61	159
1961-62	165
1962-63	172

Students at the Secondary Levels:

No data were available for average expenditures per secondary student for books and school supplies. No expenditures for outside transportation are estimated since it is presumed that students at the secondary levels do not travel outside to attend school. However, the 1956-57 survey mentioned above, estimated that college and university students spent on the average 4.6 per cent of their income or $61.00 for books and it was estimated that students in Faculties of Arts in Canada spent about $64.00 on this item in 1961-62. However, it is assumed that students at the secondary level do not spend as much for books and school supplies as students in colleges and universities. In a recent study for the United States, T.W. Schultz in "Capital Formation by Education", in the Journal of Political Economy, Vol. 68, December 1960, p. 580, Tables 5 and 6, estimated that high school students spent only half of what college and university students spent. On the other hand, in another study pertaining to the Canadian situation, Earnings and Education, Dominion Bureau of Statistics (Catalogue No. 91-510), Ottawa, (Queen's Printer), December 1965, J.R. Podoluk estimated arbitrarily "after some informal investigation" that students at the secondary levels spent, in 1961, on the average $25.00 for books and supplies, or about 16 per cent of what is spent by students in college and university. Using these findings

as baseline, it was arbitrarily assumed that Canadian students in secondary schools tended to spend from 1954 to 1963 on the average, 25 per cent of what college and university students spent, a compromise between the Schultz's and Podoluk's estimates. This 25 per cent rate was applied to the estimates of college and university students to arrive at the following results:

1954	-	$30.00
1955	-	31.25
1956	-	32.50
1957	-	33.75
1958	-	35.25
1959	-	36.50
1960	-	38.00
1961	-	39.75
1962	-	41.25
1963	-	43.00

Table X: Column 3; from Column 1, Table 6;
Column 4; from Column 1, Table 7;
Column 6; from Column 6, Table 2;
Column 7; from Column 2, Table 4;
Column 8; from Column 2, Table 6;
Column 9; from Column 2, Table 7;

Columns 1 and 2 distribute the operating costs and the estimated implicit interest and depreciation of school properties between elementary and secondary schools.

The allocation of these costs between each level was made according to a method developed by T.W. Schultz in "Capital Formation by Education", in the Journal of Political Economy, Vol. 68, December 1960, p. 578, Table 3, Footnote 10, which consists essentially in an index based on the differences between the salaries of elementary and secondary

teachers and in the number of students per teacher in elementary and secondary schools.

This index was derived in the following manner. A three year average of earnings of elementary and secondary teachers was estimated (see Table B-11).

The number of teachers does not include the total number of teachers in both elementary and secondary sectors since they exclude teachers from Quebec and, for the other provinces, include only those which have responded.

These annual average salaries have been adjusted by multiplying the average salaries by the percentage number of teachers which each year is of the total for three years in order to arrive at a weighted average for three years.

The second step was to estimate, for these same three years the number of students per teacher in both elementary and secondary schools. Since the total number of teachers at both levels were available for both the public and private schools, the total number of students at both levels and in both sectors were used (see Table A-1, Appendix A). The results are shown in Table B-12.

Now, the index can be calculated by putting together the estimated average earnings of elementary and secondary teachers with the number of teacher per student at both levels.

APPENDIX B

Table B-11

Average Salaries of Public Elementary and Secondary Teachers, Canada, 1960-61, 1961-62 and 1962-63 (academic years)

Year	ELEMENTARY				SECONDARY			
	Number of Teachers in Elementary Schools (1)	Per Cent of Total (2) %	Average Salaries (3) $	Adjusted Average Salaries (4) $	Number of Teachers in Secondary Schools (5)	Per Cent of Total (6) %	Average Salaries (7) $	Adjusted Average Salaries (8) $
1960-61	64,464	30.7	3,920	1,203	23,444	29.3	6,229	1,825
1961-62	72,955	34.8	4,126	1,336	26,864	33.6	6,410	2,154
1962-63	72,269	34.5	4,313	1,488	29,692	37.1	6,590	2,445
TOTAL	209,688	100.0	-	4,027	80,000	100.0	-	6,424

Sources and Notes: These data were derived from statistical information from surveys in Preliminary Statistics on Education, 1960-61, Dominion Bureau of Statistics (Catalogue No. 81-201), Education Division, Ottawa (Queen's Printer), June 1961, pp. 20-21, Table 7; Preliminary Statistics on Education, 1961-62, Dominion Bureau of Statistics (Catalogue No. 81-201), Education Division, Ottawa (Queen's Printer), May 1962, pp. 22-23, Table 7, and Preliminary Statistics on Education, 1962-63, Dominion Bureau of Statistics (Catalogue No. 81-201) Education Division, Ottawa (Queen's Printer), June 1963, pp. 22-23, Table 7.

APPENDIX B

Table B-12

Number of Students Per Teacher in Elementary and Secondary (Public and Private) Schools in Canada, 1960-61, 1961-62 and 1962-63

ademic Year	ELEMENTARY			SECONDARY		
	Students in Elementary Schools	Teachers in Elementary Schools	Students per Teacher	Students in Secondary Schools	Teachers in Secondary Schools	Students Per Teacher
	(1)	(2)	(3)	(1)	(2)	(3)
1960-61	3,319,978	121,048	27	834,166	42,437	20
1961-62	3,411,702	126,479	27	948,878	46,588	20
1962-63	3,498,182	131,040	27	1,041,314	51,950	20
Average Number of Students for Three Years	---	---	27	---	---	20

Sources and Notes: Data for total number of teachers are from Preliminary Statistics on Education, 1960-61, Dominion Bureau of Statistics (Catalogue No. 81-201), Education Division, Ottawa (Queen's Printer), June 1961, p. 16, Table 2; Preliminary Statistics on Education, 1961-62, Dominion Bureau of Statistics (Catalogue No. 81-201), Education Division, Ottawa (Queen's Printer), May 1962, p. 18, Table 2; and Preliminary Statistics on Education, 1962-63, Dominion Bureau of Statistics (Catalogue No. 81-201), Education Division, Ottawa (Queen's Printer), June 1963, p. 18, Table 2.

First, the difference in percentage terms between earnings at both levels is needed:

$$\begin{matrix}\text{Secondary: } \$6,424 \\ \text{Elementary: } 4,027\end{matrix} = 160 \text{ per cent}$$

In other words, teachers at the secondary level receive 60 per cent more than teachers at the elementary level.

Then using the number of students per teacher, we can calculate the following index:

$$\frac{160 \text{ ‘/. } 20}{100 \text{ ‘/. } 27} \times 100 = 216$$

This index indicates that it costs 116 per cent more per student at the secondary level than for a student at the elementary level.

The distribution of costs between both levels will thus consist in an allocation on a per student basis, of the total operating costs as well as the implicit interest and depreciation of school properties between elementary and secondary schools. The following formula will be used:

$$Ce + Cs = C$$

where Ce = Cost of one student in elementary school

Cs = Cost of one student in secondary school

and C = Total cost (i.e. operating plus implicit interest and depreciation of school properties) per student at both levels.

Total cost per student at both levels is thus needed and is shown in the following table (Table B-13).

TABLE B-13

Total and Per Student Operating Costs and Implicit Interest and Depreciation, Elementary and Secondary Schools (Public and Private), 1954 to 1963

Year	Total Cost	Number of Students	Cost per Student
	($,000)		$
1954	572,877	2,912,416	197
1955	643,249	3,106,320	207
1956	723,175	3,267,803	221
1957	827,181	3,406,204	243
1958	943,869	3,563,012	265
1959	1,076,943	3,789,210	284
1960	1,213,487	3,965,892	306
1961	1,359,865	4,154,144	327
1962	1,513,991	4,360,580	347
1963	1,699,113	4,539,496	374

Sources and Notes: Total cost represents an addition of total operating costs (from Column 8 in Table 1) and the total estimated value of Implicit Interest and Depreciation of school properties (from Table 3, Column 2).

On the other hand, since there are more students at the elementary level than at the secondary level, some provisions have to be made for this factor when distributing the cost between both levels.

For 1954 to 1963, the percentage distribution of students at both levels was as follows (Table B-14).

Now, it is possible to calculate the ratios that will distribute the cost between both levels.

e.g. 1954

$$0.88\ Ce + 0.12\ Cs = \$197$$

$$0.88\ Ce + 0.12\ (2.16) = \$197$$

$$0.88\ Ce + .2592 = \$197$$

$$Ce\ 1.1392 = \$197$$

$$Ce = \$173$$

$$Cs\ \ (173)\ (2.16) = \$374$$

Each year is calculated in the same way (see Table B-15).

It is possible, then, to estimate, for each year, the cost per student at elementary and secondary levels (see Table B-16).

Then the total cost for each level is estimated by multiplying the cost per student at each level by the number of students at each level, for each year (Table B-17)

Table B-14

Percentage Distribution of Students in Elementary and Secondary Schools (Public and Private), 1954 to 1963

Year	Elementary	Secondary
	%	%
1954	88	12
1955	87	13
1956	87	13
1957	87	13
1958	86	14
1959	82	18
1960	81	19
1961	80	20
1962	78	22
1963	77	23

Source: Derived from data in Table A-1, Appendix A.

Table B-15

Ratios Distributing Costs Between Elementary and Secondary Schools, Canada, 1954 to 1963

Year	Elementary	Secondary
1954	1.1392	2.16
1955	1.1608	2.16
1956	1.1608	2.16
1957	1.1608	2.16
1958	1.1624	2.16
1959	1.2088	2.16
1960	1.2204	2.16
1961	1.2320	2.16
1962	1.2552	2.16
1963	1.2668	2.16

Table B-16

Cost per Student at the Elementary and Secondary levels, Distributed by levels, 1954 to 1963

Year	Elementary $	Secondary $
1954	173	374
1955	178	384
1956	190	410
1957	209	451
1958	228	492
1959	235	508
1960	251	542
1961	265	572
1962	276	596
1963	295	673

Table B-17

Distribution of Annual Operating Costs and of Annual Implicit Interest and Depreciation of School Properties, Between Elementary and Secondary Schools, 1954 to 1963, in Current Dollars

Year	Total Cost: Elementary	Total Cost: Secondary	Total Cost: Both Levels
	($,000)	($,000)	($,000)
1954	437,072	135,805	572,877
1955	492,922	150,327	643,249
1956	549,303	173,872	723,175
1957	624,628	202,553	827,181
1958	703,774	240,095	943,869
1959	722,171	354,772	1,076,943
1960	805,138	408,349	1,213,487
1961	882,722	477,143	1,359,865
1962	948,460	565,531	1,513,991
1963	1,035,796	663,317	1,699,113

Table XIII: The costs of education have been converted in constant dollars by using the Implicit Price Index of the Gross National Expenditure for Operating Costs, the Implicit Index of Gross Fixed Capital Formation for the estimated value of Implicit Interest and Depreciation of School Properties and for Earnings Foregone and Additional School Expenditures.

Table B-18

Various Price Indexes, Canada, 1954 to 1963

Year	Gross National Expenditure Implicit Price Index	Business Gross Fixed Capital Formation Implicit Price Index	Personnel Expenditure on Consumer Goods and Services Implicit Price Index
1954	93.1	89.5	94.9
1955	93.5	91.7	95.0
1956	97.1	96.6	96.7
1957	100.0	100.0	100.0
1958	101.9	102.2	102.6
1959	104.5	105.1	104.1
1960	106.1	107.4	105.1
1961	106.8	108.3	105.9
1962	108.4	111.1	107.3
1963	110.3	114.0	108.9

Sources: National Accounts Income and Expenditure, 1965, Dominion Bureau of Statistics (Catalogue 13-201), National Accounts and Balance of Payments Division, Ottawa, (Queen's Printer), July 1966, p. 20, Table 6 and National Accounts, Income and Expenditure, by Quarters, 1947-61, Dominion Bureau of Statistics (Catalogue No. 13-519), Ottawa, (Queen's Printer), 1961, pp. 75-77, Table 19.