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ABSTRACT

Delayed Graduation and University Dropout: A Review of Theoretical Approaches

This paper surveys the theoretical approaches used in the literature to study the phenomenon of delayed graduation and university dropout. The classical human capital model does not contemplate failure, which the amended human capital model does. Delayed graduation and university dropout are two stages of the same decision repeated over the years to step aside or leave when the net returns to education expected ex ante are negative. Failure can also be taken as a signal of the real skills of individuals who do not succeed to gain a higher level of education. The job search approach underlines the role of positive/negative local labor market conditions as a factor able to explain choices of investment in human capital. Within the bargaining approach, the decision to delay graduation or dropout from university is related to bargaining within the family between parents and children: the former give their children better consumption opportunities in return for their presence at home. Although the amended human capital model is certainly the most compelling one, the other approaches help framing factors which are neglected in the human capital model, forming a well-structured body of knowledge to better understand the phenomenon under scrutiny, while also suggesting a set of policy tools to better control it.

JEL Classification: H52, H75, I21, I23, I28, J13, J24

Keywords: elapsed time to degree, postsecondary education, ex post and ex ante returns to education, university fees, human capital, signaling, job search, bargaining

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1. Introduction

Since 1970s, several scholars (e.g. Comay et al., 1973) started to note the existence of some important breaches in the ability of the classical human capital model (hereafter HCM) originally proposed by Gary Becker (1962) to explain specific stylized facts related to the investment in human capital:

a) delayed graduations and dropouts were mounting in importance and size in many advanced economies, including the United States and Europe (Italy, Denmark and Sweden above all);

b) there were frequent moves of university students from one field of study to another;

c) vertical, but also horizontal overeducation were widespread phenomena in all advanced economies, suggesting the existence of important mismatch between the composition of the demand for and the supply of skills.

These facts are at odds with several assumptions of the HCM. First, it is hard to believe that individuals have a full set of information regarding their skills and preferences already before starting the university and, therefore, are able to perfectly choose the optimal level and field of education for them. In the classical HCM, the equilibrium years of investment in education correspond to the level when a declining marginal rate of return to education equals the marginal cost of education. Imperfect information is much more likely, given the above outcomes, which suggests that investment in education is more the result of a trials and error process, rather than a choice made once and for all.

Second, educational systems appear to be far from neutral in allocating skills to individuals up to their optimal level. Several institutional or organizational arrangements might affect the ability of individuals to reach their optimal level of education: limited enrolment, lack of counselling before enrolment and of admission tests, insufficient tutoring, uncapped completion period, abnormal programs of study, so-called killer exams, and so on.

Third, the quality of education may constrain the ability of individuals to reach their equilibrium level of investment in education. In particular, after the seminal work by Card and

Krueger (1992) research has focused on the role of teachers' wages and pupil to teacher ratio as indicators to compare the quality of education supply across areas or countries (see for instance Ehrenberg and Brewer, 1994; Dolton and Marcenaro-Gutierrez, 2014).

Fourth, the assumption of the classical HCM according to which financial markets are perfectly competitive and efficient and/or public financial support is provided to remove the financial constraints that poorer individuals face is far from verified. In fact, financial markets are well known for not being perfect. They hardly provide financial support to poor, but talented young people, without real guarantees. In many countries, credit is not provided based on future earnings prospects, which are difficult to predict.

Several attempts have been made over time to amend the classical HCM in order to explain delayed graduation and university dropouts. The available explanations have followed different theoretical approaches, not all of which within the context of the HCM. In particular, the following four approaches have been proposed:

a) amended human capital;

b) signaling;

c) job search;

d) intra-household bargaining.

The aim of this paper is to review these theoretical approaches in order to highlight advantages and shortcoming of each. To our knowledge, no previous research has considered all these approaches together. Previous studies, especially the empirical ones, typically focus on only one approach. Our main conclusion is that the amended HCM has got important merits to explain delayed graduations and/or university dropouts, which are two sides of the same coin or two stages of the same decision, but the other approaches supply important insights to understand specific aspects of the phenomena under scrutiny. They also point to several new policy levers which could be important to consider for policy makers.

The outline of the paper is straightforward. After this introduction, we have four sections, one for every theoretical approach surveyed (human capital, signaling, job search, bargaining). A

sixth section discusses the empirical testing of these approaches and presents some of the empirical findings in a comparative perspective. Some summary remarks conclude the essay.

2. The human capital framework

To investigate why university students delay their graduation or dropout from university, we will focus first of all on the classical HCM, as set out for the first time in the seminal paper of the Nobel Prize winner Gary Becker (1962)[1]. Then, we discuss the approach which is certainly to be considered the most promising of all, namely that based on amendments of the HCM.

2.1. The classical human capital model

The main aim of Becker's model is to explain why individuals invest in human capital, which means the unique set of innate and acquired abilities that everyone possesses. The main focus of the analysis is the investment in education, although work-related competences are equally relevant components of human capital. Nonetheless, in most educational systems, which are usually sequential in nature, work related competences are generally acquired after completing education and entering the labor market, while only in dual educational systems general education and work-related competences are jointly acquired while at school (see also Pastore, 2018).

Being focused on explaining the factors affecting the decision to invest in education, explicitly or implicitly, Becker makes some crucial assumptions as: an individual continues to invest in his/her education until when the expected lifetime earnings, net of the cost of education, are positive. Costs are of various types: direct and indirect. The former can be monetary (fees, books, tutoring, living, housing and transportation) and non-monetary (effort is a positive function of the years of study). Indirect or opportunity costs include foregone earnings during the time

[1] For handbook accounts of the human capital model, see, among others, Polachek and Siebert (2008); Borjas (2015) and Bratti and Checchi (2015).

spent in education. Individuals of different ability may differ in terms of earnings that they can get in case they achieve more education, which are higher for abler individuals, and of costs, which are lower for abler individuals, especially the non-monetary costs. Other factors, that might affect the actual investment in education, are the discount rate and the family background in terms of incomes and wealth. Individuals that are present oriented discount more any foregone income, *ceteris paribus*, hence they would prefer to start working earlier. In addition, individuals from poor families are more at risk of being financially constrained and, beyond their ability and talent, without scholarships or grants, they struggle for optimal human capital investment.

Figure 1 depicts the equilibrium level of education for individuals of different ability. In panel (a), both earnings and costs schedules are upward sloping and start from the origin of the axis because individuals pay no cost and get no earnings if education is zero. As known, the earnings schedule is concave, while the costs schedule is convex. Earnings are concave because education cannot increase earnings at a constant or increasing rate: the underlying assumption is that the market requires and rewards only a maximum amount of education. Costs, instead, especially non-monetary costs, tend to increase more than proportionally with education. As a result, the most able individuals invest more in education than the less able ones. The optimal level of education corresponds to the point where the slopes of the earnings and costs schedules are equal, namely where the marginal rate of return is equal to the marginal cost of education (i.e. the benefits associated to an additional year of education is equal to its cost).

Moreover, poorer individuals will have a cost function quickly growing and becoming asymptotic to any given level of education corresponding to the level that she can afford given her family income, in case she is financially constrained. Therefore, a financially constrained individual will achieve a lower level of education (OA) than the one which is optimal, given her ability.

In panel (b), for the sake of simplicity, we report the marginal rate of return to education as a downward sloping linear function of the years of education and the discount rate as a fixed

preference of individuals and hence a constant linear function, independent of the years of education. In this case, we assume that ability affects only the marginal rate of return to education, in such a way that the marginal rate of return is higher for the abler individual ($OE>OD$). The figure shows that even assuming that they have the same discount rate, the abler individuals will choose a greater number of years of education because the marginal rate of return to education is shifted to the right. The reader can easily work out on her own, that we could get different educational outcomes also for individuals with the same ability, but a different discount rate. In this case, we would have the same marginal rate of return, but a different discount rate, higher for the individual who is more present oriented. The latter will find it less convenient to invest in education and will achieve a lower number of years of education.

[Figure 1 about here]

Even in the context of this short representation, the classical HCM is unable to explain delayed graduation, dropout and overeducation. As we will show in the next section, the adoption of a multistage, sequential framework is essential to understand and explain those phenomena.

2.2. Introducing failure in the classical HCM

Altonji' model (1993) is considered the most important theoretical reference within the framework of the HCM for understanding and analyzing the rationale behind the choice of dropping out of university, being also useful to analyze the phenomenon of delayed graduation. Altonji's model builds on two previous models, which have set the context of the amended HCM.

As first proposed by Comay et al. (1973, pag. 423, n. 8), both delayed graduation and dropout are strictly dependent on the student's perception of *ex ante* rates of return to

investment in education, which measure the net return to the university degree weighed by the probability to graduate.

The models described hereinafter should therefore be regarded as an extension of Becker's model (1962), which they amend to take into account the sequential nature of the decision of investment in education as well as the degree of uncertainty, which dominates such decision. Contrary to what happens in the basic HCM, the decision to invest in education does not take place instantaneously, but rather is made year after year by weighing for the probability to succeed the expected marginal rate of return to education, which is continuously adjusted according to market conditions, and the direct and indirect cost of an additional year of schooling. Costs and returns are measured exactly as in the HCM.

Comay et al. (1973) provide evidence supporting the view that investment in one's own education is a multi-stage process: every year, individuals compare the marginal benefit and cost of education contemplating whether it is worthwhile to acquire an additional year of education. This process is likely to continue until successful course completion and qualification achievement. It goes without saying that the decision to invest in education is strongly influenced, at each step of the way, by the uncertainty about the ability of the individual to actually complete the educational program. Consequently, such decision is never made once and for all until the qualification is eventually achieved.

According to the standard Becker's model, the optimal choice of investment in education is the one that maximizes the individual's expected net lifetime return to the investment and it is made once and forever. In this framework it is rational to complete only partially the course of study and to go beyond the legal duration of it, but this decision is taken at the time when the initial choice is made, taking into account the

person's skills and the current labor market conditions. As a consequence, the model implicitly assumes that it is not necessary to graduate, since every period at school increases the individual's human capital. According to Comay et al., (1973, p. 426) the decision is instead continuously revised as the individual gains more information on his/her abilities and on the labor market returns of educations.

As in the classic model, Comay et al. (1973) suggest different policy tools to increase/reduce the share of dropouts or of university graduates, such as scholarships (that reduce the cost of course attendance), mentoring and tutoring programs especially for students that are more likely to drop out. An additional policy that would be likely to reduce dropout rates would obviously consist of lowering the requirement standards for graduation.

Likewise, Manski (1989) depicts investment in one's own education as a sequential choice, to be renewed year after year, and is affected by a number of educational policies. Interestingly, the focus of Manski's analysis is whether a reduction in dropout rates at the university is itself a socially desirable goal. The author concludes that there is no normative basis that can clearly and fully justify the existence of an optimal share of dropouts – and, implicitly, of delayed graduation rates[2] –, since the goal of an effective education policy is that of increasing the percentage of both enrolled students and graduates.

Manski (1989) also points out that, to complete their schooling program, students need ability to pass the exams and motivation. However, it is highly unlikely that any student contemplating enrollment knows *a priori* whether she has the right aptitude and

[2] The telling title of his study is "Schooling as Experimentation."

talent to complete her education program. The only way a student can figure this out is by gaining first-hand experience on the various aspects of education. The decision to start experimenting does not depend on the *ex post* return, computed on the earnings of graduates, who represent only a limited selection of those who enroll, but on the *ex ante* return which contemplates also the probability to fail. The *ex ante* return is computed as the probability-weighted average of the return to education in case of success or failure. As the experimentation progresses, the latter (the probability of failure) decreases while the former (the probability of success) increases. If it is fair to let young people experiment with schooling, nevertheless, in theory, according to the author, no particular support should be given to those students who have neither sufficient motivation nor enough skills to graduate. This is basically what happens in today's marketplace, where, thanks to low start-up costs, all small medium-sized enterprises (SMEs) have the chance to access the market regardless of their initial investment, but only the most competitive ones can survive in the long-term. Likewise, low educational fees allow a large number of students to enroll in post-secondary schooling. However, only the highly skilled and motivated students are able to successfully carry out their studies.

According to Manski (1989), student aid policies aimed at reducing dropout levels might lead to opposite results and unintended consequences. On the one hand, withholding financial aid to students at greater risk of dropping out would ultimately favor the enrollment of those students that are more likely to succeed. As a result, on the basis of incomplete initial information, such policy would significantly reduce the number of enrollees as well as the student's overall chance to experiment with schooling. On the other hand, this policy might not only reduce dropout levels among students that were enrolled before implementing such policy, but also, due to higher success rates of those

who actually enroll, may encourage low-skilled and unmotivated students to enroll at a later stage, thereby increasing the total number of dropouts. The overall effect of such aid policy might best be represented as the algebraic sum of the lower number of dropouts among high-skilled students (senior students) and the higher number of dropouts among the low-skilled students (freshmen). Thus, it is not at all certain that the final outcome of student aid policies would be a reduction in dropout levels (Manski, p. 306).

In Manski's model a student enrolls in postsecondary schooling if:

$$PV_C + (1 - P)V_D \geq V_W \quad (1)$$

Where P indicates the probability of success; V_C denotes the expected utility associated with the completion of one year of education – which depends on the *ex ante* net return, that is to say the expected return of an extra year of education, net of direct, indirect and opportunity costs of one more year of schooling under uncertainty – ; V_D indicates the expected utility associated with dropping out; and V_W denotes the expected utility of working.

To simplify his model, Manski (1989) assumes that what varies across students are not the values of the expected utilities (V_C, V_D and V_W), but rather the distribution of P. Specifically, the author focuses on the case when $V_D < V_W < V_C$ because, otherwise, such analysis would be trivial, that is if $V_W < V_D < V_C$, every student enrolls; if $V_D < V_C < V_W$, no student enrolls.

Altonji (1993) summarizes and generalizes previous contributions. He starts from conceptualizing the impact of a high dropout rate on the net return to the investment in education, noting that all calculations of *ex ante* returns to education should include not only those students who have successfully completed their schooling program, but also

those who were hoping to achieve a degree, but then dropped out. It goes without saying that this correction greatly reduces the value of *ex ante* as compared to *ex post* returns in countries where the dropout rate is high. Finally, since there are important differences in returns to degrees in different fields of study, and the cost of changing one's field of study and degree program is quite significant, the high rate of dropout can alter the *ex ante* distribution of returns to education by subject, thereby altering the choice of the optimal field of study and, ultimately, the optimal level of education of each individual.

The specific addition to Altonji's model with respect to the previous contributions is to highlight the importance of factors that were unnoticed before, such as: a) individual preferences and talent for a certain field of study; in particular, the Author seeks to explain why students who enroll in a scientific degree are more likely to change into arts degrees, while students who enroll into arts degrees are less likely to do the opposite; b) the level of background achieved at high secondary school; c) talent and interest for college education; d) the probability of completing a certain program of studies once started. All these individual characteristics affect both the expected return to education and the likelihood to complete or abandon the study program. As in previous models, the *ex ante* calculation of the return to a certain type of education depends not only on the expected return in case of success or completion, but also on the probability of either changing field of study or dropping out, which inevitably leads to a higher cost of the investment in education by causing a delay in graduation. In turn, the probability to delay the degree or dropout depends on a number of individual characteristics.

In its simplest two-period version, the Altonji's model assumes that in each period an individual chooses to begin postsecondary education in either math/science (m) or humanities (h). Individuals do not know their precise type, namely if they totally dislike

studying, if they are indifferent between being student or worker, or if they prefer to start college. At time 0, before starting the schooling program, the choice depends on a number of factors: the stock of knowledge gained at school, the individual's aptitude, and an error vector. The probability of starting college is a positive function of several variables (equation 2):

$$PR_{SC} = f\left(K_0, A, \frac{\theta_2}{\theta_0}, \frac{Y_1}{Y_0}, \frac{Y_{2m}}{Y_0}, \frac{Y_{2h}}{Y_0}\right) \quad (2)$$

The greater is the knowledge acquired at high school (K_0), the individual's ability (A), the probability to be a "type" who likes college ((θ_2) (relative to the probability to dislike continue studying θ_0), the (relative) returns to one year of education (Y_1), and of the degrees in math/science (Y_{2m}) or humanities (Y_{2h}), the higher is the probability to enroll at college.[3]

At the end of period 1, the expected return on education is represented by the probability-weighted average of the returns to three alternative events: 1) a value of zero, in the event of failure; 2) a value equal to the market return to the degree in the field of study chosen at the beginning; and 3) a value equal to the market return to the degree in the new field of study chosen at the end of the first academic year. The variables affecting the probability to dropout at the end of the first year are the same as in equation (2), but with the difference that now K_0, A, θ_2, Y_{2m} and Y_{2h} negatively affect such outcome. Another variable that can influence the type of choice made in period 1 is the knowledge and experience acquired while attending university, which allows a more accurate calculation of the probability of successful degree attainment than in period 0 (i.e. before starting the study program). The only difference between the probability to start college

[3] Readers must be aware that returns are not only monetary, as they include also the utility of studying in a particular field.

- represented in equation (2) - and the probability of graduating (in one field or the other) is the role played by Y_1, i.e. the return to one year of college: while in equation (2) it enters positively, it enters negatively in the function of the probability to achieve the degree. The probability to graduate in the math/science (s) rather than in humanities (h) trivially depends on the relative returns to different majors.

The more detailed analysis of Altonji provides the foundation to his empirical analysis of *ex ante* returns and costs of education, which is aimed at explaining the high dropout rates of US students. According to this analysis, not only a low demand for high-skilled workers, but also the inefficiency in the higher education system may negatively affect *ex post* payoffs leading to a reduction in university enrollments and to a concomitant increase in delayed graduations and dropouts.

As it will be more thoroughly addressed below, a specific body of the empirical literature focuses on the most appropriate methodologies to estimate the effect of economic conditions on the probability to continue or abandon the chosen postsecondary education. In this regard, low demand for graduates caused by high unemployment rates could either increase or reduce university enrollments, according to whether lower expected returns outweigh or not the opportunity cost of education.

In graphical terms, with reference to the classical HCM, the impact of a reduction in the marginal rate of return to education caused, for instance, by a worsening of the general labor market conditions could be represented as a shift to the left of the relative curve, which, holding constant the subjective rate of discount of the cost of university education, reduces the total number of years of education (see, for example, Borjas, 2010, Fig. 6.3). In the HCM theoretical framework, these are in summary the terms of the ex ante choice

of investment in human capital. It could then lead to a reduction in enrollments and to a simultaneous increase in delayed graduation and dropout.

2.3. A simple graphical representation

We propose Figure 2 as a visual representation of the phenomena of delayed graduation and university dropout, according to the amended HCM. They can be seen as two sides of the same coin: the uncertain and sequential nature of the investment choice. Students that have obtained a high school diploma are divided into two main groups: those who enter the labor market, because of their negative expected net return to education, and those who pursue postsecondary education, because of a positive net return. For simplicity's sake, we assume university education to last three years and, unlike Altonji's analysis, to be only in one field. Moreover, those students who begin an academic year always manage to complete it, unless, in reality, it is not uncommon to observe a number of temporary and/or permanent dropouts throughout the academic year. At the end of the first period, some of the students that started working decide to enroll in postsecondary education. Conversely, some of the enrollees decide to abandon schooling after having experienced the many challenges of their education program. At the end of the second period, we can observe the same trend: those individuals who had previously given up studying enroll or re-enroll if they had left at the end of the first period; most of the students attending university decide to continue; however, a small number decides to abandon schooling on a temporary or permanent

basis. The same trend can be observed once again at the end of the third period. Thus, Figure 2 clearly shows that the percentage of dropouts decreases over time.

[Figure 2 about here]

Figure 3 represents the expected lifetime earnings of individuals according to their education level. This Figure can help us better understand the differences between the models discussed above and that proposed by Becker. The horizontal axis represents the years of employment from the age of completion of high school (i.e. 18-19 years) to retirement, (i.e. 65 years for both men and women) for individuals who achieve the university degree (steeper lines) and for individuals who do not (flatter lines). The expected return starts immediately from the time of graduation, or, in the case of dropout, from the age when the withdrawal from university takes place. This analysis assumes that there is no unemployment, a condition that is highly unlikely to occur in many countries, since duration of the school-to-work transition is generally quite long. Students can be grouped in the following categories:

a) individuals that after postsecondary education completion start working and earn money;

b) individuals that drop out of university after 1, 2, ..., n years;

c) individuals that graduate within legal length;

d) individuals that graduate beyond legal length.

The path of each student depends not only on his/her chances of completing postsecondary education, but also on its entry-level salary and on the slope of its wage-earning curve. At the beginning of its postsecondary education, the student calculates the *ex ante* return to investment in education as a probability-weighted average of the returns in the various cases mentioned above. In each of these cases, the *ex ante* return is much lower than what is predicted by the classical Becker's model, which, in fact, only applies to graduates holding a job. Consequently, the greater is the uncertainty about the educational outcomes, the higher is the rate of delayed graduations and dropouts. These two phenomena will, in turn, increase the number of students

that choose not to enroll due to the risk of failure. Furthermore, the students' propensity to drop out or to seek a job during the course of their studies will further reduce the overall chance of successful degree attainment.

[Figure 3 about here]

Making a comparison with the macroeconomic theory of investment, we could say that Becker assumes perfect information of individuals about their talent and future income prospects, or at least risk, which can be computed *ex ante*. Instead, the amended HCM assumes that the investment is done in conditions of uncertainty: *ex ante*, individuals are unable to accurately predict whether they will be able to pass the exams, when they will pass them, when they will find a job, and with which earnings. Therefore, individuals may understand their actual returns to investment in human capital only over time. Their initial calculations may be wrong which explains their delayed graduation or decision to drop out.

2.4. Recent issues

A number of specific issues have been raised within the framework laid down in the amended HCM, which allow better assessing its heuristic power. Among others, Garibaldi et al. (2007)[4] aim to suggest that an increase in tuition fees specifically applied to students lagging behind regular study times can increase their commitment, thereby increasing their likelihood of graduating in time. Indeed, tuition fees paid in the years after the first potential graduation year (so called "continuation" fees) have two effects: a direct (negative) effect on the utility of the corresponding year; a backward (positive) effect on the effort level of the previous years.

[4] The NBER working paper version by Garibaldi et al. (2007) describes the theoretical model we are referring to in the text. Such model is not included in the 2012 journal article version, which focuses exclusively on the empirical analysis.

Therefore, the authors demonstrate that increasing tuition fees in the extra-time years increases the effort exerted in normal-time years, thus reducing the delay.

While acknowledging that from a theoretical point of view there is no optimal length of studies for each individual, Garibaldi et al. (2007) argue that it is socially desirable to obtain a degree within regular study times, whereas delayed graduation is probably due to a sub-optimal effort of students. Consequently, delayed graduation might represent a heavy financial burden for taxpayers since universities receive public subsidies to pay part or all of the tuitions for falling behind students. Moreover, students who delay their graduation generate negative externalities due to public university congestion and negative peer effects. These last may further contribute to prolong the average duration of time that is necessary to attain a degree. Taking this line of reasoning to its extreme consequences, under these conditions, elapsed time to degree can be viewed as the rule rather than the exception by most students.

A shortcoming of this approach pointed out by other authors – see, among others, Coin and Sylos Labini (2012) – is that it considers delayed graduation as a choice. In other words, Garibaldi et al. (2007) assume that students are lagging behind only because they lack the necessary commitment to study. In fact, this is only partly true: the great majority of students lagging behind[5] have lower than average abilities, thus they are likely to graduate late because the

[5] On average, the distribution of elapsed time to degree with respect to the total number of enrolled students shows some territorial differences. In years 1969-2007, the students' propensity to delay their graduation was more common in areas with higher unemployment rates. In particular, the median rate of students lagging behind regular study times in Italy by location is as follows: North-West 20%, North-East 28.6%, Central 26.9%, and South and Insular 31.4% and 30.2%, respectively (MIUR, 1969-2007).

teaching load is too heavy for them. The obvious consequence of increasing tuition fees could then be an increase in the dropout rate.

3. Signaling

Let us now briefly consider how elapsed time to degree could be rationalized within the theoretical framework of the signaling model, which was first proposed by Nobel Laureate Michael Spence (1973). Although, to the best of our knowledge, a theoretical model in the spirit of Spence is still missing, Groot and Oosterbeek (1994) construct some interesting hypotheses to indirectly test the sign of the correlation between delayed graduation and wages. One of the basic hypotheses of the signaling model is that in the case of sub-optimal *ex ante* information on workers' productivity[6], wages are not only directly proportional to the workers' productivity, but also to the workers' innate abilities. In other words, education does not enhance workers' productivity, like in the HCM, but rather acts as a signal of their innate abilities to future potential employers. According to this theory, the speed at which students complete their education can be taken as a signal of their skills by the potential employer. *Vice versa*, the delay and, even more so, dropping out of higher education mirrors a lower than average skill level.

In the literature, there are both models of *pure signaling*, where education is merely a signal of ability and does not affect productivity; and mixed models of signaling and human capital where education is not only a signal, but also a process that is able to enhance productivity. Brodaty et al. (2013) developed a mixed theoretical model that

[6] Whereas Becker's human capital model contemplates only optimal *ex ante* information and, then, human capital should mirror also ability.

considers two distinct types of education system. The first one is more oriented to economic efficiency in that it takes upon itself the task of certifying the level the individuals' skills. In this type of system, failures are quite frequent and affect the subsequent course of studies: those students that fail to pass their exams are tracked and they have to re-attend the study course before they are allowed to go further. The second type of education system is more egalitarian because it follows social promotion mechanisms: essentially, everybody is admitted to the next academic level regardless of his/her academic performance.

In both cases, late graduation always gives a negative signal to future employers. Remarkably, delayed degree attainment could ultimately counteract the positive effect of graduation on productivity and wages. On the one hand, students convey the positive signal of education; on the other hand, they transfer a negative signal related to the delay; the overall effect depends on which signal is dominant. Only empirical analysis can measure the algebraic sum or net effect of these two gross effects.

As Groot and Oosterbeek (1994) argue, the human capital theoretical approach also helps rationalize the effects of delayed graduation on *ex post* payoffs (i.e. earnings and employment). If attending the university increases the human capital then the delay does not need to be a problem as it increases also productivity and earnings. If this does not happen, delayed graduation is, in fact, rather a signal of low skills. However, despite having been addressed in several other studies, it appears that the overall effects of dropout and delayed graduation on several labor market outcomes are not easy to predict. According to the HCM, delayed graduation should increase or reduce labor outcomes such as wages, employment chances. The evidence on the consequences of postponing

tertiary graduation is still narrow, especially on its effect on the probability of experience overeducation (see for instance Ordine and Rose, 2009; and Aina and Pastore, 2012).

Brodaty et al. (2008; and 2013), and Domadenik et al. (2014) argue that, on the one hand, delayed graduation could lead to more exposure to educational activities, thereby increasing the individual's human capital; on the other hand, though, the delay in graduating will postpone also entry into the labor market, therefore, compromising the acquisition of other complementary components of human capital, such as general and job-specific competences, thus creating an adverse effect on the process of human capital accumulation. It is clear, then, that the key issue is to determine what causes delayed graduation: if the delay is due to the fact that students are actually accumulating work-related competences through work experience, then it may also have a positive effect on the productivity of the *late graduate*; if, instead, it is caused by work experience of low skill content, then the negative effects may prevail.

Let now take another look at Figure 3. Recall also that, according to Becker (1962), human capital is constituted of three highly intertwined and complementary components: education, general and job-specific work experience. It is the complementarity between education and work experience that makes the expected age-earnings profile become steeper than that of those individuals who only hold a secondary high school diploma. Conversely, each component of the human capital, taken on its own, is of little value (Polachek and Siebert, 1993). Now, if students graduate with a delay, without developing their work related competences during their study period, the age-earning profile will tend

to develop a positive slope farther in time and, hence, it could also never reach its maximum peak as well as the descending phase before individuals retire.

Other contributions have highlighted the role of the family and other institutions, both academic and extra-curricular, in paving the way for the phenomenon commonly known as *parking lot hypothesis*, namely the tendency of young people to remain literally "parked" at the university waiting for a job to come. This hypothesis originated from the sociological field and moves from a reversal of the human capital theory. In fact, implicitly, this hypothesis is based on the intuition that education should not be viewed as an investment to increase one's own labor opportunities, but rather as a consumption good or as investment in future employment opportunities, especially in a period of low job demand currently determining unsatisfactory employment prospects.

4. Job search

Sasha Becker (2006), instead, seeks to explain the differences in university dropout rates across regions and countries, by resorting to the job search theoretical framework. Within this context, contrary to the standard HCM but similar to the amended one, investment in education is not instantaneous, but it is made over time. According to this model, local unemployment rates might importantly affect the choice whether continuing to study or start looking for a job. For instance, when unemployment rates are high, the job search process is generally less intense, also when it comes to the so-called *non-college material* students, i.e. the low-skilled and less motivated students. This trend might be explained by the students' willingness to invest in education, rather than searching for a job, in order to improve their chances to get a job in the future. However,

in the meantime, they are looking for a job and, if they find it, then they drop out of university.

Individual's skill heterogeneity allows identifying three different categories of workers:

1. those with lower qualification levels would rather be unemployed while waiting for the right job to arrive;
2. those with average qualification levels, who, despite being enrolled in the education system, are ready to accept a job offer;
3. the highly qualified individuals, who keep studying until when they get their aimed university degree, regardless of labor market conditions.

Which key variables can influence the transition from education to employment and the choice between education and employment? An increase in the earnings of low-qualified workers would make them more likely to drop out of university. Instead, an increase in the wages of highly qualified workers, which would then expand the existing gap between high- and low-skilled workers, would force non-college material students to remain in the education system for longer periods or re-enter more frequently in the hope to gain higher earnings in the future. Reduced unemployment rates of highly qualified workers would lead to an increase in both job offers for skilled workers and expected rate of returns to education, thus reducing the probability of dropping out. In contrast, an increase in the discount rate would lower the waiting time, thereby favoring university dropout. Furthermore, an increase in enrollment and tuition fees would likewise shorten

the time to degree completion as it would increase the cost of being parked at the university (Becker, 2006, p. 67).

The role of the local economic context, particularly the unemployment rate as a factor affecting human capital investments has also been addressed by other empirical studies (see, for instance, Messer & Wolter 2010; Pastore, 2012), which, besides focusing on investments in education, have also marginally touched upon delayed graduation and university dropout. From these studies, it appears that the impact of local unemployment on schooling is far from being unanimous. Some papers endorse the *parking lot hypothesis*, proposing that higher local unemployment rates reduce the opportunity cost of investing in education, thereby enhancing the likelihood of university enrollment, especially if university fees are low (Di Pietro, 2006; Adamopoulou and Tanzi, 2017). Based on this hypothesis, we can infer that given an equal distribution of skills and scholastic aptitude among students belonging to a certain public education system, those areas with higher unemployment rates will be characterized by higher rates of delayed graduation.

On the other hand, other papers contend that high unemployment rates negatively affect educational performances, thus reducing the rate of return to education and discouraging investment in education. As a result, delayed graduations and dropouts should occur less frequently in periods and areas with high unemployment rates (e.g. Pastore, 2012). Since it is basically impossible to predict in advance which one of these

two models better represents reality, each model's empirical validity should be evaluated through context-specific testing.

5. Bargaining models

In other theoretical frameworks, the choice to continue the course of studies must be evaluated together with the decision to either live with parents or form a new household.

In this regard, Giannelli and Monfardini (2000; 2003) have developed a theoretical model based on the decision of either remaining in the parental household while studying or starting a new family and finding a job. According to their model, the decision of living with the parental family can help us better predict the length of the education investment of an individual because of the following reasons: a) it increases the reservation wage, thereby reducing the intensity of job search; b) in case of capital market imperfections (i.e. problems in accessing loans for students), it allows individuals to either keep investing in their education or opt for vocational training and lower wages because their parents can cover all accommodation costs; c) it allows delaying the decision to form a new household, with negative effects on fertility.

Cohabitation and the resulting availability of a higher reservation wage are highly intertwined with the tendency to lengthen the time required for degree attainment beyond legal terms. In this regard, Manacorda and Moretti (2006) seek to determine the reason/s why about 83% of young people live with their parents – often while attending university. In their study, they show how the willingness of Italian parents to live with their kids might influence such decision. The underlying hypothesis is that the kids' decision to leave their parental house is the result of a negotiation process between them and their parents: the latter give to their children better consumption opportunities in return for their presence at home. We can infer that, even though

the authors do not explicitly state it, this might help make delayed graduation a more bearable option.

6. Empirical testing

As it is often the case, the empirical literature has sought to verify the validity of what we have called the modified HCM by testing some of its hypotheses and/or some of its predictions.

Once ascertained that the stylized facts support the amended HCM as a more realistic theoretical framework to understand several outcomes of the supply of high education across countries and over time, we are left with the aim of testing the predictions of the model. In fact, the amended HCM does have a number of predictions regarding the determinants and effects of graduating with delay or dropping out of university education, which the empirical literature has taken as a testing ground of the model. In the rest of this section, we try to bring to the fore the typical modelling framework adopted in the empirical literature. We will focus on three main issues:

a) Does the demand for education and, hence, the share of university graduates differ across countries based on the *ex ante* (or ex post) returns to education?
b) Which are the determinants of delayed graduations and dropout?
c) And which are the consequences?

a) ex ante versus ex post returns to education

As noted in the previous section, once ascertained that the share of dropouts and delayed graduation are non-trivial in most countries, there should be a clear difference

between *ex post* and *ex ante* returns to education. In addition, the latter will be a better predictor of the demand for education and of its evolution over time and across countries.

However, we are aware of no studies that try to measure *ex ante* returns to education and to relate them to the share of graduates. The reason is that, until recently, national and international statistical offices have lent little attention to measuring the share of dropout and the extent of delayed graduation. The lack of systematic information on the size of these two phenomena prevented researchers from understanding better the impact of *ex ante* returns, although there are many signs that policy makers are becoming increasingly aware of the impact of delayed graduation and dropouts on the share of university graduates. It is not by chance that several countries where delayed graduation and dropout are a sizeable phenomenon, policy makers are starting to introduce incentives for universities to reduce them. For instance in Italy, where the problem of time to completion of bachelor degrees is particularly serious (Giavazzi et al. 2012), the main parameter used by the government to fund state universities is the number of "regular" students, i.e. those who are enrolled within the legal duration of the respective degree course. Up to 2012 the parameter was the overall amount of students (regular and stragglers), with a perverse incentive to keep students enrolled longer than necessary. To partially compensate universities for the consequent funding drop, and to incentive students' regularity, government allows to levy higher fees to students who are still enrolled after the legal duration of their degree program. Several financial incentives/disincentives to students have been introduced also in Northern Europe countries characterized by long times to degree, such as Finland (Hakkinen and Uusitalo, 2003), Germany (Heineck et al. , 2006,

Glocker, 2011), Norway (Gunnes et al. 2013). The efficacy of such reforms is however controversial (Garibaldi et al. 2012).

As regards dropout, policies range from the application of more selective admission criteria, to the amelioration of the orientation activity, to the tutoring of students more at risk to withdraw from university. Concerning the first policy, it has to be noted, that admission standards – where present - are set mainly to ration the excessive demand of tertiary education in presence of supply-side constraints, rather than to select the most promising students (Jacobs and van der Ploeg, 2006). Orientation activities are, according to the human capital models described in section 2.2, particularly suited to reduce dropouts, as these interventions are expected to provide students with better information on their own ability and on the contents of the degree programs. Indeed, according to Stinebrickner and Stinebrickner (2012 and 2014), a relevant share of dropout in the first year of college can be attributed to the learning process occurring at the beginning of the academic experience. Several measures have been introduced, especially in US colleges, to ameliorate orientation and anticipate this learning process (see for instance Upcraft et al. 2004). Their efficacy, however, has not yet been robustly tested so far.[7] Finally, to make tutoring effective and to avoid the potential waste of resources associated to such demanding activities, it is crucial to detect timely those who are more at risk of failing at university to target interventions. To this aim, tertiary education institutions should be enabled to collect information on students' past performance, socio-economic background, academic abilities that, according to the empirical literature, are good predictors of students' success/failures at university.[8] Finally, it has to be mentioned that the Bologna Agreement, which led to a deep reform of tertiary education in several

[7] The only paper on this issue, at the best of our knowledge is Pascarella et al. (1986).
[8] For a survey of the empirical literature on the determinants of university failures see Aina et al. 2018.

European countries by reorganizing the structure of the degree programs, was explicitly aimed at reducing the study length and dropouts issues due to their prevalence in several higher education systems.

b) determinants of investment in education

The general modelling framework to assess the role of different determinants of delayed graduation and dropout follows the following scheme:

$$Pr(DG = 1|X) = \Phi(X'\beta) \quad (3)$$

$$Pr(D = 1|X) = \Phi(X'\beta) \quad (4)$$

Where *DG* is delayed graduations, *D* is dropouts and *X'B* is a vector of explanatory variables and their coefficients, including generally individual characteristics (e.g. gender, marital status), previous educational characteristics (type of high school diploma, final grade at school, etc.), family background (social class and/or educational attainment level of parents), quality of the educational system (teachers' wages and pupil to teacher ratio), efficiency of education (field of study, number of exams, scholarships available, level of university fees), and so on. The related evidence suggests that, both for the decisions of early withdrawing from university or for completing tertiary education not within the prescribed length, key roles are played by students' characteristics, abilities and preferences, parental background and family networks, higher education system features and labor market conditions. In fact, better students' performance in terms of lower dropout and delayed graduation rates relies on being students with academic tracks, females, young, not belong to a minority group and living in a well-off family, namely with a larger human capital endowment and/or with better financial conditions and ties.

In addition, fewer chances of dropping out or of delaying university completion depend on the degree of selectivity, the organization and rules applied in each institution as well as the intensity of the scholarships. Finally, it has been well documented that in a period of recession, high school graduates are more likely to enroll at university and less inclined to early withdraw, hence they tend to achieve a university diploma unless they are not high ability students. On the contrary, once the labor market opportunities improve, students may enroll at university by considering this option as a *parking lot*, but as soon as they receive a job offers they dropout.[9]

Then, by applying this simple empirical framework, it potentially becomes much more complicated to model the omitted heterogeneity. Two types of omitted heterogeneity are generally considered, although not always in the same paper. Some studies attempt to control for this bias, which might come from the omitted heterogeneity of the individuals who graduate with delay or dropped out from university with respect

[9] See Aina et al (2018) for a more comprehensive survey of the determinants of these two phenomenon.

to those who graduate in time and/or did not dropout. The second type of heterogeneity refers to the difference between the students who enroll and those who do not enroll.

The methodologies adopted to take into account these types of bias are discussed in the context of the wage effect of delayed graduation and/dropout in the rest of this section.

c) Consequences of delayed graduation and dropout

Another typical empirical assessment of the model consists of studying the impact of delayed graduation and dropout on the usual labor market outcomes, such as earnings and the probability to find employment:

$$Lnw = \alpha + \varphi' DG + \omega' D + X'\beta \tag{5}$$

$$Pr(E = 1|DG, D, X) = \Phi(\gamma DG + \delta D + X'\beta) \tag{6}$$

Where Lnw is the natural logarithm of net monthly or, more often, hourly wages. Indeed, equation [5] is a typical Mincerian earnings equation, whereas in addition to the variables of interest (DG and D), a number of typical control variables (X) are included, with their relative coefficients. The control variables in [5] and [6] may or may not overlap with the control variables of the previous two equations.

In this case there is a high risk of omitted heterogeneity of the individuals who experience delayed graduation or dropout and the rest of the individuals in the sample (endogeneity bias) and between university graduates who find and who do not find employment (sample selection bias). The methodology to address these two issues are

partly different. As it is well know, endogeneity bias can be addressed in this context in different ways:

a) Instrumental variable (IV) approach;

b) Panel data analysis;

c) Semi-parametric approaches and experimental design.

The approach a) is typical of cross-section data. It consists of using the equations [5] and [6] as the second step equation and equation [3] and [4], respectively, as first step equations. Obviously, in this case, the equation [3] and [4] should be amended to include some instrumental variables, namely exogenous variables which affect DG and D, but do not affect wages or employment (so-called exclusion restriction). The difficulty of finding suitable instruments able to satisfy the above conditions, especially the exclusion restrictions, is making this IV approach less popular over time, although until about 10 years ago it was considered to be very important. In other words, it is very hard to find any instrumental variable able to affect dropout or delayed graduations, without affecting wages and/or employment. As an example of this approach, Brodaty et al. (2013) exploit a policy change taking place in France (i.e. the opening of new schools) in order to estimate the effect of one year of delay in degree attainment at upper secondary school. Estimates show a wage disadvantage of 9% per each year of delay persistent over time.

Approach b) is problematic in the case under scrutiny, because DG and D are fixed effects and, therefore, panel data analysis is unsuitable to address the impact of these variables on labor market outcomes. Taniguchi (2005) takes account of the above-mentioned endogeneity by exploiting the longitudinal structure of dataset to separate fixed effects (i.e. students' skills/motivation) over time. Results show that accessing the labor market at an older than standard age reduces dramatically and persistently the

returns to education, in the US Interestingly, even though people graduated at an age over than 25 have a positive return during their career, they cannot fill the gap with the entry-level salary.

The last approach, which is becoming increasingly popular is the semi-parametric approach, consists of estimating the equations [5] and [6] for a target group (the individuals who have experienced DG or D) and a control group (all the rest of the sample of graduates), after running a propensity score matching of the probability of experiencing DG and D as a function of the above-mentioned determinants. The propensity score is used to select individuals of the target and control group with exactly the same characteristics so as to allow the investigator to study the diversified impact on the outcomes of interest of the given characteristics (DG or D), considered as the treatment. The advantage of this method is that it is better able to control for the observed characteristics of the two groups than traditional fully parametric estimates, while the main disadvantage is that it does not allow controlling for unobserved heterogeneity. In other words, we can control for the observed characteristics available in the data, but not those which are not observed in the data. As an example of this promising approach, Schnepf (2014) assesses the labour market outcomes of university dropouts in European countries based on self-reported information from participants in the Program for the International Assessment of Adult Competencies (PIACC). To evaluate the counterfactual effects of dropouts, the author uses two methods (i.e. logistic regression and propensity score matching) which control for the non-random selection of the dropout samples, even though they are both based on the debatable assumption that all relevant differences between individuals are captured by the observable variables. Findings show that students who attended and then dropped out of tertiary education benefit anyway

from their university experience, and have higher probabilities to find a job than their peers who never enrolled. This result casts doubts on the negative view of dropouts, which is common in the theoretical literature on education.

As shown in Aina et al. (2018), there is substantial evidence suggesting that unobserved heterogeneity is less problematic than expected and that it might explain only a limited part of the differences in outcomes between target and control group. Holmlund et al (2008), after having introduced several promising instruments (including a university enrollment reform) to estimate the labor market effects of gap years, conclude that they do not provide enough power for identification, and prefer to rely on observable characteristics for identification, showing only OLS estimates results. More in general they observe that if instruments are very hard to find when studying returns to education, it is even harder when the main variable of interest is the timing of education.

The problems of sample selection bias are typically addressed by means of the Heckman sample selection correction procedure and its variants. The Heckit has been used for equation [5] and the Heckprobit version for equation [6]. It consists of a two-step procedure whereas [6] is the section equation and [5] the main equation. It happens that in order for the model to be fully specified, we need to amend [5] by means of some instrumental variables able to predict the probability of employment but not wages. The Heckman approach suffers of the same problems as the IV approach: it is almost

impossible to find suitable instruments able to satisfy the exclusion restriction, which is making this procedure increasingly unpopular.

7. Concluding remarks

The human capital model (HCM), as originally elaborated by Gary Becker (1962), is unable to explain such phenomena as delayed graduation and university dropout, which, nonetheless, are becoming ever more sizeable in many countries, making often ineffective the policies implemented to further increase educational attainment levels.

In order to better understand and explain delayed graduation and university dropout, several authors have developed new theoretical models and, in some cases, new theoretical approaches that allow also identifying new policy levers to increase education attainment by reducing the dropout rate. We review what could be called the amended HCM: it is a HCM that takes into account the sequential nature of the decision of investment in education and allows, hence, bringing in the decision to invest in human capital an important aspect, namely the uncertainty regarding the final outcome and the actual returns to the investment in education. In Beker's classical HCM, there is perfect information and the returns to education computed on graduates are a good proxy to measure also those of freshmen. However, under conditions of imperfect information, *ex ante* returns may importantly differ from *ex post* returns. Moreover, family background, institutional settings as well as a number of factors regarding the organization and management of university studies may importantly affect the decision to continue

investing in education or dropping out. The duration of university studies affects the overall *ex ante* returns to education, therefore, influencing enrolment and attainment rates.

Our main contribution is to develop this theoretical framework and link it to the empirical literature aimed at understanding the determinants of university delay and dropout. The amended HCM is the underlying model, although only few empirical studies mention it and explain its fundamental assumptions to the reader. Moreover, the policy makers, also the most minded and knowledgeable, often ignore the consequences on delayed graduations and dropout rates of reforms of the institutional setting and management not only of the university system, but also of the labor market.

Last, but not least, we show that there are other approaches, namely those which rest on signaling, job search and intra-household bargaining models, that could be usefully used to explain the phenomena, which are the object of this paper. They are also important to identify further policy levers to reduce the duration of studies and the probability to drop out. This models tend to focus on local labor market conditions, allowing us to better understand geographical differences within and across countries, and monetary and non-monetary incentives within the family, which might also play a very important role, especially in some countries, such as Italy, where education attainment and fertility rates are becoming very low.

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Tables and Figures

Figure 1. The classical human capital model. A graphical representation

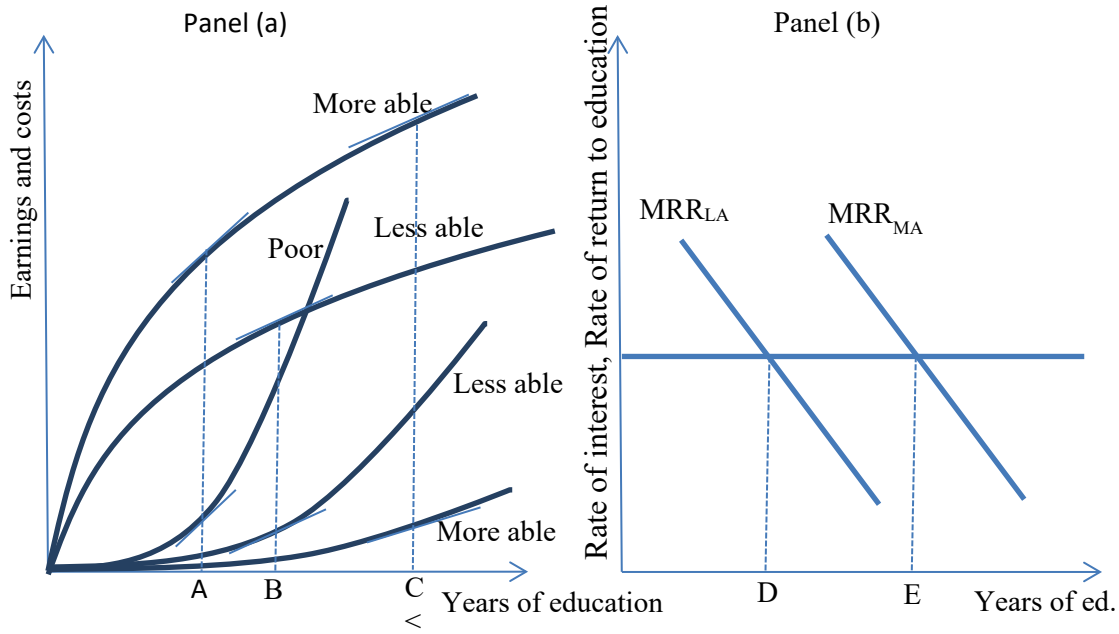

Figure 2. Delayed graduation and university dropout in a multi-stage decisional process

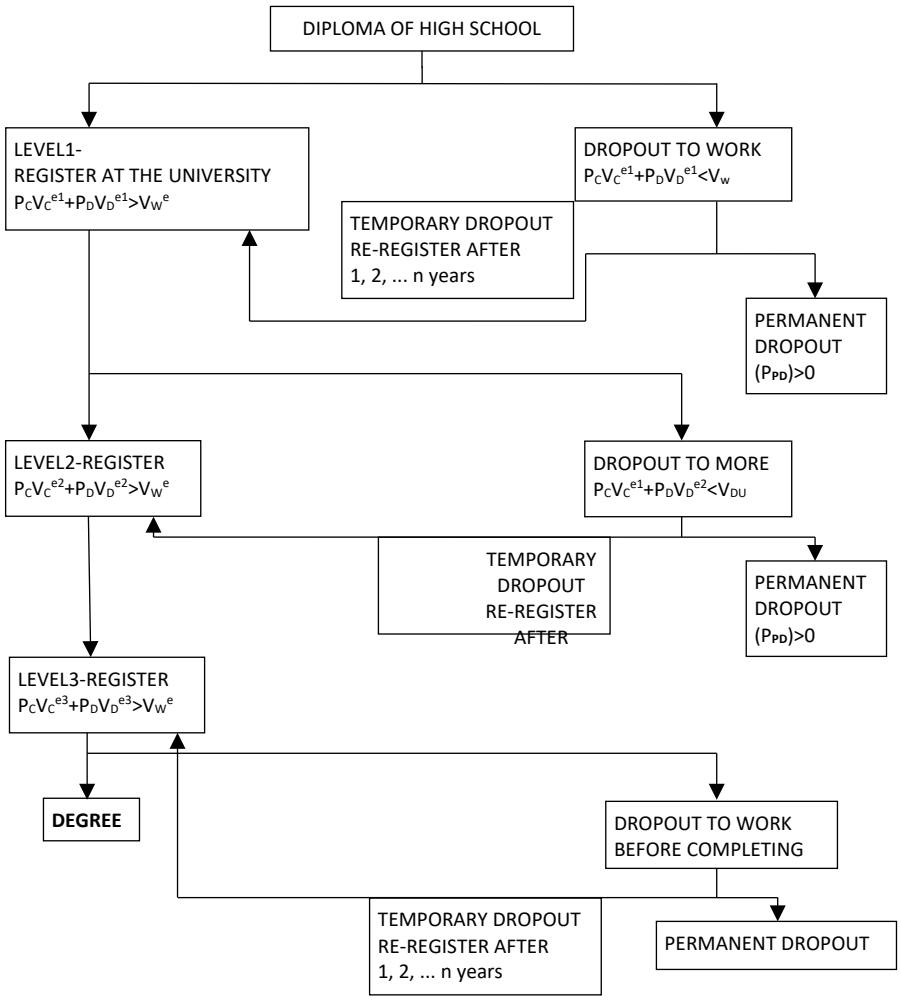

Figure 3. Net expected returns to education for different types of students