

## Private Return on Higher Education in Pakistan

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### Abstract

*Since the development of human capital theory, education has been established, by various empirical researches, a key element in raising the economic well-being of an individual and a nation alike. However, demand for education in general and demand for higher education in particular has not picked up, so far, in many developing countries including Pakistan. A probable reason for this paradox could be the discrepancy in social and private rates of return on higher education. Therefore, this research estimates private rate of return for four successive degrees of higher education. This study considers education by degree and estimates private rate of return for each degree rather than social one. Private return on higher education has been estimated by two criteria; NPV and IRR, considering explicit as well as implicit costs and life long earnings. Results show that private rate of return is lowest for PhD degree by IRR criterion and for professional bachelor degree by NPV criterion, so, to boost demand for the highest degree of education, private rate of return must increase that can be achieved effectively either by raising pay scale or by increasing retirement age for PhD degree holders or by giving interest-free scholarships to PhD scholars.*

### I. Introduction

Until 1960s, accumulation of physical capital had been considered as the main factor of economic growth. Since capital accumulation, in turn, depends on savings of individuals and institutions, therefore primary focus in that period was on saving. This view has however changed after the development of endogenous growth theory in general and human capital

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theory in particular. Currently development of human capital is attached top priority to achieve sustainable economic growth. An individual or a nation that continuously strengthens its human capital can enjoy a higher standard of living for an extended period. Whereas a nation that ignores development of its human capital fails to achieve technical progress.

Human capital refers to enrichment of any latent ability of a person that adds to his/her productive efficiency. It simply means that human capital is not exogenously given; rather it can be generated by conscious effort of individuals and by a well-planned policy of government. Human capital is developed by improved nutrition, better healthcare, extra schooling, higher education, on-the-job training, involvement in productive research and other similar activities. To quantify the importance of each factor contributing towards human capital is a gigantic task. Therefore, to keep it manageable, this research will focus only on higher education

Higher education promotes economic growth in three different ways. First, to establish institutions of higher education, funds are activated to build, equip and furnish these institutions; to remunerate services of their staff and professors; and to pay for expenses of their students. Such activated funds are not turned over just once; rather they add to economic activity in the economy many fold through multiplier effect.

Second, higher education leads to additional earnings of successful graduates throughout their remaining life. Moreover, an increase in educated populace of a country enhances its welfare in many different ways. For example; decrease in the crime rate, improvement in the social, political and ecological environment of the society, development of communication skills, and strengthening of cultural and commercial relations with other nations.

Third, institutions of higher education incubate further research and experimentation which are necessary for technological progress. Off and on inventions and innovations may be conceivable in a country with low levels of education but a sustained growth in technology cannot be managed absence of institutions of higher learning. A qualified worker not only handles existing equipment and machines with more care but also thinks of improvement in their functioning and design.

In spite of long-standing evidence in support of higher education, so far, many developing countries have paid little attention towards higher education. Consequently, these countries lack in basic infrastructure for

growth and development and show poor indicators of human development. Unfortunately, Pakistan also falls in the category of those countries which have lowest human development index (HDI). Pakistan's HDI is 0.539 that is lower than that of India, Sri Lanka and many other developing countries. Pakistan stands at 135<sup>th</sup> position in the ranking of HDI compiled by United Nations Organization<sup>2</sup>.

To promote higher education in the country, Government of Pakistan government established Higher Education Commission (HEC) in 2000. HEC started, on one hand, awarding scholarships to seekers of higher degrees of education and on the other hand, increased funding to degree-awarding universities. Such efforts of HEC are though extremely laudable, yet they may not bring desirable results unless clubbed with a befitting reward system for those who successfully complete their degrees. The reason is that in hope of getting more funding from HEC, many universities might- admit all those who apply for admission without really testing their caliber and commitment to complete their degrees. Similarly, many bachelor degree holders, in charm of getting scholarships and stipends, might proceed for higher studies without showing real urge to complete their degrees. It means that current policy will definitely increase enrollment in higher studies but will not guarantee any increase in pass out ratio.

As in case of any other service like tailoring, hair-cutting and welding, it is the private rate of return to that service that truly represents its demand. As a principle, the higher is private rate of return to a service, the more willing should be a common person to learn it to its highest possible level. The same must be true in case of higher education. It can therefore be hypothesized that low demand for higher education in the country may be due to unattractive salary structure for graduates of higher education.

It is true that some people obtain higher education simply for the sake of social prestige that it confers. For example, in Pakistan, a bachelor degree is obligatory to become a member of legislative body or to head a national-level institution. However, in this research it is assumed that financial reward for a degree of higher education remains the main driving force for its pursuit. It means that a young man looks at relative rates of return of consecutive degrees of higher education to decide where to stop his/her education and enter the labor market.

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<sup>2</sup> Human Development Index (HDI) 2007, UN, Washington D.C.

In many previous studies, though the return on education has been estimated, yet their focus has been either too broad or too narrow. Some studies have compared rate of return on primary, secondary and higher education while others have estimated rate of return for a single year of schooling. Furthermore, some studies have estimated only social rate of return on education that duly highlights the importance of education in a society but does not reflect its demand. Therefore, the main objective of this study is to estimate private rate of return of four degrees of higher education; professional bachelor, master, M Phil and PhD. Particularly this research has the objectives to; estimate private NPV and IRR for professional bachelor, master, M Phil and PhD degrees, at first, on the basis of simplified assumptions, repeat the same exercise on the basis of relaxed assumptions and recommend various policies to boost the higher education.

The remaining portion of the study is organized as follows. Section II reviews the existing literature and empirical findings on the subject. Section III explains methodology, mentions data sources and discusses estimation methods. Section IV contains numerical results of this research and offers a thorough discussion of these results. Section V provides a summary of the study and lists few policy implications.

## **II. Literature Review**

For a long time, economic growth had been considered a fruit of capital accumulation and of exogenous technological progress. Later on, development of endogenous growth theory cast doubts about this view. One of the proponents of endogenous growth theory, Romer (1987) argued that differences in exogenous factors cannot fully explain different rates of economic growth experienced in various countries of the world. Indeed, there are certain endogenous factors which are useful to explain observed differences in growth rate of various countries. Among these factors, investment in human capital is the most important one. Improvement of knowledge and skills of individual workers enhances their productivity that results in sustained economic growth in the country.

Becker (1964) takes expenditures on education as an investment. It means that while deciding for admission in a higher degree of education, a person looks at the rate of return for that degree. If it is attractive, he/she gets admission in the degree program; otherwise he/she enters the labor market. That is why Becker (1974) interprets private return on educational investment as the demand for education.

Psacharopoulos (1985) analyzing the data of 60 countries explains that productivity benefits are attributed to education for two reasons. One is that productivity of the same physical capital when operated by a higher degree holder increases because he/she operates it more skillfully. The other is that he/she thinks of new ideas and innovative methods of operating it.

Education is widely accepted as the most important form of investment in human capital. For example, Luis and Romer (1991) noted that the success of South Korea and Taiwan and failure of Thailand in developing their economies in 1960s and 1970s may be attributed to differences in their levels of education. Realizing this lacuna, later on Thailand has been paying due attention towards its educational development. As a result, by the end of 1990s educational achievement of Thailand were comparable with those of other nations. Thus, Thailand emerged as the fifth largest economy in the cadre of newly industrialized countries of the region.

Psacharopoulos and Patrinos (2002 and 2004) reviewed studies of 98 countries conducted from 1960 to 1997 and concluded that higher education gives less return than that on primary and secondary schooling. All these studies focus only on financial benefits that accrue to individuals and tax revenues that go to government exchequer. In their analysis, they did not consider social benefits of education and positive impacts of research and development on technological innovations and inventions.

Lin (2004) is of the view that higher education plays a strong role in the economic growth of a country. According to his estimates, a one percent rise in higher education stock leads to a 0.35 percent rise in industrial output, and a one percent increase in the number of engineering or natural sciences graduates leads to a 0.15 percent increase in agricultural output. The author also concluded that graduates of natural and engineering sciences had the largest positive contribution in national output.

By using labor force survey data for Germany, Mark *et al.* (2004) calculated rates of return for higher education by subject and by gender. Their analysis shows that Medicine, Law, Economic and Social Studies yield highest private return followed by Mathematics, Engineering and Natural Sciences. They discovered that Language and Cultural Studies are quite unattractive among youth of the society because their rate of return is the lowest that is even less than that on government bonds.

In case of Pakistan, Guisinger et al. (1984) has studied return on education using Mincerian function and data for males only. They found a low rate of return for primary and lower secondary schooling and a high rate of return for higher levels of education in Pakistan. Haque (1977), Hamdani (1977), Khan and Iran (1985), Shabbir (1991), Nasir (1998) and Asadullah (2005) all have similar findings that return on education in Pakistan increases with the level of education and, on the average, return on education in Pakistan is less than that in other developing countries.

Monazza (2007) has found large differences in labor market earnings between males and females in Pakistan. She has concluded that return on an additional year of schooling ranges between 7 to 11 percent for men and between 13 to 18 percent for women. She has also discovered that in the labor market overall reward for men is much higher than that for woman. However, the increase in rate of return on higher levels of education is much higher for women.

As can be seen from all these studies whether conducted in context of a foreign country or in context of Pakistan, they have categorized education either too broadly like primary, secondary and higher or too narrowly like a year of schooling or education without mentioning any degree as pioneered by Mincer (1974). Whereas the right categorization, in our view, is education by degree like primary, middle or lower secondary, secondary, intermediate or higher secondary and bachelor degree at the lower level of education and professional bachelor, master, MPhil and PhD at the higher level of education. This study aims to fill up this gap as it concentrates on private rate of return for various degrees of higher education.

### **III. Methodology and Data Sources**

Computation of educational costs and benefits involves many assumptions and proxies. There are two types of costs; public cost incurred by the government and personal cost incurred by the individual who obtains education. Though both are relevant, yet it is the latter one that affects an individual's demand for higher education. Therefore, in this study, only private cost is taken into account. Personal costs can be further divided into two types; direct, explicit or out of pocket cost and indirect, implicit or opportunity cost of education. The former denotes the tuition fee and expenditures on stationary, books and boarding and lodging while the latter denotes the income forgone during the period of study. Both of these costs are taken into account in this research.

Benefits of education are also of two types, personal and social. Here, we take up only personal benefits because they determine the demand for education. Personal benefits of higher education can further be decomposed into financial benefits like salary and non-financial benefits like prestige in society. Since quantification of non-financial benefits requires many restrictive assumptions therefore they are ignored.

Financial benefits of education can be either regular like monthly salary or irregular like bonus pay. We take into account only regular benefits because data on irregular monetary benefits is scanty and unreliable and also because irregular benefits vary for employees of the same institution, not speak of employees of different institutions or ministries. Educated people find jobs either in public or in private sector. Since the pay of an employee in private sector depends more on his/her efficiency and managerial abilities than on his/her academic qualifications, therefore one can hardly find any standard pay scale in private sector. Each firm and industry has its own pay structure. Instead of taking the average pay in private sector, this study assumes that a potential candidate for higher education keeps in mind mainly basic pay scales (BPS) that are applicable to all employees of the government of Pakistan and autonomous bodies like universities. Therefore, opportunity cost and earnings of education are estimated on the basis of BPSs only.

Moreover, to obtain a degree, the timings of costs and benefits are not same because costs are incurred heavily at the beginning of a degree program while earnings accrue over an extended period of working life. Therefore, comparison of absolute costs and earnings is not meaningful. To get around this problem, net present value (NPV) and internal rate of return (IRR) that duly inculcate time value of money are used. Both methods give same results if initial investment for all investment projects or educational degrees under consideration is same. In case of different initial investment outlays, NPV is more pertinent than IRR.

For illustration, let us consider two projects, A and B, with initial investment of 100 and 1000 and one-period return of 110 and 1050 respectively. It means that IRR on project A is 10 percent and on project B is 5 percent. Therefore, according to IRR criterion, project A is definitely preferable over project B. On the other hand, NPV criterion requires a given interest rate to work with. In this example, if it is in the range of zero to 4.4 percent, then project B becomes preferable because the amount of its NPV comes out greater than that for project A even though IRR for project A

remains twice of that for project B. On the other hand, if interest rate is more than 4.5 percent, then NPV for project A is greater. In fact, a rational individual maximizes amount of NPV rather than IRR. However, IRR is more useful for general comparison of two projects. Therefore, in this research, both NPV and IRR have been measured.

NPV is the difference between present value of benefits of higher education and present value of its cost at a given interest rate. The greater is margin by which benefits exceed costs of a degree program, the more rewarding and attractive is that degree to potential candidates. On the other hand, IRR represents the discount rate that equates the present value of income stream accruing to a degree holder to the cost of degree. If this discount rate is higher than the market interest rate, then education is a worthwhile investment on pure economic grounds, otherwise not.

### 3.1. Calculation of Net Present Value (NPV)

Following formula has been used to calculate NPV for different degree programs.

$$NPV = \sum_{i=e+m+1}^n \frac{E_i}{(1+r)^i} - \sum_{i=e+1}^m \frac{(C_{Di} + C_{Oi})}{(1+r)^i}$$

- $E_i$  is the annual earning after obtaining a degree.
- $C_{Di}$  is the annual direct cost and  $C_{Oi}$  is the annual opportunity cost of a degree.
- $r$  denotes the given interest rate to discount future costs and future earnings.
- Subscript  $e$  denotes the age at the time of admission in a degree,  $m$  denotes the period for completion of a degree and  $n$  denotes the retirement age that is 60 for all degree holders.

### 3.2 Calculation of Internal Rate of Return (IRR)

IRR is defined as that rate of discount which equates the present value of future stream of net receipts with initial investment outlays. It is denoted as follows.

$$\sum_{i=e+m+1}^n \frac{E_i}{(1+d)^i} = \sum_{i=e+1}^m \frac{(C_{Di} + C_{Oi})}{(1+d)^i}$$



Explanation of all variables and super/subscripts is same as above except  $d$ , which denotes that discount rate or IRR which equates the present value of future benefits to the present value of costs.

### **3.3. Data Sources**

#### **3.3.1. Explicit Cost**

The explicit (direct) cost includes university fees, expenditures on books, stationary and transportation. Out of them, tuition is paid generally at the beginning of each semester and is same for all students whereas other expenses are incurred periodically over the whole period of study and may be different for each student. However, for simplicity, total explicit expenses in this research are treated as same for all students in a specific degree program. They are paid, by assumption, at the beginning of each academic year in lump sum.

Pakistan Social and Living Standard Measurement Survey (PSLM) 2004-05 reports education expenditures of 14000 households whose children were studying at any level. Out of them, 96 households had their children studying only in professional bachelor degree, 100 in master degree and 4 in MPhil and PhD programs. Other households had their children at different degrees of education. Therefore, we have picked up only these 200 households to estimate explicit cost of concerned higher degree programs. As the number of observations for M. Phil and PhD is very small, therefore it may not be advisable to make an analysis on the basis of PSLM only.

To take care off this data problem, we conducted a survey of 103 students of four universities in Islamabad; International Islamic University (IIU), Quaid-i-Azam University (QAU), National University of Modern Languages (NUML) and Allama Iqbal Open University (AIOU) in Summer 2008. The breakup of students who were interviewed is given in the appendix table 1. We asked them to disclose their expenditures on tuition fee, transport, stationary, books, and lodging and boarding. The figures obtained in this survey are compared with those ones deduced from PSLM 2004-05 data in table 3.1. Since cost figures from both data sets are quite close, therefore in calculations of NPV and IRR, we have used only those figures derived from PSLM data. Total cost of a degree is then evenly distributed over all years required for its completion.

**Table: 1. Explicit Cost of Different Degree Programs**

	<b>Professional Bachelor</b>	<b>Master</b>	<b>M. Phil</b>	<b>PhD</b>
PSLM	49742	26054	20490	4980
Survey	50968	27852	23692	51610

Source: Calculated by the author on the basis of PSLM 2004-05 and primary survey data.

### 3.3.2. Implicit Cost (Opportunity Cost)

Implicit cost is the income forgone during the period of a degree program. It is calculated on the basis of BPS to which an admission seeker for that degree is eligible to apply for job. For example, an admission seeker in a master degree must have a bachelor degree and having a bachelor degree, he/she is eligible to work in BPS 16. Therefore, indirect cost of a master degree is two-year salary in BPS-16; the first year salary without any increment and the second year salary with one increment. In addition to the specified pay of BPS as given in appendix table 2, 45 percent of the initial pay is added as house rent and a lump sum amount of Rs.2480 as conveyance allowance that is same for BPS 14 to 22 as per regulations of Government of Pakistan.<sup>3</sup> Similarly indirect cost of M Phil and PhD degrees is 2-year and 4-year salary in BPS-17 respectably. However, the first year salary for M Phil degree starts from initial pay without any advance increment while the first year salary for PhD degree starts with four advance increments. For each subsequent year, a single increment is added. Indirect cost for professional degree is not in one pay scale; rather it is assumed as 2-year salary in BPS-9 to which a higher secondary school graduate is eligible to apply and 2-year salary in BPS-16 to which a bachelor degree holder is eligible to apply. Conveyance allowance for BPS 1 to 13 is Rs.1380. The data used on BPS has been issued by Regulation Wing, Finance Division Government of Pakistan in June 2008.

Medical allowance is not included because its payment is usually not in cash. Dearness, special and other similar allowances, which are the part of salary of existing employees, are not included because a new entrant is not

<sup>3</sup> Some officers in BPS 20 to 22 who hold some executive posts are provided chauffer –driven cars. However, their percentage is small and moreover due to difficulty in estimating the cash-value of chauffer –driven cars, in this study the amount officially specified as conveyance allowance (that is Rs.2480) for these officers is taken for all.

entitled to them. Earnings other than regular pay of an individual such as traveling allowance are not considered due to lack of data and uniformity.

### **3.3.3. Degree Completion Time, Induction in Labor Market and Working Years**

The minimum prescribed time for completion of a professional, master, M Phil and PhD degree is 4, 2, 2 and 4 years respectively as collected from prospectuses of various universities and educational institutions. The age at time of admission and the age at time of completion of various degrees are estimated on the presumption that a child gets admission in first grade, on the average, at the age of 6 years. Then he/she passes his/her primary education at the age of 11 years, higher secondary or intermediate education at the age of 18 years and graduate degree at the age of 20 years. It is also supposed that degree holders enter the job market just after completing their degree and get jobs immediately. This information is summarized in appendix table 3<sup>4</sup>.

### **3.3.4. Lifelong Earnings**

Like opportunity cost of a degree, lifelong earnings are estimated on the basis of BPSs. It is assumed that after completing his/her degree, a degree holder immediately starts job in the BPS to which he is eligible to apply. More specifically it is assumed that a master and a professional bachelor degree holder joins BPS 17 without any increment, an M Phil degree holder joins BPS 17 plus four advance increments and a PhD degree holder joins BPS 18 without any increment plus five thousand PhD allowance. Then every degree holder keeps on getting an annual increment in the same BPS until he/she crosses all stages of relevant BPS. After getting the last stage, he/she is promoted to the next BPS in which his/her salary is fixed as per rules<sup>5</sup>. These assumptions are made for convenience and uniformity<sup>6</sup>. House rent and

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<sup>4</sup> Some individuals complete higher degrees of education while doing some part-time job. Accordingly their opportunity cost of education must be less. Similarly some degree-holders do not get job just after completing their degrees. Accordingly their lifelong earnings must be less. However, due to lack of data on part-time jobs and length of period for job-seeking, it is assumed that all degree seekers complete their degrees without doing any part-time job and get job just after completing their degree.

<sup>5</sup> In order to protect the existing pay, the difference in highest salary in the existing BPS and initial salary in the next PBS is filled with the increments of next BPS such that the salary becomes at least as much as in the existing BPS but not greater by the full amount of an increment in the next BPS.

<sup>6</sup> In fact, many employees are promoted to next higher scales before reaching the maximum limit of their existing scales. However, due to having little knowledge about possibility and

conveyance allowance are added to the salary mentioned in concerned BPS as explained above in context of indirect cost of a degree. Dearness, special and other similar allowances are granted to current employees only and not to fresh ones, therefore they are not included. Irregular financial benefits like bonuses and traveling allowance are ignored because of their non-uniformity and lack of data.

It means that a master as well as a professional bachelor degree holder who joins BPS 17 in the age of 23 years is promoted to BPS 18 in the age of 44 and is placed in the 14<sup>th</sup> stage of BPS 18. He/she is then promoted to BPS 19 in the age of 51 and is again placed in its 14<sup>th</sup> stage. He/she gets the final promotion in BPS 20 in the age of 58 years and is placed in its 12<sup>th</sup> stage. Finally he/she retires while getting the highest stage of BPS 20. Similarly an M Phil degree holder who starts job in the age of 25 years is promoted to BPS 18, 19, 20 and 21 in the age of 42, 49, 56 and 59 years respectively. He/she retires in 13<sup>th</sup> stage of BPS 21. Accordingly, a PhD degree holder joins BPS 18 in the age of 29 and then gets promotion to every next BPS a year latter than does M Phil degree holder.

### **3.3.5. Net Present Value (NPV)**

To calculate NPV, an interest rate must be given that represents the time value of money or opportunity cost of a degree. Mostly the risk-free interest rate that is given on Treasury Bills (T-Bills) is taken as the time value of money. In this research, the average interest rate on fortnightly offered 3 month T-Bills from July 2005 to June 2008 that comes out 8.67 percent is used as discount factor. The data on interest rates on T-Bills is taken from various issues of *Statistical Bulletins* published by State Bank of Pakistan.

### **3.4. Relaxation of Assumptions**

In sensitivity analysis in the subsequent section, the base case assumptions described above are changed in the following three ways.

- Retirement age is changed from 60 to 55 and 65 years.
- Completion time for each degree has been increased from the minimum prescribed period by one year because many students take longer than the minimum prescribed time to complete their degrees.

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actuality of such promotions at the time when an individual plans to take admission in a degree program, it is assumed that degree-seeker keep in mind this most probable scenario, which is known to them at the planning stage as well.

- The average of last 3 years' interest rate on 3-month T-Bills to calculate NPV for various degrees has been replaced with 5, 10 and 15 percent interest rates.

## VI. Results and their Description

Following table 2 shows costs and earnings of various degree programs for the base case. The figures are based on a detailed worksheet (not shown) that includes yearly costs and yearly earnings of each degree program under alternative assumptions. The base case adopts 60 years as retirement age, 8.67 percent as the discount rate which is the average of last 3 years' interest rates on 3-month T-Bills and assumes that a degree seeker completes his/her degree in minimum prescribed time for the degree. First three rows of the table report direct, indirect and total costs at zero rate of discounting for each degree program respectively. Fourth row shows total lifelong earnings. Fifth line gives NPV of total cost and earnings discounted at 8.67%. The last line of the table shows IRR for each degree program.

**Table: 2. Total Costs, Earnings, NPV and IRR for Different Degrees**

Education Level	Professional Bachelor	Master	M Phil	PhD
Direct Cost (in Rs.)	49,742	26,054	20,490	40,980
Opportunity Cost (in Rs.)	464,202	276,288	411,420	1,000,440
Total Cost (in Rs.)	510,944	302,342	431,910	1,041,420
Life Long Earnings (in Rs.)	15,181,461	15,181,461	15,815,085	16,275,819
NPV at r =8.67% (in Rs.)	1,938,944	2,507,645	2,734,545	2,405,757
IRR	30.42%	56.24%	47.88%	24.41%

Source: Author's calculations; based on PSLM 2004-05 and on BPSs 2008.

The total cost of education is the highest for PhD degree, second highest for a professional bachelor degree and is the lowest for a master degree. The main reason for visible differences in costs for these degrees is opportunity cost of education; otherwise yearly direct cost is the highest for master degree and lowest for M Phil and PhD degrees. The opportunity cost for professional bachelor degree is spread over 4 years including 2-year opportunity cost of simple bachelor degree. Here one might argue that opportunity cost of a simple bachelor degree should also be included in

indirect costs of other degrees. This argument is valid if the emphasis is on professional bachelor degree versus other three degrees. Since the focus of this research is to compare return on master, M. Phil and PhD degrees, therefore opportunity cost of simple bachelor degree is ignored for these degrees.

Total earnings of a professional bachelor and a master degree holder are same as both of them join BPS 17 in the age of 23 years and get promoted to next BPSs in same years. The absolute amount of lifelong earnings for PhD degree holders is the highest, Rs.16.276 million, and is the lowest for professional bachelor and master degree holders, Rs.15.181, as one would expect, yet the difference is not much. That is why NPV at  $r=8.67$  percent is the lowest, Rs.2.406 million, for PhD degree holders and highest, Rs.2.735 million for M. Phil degree holders. The reason for this discrepancy is clear that higher earnings to PhD degree holders start accruing in far future, in the age of 29 years.

IRR for all degrees is positive. It is the highest for master degree, 56.24 percent, followed by that for M Phil degree, 47.88 percent, then for professional degree, 30.42 percent and least for PhD degree, 24.41 percent. Hence, according to IRR criterion, obtaining of a master degree is most profitable while obtaining of a PhD degree is least profitable. Another anomaly that has been noted above is that an M Phil degree holder moves to next higher BPSs one year ahead of a PhD degree holder.

#### **4.1. Sensitivity Analysis**

Sensitivity analysis indicates one by one relaxation of three assumptions of the base case. First, two alternative retirement ages, 55 and 65 years, are considered in lieu of 60 years. Second, degree completion time is increased by one year from the minimum prescribed time for completion of each degree. Third, to calculate NPV, instead of using the average of actual interest rates on 3-month T-Bills during July 2006-June 2008 that is 8.67 percent, three arbitrarily chosen interest rates; 5, 10 and 15 percent are used.

The change in retirement age does not affect the cost for any degree but only the earnings of all degree holders. Absolute amount of earnings though decreases significantly in case of 55 years of age for retirement as shown in table 3, yet the order of earnings for various degrees remains unchanged. That is the highest lifelong earnings are for a PhD degree holder (Rs.12.691 million) and the lowest ones for a professional bachelor and a

master degree holder (Rs.11.969 million). Life long earnings for an M. Phil degree holder remain in the middle (Rs.12.330 million).

**Table: 3. Total Costs, Earnings, NPV and IRR for Different Degrees at Alternative Retirement Ages**

Education Level	Professional Bachelor		Master		M. Phil		PhD	
	55 year	65 year	55 year	65 year	55 year	65 year	55 year	65 year
Retirement Age	55 year	65 year	55 year	65 year	55 year	65 year	55 year	65 year
Total Cost	238,301	238,301	149,036	149,036	221,784	221,784	597,872	597,872
Life Long Earnings	11,968,548	19,083,201	11,968,548	19,083,201	12,330,372	19,936,425	12,691,386	20,297,559
NPV at r=8.67	1,823,443	2,031,503	2,371,247	2,616,948	2,559,653	2,871,285	2,192,914	2,563,013
IRR	30.41%	30.42%	56.24%	56.24%	47.87%	47.88%	24.35%	24.43%

Source: Calculations are based on PSLM 2004-05 and BPSs 2008.

NPV for PhD degree holders decreases from Rs.2.406 to 2.193 million and remains lower than those for M Phil and master degree holders. NPV for M Phil degree holders decreases from Rs.2.735 to Rs.2.560 million and remains the highest one. NPV for professional bachelor degree holders decreases from Rs.1.939 to Rs.1.823 million and remains the lowest one. The effect of change in retirement age on IRR is negligible.

In case of 65 years as retirement age, lifelong earnings for all degree holders increase significantly. However ordering of absolute earnings and NPV remain the same. In absolute terms, lifelong earnings for PhD degree holders are at the top (Rs.20.298 million), followed by those for M Phil degree holders (Rs.19.936 million), and at the bottom are for professional bachelor and master degree holders (Rs.19.083 million). With respect to NPV, M Phil is at the top (Rs.2.871 million), followed by master (Rs.2.617 million), then by PhD (Rs.2.563 million) and at the bottom is professional bachelor degree (Rs.2.032 million). The effect on IRR is in few basis points.

Many students take more than the minimum prescribed period to complete a given degree. Therefore, degree completion time for each degree is increased by one year arbitrarily to measure the cost of each degree. This change affects both costs and earnings as the average cost of another year of education is added to total costs and one-year earnings are deducted from lifelong earnings. Table 4 shows total costs and earnings for different degrees.

**Table: 4. Total Costs, Earnings, NPV and IRR for an Extra Year to Complete Each Degree**

<b>Education Level</b>	<b>Professional Bachelor</b>	<b>Master</b>	<b>M Phil</b>	<b>PhD</b>
Direct Cost	58,427.5	39,081	30,735	51,225
Indirect/Opportunity Cost	610,806	422,892	630,450	1,272,750
Total Cost	669,233.5	461,973	661,185	1,323,975
Life Long Earnings	15,181,461	15,181,461	15,815,085	16,275,819
NPV at $r = 8.67\%$	1,627,731	2,139,082	2,278,187	1,926,391
IRR	23.54%	35.36%	30.39%	19.29%

Source: Calculations are based on PSLM 2004-05 and BPSs 2008.

Though NPV for each degree decreases due to one year increase in degree completion period, yet their ordering remains the same. That is, M Phil is at the top (Rs.2.278 million), followed by master (Rs.2.139 million), then by PhD (Rs.1.926 million) and at the bottom is professional bachelor degree (Rs.1.627 million). In this case, IRR decreases significantly but ranking of degrees does not change. Master degree remains at the top as its IRR decreases from 56.24 percent to 35.36 percent; M Phil degree remains at number two as its IRR decreases from 47.88 percent to 30.39 percent, professional bachelor degree remains at number three as its IRR decreases from 30.42 percent to 23.54 percent; and PhD degree is at the bottom as its IRR decreases from 24.41 percent to 19.29 percent.

In stead of relying on a single interest rate (8.67%) to calculate NPV, we have considered three different interest rates; 5, 10 and 15 percent, because any of them may actually prevail in future. This change has no effect on IRR for any degree. It affects only NPV values as given in table 5.

It is interesting to note that NPV for M Phil degree remains the highest and for professional bachelor degree remains the lowest for all three interest rates used for discounting future costs and future earnings. However, NPV for PhD degree is the second highest at 5 percent discount rate that drops down to number three at higher discount rates. The reverse is true for master degree that is at number three at 5 percent discount rate but moves to number two at 10 and 15 percent discount rates. The reason is that earnings for PhD



**Table: 5. Total Costs, Earnings and NPV for Different Degrees at Alternative Interest Rates**

Education Level	Professional Bachelor	Master	M Phil	PhD
Total Cost	510,944	302,342	431,910	1,041,420
Life Long Earnings	15,181,461	15,181,461	15,815,085	16,275,819
NPV at r=5 percent	4,155,648	4,795,582	5,177,248	4,980,755
NPV at r=10 percent	1,509,404	2,045,714	2,230,658	1,868,780
NPV at r=15 percent	634,461	1,063,747	1,144,545	719,444

Source: Calculations are based on PSLM 2004-05 and BPSs 2008.

degree accrue in later periods and as a principle in finance, the later in time accrue the returns of a project, the less profitable it becomes at increasing interest/discount rates.

## V. Summary and Policy Implications

Endogenous growth theory in general and human capital theory in particular emphasize education as a powerful determinant of prosperity and economic uplift of an individual and of a nation alike. Any individual who lacks education and any nation which ignores education of its citizens remain lowest in economic ranking. Implication of human capital theory that education is the fastest route to achieve economic prosperity, however, does not seem to be working in Pakistan because demand for higher education is not increasing as expected.

To understand this contradiction in theory and practice, an educational degree should be treated as an investment. Since investors of physical and financial assets compare NPVs and IRRs of competing investment options and choose the one which has highest NPV or IRR, therefore the same criterion should be applied to any degree of higher education. In this regard, private rather than social return on educational investment should be estimated because the former determines the demand for education while the latter shows the importance of education in a society. Therefore, this research has estimated only private return on higher education in Pakistan.

Initially NPVs and IRRs for various degrees have been estimated by using base case assumptions that are 60 years as retirement age, a single

interest rate of 8.67 percent that is the average of last 3 years' interest rates on T-Bills of 3 month maturity for discounting future costs and earnings of a degree holder, and the minimum prescribed time for completion of a degree as the actual time to complete that degree. In sensitivity analysis we have relaxed these assumptions one by one. Two alternative retirement ages, 55 and 65 years are considered in lieu of 60 years; degree completion time is increased by one year from the minimum prescribed time for completion of each degree; and to calculate NPV three arbitrarily selected interest rates; 5, 10 and 15 percent are used.

Overall result is that the rate of return for master and M Phil degrees is much higher than that for professional bachelor and PhD degrees. The reason for lower rate of return for professional bachelor degree is due to high cost of this degree that includes additional opportunity cost of simple graduation that may be arguable. However, lower rate of return for PhD degree explains precarious demand for this degree of highest learning. This research discovers another anomaly that besides low rate of return for PhD degree, its holders remain one-year behind M Phil degree holders with regard to their promotion in next higher BPSs.

Change in retirement age though affects total earnings of degree holders significantly, yet the IRR for these degrees do not change much. One year increase over the minimum prescribed time for completion of each degree affects both costs and earnings of a degree. It reduces IRR for various degrees tremendously. It means that if a longer than minimum prescribed period becomes common that is currently in case of M Phil and PhD degrees, then demand for these higher degrees would reduce significantly. Use of different interest rates to estimate NPVs for various degrees highlights that an increase in interest rate lowers the demand for PhD degree the most because its earnings start coming relatively late in potential working life.

In spite of all the emphasis of human capital theory that education is the most rewarding investment, still demand for the highest degree of education, PhD, is extremely low and is not catching up in Pakistan as expected. The results of this research explain this contradiction in theory and practice to a great extent. Potential degree seekers look at private rate of return for a degree whereas human capital theory proclaims obtaining of education as one of the best investments on the basis of social rate of return.

Policy implications of this research are that private rate of return should be improved for professional bachelor and PhD degrees. It can be achieved in following three ways:

- One is to raise the pay scale or give advance increments to professional bachelor and PhD degree holders. The current reward structure is anomalous not only from pure economic point of view as IRR is lower for professional bachelor and PhD degree but also from social point of view as PhD degree holders lag behind M. Phil degree holders for promotion to next BPSs.
- The other is to grant interest free loans in stead of scholarships and stipends to students of these degrees so that the cost of these degrees decreases only for successful degree seekers and remains high for unsuccessful ones. The reason is that a successful degree holder will pay back the loan at a latter period out of high earnings; therefore the present value of costs will decrease for him/her. On the other hand, since an unsuccessful degree seeker will have to pay back the loan just after he/she drops out, therefore present value of costs will be higher. Consequently only committed students will take admission in higher degrees.
- Retirement age for M Phil and PhD degree holders may be increased at least by the minimum prescribed time for completion of these degrees so that earning span for all degree holders becomes equal. The retirement age for PhD degree holders may further be increased in compensation of having their earnings late in life due to longer period of their studies.

## References

- Asadullah, M. N. (2005). The effectiveness of private and public schools in Bangladesh and Pakistan. University of Oxford (memeo).
- Becker, G. (1964). Human capital. *National Bureau of Economic Research*.
- Becker, G. (1974). *Human capital: A theoretical and empirical analysis with special reference to education*, Princeton University Press.
- Guisinger, S. E., Henderson, J. W. & Sculll, G. W. (1984). Earnings rate of returns to education and earning distribution in Pakistan. *Economics of Education Review*, Vol. 3(4).
- Hamdani, K. (1977). Education and income differential: An estimation for Rawalpindi city. *The Pakistan Development Review*, Vol. 16(2).
- Haque, N. (1977). An economic analysis of personal earnings in Rawalpindi city. *The Pakistan Development Review*, Vol. 16(4).
- Khan, S. R. & Iran, M. (1985). Rate of return to education and determinants of earnings in Pakistan. *The Pakistan Development Review*, Vol. 34 (3).
- Lin, T. C. (2004). The role of higher education in economic development: An empirical case study of Taiwan. *Journal of Asian Economics*, Vol. 15 (2).
- Luis, A. R. & Romer, P. M. (1991). Economic integration and endogenous growth. *The Quarterly Journal of Economics*, Vol. 106(2).
- Mark, et al. (2004). *Return to investment in higher education –Evidence for different subjects, degrees and gender in Germany* Goethe: University of Frankfurt.
- Mincer, J. (1974). *Schooling, experience, and earnings*, New York: Columbia University Press.
- Monazza, A. (2007). Rates of return to education by gender in Pakistan. Research consortium on education outcomes and poverty (RECOUP), *Working Paper 1*.
- Nasir, Z. M. (1998). Determinants of personal earnings in Pakistan: Findings from the labour force survey 1993-94. *The Pakistan Development Review*, Vol. 37, pp. 251-74.
- Psacharopoulos, G. & H. A. Patrinos (2002). Returns to investment in education: A further update. *World Bank policy research working paper 2881*.
- Psacharopoulos, G. & H. A. Patrinos (2004). Returns to investment in education: A further update. *Education Economics*, Vol. 12(2).

- Psacharopoulos, G. (1985). Returns to education: A further international update and implications. *Journal of Human Resources*, Vol. 20(4). pp. 583-604.
- Romer, P. M. (1987). New theories of economic growth. *American Economic Review*, pp. 56-62.
- Schultz, T. (1961). Investment in human capital. *American Economic Review*, Vol. 51. pp. 1-17.
- Shabbir, T. (1991). Sheepskin effects in the returns to education in a developing country. *The Pakistan Development Review*, Vol. 30(1).
- State Bank of Pakistan, *Statistical Bulletin* (various issues).
- United Nations (2007). *Human Development Report*.

**Appendix Tables**

**Table: 1. University-Wise Students Interviewed for Direct Cost**

Education Level	Professional Bachelor	Master	M Phil	PhD	Total
IIUI	08	08	06	12	34
QAU	-	07	06	13	26
NUML	02	05	05	05	17
AIOU	03	10	05	08	26
Total	13	30	22	38	103

*Source:* Survey conducted by the researchers in summer 2006.

**Table: 2. Detail of Relevant Basic Pay Scales (BPS)**

BPS	Existing Pay Scales 1/7/2005	Stages	Existing Pay Scales 1/7/2007	Stages
19	14260-705-28360	20	16400-810-32600	20
18	9355-675-22855	20	10760-775-26260	20
17	7140-535-17840	20	8210-615-20510	20
16	4375-340-14575	30	5050-390-16750	30
9	2770-165-7720	30	3185-190-8885	30

*Source:* Regulation Wing, Finance Division, Government of Pakistan, June 2008.

**Table: 3. Life Time Plan of a Degree Seeker**

Education Level	Age to begin degree	Min. period of study	Age when starts job	Working years
Professional Bachelor	19	4	22	38
Master	20	2	22	38
M Phil	22	2	24	36
PhD	24	4	28	32

*Source:* Various prospectuses of educational institutions.