OPPORTUNITY COST OF EDUCATIONAL HUMAN CAPITAL INVESTMENT. APPLICATION FOR THE POSITION OF BENEFICIARY-INVESTOR

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ABSTRACT: *The present paper focuses on providing a model of applying the opportunity cost concept on investments in human educational capital. In the first part we have shown that the real costs of educational capital investment does not involve direct and indirect educational costs only but also the opportunity costs, i.e. the earnings that are lost by choosing to invest in education (and not in something else). From our research there results the fact that the share of the opportunity cost within the total of the investment in educational capital is 60% that is a great share in rapport with other types of investments. Further on, we have shown that the recovery of the investment is determined by two main factors: money and time. The first factor is the growth of revenue that the skills acquired through higher education bring into relation with the situation "without education" and the second is the duration measured in years, in order that the question of revenue growth, investment are fully recovered and bring additional revenue (similar profit). The main conclusion of the present paper is that investment in education has a significant positive effect on the dynamics of the relationship between age and earnings, which weakens or even undoes the effect of the high level of opportunity cost of this type of investment. The argument for investment in human capital and education plus "non-market income" or "non-monetary effects" of education relates mainly to the role that education has on the quality of life. As a long term investment, education brings a permanent increased certainty of a better situation and it increases social development and social promotion.*

Key words: opportunity cost, educational human capital, investment in education

JEL codes: I – Health, Education and Welfare; A – General Economics and Teaching

Introduction

The term opportunity cost, also called the cost of choice, reflects, at the cost level, a fundamental economic law: the law of rarity. In short, this law expresses the "relationship of interdependence between the volume, structure and intensity of needs, on the one hand, and the quantity, quality and structure of resources, on the other hand, translating a "constant tension, but with degrees of different intensity the unlimited needs and resources (including economic goods) under specified conditions of place and time" (Dictionary of Economics, 2001, p. 260).

The fact that the needs always exceed the volume and dynamic resources and that therefore there are never enough resources to meet all the needs, determines any allocation of resources to have the character of a choice according to which the income of the option chosen is accompanied by loss (cost) resulting in giving up the best of the variants. In short, opportunity cost measures the gain by losses.

In a more direct way, opportunity cost shows "how much would I have won if I had chosen another option and, therefore, how much I lost on choosing it. Because the opportunity cost elements do not appear in the accounts (excluding depreciation), they are implicit costs (part of the economic cost) that the trader will incur as a result of choices he/she has made.

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Under normal conditions, the opportunity cost should be recovered from revenues brought by the option chosen (if the choice was well done), which means that these revenues are higher or at least the same with the opportunity cost. Moreover, in the case of lucrative activities, the amount of opportunity cost elements form what is called normal profit (income) so that to highlight that under this level one marks real losses, which (will) require giving up the first choice and choosing other variant.

The opportunity cost does not involve only the losses expressed in physical units or values (goods, money), but may include psychological costs, subjectively experienced in terms of satisfaction or dissatisfaction. Therefore, the decision for one option or another can not be explained by reasons of physical or financial bill, but by the issues, the nature of motivation, aspirations, interests and choices, maybe the "philosophy of life" of the individual or of the community.

If we consider that the law of rarity applies to the educational goods, the educational services and the human capital, then the paradigm is applicable in the case of education too. And indeed, the needs of education, like other human needs, always exceed the resources required to meet them, so there are never enough resources for all needs. Therefore, in the case of education, too, the resource allocation is the result of choices that, like any choice, involve both gains and losses in earnings in a combination where the selected variant gains can not be properly estimated without taking into account the losses of sacrificing at least one (the best) of the eligible options that have been given up.

Therefore, investment in education is the result of choice, both at the levels of society, the state and the individual, a choice which is necessarily accompanied by giving up something else, that is a choice that has an opportunity cost.

Application of the investment beneficiary position

The opportunity cost and can be measured at many levels and in relation to several categories of investors and beneficiaries in education. Basically, opportunity cost can be determined for any agent (individual, institution, company, organization, including the state) that bears the costs of education or participates in partial coverage of these costs and benefits in one way or another from the investment. To the status of investor hypostasis one may also add the relationship between the receiver and the investor of the educational capital. When referring to the individual, the individual investor / beneficiary, then such cases can occupy different positions on an axis between two extremes:

- One is when the two aspects that, customer and investor, fully overlap, and illustrative in this respect is the situation of the student who pays a fee, which also supports all other direct or indirect costs of schooling (school supplies, books, administrative fees, accommodation, meals , transport, etc..) and not receiving any form of support, be it subsidies from the state budget (or social scholarships, grants for homes, etc..), be it private sources (private scholarships , sponsorship, support, etc..);

- The other is when the two hypostasis, customer and investor, are totally unrelated, illustrative in this situation is the student who fails to pay the studies (regardless if they have a place funded by the state budget, a grant to study private or other funding), which enjoys all forms of support from whatever source, which supports virtually any direct or indirect cost of schooling, his only contribution being what he/she allocates for learning and the effort.

To illustrate how one may estimate the opportunity cost of educational investment in human capital we shall use a simplified example, choosing the situation when the customer and the investor fully overlap, i.e. the direct beneficiary bears the entire cost of investment in his/her own educational capital. We believe that in this aspect the situation of the student who pays his/her own fee is typical. He/she also bears all other direct or indirect costs of schooling and does not receive any form of state support or other potential donors. In the application we suggest we have the

following data:

- the student is a college graduate, who in spite of the fact that he/she found a job, chose to continue his/her studies in higher education at a university in another location than his/her home;
- as a result of the entrance examination he/she has managed to get a position on the fee places, and the entrance average has not allowed him/her to get a place in the hostel;
- when estimating the efforts he/she is required to bear, the family has decided to financially support him/her at daily courses at that college.

Further on we shall apply the structure of investment in human capital costs of education, based on estimated prices in the mid-market (the 2006), and the cost structure of an academic year. These data are presented in Table. 1. Note that the opportunity cost of wages was calculated according to the salary income that our graduate would have obtained if he/she had chosen to get a job and not attend college.

Table no. 1

Structure of human capital investment costs in education

Type of costs	Costs structure	Sums (RON)
Direct educational costs	Annual tuition fee	2000
	Various administrative taxes	100
	Expenditure for books, supplies, equipment	1000
Indirect educational costs	Expenditure on accommodation (host)	1000
	Transport costs (regular trips home)	400
	Additional costs for food	500
Total		**5000**
Opportunity cost	Direct net revenue derived from wages	8400
	Income from the placement (investment) savings	1000
	Other gains in terms of value	500
Total		**9900**
General total		**14900**

The key to the example given is that the total actual costs of investment in educational capital is not confined, as it might seem, the direct and indirect costs of schooling, but also opportunity costs, i.e. earnings that are lost through option education. In this example, the total investment in the three years of Graduating, amounting to 44,700 RON, and opportunity cost share is 66%, i.e. a very high proportion compared with other types of investments.

In the terminology of GS Becker (1997, p. 119), education is classified as goods "with large gains to be waived", and this feature of education is given mainly by the fact that education is time consuming, and the productivity of time spent in education is relatively rigid, so the time price elasticity of education is very low (not responding to the demand-supply relationship or the movement of other prices in the market). And indeed, the duration of study is quite rigid, most times it is required by law, so it's almost impossible to increase the amount of study time per unit, or, conversely, to reduce the time per unit studies (as it happens in other areas). Naturally, learning itself as a psychological process, involves time as an essential dimension: you can not learn everything at once, the pace of learning has limits beyond which the quality is affected, the staggering steps with inserting periods of "holiday", are essential for quality acquisitions.

Investment recovery factors: money and time

The main problem that arises is where and especially how long the student can recover the capital investment costs in education. From an economic perspective, the answer is quite simple: a

higher income gained from the higher skills will bring to the graduate student. This response requires that the investment in one's education should truly be a capital investment, i.e. an investment that will generate revenue to the one that has the capital. Although this condition depends not only on the capital acquired through graduate education, but also on other factors (mainly those affecting the market situation), we shall assume that it is carried out and will continue our analysis in terms of this assumption.

The conditions under which the actual recovery of investment - summarized as GS Becker calls rate of return or return on investment in human capital - are determined by two main factors: money and time. The first factor is the growth of money income which is brought by one's expertise in education in relation to the situation "without education" and the second is the duration (usually measured in years) required because, at that income growth, the investment should fully recover and should bring additional revenue (similar profit).

Returning to the given example, suppose that, after graduation, the person finds employment in the field with a better salary, which, together with other gains, represents an annual income of 12,000 lei, or an increase of 2,100 lei year compared to "no education" (data in the table). With this increase of revenue one needs 28 years to recover the entire investment (58200 / 2100 = 27.71), during which the investment is working "with losses". Obviously, the period is quite long, and the family that invested cannot enjoy the benefits of the investment, except maybe the "mental benefits". Moreover, a comprehensive calculation might find that losses may be even greater than previously assumed. For example, one can consider that the sum of 58,200 lei has been invested in the financial market rather than pay tuition fees, so, at a minimum annual income of 5% (corresponding interest in a bank deposit) would be made in those 28 years, an income of 81,480 lei, this at an elementary calculation, because that would apply a progressive calculation, which would take into account the capitalization of interest, when the amount would be substantially higher.

The data from the example, although approximate a real situation, have deliberately been chosen to emphasize the idea that the option for education (with reference to formal education which brings formal skills) has an opportunity cost and that cost can be sufficiently large for the given circumstances and this may impose a different choice (with less education). Furthermore, one should take into account the fact that the cost of determining whether there really is a choice makes sense only if the choice is possible. In our example, if a young graduate did not have a family able to support him financially, he would virtually have no choice, i.e. to give up income from wages lost by the choice of education.

Investment in educational capital and the dynamics of the relationship between age and earnings

The main characteristic of the investment in educational capital, which has an impact on the relationship between the direct and opportunity costs, and on the relationship between earnings and gains, is given by the fact that education is a long term investment, both as the duration of raising capital and the life of the capital formed. This feature makes the linear model of the dynamics of cost and investment in educational capital gains - such as that of the example shown - does not adequately reflect the real situation. By analogy with fixed capital depreciation (composed of durable goods involved in several production cycles), return on investment in human capital education may consider age as a benchmark equivalent to the normal operation of fixed capital (the investment period may be fully recovered) and the retirement age limit on the duration of the educational capital invested. From such a perspective, it becomes increasingly clear that investment in education has an important effect on the dynamics of the relationship between age and earnings, negating or alleviating the high level of opportunity cost of this type of investment.

In this regard, referring to the general training (whose costs are usually borne by individuals, not by the company - with reference to the U.S.), GS Becker (1997, pp 39-40) makes some

interesting observations: "The ideal amortization of a capital asset over a period would be equal to changing its value during that period. Specifically, if the value increased, the income from those activities should be decreased to a negative term to designate the amortization or a positive term should be added to the income to make a right assessment. Since training costs should be deducted from earnings during the training, the economic "value" of the educated person would increase and would decline in time during the ageing process. Therefore, initially, a negative term will be reduced and no element that might represent appreciation should be added.

Under these assumptions, G.S. Becker concludes that vocational training has an important effect on the relationship between earnings and age effect shown in the following diagram (Figure no. 5.1). In the diagram, the horizontal line U-U plays the assumption that all people get the same gains, regardless of age. By comparison - Becker wrote - "those qualified will get lower earnings during training, because during that period they pay the training courses and get higher earnings later in life because then they collect profits. The combined effect of paying the costs of training and receipt of further profits will thus widen the age-earnings curve slope for qualified people, illustrated by T-T in the chart, compared with that of the unskilled, the difference is greater, the higher costs and profits for the investment are greater. ". Moreover, "the training determines not only deepening the curve, as shown in the chart, but also increases its groove, this means that the earnings growth rate is affected more in youth than later in life" (Becker, 1997 , p. 40).
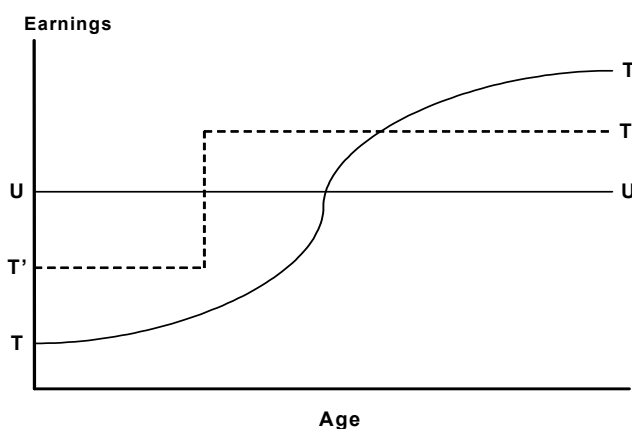

Fig. no. 1 – The relationship between earnings and age
Source: Becker, 1997, p.40

To support this argument, Becker (1997, pp 40-41) calls for a borderline case, involving the assumption that the training program has increased the marginal productivity, but has no effect on the slope so that the marginal productivity persons qualified under this program were independent of age. If earnings were equal to marginal production, the T-T would be just lying parallel to the U-U and above it, without presenting any slope or concavity. However, because such qualified persons' earnings would be below the marginal productivity during training, only equaling afterwards, they would jump at the end of training and would then stabilize at a certain level (as illustrated dashed line T'-T 'in the diagram), giving a concave curve as a whole. In this case the limit is a maximum concavity (as the TT), in less extreme cases, the principle should be the same and the concavity continues. In conclusion, "anticipated gains represent a major cost, which is unfortunately neglected, and they should be treated the same as the direct costs."

But we must also point out that the model proposed by GS Becker refers to training programs, which can be organized both in schools (in a specialized institution), while the work program is stopped and through training at work, without interruption or only by reducing the working time. It is clear that the proposed diagram only suits the second case, because in the case of the first event curves TT and T'-T '(smooth dotted) should leave the origin of the graph,

corresponding to zero earnings during the training program.

Even if the model proposed by Becker is based on data and economic North American specific situations, some elements are difficult to transpose to our the situation, this can only provide benchmarks applicable to our empirical analysis on the rates of depreciation of capital investment in human education. To this end, we propose an example of analysis of the effect of training on the relationship between earnings and age in the case of a training program for the teaching profession. The example concerns two people who have graduated high-school: person A who chooses to pursue studies in higher education (bachelor and master, i.e. 5 years) and person B who chooses to get employed.

In the case of person A, the example approximates the current level of monthly salaries of teaching staff, appropriate to the main degrees, respectively: 500 lei ≈ beginner teacher, permanently appointed teacher ≈ 700 lei, teacher II degree ≈ 950 lei, 1250 lei ≈ I degree teacher. To these there are also added pay rises of 5% for each period of 5 years. It is also assumed that the studies are completed between 20-25 years of age and that in the first 15 years of activity the people get all the didactic levels.

In the case of person B, the example considers a job that starts at an initial monthly salary higher than a beginner teacher, respectively, 700 lei (which might explain the option to employ the person immediately for a salary than to "lose" 5 years in college for a lower salary, at least in the early years). We have also taken into account that the lack of higher education cannot provide a type of professional career development, so one may not anticipate substantial increases in wages as a result of progressive professional degrees. Therefore, in this case, the age wage increases are made only on account of age and gain seniority based on the accumulation of professional experience, except that, according to many real situations, work experience without salary increases up to around 50 years after this, age begins to be seen as a flaw rather than as an advantage. Based on this information, comparative data on the earnings of people in the two situations are presented in Table 2 and graphically rendered in the following figures.

Table no. 2

The comparative situation of average earnings according to age

	The period of calculation	Medium earnings (salary income) according to age								
		20 – 25 years	25 – 30 years	30 – 35 years	35 – 40 years	40 – 45 years	45 – 50 years	50 – 55 years	55 – 60 years	60 – 65 years
Person A (who pursues his/her studies in higher education)	Monthly	-	650	950	1250	1300	1350	1450	1600	1800
	Yearly	-	7800	11400	15000	15600	16200	17400	19200	21600
	5 years	-	39000	57000	75000	78000	81000	87000	91000	108000
	Cummulated	-	39000	96000	171000	249000	330000	417000	508000	616000
Person B (who gets employed)	Monthly	700	750	800	850	950	1000	1000	1000	1000
	Yearly	8400	9000	9600	10200	11400	12000	12000	12000	12000
	5 years	42000	45000	48000	51000	57000	60000	60000	60000	60000
	Cummulated	42000	87000	135000	186000	243000	303000	363000	423000	483000
The increased income of A as compared to B	Cummulated	-42000	-48000	-29000	-15000	+6000	+27000	+54000	+85000	+133000

The graphic in figure 2 is built on revenues of the two persons in each period of 5 years from the age of 20 years, until retirement age (65 years). The point of intersection of the two lines indicates the age at which the income of the two persons becomes equal. After this point, the chart shows a stronger growth income of person A than the person B, confirming that higher-level training has a positive effect on the relationship between earnings and age. The graph may be misleading about the evolution of the real gains. In the case of person A, the graph does not mark the effect of the losses in the first 5 years on income throughout the whole period, and in the case of person B it does not mark the effect of the earnings in the first 5 years on income throughout the whole period.
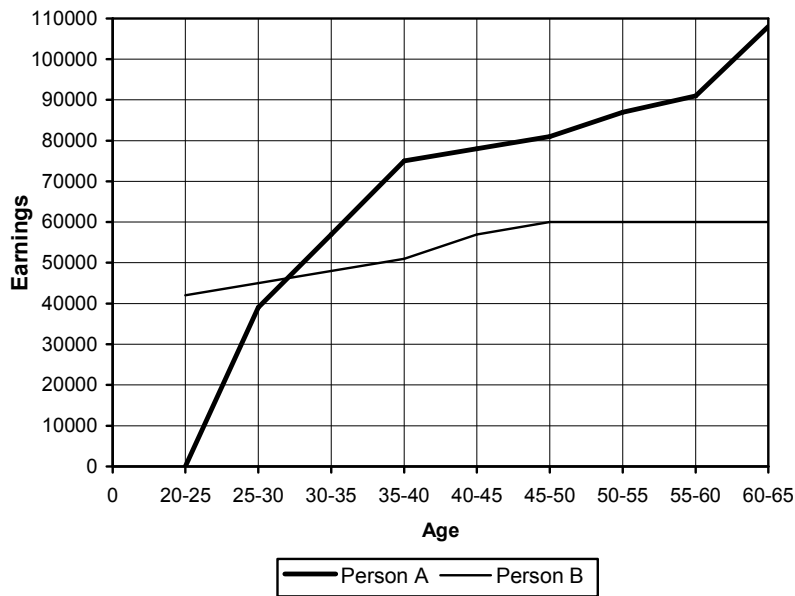

Fig. no. 2 – The comparative situation of average earnings according to age

To remove this gap, Figure. 3 is built on the cumulative revenue derived from those two people over the whole period. Thus, in the case of person A the revenue growth is less spectacular because of the lack of revenue in the first period (20-25 years) and this has a powerful effect on the entire period, while in the case of person B the losses during the period 25-65 years (comprising a lower growth of revenue) are mitigated by the gains obtained in the first period (20-25 years). We should note that the moment when the two curves intersect, which marks the income equality, takes place later than in the chart above, after the age of 40 years. But this is closer to the truth because it marks:
- For person A, the moment when the effect of losses in the first period has been lifted by higher earning growth in the future periods;
- For person B, when the effect of gains in the first period has been lifted by lower earning growth in subsequent periods.

We can also say that to this moment, the person A has paid the cost of opportunity choice whether to pursue a college (and not directly get employed), and after that time person B will pay the cost of opportunity choice whether to get employed (and not continue their studies in college).

Fig. no. 3 - The evolution of comparative cumulative revenue

A more striking illustration of the effect of training on the relationship between earnings and age is in Figure 4 where the graph is built on surplus earnings of the person A as compared to person
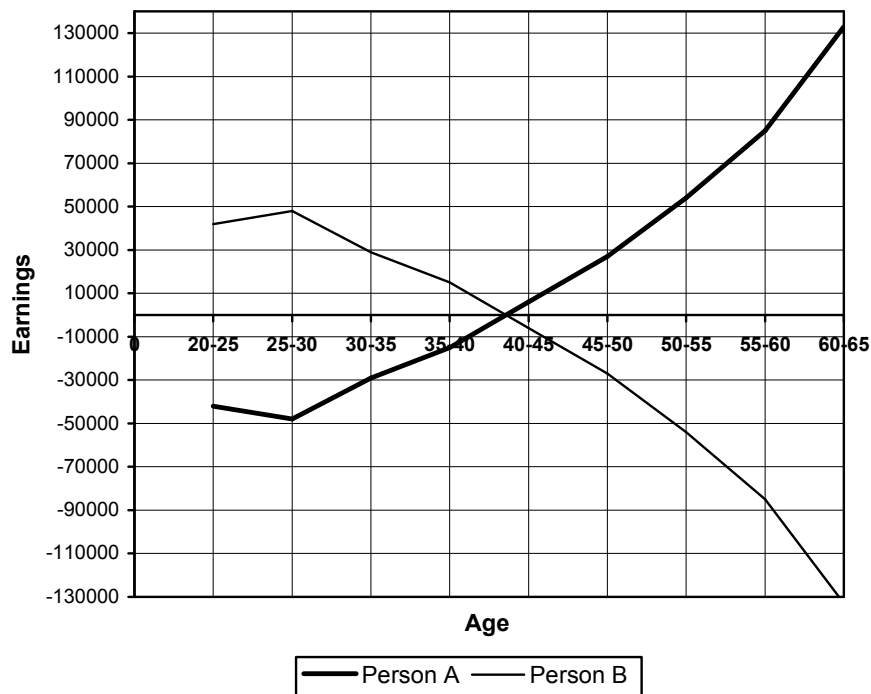
B.

Fig. no. 4 - The evolution of earnings of a person a as compared to person B

As you can see, throughout the period of amortization of the cost of studies the person has recorded a negative growth (minus). This graph can be interpreted as a comparison between two situations designed for the same person, but for two different decisions. Thus, the area bounded by the curve at the point of intersection to the left plays the opportunity cost of the decision to study in

university, and the area bounded by the curve B from the point of intersection to the right plays the opportunity cost of the decision not to follow studies in higher education (to get a job straight away).

In connection to the data presented in this example, we should make a very important statement: that in calculating the opportunity cost for the decision to continue studies in higher education they did not take into account only the loss of income caused by not getting a job. In fact, the actual cost of whether that decision can be (much) higher if we consider the costs of schooling (which practically is never zero).

Thus, to estimate the total capital investment in education to determine the full amortization period of this investment, it is necessary that one should add to the loss of wages (as a result of not getting a job) both the direct and the indirect costs of school.

When looking back at the data from the first example (table no. 1), at an annual cost of tuition of 5,000 lei, it would result that during the 5 years of school (bachelor + master), one would have to pay a sum of 25,000 lei. When we also add the amount collected by the loss of wages in the 5 years the person does not work (42,000 lei), this leads to a total value of investment in educational capital of 67,000 lei. If this value were marked with a minus, it could be summed algebraically with the increase of income of the person A (see Table. 2). Thus we may get the real image of the conditions under which the recovery of capital investment in education takes place (see Table. 3 and Figure no. 5).

Table no. 3

Situation of the recovery of investment in educational capital

	Age trances								
	20 – 25 years	**25 – 30 years**	**30 – 35 years**	**35 – 40 years**	**40 – 45 years**	**45 – 50 years**	**50 – 55 years**	**55 – 60 years**	**60 – 65 years**
Gain increase of person as compared to person B	-42000	-48000	-29000	-15000	+6000	+27000	+54000	+85000	+133000
Investment recovery situation	-67000	-115000	-144000	-159000	-153000	-126000	-72000	+13000	+146000

It is noteworthy that, according to the model proposed by GS Becker, the effect of training on earnings is lower in the first period after graduation, and the economic "value" of the educated person increases with age. However, we should also note that in our example we chose a profession – the didactic profession – that does not offer very good salaries both in our country and elsewhere. Furthermore, in our example we chose a situation in which the student shall bear the costs of schooling. However, in Romania, a significant proportion of the students preparing for the didactic profession benefit from subsidies by the state education, so private investment is usually lower. Perhaps, however, there are other reasons than economic ones that generate orientation towards the teaching profession.
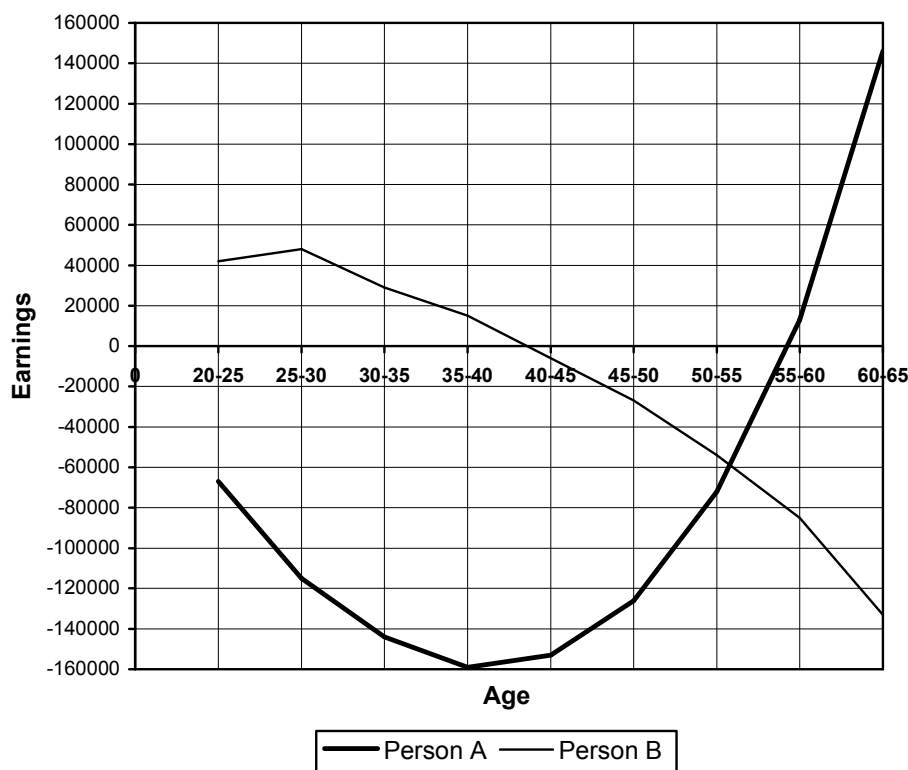
Fig. no. 5 - The evolution of educational capital investment recovery

Final Remarks

It must be said that the examples we have chosen simplify things as they limit both the gains brought by the choice for education and the opportunity cost of this option just to economic issues, income and losses. In fact, education is not just an ordinary service and the earnings brought by education or, conversely, the losses it brings have other dimensions, not only the financial ones.

There are many "non-market incomes" and "non-monetary effects" of education that are related mainly to the role that education has on the quality of life. As a long term investment, education brings a permanent increase certainty on a "better" situation and increases the hope of evolution and of social development (education generates careers). Education increases the "proximity effect" (the pleasure of living in the vicinity of a cultivated environment), raises hope for a better marriage, it positively correlates with health, generates prestige and pride etc.

In addition, the option for education has also some "unobserved variables". These make certain types of gains not to be negotiable in terms of economic opportunity cost. For example, a student with exceptional skills in mathematics will choose to pursue higher studies in this area, regardless of the revenue lost by this choice, i.e. the second variant – giving up mathematical studies – and this would have a far greater "psychical" opportunity cost than the first option.

It is these "other dimensions" of earnings brought by education that explain why the option for education and often for higher education is socially widespread, even if the extra revenue it generates is not always very high (sometimes even does not offer higher income), and the opportunity cost of the option is high.

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