Aina, Carmen; Baici, Eliana; Casalone, Giorgia; Pastore, Francesco

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The economics of university dropouts and delayed graduation: a survey

Carmen Aina[a]
University Piemonte Orientale and GLO

Eliana Baici
University Piemonte Orientale

Giorgia Casalone
University Piemonte Orientale and Dondena Research Centre

Francesco Pastore
University of Campania Luigi Vanvitelli, IZA and GLO

Abstract

This survey organizes and discusses the theoretical and empirical literature on the determinants of university student achievements. According to the theoretical framework, the decision to invest in tertiary education is a sequential process made under gradually decreasing levels of uncertainty on education costs and future returns. Students, applying a learning by doing approach, update their information set each academic year and revise benefits and costs associated to tertiary education. Accordingly, they decide whether to continue university studies in order to get a degree or to withdraw. This university decisional process is discussed by clustering the determinants of university outcomes into four main categories - students' characteristics, abilities and behavior; parental background and family networks; characteristics of the tertiary education system and its institutions; labor market performance - which are drawn from the empirical evidence. The policy advice resulting from the encompassing analysis is to provide an all-inclusive orientation activity for students, before they enroll at university. A complete understanding of the potential costs and benefits of this human capital investment can in fact reduce the risk of early withdrawal or delayed graduation.

JEL classification: H52; I21; I22; I23; J13; J24
Keywords: university dropout; time-to-degree; tertiary education; human capital theory.

[a] Corresponding author: email: carmen.aina@uniupo.it Via Perrone, 18 – 28100 Italy. Tel. +39(0321)375303

1. Introduction

In recent years, several governments of advanced and developing economies have put the increase in the number (and share) of individuals holding tertiary education qualifications at the top of their policy agenda. While the economic returns to general education are well-known (see among others, Harmon et al. 2003, Sianesi and Van Reenen 2003, Sauer and Zagler 2012, Sauer and Zagler 2014), the need to widen the fraction of university degree holders to compete in a globalized marketplace is a more recent issue. For instance, in 2009 US President Barack Obama recognized investment in higher education as a key issue of his administration's agenda, announcing the ambition for the United States to become once again the nation with the greatest proportion of higher educated citizens in the world by 2020[1] (i.e. 60% of college-educated people). Besides, in view of the implementation of the Europe 2020 strategy, the European Union (EU) has set the goal of increasing the number of people aged 30 to 34 attaining tertiary education to at least 40% by 2020. Increasing educational attainment has become relevant in both national and international debate on higher education, and thence several policy initiatives have been adopted to enrich the quality, efficiency and attractiveness of university education at large.

Within the OECD area the proportion of 20 to 24 year olds enrolled in tertiary education increased by 14 percentage points (from 29% to 43%) from 2005 to 2016 (OECD, 2017). In 2016, within the EU, most countries have already achieved the Europe 2020 target, but a non-negligible number of states are still below: Italy (26%), Hungary (30%), Germany (31%), Czech Republic (33%), Slovak Republic (33%), and Portugal (35%) (OECD, 2017). Similarly, the United States, with 48% of graduates, is still rather far away from Obama's target, albeit exceeding the OECD average of 43% (OECD, 2017).

These figures suggest that more comprehensive policies are required to boost the proportion of young adults holding tertiary qualifications. Nevertheless, focusing only on measures aimed at increasing tertiary enrolment rates could be detrimental, if they fail to guarantee university completion. In fact, in most countries, the slow progress in achieving higher education attainment among young adults, despite the rise in participation, is mostly explained by university "failures", i.e. dropouts and delayed graduation.[2] In all developed countries, the percentage of students dropping out of university or graduating beyond legal terms is very large, and, needless to say, deeply worrying. The share of students who did not complete postsecondary (i.e. tertiary) education is about 31% in OECD countries. However, it should be pointed out that dropout rates are not evenly distributed. In particular, this phenomenon reached dramatic levels in the US and in Italy, where, on average, more than one student in two abandons university without obtaining any university degree. Likewise, dropout rates were above average also in New Zealand, Hungary, Mexico, UK, Poland, and Norway; while they were below 24% in Belgium, Denmark, France, Germany, and Japan (OECD, 2009).[3]

Correspondingly, the prevailing propensity of taking longer than the minimum period to graduate poses a direct threat to the associated benefits of higher education investment. Based on the conventional statics used to gauge delayed graduation (i.e. age at graduation), OECD data show that the average age at graduation for type A first degree program is 26.4, but with significant disparities across countries. In particular, the age at graduation for successful degree attainment is about 22.0 for Belgians, 24.0 for British, approximately 26.4 for Italians, 27.5 for Danes, and 29.4 for Swedes (OECD, 2014). Likewise, lengthening time to graduate has become a growing concern also in the

[1] The announcement has been done the 24 February 2009, during the President's address to a joint session of Congress.

[2] We refer to dropouts as students who leave the university system without earning a degree, whereas delayed graduates are students who get a tertiary qualification beyond the legal duration. Both these behaviours represent university "failures", because they decrease the share of graduates available to the economic system. A further phenomenon, less studied but similar to dropout, is "stopout", which indicates students who drop out of college and subsequently re-enrol either in a different institution or field of study. All in all, drop out, stop out and delayed graduations denote non smooth university paths.

[3] Data on dropout rates refer to 2009 as it is the latest survey conducted by OE on this topic.

US, since at most public universities only 19% of full-time students achieve a degree in 4 years and this percentage raises to 36% if state flagship universities are considered.[4] This issue attracted great public attention as confirmed by the massive media coverage in a variety of outlets.[5] In fact, taking longer to graduate is not a costless choice, especially when tuition fees are high, while financial aid are narrow.

Given the structural characteristics of the different economies, in terms of degree of development, type of technologies adopted, and labor market conditions, such discrepancies in raising tertiary education attainment are obviously due to the intrinsic differences among higher education systems and the policies implemented in each country, which largely influence the age at completion of secondary school, the university's capacity to enroll students holding a secondary high school degree, the universities' selection and admission procedures, the duration of the courses, and the availability of scholarships for the most talented individuals belonging to households in need. An in-depth analysis of the interrelationship among all of these factors is therefore necessary to determine which education systems are – net of individual choices, and to personal and parental characteristics – more efficient in facilitating regular university trajectories.

Until now, no studies have taken a comprehensive approach to survey the existing scientific literature in economics, as well as in education and sociological fields, so as to provide a consistent theoretical interpretation able to allow academicians, policy makers at all levels and practitioners to understand and address the issue of university dropout and delayed graduation. Considering the common goal - in many advanced and developing economies - of raising higher education attainment rates, this paper extensively reviews the empirical evidence by examining risk factors at place, and the degree of effectiveness of different policy interventions adopted to lessen university failures.

The outline of the essay is as follows. Section 2 reports a simple theoretical version of the human capital model amended to consider uncertainty regarding returns to tertiary education. Section 3 summarizes findings from various empirical studies and analyzes the determinants emerging as associated to (or causing, depending on the empirical methodology applied) delayed graduations and dropouts, by clustering these factors in four groups: students' characteristics, abilities and behavior; parental background and family networks; characteristics of tertiary education system and institutions; labor market features. Section 4 offers the conclusions of our analysis and some ensuing economic policy guidelines.

2. Theoretical framework

The theoretical framework of the human capital investment model (hereafter HCM), firstly proposed by Becker (1962), assumes that the decision to invest in education is made by comparing monetary benefits and costs associated to this decision. Each individual will achieve a certain education level (i.e. university degree) if the net present value of the degree is positive at the time of enrollment. Implicitly, this model relies on two assumptions: first, individuals consider only the amount of monetary benefits and costs associated to the investment in education; and, second, they are perfectly able to calculate those benefits and costs.

However, the education decision process is more complex. Students and their parents do not consider only the economic returns to education, but, more in general, they take into account the overall utility gained by getting the degree, and the overall costs (included non-monetary costs). Moreover, before enrolling at university, students are not perfectly informed about the quality of the study program, their genuine interest in the contents of the courses, their abilities/skills to comply with the study program requirements and the effort needed. Random utility models developed for

[4] See "Four-Year Myth: Make College More Affordable. Restore the Promise of Graduating on Time" – Complete College America, 2004.

[5] Many newspapers and magazines discussed this tendency of postponing graduation, see for instance *New York Times*, *The Washington Post* and *The Economist*.

instance by Comay et al. (1973), Manski (1989), Altonji (1993), Stinebrickner and Stinebrickner (2012; 2014) the original HCM and introduce the latent demand for college as a function of (expected) utility and costs. In this framework, students' decisions and their outcomes are modelled by applying a sequential process, which exploits the additional information acquired over time. At the end of a given educational level (i.e. high school), individuals decide whether to enroll or not to the subsequent educational stage (i.e. university) based on the informative set at their disposal at that time. Nevertheless, once enrolled, students may progressively modify their choice since their set of information improves by knowing the characteristics of the study course attended, its complexity, and their ability to meet course requirements. Therefore, the decision process can be represented by the following equation:

$$d^i(t) = 1 \quad \text{iff} \quad U\left(NPV_t^i, B_{NMt}^i\right) > C_{NM}(e_t^i) \qquad t=0,1,2,\ldots x \qquad [1]$$

where $d^i(t)$ is a dummy variable equals to one if the student *i* decides to enroll at university at the end of high school (time *t=0*), and it is still equal to one if the student keeps staying enrolled in the following years (time *t=1,…,x* where *x* is the total years spent at university).

Each student decides to enroll at university, and to continue higher studies in the following years, if the utility, which depends on the Net Present Value (*NPV*) of attaining a university degree and on the non-monetary benefits of studying (B_{NM}), is greater than non-monetary costs (C_{NM}). Monetary benefits, together with direct and indirect monetary costs, determine the *NPV* of the university degree:

$$NPV_t^i = \sum_{j=x+1}^{L} \frac{Y_{Dt}^j}{(1+r)^j} - \sum_{i=1}^{x} \frac{C_{Mt}^j}{(1+r)^j} - \sum_{i=1}^{L} \frac{Y_{Nt}^j}{(1+r)^j}$$

where Y_D represents the yearly earnings of a university graduate, Y_N the yearly earnings of a high-school graduate (which is also the foregone earnings for the period when the student is enrolled at university), C_M is the amount of monetary direct costs afforded to get the degree, *L* is the retirement age, and *r* is the discount rate. Notice that the underlying hypothesis is that monetary benefits and costs may change over the period *t* in which the student is enrolled at university.

2.1 Higher education investment decisions and university failures

Students may revise their education decision throughout all the periods *t* they carry on their studies.[6] The learning process can modify, ex-post, the monetary benefits and costs associated to university investment of each individual, thus changing her *NPV*. Moreover, students learn more about non-pecuniary benefits associated to the study program (or to the type of jobs they can start once graduate) and about non-pecuniary costs (effort), which depend on their ability.
Taking advantage of the additional information acquired and possibly of calibrating the effort exerted, students shape their behavior and achieve one of the following outcomes:

I. interruption of the study program (i.e. dropout),
II. graduation on time (i.e. within the legal duration),
III. graduation beyond the minimum period prescribed.

Considering that a learning process occurs by staying at university, the initial decision to enroll at university can become suboptimal after *1,2,…,x* periods because the costs exceed benefits. If this is the case, students dropout. Alternatively, it may happen that benefits still overcome costs, so that

[6] For the sake of simplicity, we can assume years.

university choice is still worthy, but students will not graduate on time. Applying this dynamic framework, all the previous educational outcomes, namely dropout, graduation on time, and delayed graduation can be explained.

To stress the importance of the contribution given to the traditional framework by the random utility models, let us suppose that monetary benefits and costs do not change as long as students stay enrolled at university. Over time, students gain experience, thus non-monetary benefits and costs may be revised. In particular, they can properly assess whether the degree course chosen matches with their expectations, and the effort needed to fulfill study program requirements. Thus, three situations may occur at any point in time of the study process:

1) If student's expectations about the contents of the study program are satisfied, and the effort needed to keep up the study program is affordable, the student remains enrolled at university and she is able to graduate on time.
2) If the reverse inequality holds in [1] at time *1, 2,…..,* x, because one of the following cases holds: a) student's expectations (B_{NM}) are lower than expected; b) the effort requested (C_{NM}) is higher than expected; c) both B_{NM} and C_{NM} are different than expected, but C_{NM} is greater than B_{NM}, the final outcome is that the student dropouts.
3) If student's expectations (B_{NM}) are not lower than expected and the effort required C_{NM} is higher than anticipated, but inequality [1] holds, then the student has to slow down, if possible, as she cannot meet all the requirements of the study program. In this case, the final outcome is that the student delays graduation.

Trivially, if also monetary benefits and costs change (for instance once expected earnings, tuition fees, family financial conditions, time devoted to study, etc. vary) the initial *NPV* may become negative and the optimal outcome turns to be university withdrawal. It is noticeable that in this framework the decision of postponing graduation depends on the matching between students ability and study program requirements (i.e. on the effort), that is gradually updated with university attendance.

2.2 Determinants of students' outcomes

To facilitate interpretation of this model, we provide a list of the determinants that, both at micro and macro level, can affect students' benefits and costs of education investment, thus shaping individuals' choice.

Within the extended HCM framework, we can distinguish both the benefits and the costs of graduation into monetary and non-monetary. The (expected) earnings of graduates, which depend on graduates' wages and employment probabilities, represent the first category. Non-monetary benefits reflect nonpecuniary preferences for education, together with inclinations for the specific degree program attended (for instance Business, Medicine, Law, and so on) and for the type of job it leads to (for instance Manager, Doctor, Lawyer, etc.) (Altonji et al., 2012). Other non-monetary benefits, associated to college attendance, are the possibility to be involved in side-activities, making friends and forming relationships with them, the possibility of gaining independence, etc. (Toutkoushian and Paulsen, 2016). Monetary costs can both be direct, for example schooling related expenses, such as tuition fees, books, living costs, and so on; and indirect, namely foregone earnings.[7] Non-monetary costs mainly include the effort that a student has to exert to get the degree and dislike for education. Since the degree of difficulty increases as far as the education level increases, the effort needed to fulfill study requirements rises with the education level, too. Finally, since students take decisions comparing the present value of both benefits and costs, time enters the decision set in two ways: firstly, through the discount rate; secondly, through the time span over which graduates benefit of the earnings differential as regards to the non-graduates, which depends on individuals' preferences, but

[7] We mean the earnings that an individual can obtain by entering the labor market directly after high school diploma rather than enrolling at university.

also on the institutional setting, which defines retirement's rules. Monetary benefits (i.e. expected graduates' earnings) are related to students' characteristics (i.e. ability, gender, ethnicity, family network), to the field of study chosen, and to the graduates' labor market conditions (for instance, graduates' employment rate). Non-monetary benefits depend on the matching between students' expectations and study programs characteristics. Monetary direct costs are strictly related to the university funding system and the family financial conditions. In countries where tertiary education is funded by the State (i.e. no or very low tuition fees and scholarships given to not well-off students), direct costs are approximately null, hence households' conditions do not affect students' choice, except for indirect costs. Instead, in countries where students pay non negligible tuition fees (either fixed or related to family income), monetary costs and their sustainability greatly depend on family financial conditions and on the possibility to borrow money from the market. Monetary indirect costs, represented by the foregone earnings, depend on the same set of variables that affect the expected earnings of graduates, i.e. ability, gender, ethnicity, family network together with the non-graduates labor market conditions. Non-monetary costs (effort) are related to several features. Firstly, to students' ability in relation to the specific degree program: the greater the ability, the lower is the effort needed. Secondly, other things being equal, disutility increases with the time devoted to commuting or working rather than to leisure. Finally, effort is also conditioned by the structure of teaching activities, together with their timetable, and the quality of the facilities provided by the university (for instance tutoring activities, counseling services, etc.).

In this theoretical framework, we argue that students', households' or institutional characteristics may affect the capacity of individuals to correctly predict benefits (monetary and not) and costs (monetary and not) associated to tertiary education investment, thus shaping their outcomes (dropout, completion on time or with delays). As an example, individuals who decide to enroll at university at an older than "usual" age are likely to be more conscious of their own ability and aptitude, and they can make well-informed decisions. This may prevent them from taking the wrong choice at university. At the same time, older freshmen are aware that they have a shorter time-span to benefit of the wage premium related to university education, and this should incentivize a faster academic path. On the other hand, older students (i.e. due to being enrolled beyond the legal length) are likely to experiment the "obsolescence" of their previous knowledge, and this could increase their costs and lead them to dropout or to slow down the achievement of the degree. Offspring of university graduates may have better information about the university system, its organization and the expected effort that has to be made to complete the degree than those who grew up in a poor educational environment. This would lead them to dropout less frequently than their peers who acquired information only after university enrollment. Finally, if the university system is publicly funded and/or if a student comes from a well-off family, the monetary direct costs of education are null or easily affordable, and this should lead to reduce the dropout likelihood. Whereas, if a student faces no constraints (set by the institutional framework or by the family itself) to remain enrolled, he/she could be encouraged to stay longer than needed at university.

To sum up, once the assumption of imperfect information is introduced, investment in tertiary education is not anymore static, hence potential failures (i.e. either dropout or delayed graduation) are the results of a continuous optimization process.[8] In particular, dropout occurs when reverse inequality holds in [1]. If both monetary benefits and costs do not change over time, this happens because of the effects of the learning process which has changed non-monetary benefits and costs. Delayed graduation, instead, occurs when the effort required for the study program was undervalued and or the benefits were overvalued (i.e. abilities are very low), but the inequality in [1] still holds.

In this framework, the outcome of the education process depends on the student's ability to correctly predict the expected non-monetary benefits and costs of education, as well as on the *difference* between monetary benefits and costs. The lower is this difference (i.e. the closer is the

[8] In this regard, DesJardins et al. (1999) as well as DesJardins et al. (2002) argue that early withdrawal from university would not necessarily be considered as a failure.

student to the margin), the lower is the decrease (increase) of the non-monetary benefits (costs) that leads the student to dropout, instead of graduating (on time or with delay).

By applying this theoretical framework, in Section 3 we review the most relevant empirical contributions on the choice to invest in tertiary education, focusing on two specific outcomes: dropout and delayed graduation. For each determinant, we discuss how it influences the costs and the benefits associated to this type of investment, and thence how it may potentially modify the staying on decision over time.

3. University dropout and delayed graduation: an overview of the determinants

As argued in the theoretical section, university dropout and delayed graduation are the results of a sequential process made under gradually decreasing levels of uncertainty on education costs and future returns.

In what follows, we review the existing empirical literature to assess the factors that shape university final outcomes at an individual level. We organize those determinants into four categories:

I. students' characteristics, abilities and behavior,
II. parental background and family networks,
III. characteristics of tertiary education system and institutions,
IV. labor market performance,

by discussing the role of each factor on students' decision. For the sake of clarity and to link theoretical framework and empirical literature, note that all determinants affect both benefits and costs of university investment.

3.1 Students' characteristics, abilities and behavior

Students' *age* is a relevant factor frequently explored in the empirical literature. Students enrolling in university at an older age, whatever the reason is, are more likely to drop out (Montmarquette et al., 2001; Smith and Naylor, 2001; Stratton et al., 2008) or to graduate later than the legal duration (Lofgren and Ohlsson, 1999; Brunello and Winter-Ebmer, 2003; Lassibille and Navarro Gómez, 2010; Vallejo and Steel, 2017). While this finding highlights a clear correlation between entry age and university failures, it cannot establish a causal relationship since these studies do not control for the non-random selection of freshmen students by age at enrollment.

Results are much less robust when a totally exogenous demographic factor, namely *gender*, is investigated. On average, men tend to drop out of university more often than women (McNabb et al. 2002; Arulampalam et al., 2004a; 2004b; Gury, 2011; Cappellari and Lucifora, 2009), but women are more likely to drop out when most of their classmates are men (Mastekaasa and Smeby, 2008; Belloc et al., 2010). According to Goldin et al. (2006), among the main determinants of women's completion advantage, there are higher ex post payoffs to tertiary education, the postponement of maternity, and a stronger commitment to education. Moreover, Stinebrickner and Stinebrickner (2012) report that women's academic success is largely due to gender differences in study effort, resulting in differences in grade point average (GPA) and beliefs about ability. Instead, agreement has yet to be reached on the relationship between gender and delayed graduation. On the one hand, Aina et al. (2011) and Löfgren and Ohlsson (1999) report a lower tendency of men to graduate on time. On the other hand, Häkkinen and Uusitalo (2003) and Lassibile and Navarro Gómez (2011) come to opposite conclusions when they analyze cohorts of students enrolled in short university degrees.

Another exogenous determinant is *ethnicity*. Some studies, which focus on the university performance of "minority" students (Alon, 2007; Alon and Tienda, 2005; Light and Strayer, 2000), show higher than average dropout rates (Harvey and Anderson, 2005). Moreover, these studies argue against the effectiveness of affirmative action policies, which advocate the application of less severe criteria when selecting minority students. Intriguingly, Light and Strayer (2000) and Alon and Tienda (2005), who analyze the same dataset (National Longitudinal Survey of Youth) using two different

statistical strategies – a two-period model with simultaneous estimates, and the propensity score matching, respectively –, draw opposite conclusions. On the one hand, Light and Strayer (2000) conclude that, regardless of the students' ethnicity, the higher is the quality of the matching between a university and the student's skills, the higher is the likelihood of educational attainment. On the other hand, Alon and Tienda (2005) argue that minority students have a greater chance to get a degree if they enroll in more selective universities. While the first result is rather intuitive, the second one is supported by the fact that the performance of minority students are enhanced when universities provide higher quality standards of both faculties and peers.

Likewise, the students' *abilities* at the time of enrollment seem to play a controversial role in determining the probability of dropping out. Some articles show that students with better school attainments are less likely to drop out of university (Smith e Naylor, 2001; Arulampalam et al., 2004a; 2004b; Stratton et al., 2008). The high school final mark is found to be the most important determinant of both the probability of earning a degree and of obtaining a higher final grade also by Danilowicz-Gösele et al. (2017) for Germany. In line with these findings, comparing two cohorts of high school leavers in the US, in years 1972 and 1992, respectively, Bound et al. (2010) observe that the increase in the number of freshmen was not paralleled by an equal increase in graduations, and argue that this might be due, in part, to the fact that freshmen are ill-prepared to complete postsecondary education. By contrast, a number of studies show that students with higher secondary school final marks are more likely to withdraw (Desjardins et al., 1999; Belloc et al., 2010). In this regard, the educational behavior can also be influenced by the combination of high expectations and university achievement: whenever the students' beliefs are not met by university performance, they are more likely to dropout. Prior academic skills also affect the time needed to attain a degree.

Both Lassibille and Navarro Gómez (2011) and Aina et al. (2011) provide evidence that highly skilled students, as measured by the type of high school attended and by their final grade, need less time to complete their degree. However, it still remains unclear whether the positive impact of pre-enrollment students' characteristics on the time to degree completion can have a causal interpretation. In this regard, two studies from the US reach opposite conclusions. On the one hand, Bowen et al. (2009) report that, in the last decades, the lengthening of the time needed to graduate is mainly due to the continuous worsening of the abilities and/or the socio-economic conditions of the students enrolling in university. On the other hand, Bound et al. (2012) do not find any empirical evidence correlating the variation of students' characteristics with the elapsed time-to-degree. Thus, they conclude that if the time needed to graduate depend on the students "quality", the worsening of the median grade of high school final exams, observed in the last decades in the US, should have led to a much longer time to degree completion than the one actually recorded.[9] The dropout probability is also directly correlated to a student's awareness of her academic skills, which could be overly optimistic at the time of starting college (Manski, 1989; Altonji, 1993; Carneiro et al., 2003; Cunha et al., 2005; Stange, 2012; Stinebrickner and Stinebrickner, 2014).

Early academic achievements appear to influence significantly the probability of dropping out. In this regard, students are more likely to continue university if they get good grades right at the beginning, regardless of their previous school experience (Montmarquette et al., 2001; Bennett, 2009; Belloc et al., 2010). In addition, in a survey of Berea College[10] students, Stinebrickner and Stinebrickner (2014) highlight the importance of grade performance on dropout decision. They observe that poor grades at the beginning may influence dropout in three ways: 1) through grade

[9] Further psychological students' characteristics at the time of postsecondary education enrollment (e.g. self-confidence, stress management, inclination to procrastinate, and so on) that may affect university success or failure are key topics of some psychological/cognitive studies, which, for reasons of space, this review will not address. See for instance, Pritchard and Wilson (2003) and Johnson and Bloom (1995), Beswick et al. (2011), and Lee (2005) concerning dropouts.

[10] Berea College was founded with the aim of favouring access to tertiary education to deserving students who had limited financial resources thanks to low tuition fees and affordable accommodation. In 1998, university fees were equal to $1,000.

progression cutoffs that force them out of university, 2) by decreasing the ex post payoffs to education, and 3) by reducing the enjoyability of university. Through a dynamic learning model of university dropout, the authors also show that 45% of dropout in the first two years are due to increased students' awareness of their low academic performance; however, this effect vanishes in the following years. According to Stinebrickner and Stinebrickner (2012), the same holds true for early dropouts, thus confirming the importance of investing in policies aimed at increasing students' knowledge of their academic skills during high school, to prevent both individual and system inefficiencies.

Another important issue concerns the correlation between the *amount of time* dedicated to study and the university outcomes. Research carried out in the US shows that the time spent attending lessons and studying has decreased over the past few decades, thereby lengthening the time to degree completion (Babcock and Marks, 2011; Scott-Clayton, 2012). Such empirical evidence should nonetheless be examined carefully as tertiary outcomes do not only depend on the time spent to study, but also on the interaction between study time and the student's abilities and motivation (Nonis and Hudson, 2006; 2010).

A reduction in study time is often related to the fact that students work. For example, Stinebrickner and Stinebrickner (2003), by using as instrumental variable (IV) the random assignment of Berea College students to a mandatory work-study program correlated with different working hours, show that an increase in working time during university negatively affects academic performance. This finding is partially confirmed by Darolia (2014), who extends the analysis to all American students, divided into part-time and full-time workers, as well as to all off-campus jobs. This analysis relies on estimates with fixed effects to control for students' unobserved and permanent characteristics that may affect both work and study intensity. In addition, generalized method of moments models (GMM) are employed to account for potentially endogenous relationships between working and academic performance, varying over time. Using this model, Darolia (2014) shows that long working hours decrease the number of credits completed by full-time students, but do not affect significantly the grade distribution. Similarly, the negative impact of working time, even at "low intensity", on academic progression is confirmed by Triventi (2014) in a study where a cohort of European students is analyzed by means of a negative binomial regression model, which takes into account work experience as an endogenous multinomial treatment. In general, having a job while at university entails poor final outcomes: namely high risk of dropping out and lower completion rates (Thomas, 2002; Dolton et al., 2003; Kim, 2007; Lassibille and Navarro Gómez, 2011).

Among the factors linked to behavior of students during the university period, *their ability to interact* with mates and professors is crucial to determine their university persistence in the theoretical approach of Tinto (1975) and in the empirical analyses by Pascarella and Terenzini (1978), Pascarella et al. (1978), and Terenzini and Pascarella (1978). Conversely, with regard to social interaction and relationships with peers, Tinto (1997) reports that students participating in study/learning groups are more likely to persist between the first and the second year of university. This happens thanks to the reference network and the bond created with the institution, even though such result reveals a simple correlation because the adopted methodology does not take into account the endogeneity of the students' participation in any study groups. Moreover, using administrative data integrated with a unique survey on the roommates' observable characteristics, Stinebrickner and Stinebrickner (2006) highlight the importance of peer effects[11] (e.g. students' study time and effort) in increasing the probability of degree attainment.

3.2 Parental background and family networks

The body of literature addressing the intergenerational transmission of education has provided conclusive evidence that *parental background* strongly affect children's educational attainment,

[11]For a general overview of the role exerts by peers on educational outcomes see Sacerdote (2011).

although to a different extent according to the country and education system considered (Haveman and Wolfe, 1995). In particular, several studies show that family background (proxied by parents' education or occupation) has a significant negative correlation with dropout behavior. For instance, Johnes and McNabb (2004) find that the parents' occupation plays a significant role in determining both educational attainment and voluntary dropout, providing evidence that students with unskilled parents are more at risk of failure. Similarly Di Pietro (2004), Cappellari and Lucifora (2009), Trivellato and Triventi (2009) and Aina (2013) supports the result that dropout rates are higher amongst poor socio-economic groups. By contrast, a negligible effect of social class background for students enrolled in medical schools is shown by Arulampalam et al. (2004a; 2004b and 2007), although, according to their findings, having a parent that is a medical doctor reduces the likelihood of dropping out. The cultural family background, proxied by the parents' education level, does not seem to play a significant role (Aina et al., 2011; Lassibille and Navarro Gómez, 2011) – and sometimes appears to be completely irrelevant (Brunello and Winter-Ebmer, 2003) –, in determining the time to degree completion.

The education level and occupation of parents, altogether, do not only allow to determine the socio-economic conditions of students, but are also good proxies of *family income*, which has controversial effects on students' academic outcomes. Raw data provide evidence that high school leavers coming from low-income families are generally less likely to attain a university degree than others. For example, according to Manski (1992) the probability of graduating in the US for students from low-income families is 11%, whereas it is 24% for students from high-income families. A possible explanation of these findings is that poor students might have to work in order to afford increasingly higher tuition fees (eg. the US and the UK), especially in absence of financial aid (i.e. scholarships, grants or loans). This, in turn, would reduce their commitment to graduation. Family resources may influence dropout probability also through another channel. Students from low-income households could be the first ones in the family to get a degree, leading to potential lower than expected university returns due to lack of good family networks[12], as well as of a family business inheritance. This could prevent them not only from enrolling at university, but it would also favor the choice of dropping out after experiencing early academic or financial problems (Kiker and Condon, 1981; Thomas e Zhang, 2005). With regard to an education system where university tuition fees are commensurate with family income, like the Italian one, disentangling the effect of family income from parents' education, Aina (2013) finds that the household economic conditions do not affect dropout rates, while academic persistence is positively correlated with parental education. An alternative explanation of the higher dropout rate observed in less privileged students comes from Stinebrickner and Stinebrickner (2003). Using again administrative data and *ad hoc* surveys on Berea College students, these authors demonstrate that academic failure of students from low-income families persists also in the absence of direct education costs. Similarly, by integrating administrative data with a set of information gathered through repeated surveys on financial conditions, Stinebrickner and Stinebrickner (2008) identify credit-constrained students and show that dropout determinants are mainly related to other factors since when financial constraints are removed, dropout rates remain unchanged. Even though, to the best of our knowledge, there are no studies correlating directly the time to degree completion with family economic resources, Bound et al. (2010) show that the largest increase in time needed to attain a degree was registered among US students from low-income families. Furthermore, Bowen et al. (2009) show that the inverse relationship between socio-

[12] Existing literature suggests the central importance of social networks (Jackson, 2010). Family and social networks are stated as one of the main channels that affect labor-market outcomes (see Holzer, 1987; Ioannides and Loury, 2004; Kramarz and Skans, 2014; Plug et al., 2018; Aina and Nicoletti, 2018).

economic conditions and time needed to attain a degree depends more on family income rather than on parents' education level.

3.3 Characteristics of tertiary education system and institutions

Since this cluster group includes a wide and rather heterogeneous set of characteristics, we distinguish among three different sub-groups.

a) University facilities, admission rules and organization of academic activities

There are a number of indicators that can be used to identify the *facilities* offered to students by universities. Indeed, aspects of degree course organization, for example type of teaching tools and tutoring, type and scheduling of examinations, amount of concurrently teaching classes, may affect students' success by stimulating or discouraging their college progression and their motivation (Jansen, 2004; Van Den Berg and Hofman, 2005). Among them, the most common one is definitely the teacher/student ratio. Other measures include the number of students attending class, the amount of tutoring hours, and the time spent on bureaucratic tasks. According to some literature widely acknowledged in the US (Bowen et al. 2009; Bound et al., 2010), the increase in university failures in the last few years is related to the worsening of the "quality" of the services offered to students, as a result of increased demand for postsecondary education not paralleled by an adequate growth of university resources. In this regard, two surveys by Bound and Turner (2007) and by Bound et al. (2010) analyze two cohorts of students, enrolled in 1972 and 1988, to estimate the most recent counterfactual attainment rates on the basis of collegiate characteristics in 1972. They demonstrate that the increase in dropouts and delayed graduations dating back to the 90s was caused not only by a decrease in financial and human resources per student, but also by an upturn in enrollment in universities with poorer resources (i.e. sectoral shift). Herzog (2006) corroborates the importance of the quality of academic resources by demonstrating a negative correlation between the ratio of tenure track faculty members to temporary faculty members and the dropout probability. A more recent paper (Kurlaender et al., 2014) quantifies the amount of resources by determining the total number of available slots in various courses at the University of California, Davis. This analysis is based on the observation that, in a situation of course scarcity, students are more likely to enroll in courses they do not want to attend, completing fewer credits. As a result, these students will graduate beyond legal terms. Kurlaender et al. (2014) use the exogenous variation of randomly assigned course registration times as an instrument to establish the casual link between course scarcity and on-time graduation. The authors conclude that the OLS estimates, which do not take into account the endogeneity of course enrollment, overestimate the negative effect of course scarcity on the number of credits completed in a given term. With reference to size, Ryan (2004) finds that retention and graduation rates are greater in large institutions because of the increasing amount of academic services and support universities can provide to students, due to scale economies.

As expected, tertiary education systems applying *admission criteria* are characterized by lower dropout rates and shorter time to degree completion compared with less selective systems (Bowen et al., 2009; Bound et al., 2010). Nevertheless, selective processes are effective only if they are well-designed. For instance, in their research, Arulampalam et al. (2007) show that the dropout rate in the UK medical schools in the last few years has been mainly caused by increasingly less efficient rules applied to the selection of entering students. Such policies, although generally based on observable characteristics of students (e.g. final marks of high school diploma, type of high school attended, grades in the main subjects, etc.), do not allow a proper evaluation of the students' motivation or attitude to medical studies. More generally, Arulampalam et al. (2007) and Smith and Naylor (2001) discuss the trade-off faced by universities. On the one hand, tertiary education institutes, to preserve their financial stability, need to increase enrollments, which may lead to admit also students lacking adequate academic preparation and/or motivation. On the other hand, universities are forced to

improve their efficiency, by reducing dropouts and elapsed time to degree. Similarly, Francesconi et al. (2011), using administrative data from a large private Italian university, report the inefficacy of the admission selection process with regard to academic performance of selected students, thus arguing that the existence of many public universities not implementing strict procedures for students' selection provides a valid outside option. Carrieri et al. (2015), instead, find that a selective admission policy introduced in a large public Southern Italian university reduces the dropout rates of freshmen and improves their grade point average. They argue that this result is mainly driven by the narrow university supply in the area.

As already mentioned, a large body of literature referring to the model of Tinto (1975) correlates the probability to get a degree with the level of the student's academic integration. According to Terenzini and Pascarella (1977 and 1978) and Pascarella and Terenzini (1978), universities should improve the relationship between faculty members and students by increasing the frequency of student-faculty interactions, especially those based on an informal exchange of views or those aimed at discussing the students' academic achievements. However, such interactions would not be equally effective for all students, as these relationships are strictly related to students' characteristics such as ethnicity and socio-economic background. According to Pascarella et al. (1986), the organization of intensive (i.e. full time) orientation days at the beginning of university courses appears to be particularly effective in strengthening the relationship between students and universities. Nevertheless, such literature cannot give policy indications, because it does not consider the potential endogeneity of the students' integration to university. Anyway, the same authors state in a different paper (Pascarella and Terenzini, 1980) that a quick identification, by means of proper determinants, of students who are more at risk of dropping out would allow universities to implement *ad hoc* interventions for these students (e.g. counseling, tutoring, etc.). According to Montmarquette et al. (2001), the learning environment and the possibility for a student to establish fruitful relationships with faculty members and peers are crucial. In support of this hypothesis, the authors show the existence of a non-linear relationship between class size and dropout probability. In disagreement with previous analysis, showing that small classes favor academic performance, Montmarquette et al. (2001) state that the ideal class size, in terms of persistence probability, is between 80 and 90 students; if it exceeds 110 students, then the persistence probability drops dramatically. The authors provide a rationale for their observation by speculating that optimal academic performance is achieved by the greater effort provided by professor in developing a lesson plan once the class size is perceived as adequate and effective (i.e. neither too small nor too big). Furthermore, in this context, other factors such as the availability of technology support in the classroom as well as the presence of an appropriate number of teaching assistants seem to boost academic performance.

According to Di Pietro and Cutillo (2008), a greater flexibility in curricula and the improvement of the services offered to students brought by the 2001 reform of the Italian tertiary education system had an overall positive effect on academic performance leading to a subsequent decrease in dropout rates.

Regarding delayed graduations, it appears that the organization of teaching activities – especially those about rules to access exams, possibility to resit exams, number of sessions available for thesis examination, etc. –, might affect students' performance as well. Even though there is no robust empirical evidence corroborating such hypothesis, which therefore should be further examined, it is possible that an excessive freedom given to students to organize their studies does not necessarily favor the attainment of the degree in due time. In this regard, Löfgren and Ohlsson (1999) compare Swedish universities, which establish fewer thesis defense sessions with respect to other universities, and find that, *ceteris paribus,* students enrolled in the former graduate more rapidly.

b) Public and private funding of tertiary education

In most OECD countries, university education is heavily financed through public resources: on average, 69.9% of tertiary education costs are financed by taxpayers, with an average of 78% for EU countries (OECD, 2017). Nevertheless, public support for tertiary education goes from less than 40%

of total spending in some countries (i.e. US, UK, Korea, Japan, Chile, Australia), to more than 90% in others (i.e. Sweden, Iceland, Austria, Denmark, Finland, Norway).

The greater is the financial burden on college students, the more they need to work and/or to get loans, to finance their studies. Kane (1994) shows that university fees play a major role in deciding whether it may be worthwhile or not to invest in tertiary education. Remarkably, students coming from low-income families appear to be more responsive to a one-dollar reduction in tuition fees than to a one-dollar increase in financial aid.

As for the time needed to attain a degree, the higher university fees are, the more expensive delayed graduations become. Consequently, students who pay high tuition fees are encouraged to graduate on time, although this incentive could be mitigated if they work to pay the fees. The empirical analysis of Garibaldi et al. (2012), which applies a regression discontinuity design to a homogeneous sample of students enrolled in a private Italian university, shows that an increase of €1,000 in university fees leads to a 5.2% decline in delayed graduations. Since this fee hike does not appear to affect the quality of the student performance, as far as university final grade is concerned, nor does it cause more students to drop out, the authors conclude that delayed graduation is due to a suboptimal effort made by students. However, it should be pointed out that a similar reduction in delayed graduation would not be necessarily observed in public universities where the socio-economic background and the preparation level of students are likely to be different from the private university analyzed. From a slightly different viewpoint, which anyway substantiates the findings by Garibaldi et al. (2012), Brunello and Winter-Ebmer (2003) show that, if universities are highly financed by public resources, students prolong the time needed to attain a degree, since the private marginal costs of university investment decrease. On the other side, Scott-Clayton (2012) finds that high university fees (and a low public support to tertiary education funding) force low-income students to work, to pay for their studies, as either their families cannot financially help or they cannot get access to loans, thus delaying the time to degree attainment. Even though such result might seem in contrast with those mentioned above, it has to be noted that the average amount of tuition fees in the US, where the Scott-Clayton's empirical exercise was carried out, is much higher than the one observed in Europe where the other two studies are focused on.

c) Financial aid and student services.

University students may benefit from various kinds of aid: scholarships, fee exemptions, food stamps, housing, books, etc. In this regard, previous studies on university dropouts have mainly focused on the effect of *financial aid*, omitting from their analysis transfers in kind (i.e. services directly offered to students). For example, Alon (2007) observes that the negative or negligible effects of such aid on the probability of university persistence – a quite puzzling result of the empirical literature until the early 2000s - are mainly due to the endogenous access to such aid. If not taken into account properly, the non-random selection of students that can access financial aid could attribute to these aid a misleading effect which, in fact, depends on the characteristics of the student benefiting from them: individuals who often belong to low-income groups. An example of such result can be found in Stratton et al. (2008) who analyze three outcomes (i.e. persistence, dropout, and stopout behaviors) in a multinomial logit context to demonstrate that students receiving a scholarship are more likely to drop out than students receiving a loan. This finding can be explained observing the different criteria that regulate the access to loans and scholarships: university loans generally go to students with high credit scores, while scholarships are given to low-income students according to their merit. Studies that, instead, take into account non-random selection of financial aid recipients reach different results. In this regard, comparing individuals who are entitled to a scholarship with those who have actually received it, Singell (2004) shows that a raise of $1,000 in a scholarship can increase the probability of persistence to the second year of university by 1.4 to 4.3%. Furthermore, Alon (2007), using an IV method, reports similar findings in the probability to attain a degree, especially when minority students (e.g. Afro-Americans, Hispanics, and so on) are the recipients of such benefits. Moreover, Arendt (2013) reports that a reform implemented in Demark in 1988, which

brought the total amount of financial aid per student to $3,000 per year – considering that the access to financial aid was allowed to all students, who turned down other incomes –, had negligible effects on the dropout rates of students from wealthy and highly educated families, whereas it reduced dramatically the dropout rates of students from non-graduate families. Interestingly, also a greater geographical diffusion of universities may be listed as an "indirect" financial aid to students, considering that it would reduce mobility costs. In the 90s, the Italian education system changed the geographical distribution of its universities at the province level; exploiting this change, and controlling for the selection at the time of enrollment, Oppedisano (2011) finds that the opening of a new university site reduces the dropout rates by 6 percentage points, with no effect on the time to degree.

Regarding the time required for successful degree completion, the effect of financial aid interventions is quite controversial. For instance, two empirical studies evaluating the impact of new reforms on student financial aid in Finland and Germany show a drop in the time to degree in Finland (Häkkinen and Usitalo, 2003), albeit of modest entity and limited to graduation programs that traditionally require longer time to degree completion, but no effect at all in Germany (Glocker, 2011). Similarly, a case study of a merit scholarship program in West Virginia, which provided financial aid to students with a minimum GPA and course load, reports a significant reduction in the time needed to graduate (Scott-Clayton, 2012). Likewise, a program implemented in Norway, that expected the state to refund 10% of university loans in case of on-time graduation, showed a decrease in the time to degree completion (Gunnes et al., 2013).

Taken all together, these findings show that the outcome of financial aid programs depends on the nature of the incentives/disincentives: the time to degree lengthens when the program reduces tuition fees for all students independently of students' efforts, whereas the time to degree shortens when the program provides scholarships or fee waivers only to deserving students.

3.4 Labor market conditions

Labor market conditions are crucial determinants of the student's decision about education (Stange, 2012), since they affect both foregone earnings once enrolled, and earnings as university graduates. Consequently, a rise in unemployment rates could lead to either educational persistence, due to job scarcity, or to university dropout, if students predict lower than expected ex post return to education. Since labor market opportunities of graduates may be different from those of secondary degree holders, it is hard to predict whether a rise in unemployment rates would increase or reduce the time to degree completion. According to Smith and Naylor (2001), an increase in unemployment rates would raise dropouts in the UK. Di Pietro (2006) shows that such result is true also for Italy, but only in specifications omitting regional dummy variables since unemployment rates would capture the uncontrolled regional heterogeneity effect. In contrast, the inclusion of regional dummy variables reveals a negative correlation between unemployment rates and dropout probability. This result can be explained by the tendency of Italian students to remain at the university in the presence of job scarcity; a choice that is also determined by the relatively low (direct) costs of Italian public universities. Similarly, Adamopoulou and Tanzi (2017) find that the recent recession, by lowering the opportunity cost of university education, has reduced the risk of withdrawal for Italian students.

Concerning delayed graduations, two papers, the first one exploiting the variability of labor market conditions in 10 European countries (Brunello and Winter-Ebmer, 2003), and the second one using the unemployment rates variability in Italy (Aina et al., 2011), come to similar conclusions: there seems to be a positive correlation between unemployment rates and the time needed to attain a degree, a result that supports the parking lot hypothesis.[13] In contrast, Messer and Wolter (2010), analyzing the Swiss education system, notice a negative correlation between unemployment and time

[13] We define as *parking lot* students that keep being enrolled at university only because in the meanwhile they do not receive any job offers.

to degree completion; that is to say that when unemployment rates rise, students tend to graduate in a shorter time because they have fewer possibilities to find a job during their studies.

4. Conclusions

The theoretical framework of the human capital investment model, firstly proposed by Becker (1962) and subsequently extended by applying a dynamic utility framework (see for instance Comay et al., 1973; Manski, 1989; Altonji, 1993; Stinebrickner and Stinebrickner, 2012), is the basis of our review, which helps to analyze the well-known university failures, namely dropout and delayed graduation.

In this framework, students' university choice and their academic outcomes are modeled using a sequential approach, in which students gather information through university enrollment. By adjusting their information set, students continuously revise benefits and costs of university investment, thus modifying the number of years of education chosen, making rational even the decision to drop out or to delay graduation.

The factors that explain university failures are considered in the investment decision model, too. We clustered those determinants into four main categories - students' characteristics, abilities and behavior; parental background and family networks; characteristics of tertiary education system and institutions; labor market performance - to discuss findings of the empirical evidence.

The existing literature does not offer undisputable evidence of which are the key determinants of dropout and delayed graduation, making it difficult to propose specific interventions, while suggesting that university failures are, indeed, determined by a complex range of individual and institutional characteristics.

From the proposed survey the importance of having a complete set of information for making the best evaluation of the university choice emerges. First, institutions should help students to have an accurate perceptions about their true attitudes, abilities, motivations, and characteristics necessary to succeed in the field of study chosen. Second, it would be useful to provide correct forecasts of the prospective labor demand by sectors and skills, at national and international level, together with details of future remunerations. Third, it should be important to produce information on the provision of degree courses, on the characteristics of tertiary education institutions in terms of facilities (i.e. tutoring, counseling, sports, etc.), class size, teaching quality, financial aid, and interactions between professors and students.

Independently of students' characteristics and behavior, the surveyed literature clearly argues in favor of the importance of the quantity and quality of human and financial resources available at the university level. In fact, it is quite well documented that the increase in university failures in more recent years, all over the world, is related to the worsening of the quality of services offered to students, as a result of an increased demand for postsecondary education not paralleled by an adequate growth of university resources. In this context, the worst solution would be to enroll more students to increase the total amount of financial resources. Nevertheless, to avoid additional deterioration of university efficiency, tertiary systems need to have sufficient resources since the start, as they allow to implement appropriate remedial measures to tackle these university failures and contemporaneously guarantee highly skilled human capital to the economy.

In summary, we find that the university decisional process can largely benefit from an all-inclusive orientation activities provided to students before they enroll at university. As they obtain a more complete understanding of the potential costs and benefits of this human capital investment the risk of early withdrawal or delayed graduation can be reduced (Levy and Murray, 2005). Similarly, also activities devoted to help first-year students in adapting to the college environment and life may increase students' success.

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