Journal of TESON
3(1), 41-61, December, 2022.

A Survey on Existing Measures of Cost-Benefits Analysis in Education

Minraj Paudel[4]

Abstract

Cost-benefit analysis helps the private sector to decide on additional investments in education. It also helps the social sector to make educational plans and policies. This paper aims to review the methods and procedures, current practices, and guiding theories for the study of cost-benefit analysis of education. This study is based on the review survey design, and the materials have been collected using the purposive sampling method. It is concluded in the study that to study the cost-benefit analysis of education, researchers have used only five sources of data; households, employees, employers, students and educational institutions. Furthermore, to estimate the rate of return to education, Ingredient Approach, Mincerian Log Earnings Function, Ordinary Least Square, Multiple Regression and Age-earning Profiles (before-tax, after-tax, adjusted and unadjusted profiles) have been used. Likewise, it is also found that the value of BCR, NPV, IRR, adjusted R2, Mean, and Standard Deviation should be used; and human capital theory as a guiding theory should also be used to analyze the cost-benefit analysis of education.

Keywords: Educational-costs, educational-benefits, age-earnings-profile, rate of returns, survey-design

Introduction

Cost-Benefit Analysis (CBA) is a systematic process for identifying and assessing all costs and benefits of a policy, project, or program in monetary terms (Boardman et al., 2018). It is also used to analyze the costs and benefits of educational programmes. This analysis focuses on the cost structure of education and the corresponding earnings pattern. It provides a tool for decision-making in the provision of educational facilities to individuals and society (Debi, 1982).

[4] Mr Paudel is a Lecturer at Central Department of Education, University Campus, Tribhuvan University, Kathmandu, Nepal. Email: minrajpaudel19@gmail.com.

Education costs are often loosely equated with 'expenditure on education (Woodhall, 1992). It refers to the amount of money spent to acquire or impart education. Education costs can be explained in terms of private and social costs, which are further sub-divided into direct and indirect private and social costs. Private costs include books, stationery, fees, hostel, uniforms, transportation, and others incurred by the pupils or their parents (Majumdar, 1984). They are called direct private costs, and earning foregone is the indirect private costs, and social costs which represents the expenditure on staffs' salary, books, furniture, and others are called the direct social costs, and earnings foregone is known as indirect social costs of education (Babalola, 1995; Woodhall, 1992). Cost analysis in education provides a valuable guide to education planners on the actual cost involved in producing a graduate at any level of education. It indeed gives an insight into the pattern of educational expenditures (Khandagale & Pandya, 2014).

Benefits mean returns measured in terms of money, and they are also classified as private and social benefits. Private benefits of education are the form of additional income obtained during the person's life who invested in education (Moroșan & Sava, 2010). These benefits can be measured in different ways. Firstly, people are more likely to participate in the labour market; secondly, individuals are likely to experience less unemployment and, thirdly, higher educated workers can earn, on average, higher wages than those with lower skills (Europian Commission, 2005). Education provides material monetary benefits like current income, future income and lifetime income, and material non-monetary benefits like career prospects, job security, and job adequacy. Likewise, education provides non-material benefits like sound health, quality of life, social and cultural participation, personal well-being, age, life expectancy, chances of marriage, and honorary activity (Heise & Meyer, 2004). The personal economic benefits of education refer to monetary benefits accrued by individuals due to participating in education (Institute for Higher Education Policy, 1998; Leslie & Brinkman, 1988). Societies with high education completion rates have lower crime, better overall health, and civic involvement (University of the People, 2021).

Quantitatively, a 1 percent increase in enrollment causes 1 to 3 percent increases in per-capita GDP growth, and a one-year increase in average years of education of the population contributes to a 3 to 6 percent increase in per-capita output (Guo et al., 2019). On average, individuals add one year of schooling for every 8.3 years of increased life expectancy at birth, and lifetime earnings increased by 1.7 percent per year of added life expectancy at birth (Houqe at al., 2020). Therefore, it is necessary to analyze the CBA in Nepal. Furthermore, it is necessary to analyze the CBA to calculate the rate of return to education. It gives us more critical information like relative profitable sector and type/level of education for further investment, and the profitability of education at different points in time (Woodhall, 2004). Therefore, the rate of return can be used to provide direction signals for investment policy and to rank alternative allocations of resources in terms of relative profitability (Blaug, 1972).

To the best of my knowledge, there is a lack of sufficient materials in the markets and Nepal's physical libraries also. It means the available newest textbooks, research-based articles, reports, working papers, and other learning materials are in small quantity and thus not adequate. This deficiency may create some obstacles for new learners in the field. To solve the problem of lacking the text materials, it would be better to collect some text materials and systematically present these in such a situation. In this situation, some curiosities raised here that what are the measures of CBA, how to calculate the size of costs and benefits, how to construct age-earnings profiles of educated employed, how to separate effects of education in earnings of an individual, and what are the methods to estimate the private and social rate of return to education,? Based on these research questions, the objectives for this research are fixed as to collect the calculating methods and current practices to calculate costs, benefits, age-earnings profiles, effects of education on earnings, and rate of returns to education; and to find the guiding theories. This research is limited within the boundary of a thematically theoretical literature review related to CBA concepts and methods for calculating CBA. Nevertheless, this survey of literature and presentation of the concepts in thematic form provides the existing measures of CBA of education, which will help the new researchers in the area to understand the evolving concerns and methods in calculating CBA.

Methods

The survey research design has been used in this study, which helps to develop long-range planning for further study (Gothberg, 1990). It is a systematic collection of data concerning a system, and its primary purpose is to collect, organize and disseminate the information (Singh, 1998). In reviewing the literature, the researcher selects, reads and writes the related text and submits it to the supervisor, and then he concise and lucid the text (Mcmenamin, 2006). All these processes and norms have been followed in this research. Essential text materials were collected using the purposive sampling technique. Reliable and authentic reference books, research-based articles, research-based papers, and PhD dissertations were used as literature from e-library and physical library, and grey literature was not comprised. HINARY, JSTOR, ProQuest, Academia and World Bank's library were mainly accessed as the databases and e-libraries. Likewise, others databases and e-libraries were also accessed, such as ACADEMIA, NDLI, ResearchGate, ELSEVIER, and Google scholars and search engines. Significant five key search terms like "cost of education", 'benefit of education', 'age-earnings profile', 'rate of return to education and 'CBA of education' were used in order to search the text. The searching process was as "content I can access" in access type, "articles, books and research reports" in academic contents, "no boundary" in publication date, "economics" in a subject area, and "relevance" in short by, in order to search the text. The required materials were selected based on three criteria, firstly quantitative analysis of costs and benefits. Secondly, calculation of the rate of returns to education, and thirdly, mention CBA methods and education procedures. Based on these selection criteria, 559 were collected, and in the end, only 77 were reviewed because those were entirely within the selection criteria. The date and time were not limited to the search because the objective of this study is to review the theoretical literature, not empirical, so all the new and old materials are of equal importance for this study.

Results

In this study, 59 publications have been reviewed, and among them, there are 15 reference books, 21 research articles, 21 research reports, and 2 PhD dissertations. The authors' surname and publication date of reviewed materials are presented in Annex I. The results of study are presented under the sub-headings as follow.

Costs of education. Costs of education provide a helpful guide to education planners on the actual costs involved in producing a graduate at any level of education. It indeed gives an insight into the pattern of educational expenditures (Khandagale & Pandya, 2014), and it can also be expressed as the amount of money spent on teachers' labour, school buildings and equipment, or other goods and services with alternative uses to acquire education. Lewin and McEwan (2001) have categorized as an input of education, but, Majumdar (1984) classified it into direct and indirect costs. Tilak (1985) defines direct costs as monetary value of inputs. Asep, Tjutju, and Sumarto (2016) have mentioned the computation formula as:

Direct costs = Direct private costs + direct public costs. …….... (1)

Tilak (1985) has mentioned the regression equations (simple and multiple) to measure the unit costs of education, and this equation is:

$$U_c = a + bX_i + e_i \text{ …….. (2)}$$

Where, U_c is the unit costs of education, X_i are the explanatory variables and e_i is the error term. In practice, linear as well as non-linear forms are used. Likewise, Psacharopoulos and Woodhall (1995) have suggested the following methods to calculate it.

$$\bar{X} = \frac{X_1 + X_2 + \ldots + X_n}{N} \text{ …….. (3)}$$

Indirect education costs are defined as opportunity costs or earnings foregone is the potential gain from the best alternative forgone (Sartori et al., 2014). It indicates the non-

monetary transactions, often opportunity cost (Tilak, 1985). These are embodied in the earnings forgone of the pupils are all persons of working age, but forgone earnings are also an education cost affecting the nation's total productivity. These costs are of lost profit in lost opportunities and sacrificed by students while studying (Asep et al., 2016).

The depreciation value of capital assets should be reduced to get direct costs. Therefore, the Government of Nepal uses the Diminishing Balance Method (MoLJPA, 2019) which is presented as:

$$Depreciation = Cost\ of\ Assets \times \frac{Rate\ of\ Depreciation}{100} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Likewise, the amortization method is helpful to calculate the imputed rent rate (Brigham & Houston, 2019). This method is presented as:

$$Amortized\ value = \sum_{t=1}^{n} \frac{1}{(1+i)^t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

It is equal with that amount which is remaining balance of previous year divided by present value interest factor of an annuity of one per period at 'i' percent for 'n' periods.

Benefits of education

Benefits of education refer to returns to education, and some benefits can be measured in terms of money, and some cannot. For example, Marshall (1890) has said that educational benefits are the present and the future generations. He further said that education provides long-term effects like higher wages, better education, and medical facilities causing lower infant mortality. Likewise, education benefits can also be expressed as private direct and indirect, and social direct and indirect. Direct private benefits are obtained by the differences between the average earnings of higher and lower levels of education. The direct social benefits of education are calculated before the tax amount of an individual by age earning profiles (Moroșan & Sava, 2010). These can be

obtained as:

Private benefits (direct) = *total life time earnings of educated workers – income tax. ……..* ***(6)***

Social benefits (direct) = *total life-time earnings of educated workers before tax. ……..* ***(7)***

Private benefits (indirect) = *social status + national character + personality + satisfaction + family related benefits + employment related benefits, etc. ……* ***(8)***

Social benefits (indirect) = *utilization of voting rights + reduction in theft + given knowledge to the society, etc. ….. … … … …* ***(9)***

Likewise, marginal benefits of education (MBE) is the sum of benefits of lower and upper levels minus benefits of lower level is divided by costs of upper level (O'donoghue, 1999).

Effect of education on earnings. Education affects on earnings of an individual. Likewise, many other factors, such as education-related factors, the socio-economic background of the student/earners, and job-related factors, influence earnings. For example, Thais and Carnoy (1972) have pointed out that earnings tend to differ according to tribes having an equal level of education. Markov Cohort Model, Binary Logistic Regression, Ordinal Logistic Regression, Microsimulation Model, Ordinary Least Square (OLS) and Mincerian Semi-log Earnings Function (MEF) can be used to measure the educational effect on earnings (Klevmarken, 2001; Kopec, Edwards, Manuel, & Rutter, 2012). The Mincerian earnings function is the most popular, which is developed by Jacob A. Mincer in 1974 AD is also known as the Mincerian method, and involves

- The fitting of a function of log-wages (LnW),
- Using year of schooling (S),
- Year of labour market experience (EX) and its square as independent variables.

Mincer (1974) has provided two forms of earnings function: the logarithmic parabola (P) and the Gompertz curve (G), and they are as:

$$(P)\ In\ Es,t = In\ E_0 + r_s s + r_p k_0 t - \frac{r_p k_o}{2T} t^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (10)$$

$$(G)\ In\ Es,t = In\ E_0 + r_s s + \frac{r_p k_o}{\beta}(1 - e^{\beta t}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (11)$$

Where, Es,t is gross annual earnings of a worker with 's' years of schooling and 't' years of work experience; r_s and r_p are rates of return on schooling and post-school investments, respectively; k0 is the investment-income ratio at the start of work experience; β is the annual decline of this ratio, and T is the favorable net investment period. Woodhall (2004) has used this function in the USA in the following form.

$$Ln\ Y = a + bS + cEX + EX^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (12)$$

Where Ln Y is the natural logarithm of income (Y), EX is some years of work experience, S is the number of years of schooling, EX^2 is square of years of work experience, and 'a' is a constant, 'b' and 'c' are regression coefficients. Psacharopoulos and Patrinos (2004) have used the following formula to calculate the private returns.

$$r_p = \frac{\beta_p}{S_p},\ r_s = \frac{\beta_s - \beta_p}{S_s - S_p}\ and\ r_u = \frac{\beta_u - \beta_s}{S_u - S_s} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (13)$$

Where, r_p, r_s and r_u indicate the rate of return to primary, secondary and university level of schooling respectively. Woodhall (2004) has developed the short-cut method is used when no data are available for the complete calculation of earnings function. The method is presented below.

$$r = \frac{[E\ (High) - E\ (Sec)]}{n\ [E\ (Sec) + C]} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (14)$$

Where r represents the rate of return, E (High) and E (Sec) represent the average earnings of university and secondary level graduates, 'n' is the usual length of secondary or higher education, and C is the annual cost of secondary or higher education. For example, Liu et al. (2020) have used the following formula in their research.

Unadjusted experience = age - years of schooling - precise school entry age. … (15)

Adjusted experience = age - years of schooling - precise school entry age - years of employment interruptions …….. (16)

Net present value and internal rate of return. The net present value (NPV) is the difference between the benefits of education and its cost. The internal rate of return (IRR) represents the discount rate that equates to the present value of additional income. Psacharopoulos and Woodhall (1995) have recommended the following formula to estimate the NPV.

$$NPV = \left[\frac{B_1}{(1+i)} + \frac{B_2}{(1+i)^2} + \ldots + \frac{B_n}{(1+i)^n}\right] - \left[\frac{C_1}{(1+i)} + \frac{C_2}{(1+i)^2} + \ldots + \frac{C_n}{(1+i)^n}\right] \ldots. \quad (17)$$

$$Or, NPV = \sum_{t=m}^{n} \frac{(B_t - C_t)}{(1+i)^t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (18)$$

Where, C is education costs during the (t) time period of schooling, B_t is education benefits during the (t) time period of working (m to n), 'm' is starting age of education, 'n' represents the retirement age of workers. Likewise, 'm–n' gives the meaning of working life including schooling years, 'r' shows the IRR, and 'i' is the discount rate.

Cost-benefit analysis

NPV, cost-benefit ratio (CBR) and rate of return (RoR) are best to analyze the CBA (Bhaskaran Nair, 2005). CBA includes systematic cataloguing of impacts as benefits (pros) and costs (cons), valuing the impacts in monetary value, and then determining the net benefits equal incremental benefits minus incremental costs (Boardman et al., 2018). Carnoy, Loyalka, Androushchak, and Proudnikova (2013) have recommended the following model.

$$0 = [\Sigma C_i / (1+r)^i] + [\Sigma B_i / (1+r)^i] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (19)$$

Where, r is discount rate, C is education costs and B is education benefits. According to Psacharopoulos and Woodhall (1995), CBA is discounted sum of costs and benefits can be calculated as:

$$\sum_{t=m}^{n} \frac{C_t}{(1+r)^t} = \sum_{t=m}^{n} \frac{B_t}{(1+r)^t} \quad \ldots\ldots(20)$$

Discussion

Direct personal costs are expenditure on book/stationery, tuition fees, hostel charges, uniforms and transportation costs. These costs are incurred by the students/parents. Similarly, direct public costs are the salaries of teaching and non-teaching staff, expenditure on books for the library, costs of furniture, which the educational institution incurs. These costs can be classified into the current and capital expenditures (Babalola, 1995). The sum of these private and public costs is the direct social cost of education.

Similarly, indirect/opportunity cost refers to earnings foregone, classified into private and social costs. The principle of these costs is related to how to value the input of time by the student into the learning process, commonly valued via income foregone (Blaug, 1967; Bowman, 1966; Hough, 1993; Schultz, 1993). The private and social opportunity costs can be estimated from the after-tax and before-tax age earnings profiles, respectively. In addition, the cost of fixed assets and rental price should be included in the total costs to obtain the actual costs of education. It reduces the recorded cost of a fixed asset until the asset's value becomes zero or negligible. Some methods can calculate the depreciation value of the fixed assets like buildings and the rental value (Anthony, Hawkins, & Merchant, 2011; Peterson, 2002).

To collect and analyze the data of the costs of education, the ingredient approach, finance analysis model (FAM), cost modelling approach (CMA), and resource cost model (RCM) can be used (US Department of Education, 1999, 2003). However, Levin (1975), Levin (1983), and Levin & McEwan (2001) have recommended the ingredient approach

(as cited Parrish & Chambers, 1996). The ingredient approach provides us with the role and functions of a personnel ingredient and provides the workers' skills, education, and experience required to carry out the job (Levin & McEwan, 2002; McEwan, 2012). In 2020 AD, the US Department of Education has prepared a toolkit for the ingredient approach (Institute of Education Sciences, 2020).

A wide range of public and private benefits are believed to emanate from education, and these benefits can be divided into private and public economic benefits and private and public social benefits. The public refers to the social and the private refers to the individual, and likewise the economic refers to the monetary, and social refers non-monetary nature of the benefits (Institute for Higher Education Policy, 1998). It is estimated computing the difference in earnings between upper and lower-level graduates, and upper-level graduates generally gain greater earnings (OECD, 2021). Nevertheless, the indirect benefits of education are not accessible to quantity (Galindo-Rueda & Vignoles, 2005).

Age earnings profile refers to the lifetime earnings of workers is prepared using the data of education level, age, and workers' earnings are required. The lifetime earnings prepare the pre-tax profile, and the Mincerian earnings function prepares the post-tax profile. Age is treated as a proxy for work experience (Woodhall, 2004). While constructing it, the profiles should be constructed regardless of the sex, entering age should be accurately taken, the Government office should fix the retirement age, and profiles should be constructed for both before-tax and after-tax (Debi, 1982). Higher educated earns more than lower educated, and earnings increase with age up to a peak at middle age and then flatten or even decline, up to retirement age. The profiles of highly educated workers are steeper than less educated, and an initial, the peak earnings of an educated worker are higher than the less educated. The age at which earnings reach their peak is later for highly educated than for less-educated workers; in a few cases, the earnings of highly qualified human resources continue to rise until retirement (Psacharopoulos & Woodhall, 1995; Woodhall, 1992).

Education affects earnings. However, socio-economic variables and job-related variables also affect the way and extent the individuals earning. Blaug (1974) has applied this technique in his study of the rate of return in Thailand. He considered six essential variables: age, sex, amount of education, family background, type of schooling, and employment status. He concluded that age, sex, and education are more important than others. Likewise, Bairagya (2020), in his research of India, has used age, educational level, gender, caste, religion, region, business, and social capital-related factors. Guo et al. (2019) in China have included the quality of education, types and levels of education, gender, family background, religion, sector of job, experience. Carnoy et al. (2013), in their research in Brazil, Russia, India, and China, have taken years of schooling and labour market experience. In their study of the UK, Jepsen, Troske, and Coomes (2014), have taken an educational degree, age, race/ethnicity, and sex.

It is seen that almost all researchers in this field use the Mincerian earnings function and OLS. It minimizes the sum of squared vertical distances between the observed responses in the dataset and the responses predicted by the linear approximation (Leng, Zhang, Kleinman, & Zhu, 2007). Mincerian method involves econometrically estimating an earnings function where log earnings are regressed on the study (Stark, 2007).

However, if there is no sufficient data, the alternative way has been recommended is called the 'α' coefficient. Woodhall (2004) has said that the 'α' coefficient can be used to measure the influence of education on earnings as a rough approximation. It shows the proportion of earnings differentials attributed to education alone. The quantity (1- α) shows the proportion of earnings differentials due to factors other than education (Psacharopoulos, 1975). It is taken to be two-thirds, i.e. this is the proportion of the income differences attributed to education (Blaug, 1972). This figure of 0.7 or 0.8 may be more appropriate for developed countries, but relatively little is known regarding an appropriate value for developing countries (Psacharopoulos, 1975, 1981). Denison suggests that for some groups, including university graduates, the figure of 0.66 may be too low, but for secondary school leavers in the UK, the alpha-coefficient may well be less than 0.66. It would indeed be surprising if the exact figure applied to all groups of people in all societies (as cited Hough, 1993).

The classical investment theory suggests that the NPV and the IRR establish the cost-benefit of education. If this rate of return is higher than the market interest rate at which the individual can borrow, education represents a worthwhile investment for the individual. Conversely, if the private IRR is below the applicable interest rate, we can quantify an "unobservable" return component that would be necessary to make education a worthwhile investment (Wahrenburg & Weldi, 2007).

Returns to education may be both economic and non-economic, and it may be private and social (Barr, 1998). The rate of return or internal rate expresses revenues as a percentage of investment. A high private return constitutes a strong incentive for individuals to invest in (further) education beyond compulsory schooling (OECD, 2017). The private rate of return measures the relationship between after-tax earnings differentials and those costs (Woodhall, 1992). Likewise, it compares individual students' costs and benefits of education and is calculated by finding the rate of discount (r) that equalizes the stream of discounted benefits to the stream of costs at a given point in time. Therefore, it is used to explain the behaviour of individuals seeking different levels and types of education (Psacharopoulos & Patrions, 2004). The social rate of return measures the relationship between the before-tax lifetime earnings differential associated with a particular type of education and the total social cost of that education measured in terms of its opportunity cost (Woodhall, 1992).

The human capital theory is a guiding theory is pioneered by Gary S. Becker in the 1960s, explaining the decision to invest in human capital (such as education) that is rewarded with higher future earnings (Fitzsimons, 2017). The formal concept of human capital was developed in the 1960s by a group of economists, and they were Becker, 1960; Schultz, 1962; Mincer, 1966 (Alcantar, 2006). According to T.O. Davenport, human capital covers the four main factors: ability, behaviours, efforts, and time (as cited Haq, 2016), but M. Lynn proposed that human capital includes the skills and abilities possessed by the employees within an organization (as cited Simona Potelienė & Tamašauskienė, 2016).

Limitations

This study has some limitations. Literature has shown that the lack of data, the lengthy calculation process, and the need to cover many aspects of education make analyzing the CBA of education very challenging. However, this study aims to analyze the existing literature concerning measures of CBA of education. In this study, only thematic analysis of literature review based on survey method is presented. Only 77 research-based educational materials have been analyzed to accomplish the study. Only five significant sources like HINARY, JSTOR, ProQuest, Academia, and World Bank's library have been used, and likewise, open sources have also been used. The analysis of empirical, policy and methodological review have not been presented. Likewise, multicollinearity problems, the process of the multiple regression, computer programs using techniques, data shaping techniques, shadow pricing, upward and downward bias, and dependent and independent variables have not been analyzed. However, considering the nature of the study concern this paper did not take into account the time boundary while selecting the reviewed educational materials.

Conclusion

CBA has two objectives. The first is to determine whether the education benefits exceed the costs and, if exceeded, by how much. The second is to compare different natures, types, and levels of education and justify investments in them. The ingredient approach can analyze the costs of education and earnings differential measures the benefits of education making the age-earning profiles of educated employees. The factors affecting earnings can be summarized into education, socio-economic, and family-related. Different scholars have used the different factors in their research. The major causes of it are the availability of data and the nature of the study.

The effect of education on earnings is separated by multiple regression analysis. Calculating the NPV and IRR is necessary to find out the RoR to education. There are three methods to calculate the CBA of education: costs-benefits ratios, NPV and IRR. The

guiding theory is the human capital theory. Finally, readers of this text are new pupils and researchers of related fields, so it can be said that this study somewhat fulfills their needs, but not entirely. Therefore, further studies are needed in the field.

Finally, some research gaps have been found, and they are as like: first is that human capital theory does not provide the knowledge on the gains to various professionals, such as doctors, lawyers, engineers, scientists, and others. The second is that all types of individual studies like thesis, dissertations, and articles on title 'costs-benefits analysis of education' have omitted the indirect social benefits of education which requires to be explored by further research. The third is that no cost-benefits studies of education have been attempted in Nepal until now. So that, this paper can help the researchers and practitioners to get familiar with the existing literature.

References

Alcantar, J. M. C. (2006). *Human capital formation: The role of science and technology policy (A case study in the Mexican biotechnology sector).* (PhD Dissertation), University of Manchester, England. Retrieved from https://www.academia.edu/3786189

Anthony, R. N., Hawkins, D. F., & Merchant, K. A. (2011). *Accounting: Text and cases* (12th ed.). New Delhi: Tara McGrow hill education pvt. ltd.

Asep, K., Tjutju, Y., & Sumarto, S. (2016). *Unit cost analysis in higher education* (6th international conference on educational, management, administration and leadership, report no. 2352-5428). Retrieved from https://doi.org/10.2991/icemal-16.2016.1

Babalola, J. (1995). *Educational costs and financial analysis*. In (pp. 136). Retrieved from https://www.academia.edu/22993339

Bairagya, I. (2020). *Returns to education in self-employment in India: A comparison across different selection models* (United Nations University-WIDER working paper 2020/5). Retrieved from https://doi.org/10.35188/UNU-WIDER/2020/762.

Barr, H. (1998). Citizenship education without a textbook. *Children's Social and Economics Education*, *3*(1), 28-35. doi:10.2304/csee.1998.3.1.28

Bhaskaran Nair, P. V. (2005). *Return on higher education of women in India*. Retrieved from https://books.google.com.np/books?id=vhQvoVcPimIC&pg=PA22&lpg.

Blaug, M. (1967). Approaches to educational planning. *The Economic Journal, 77*(306), 262-287. Retrieved from https://doi.org/10.2307/2229304.

Blaug, M. (1972). *Economics of education* (Vol. 1). Penguin: The English Language Book Society and Penguin Books.

Blaug, M. (1974). An Economic Analysis of Personal Earnings in Thailand. *Economic Development and Cultural Change, 23*(1), 1-31. Retrieved from http://www.jstor.org/ stable/1153141

Boardman, A. E., Greenberg, D. H., Vining, A. R., & Weimer, D. L. (2018). *Cost–benefit analysis: Concepts and practice* (5th ed.). Cambridge University Press.

Bowman, N. J. (1966). The costing of human resource development. In E. A. G. Robinson & J. Vaizey (Eds.), *Economics of Education* (pp. 421-450). London: Ivacmillan.

Brigham, E. F., & Houston, J. F. (2019). *Fundamentals of Financial Management*. In. Retrieved from https://www.academia.edu/42150671

Carnoy, M., Loyalka, P., Androushchak, G. V., & Proudnikova, A. (2013). *The economic returns to higher education in the BRIC countries and their implications for higher education expansion* (Higher School of Economics Research Paper No. WP BRP 02/EDU/2012). Retrieved from https://ssrn.com/abstract=2005696

Debi, S. (1982). *Cost-benefit analysis of higher education: A case study of Orissa.* (PhD Dissertation), Department of Analytical and Applied Economics, Utkal University, India., India. Retrieved from https://shodhganga.inflibnet.ac.in/handle/10603/118359

Europian Commission. (2005). *The returns to various types of investment in education and training (Research report of London economics to the European Commission, DG EAC)*. Retrieved from https://londoneconomics.co.uk/wp-content/uploads/2011/09/82

Fitzsimons, P. (2017). Human capital theory and education. In M. A. Peters (Ed.), Encyclopedia of Educational Philosophy and Theory (pp. 1050-1053). Singapore: Springer Singapore. doi:10.1007/978-981-287-588-4_331

Galindo-Rueda, F., & Vignoles, A. (2005). The declining relative importance of ability in predicting educational attainment. *Journal of Human Resources, 40*(2), 335-353. doi:10.3368/jhr.XL.2.335

Gothberg, H. M. (1990). The library survey: A research methodology rediscovered. *College & Research Libraries*. Retrieved from https://core.ac.uk/download/pdf/10207641.pdf.

Guo, L., Huang, J., & Zhang, Y. (2019). Education development in China: Education return, quality, and equity. *Sustainable Education and Approaches, 11*(13), 37-50. doi:10.3390/su11133750

Haq, M. (2016). Human capital resources: a review and direction for future research. *International Journal of Management Development, 4*(1), 261-268. Doi: 10.1504/IJMD.2016.10004241

Heise, M., & Meyer, W. (2004). *Evaluation and impact of education and training: The value of learning* (Third report on vocational training research in Europe). Luxembourg: Office for Official Publications of the European Communities. Retrieved from https://www.cedefop.europa.eu/files/BgR3_Heise.pdf

Hoque, M. M., King, E. M., Montenegro, C. E., & Orazem, P. F. (2020). *Life expectancy at birth and lifetime education and earnings* (World Bank's policy research working paper 9418). Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/34556/ Life-Expectancy-at-Birth-and-Lifetime-Education-and-Earnings.pdf?sequence=.

Hough, J. R. (1993). *Educational cost-benefit analysis (education research paper no. 02)*. Retrieved from London: https://www.ueh.edu.vn/userfiles/file/edcostanedpaper02.pdf

Institute for Higher Education Policy. (1998). *Reaping the benefits: Defining the public and private value of going to college*. Washington, DC: Institute for Higher Education Policy Retrieved from https://files.eric.ed.gov/fulltext/ED420256.pdf

Institute of Education Sciences. (2020). *Cost Analysis: A Toolkit*. (IES 2020-001). Washington, DC: U.S. Department of Education, Institute of Education Sciences. Retrieved from https://ies.ed.gov/seer/pdf/IES_Cost_Analysis_Starter_Kit_V1.pdf

Jepsen, C., Troske, K., & Coomes, P. (2014). The labor-market returns to community college degrees, diplomas, and certificates. *Journal of Labor Economics, 32*(1), 95-121. doi:10.1086/671809

Khandagale, V. S., & Pandya, S. R. (2014). Private cost of education and academic achievement of students: An analysis by school types. *IOSR Journal of Humanities and Social Science, 19*(2), 39-43. doi:10.9790/0837-19223943

Klevmarken, N. A. (2001). *Micro simulation: A tool for economic analysis* (Uppsala University, department of economics, working paper, no. 2001:13). Retrieved from https://www.econstor.eu/bitstream/10419/82890/1/wp2001-013.pdf.

Kopec, J. A., Edwards, K., Manuel, D. G., & Rutter, C. M. (2012). Advances in microsimulation modeling of population health determinants, diseases, and

outcomes. *Epidemiology Research International, 2012*, 584739. Retrieved from https://doi.org/10.1155/2012/584739.

Leng, L., Zhang, T., Kleinman, L., & Zhu, W. (2007). Ordinary least square regression, orthogonal regression, geometric mean regression and their applications in aerosol science. *Journal of Physics: Conference Series, 78*(1), 1-6. Retrieved from https://iopscience.iop.org/article/10.1088/1742-6596/78/1/012084/pdf.

Leslie, L. L., & Brinkman, P. T. (1988). *The economic value of higher education*. Washington, DC: American Council on Education. Retrieved from https://eric.ed.gov/?id=ED296624

Levin, H. M., & McEwan, P. J. (2002). *Cost-effectiveness and educational policy*. In. Retrieved from https://www.researchgate.net/publication/249795327

Lewin, H. M., & McEwan, P. J. (2001). *Cost-effectiveness Analysis: Method and Applications*. Retrieved from https://www.researchgate.net/publication/44829649

Liu, C., Li, Y., Li, S., Luo, R., Zhang, L., Rozelle, S., . . . Hou, J. (2020). The returns to education in rural China: Some new estimates. *Australian Journal of Agricultural and Resource Economics, 64*(1), 189-208. doi:https://doi.org/10.1111/1467-8489.12350

Majumdar, T. (1984). Investment in education and social choice. *Journal of Policy Analysis and Management, 3*(3), 467-489. doi:10.1002/pam.4050030321

Marshall, A. (1890). *Principles of economics*. Retrieved from http://www.library.fa.ru/files /marshall-principles.pdf

McEwan, P. J. (2012). Cost-effectiveness analysis of education and health interventions in developing countries. *Journal of Development Effectiveness, 4*(2), 189–213. doi:10.1080/19439342.2011.649044

Mcmenamin, L. (2006). Process and text: Teaching students to review the literature. *Political Science and Politics, 39*(1), 133-135. doi:10.1017/S1049096506060306.

Mincer, J. (1974). Education, experience, and the distribution of earnings and employment: An overview. In F. T. Juster (Ed.), Education, Income, and Human Behavior (Vol. 1, pp. 71-94). New York: National Bureau of Economic Research. Retrieved from http://www.nber.org/chapters/c3693.

MoLJPA. (2019). *Income tax act – 2058*. Kathmandu: Ministry of Law, Justice and Parliamentary Affairs, The Government of Nepal. Retrieved from http://www.untag-smd.ac.id/files/ Perpustakaan _Digital

Moroșan, A., & Sava, R. (2010). The costs and benefits of education: A brief review. *Studies in Business and Economics, 5*(3), 286-293. Retrieved from: https://www.researchgate.net/ publication/227377443

O'donoghue, C. (1999). Estimating the rate of return to education using microsimulation. *The Economic and Social Review, 30*(3), 249-365. Retrieved from https://core.ac.uk/download/pdf/7045397.pdf.

OECD. (2017). *Education at a Glance 2017: OECD indicators*. Paris: The Organization for Economic Co-operation and Development (OECD). Retrieved from https://www.oecd-ilibrary.org/education/education-at-a-glance-2017

OECD. (2021). The economic benefits of education. Retrieved from https://www.oecd.org/berlin/42244848.pdf

Parrish, T. B., & Chambers, J. G. (1996). Financing special education. *The Future of Children, 6*(1), 121-138.

Peterson, R. H. (2002). *Accounting for fixed assets* (2nd ed.). New York: John Wiley & Sons, Inc.

Potelienė, S., & Tamašauskienė, Z. (2014). The rate of return to investment in education: A case study of Lithuania. *Wroclaw Review of Law, Administration & Economics, 4*(2), 41-55. doi:10.1515/wrlae-2015-0014

Potelienė, S., & Tamašauskienė, Z. (2016). The rate of return to investment in education: A case study of Lithuania. *Wroclaw Review of Law, Administration & Economics, 4*(2), 41-55. doi:10.1515/wrlae-2015-0014

Psacharopoulos, G. (1975). *Earnings and Education in OECD Countries*. In. Retrieved from https://files.eric.ed.gov/fulltext/ED121959.pdf

Psacharopoulos, G. (1981). Returns to education: an updated international comparison. *Comparative Education, 17*(3), 321-341. doi:10.2307/3098688

Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to investment in education: A further update. *Economics Education, 12*(2), 111-134. doi:10.1016/B978-0-08-044894-7.01216-1

Psacharopoulos, G., & Patrions, H. A. (2004). Human capital and rates of return. In G. Johnes & J. Johnes (Eds.), *International Handbook on the Economics of Education* (pp. 1-57). Edward Elgar publishing Ltd.

Psacharopoulos, G., & Woodhall, M. (1995). *Education for development: An analysis of investment choices*. Washington DC: World Bank, printed by Oxford University press.

Sartori, D., Catalano, G., Genco, M., Pancotti, C., Sirtori, E., Vignetti, S., & DelBo, C. (2014). *Guide to cost-benefit analysis of investment projects economic appraisal tool for cohesion policy 2014-2020*. Luxembourg: European Union, European Commission. Retrieved from https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

Schultz, T. W. (1993). The economic importance of human capital in modernization. *Education Economics, 13*(1), 13-19. doi:https://doi.org/10.1080/09645299300000003

Singh, R. (1998). Research methods in library and information science. *University News.* Retrieved from https://www.researchgate.net/publication/310673993_Research_Methods_in_Library_and_Information_Science.

Stark, A. (2007). *Which fields pay, which fields don't? An examination of the returns to university education in Canada by detailed field of study* (Canadian Economic Studies and Policy Analysis Division's working paper no. 2007-03). Retrieved from https://pdf4pro.com/ vendor/pdfjs-1.9.426

Thais, H. H., & Carnoy, M. (1972). *Cost - benefit analysis in education: A case study of Kenya* (World Bank staff occasional papers no. OCP 14). Retrieved from http://documents.worldbank.org/curated/en/843651468272356949

Tilak, J. B. G. (1985). *Analysis of costs of education in India (occasional paper 10).* Retrieved from https://www.researchgate.net/publication/234680086_Analysis_of_Costs_of_Education_in_India_Occasional_Paper_10

University of the People. (2021). Benefits of education are societal and personal. Retrieved from https://www.uopeople.edu/blog/benefits-of-education-are-societal-and-personal/

US Department of Education. (1999). *Measuring resources in education: From accounting to the resource cost model approach*. (Working Paper No. 1999-16, by Jay G. Chambers). Washington, DC: US Department of Education, Office of Educational Research and Improvement Retrieved from https://nces.ed.gov/pubs99/199916.pdf

US Department of Education. (2003). *The purpose and design of the special education expenditure project*. (Paper No. 2003-00). Washington, DC: United States Department of Education, Office of Special Education Programs Retrieved from https://www.air.org/sites/default /files/Purpose-Design-of-SEEP.pdf

Wahrenburg, M., & Weldi, M. (2007). *Return on investment in higher education: Evidence for different subjects, degrees and gender in Germany* (Goethe University Frankfurt Discussion paper). Retrieved from https://www.researchgate.net/publication/228434878

Woodhall, M. (1992). *Cost-benefit analysis in educational planning*. In 3rd (Ed.). Retrieved from

https://www.saide.org.za/resources/Library/Woodhall,%20M%20-%20Cost%20Benefit% 20analysis%20in%20educational%20planning.pdf

Woodhall, M. (2004). *Cost-benefit Analysis in Educational Planning* (4th ed.). Paris: International Institute for Educational Planning (IIEP), UNESCO.

Annex I. Summary of reviewed publications.

Cost of education		
Reference books: Bowman (1966); Babalola (1995); Peterson (2002); Anthony (2011); Birgham & Houston (2019)	**Research articles:** Parrish & Chambers (1996) Majumdar (1984)	**Research Reports:** Tilak (1985); USDE (1999 & 2003); Asep (2016); OECD (2017); IES (2020)
Benefit of education		
Reference books: Marshall (1890); Blaug (1972);	**Research articles:** Blaug (1974); Schultz (1993); Barr (1998)	**Research Reports:** IHEP (1998); Galindo-Rueda & Vignoles (2005); OECD (2021)
Age-earnings profile		
Reference Books: Psacharopoulos (1975); MOLJPA (2019)	**Research articles:** Blaug (1967); Psacharopoulos & Patrinos (2004)	
Rate of returns to education		
Reference books: Psacharopoulos & Woodhall (1995)	**Research articles:** Mincer (1974); Psacharopoulos (1981); O'donoghue (1999); Leng, Zhang, Kleinman, & Zhu (2007); Stark (2007); Jepsen, Troske & Coomes (2014); Montenegro & Patrinos (2014); Potelienė & Tamašauskienė (2016); Guo, Huang & Zhang (2019); Liu (2020)	**Research Reports:** Klevmarken (2001); Bhaskaran (2005); Europian Commission. (2005) Wahrenburg & Weldi (2007); Kopec, Edwards, Manuel, & Rutter, (2012); Carnoy (2013); Bairagya (2020)
CBA of education		
Reference books: Woodhall (1992); Psacharopoulos & Patrions (2004); Woodhall (2004); Fitzsimons (2017); Boardman (2018);	**Research articles:** Lewin & McEwan (2001); Moroșan & Sava (2010); McEwan (2012) Haq (2016);	**Research Reports:** Thais & Carnoy; (1972); Gothberg (1990); Hough (1993); Levin & McEwan (2002); Sartori (2014) **PhD Dissertation:** Debi (1982); Alcantar (2006)
Total 59 (reference books = 15, research articles = 21, research reports = 21, & PhD dissertations = 2).		

Source: Author's collection (2021).