Determinants of students' performance in financial accounting

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Abstract: The main objective of this paper is to analyse the determinants of students' performance in financial accounting. To do so it employs a sample composed of information relating to 3,219 students from the *Universitat Autònoma de Barcelona*. A linear regression model, adopting the Tobit technique and the censored least absolute deviations model, is applied to these data. The results obtained indicate that study grants, previous accounting studies in secondary education, intellectual ability, effort made by the student during the year, experience in the subject and the size of the class the student attends positively and significantly influence students' academic productivity. On the contrary, the student's maturity level, the time at which they attend class and the academic year in which they have enrolled negatively influence their academic productivity.

Keywords: financial accounting, academic performance, undergraduate, Tobit model, censored least absolute deviations model

1. Introduction

Formal education is one of the factors contributing to improving the productive capacity of the population, influencing the economic growth of a country, according to the human capital theory developed by Becker (1964) and Schultz (1971). This means, as Pasek et al (2006) point out, that students comprise the main social capital of a country, with the nation's development depending on the education of its young generations. This justifies (1) the important public spending incurred by countries to finance the different educational levels according to Fagerlind and Saha (1997) and (2) the change of the university education model promoted by different European countries, Spain included, through the Bologna Process, fostering students' acquisition of the skills and abilities required to enter the job market, as emerges from Martinello and Cook (2000).

However, despite the efforts made, the European Union member states present a high school drop-out rate, according to the European Commission (2011). In particular, in Spain, the academic drop-out and/or failure rate of university students reached 35%, on average, during the 2004-2009 period, according to data provided by the Ministry of Education and the National Statistics Institute. The continuation of this situation may lead to an increase in the unit cost of a graduate and, consequently, the public spending put aside for university education. This would

inhibit the financing of the continuous introduction of educational improvements demanded by the Bologna Process, in an economic situation of budget restrictions.

University faculties and administrators are making a great effort to ensure that students receive quality education with an increasingly reduced budget allowance. Considering this situation, knowing the factors that determine students' success in the subjects in which they have enrolled could help administrators to efficiently distribute the financial, human and infrastructure resources with the aim of improving the quality of teaching and the productivity of students.

Therefore, this article aims to provide empirical evidence concerning the Spanish university education sector by (1) analysing the factors determining university success/failure in the subject of Financial and Analytical Accounting taught in the degrees of Business Administration and Management and Economics, and the double degree of Business Administration and Management and Law and (2) examining the use of a consistent and robust estimator to estimate models with censored data. To do so, we will use (1) the Tobit model and (2) the censored least absolute deviations model, the results of which will provide information about the effect of explanatory variables on the average academic performance. This study acquires greater importance since, in the area of accounting, there is no evidence of similar studies that analyse the learning process by means of an education production function, the estimators of which take into consideration the fact that the dependent variable is censored.

This paper is structured as follows. In section 2 the theoretical framework is introduced, as well as its application to previous research, and proposals examined in this research. Section 3 outlines the research method, data sources and measures of variables. In section 4, the results from regression models used are discussed. Lastly, some concluding comments are provided.

2. Theoretical background and hypothesis

The impact of the educational level of a country's population on its economic development and growth has encouraged studies analysing the factors determining the academic success of students in different areas of knowledge, with the aim of promoting measures or changes in educational policy that reduce the high university drop-out rate revealed by the European Commission (2011) and provide a well-trained active population. A lot of these studies could be represented, taking as a reference the postulates of the human capital theory, by means of an education production function that characterises the learning process of students, relating the results obtained by these (output) with a number of variables (input) which measure the effect of demographic, economic, academic and/or institutional factors.

2.1 Demographic factors

In this regard, various authors, Cantwell et al (2001) and Smith and Naylor (2001) use variance analysis models (ANOVA) and discrete choice models, respectively, on a sample of British students studying in different areas of knowledge, to demonstrate that the students' age

conditions their academic success. Those students who display a greater level of maturity benefit more. According to McKenzie and Gow (2004) and Rankin et al (2003), this could be due to the fact that older students are more motivated to achieve their objectives than younger classmates, demonstrating a greater willingness to carry out the work given in class (Hoskins et al (1997)) in a constant manner (Richardson (1995)). They use critical reasoning which enables them to build on the meaning of the information transmitted by the professor (Sadler-Smith (1996)), sensing that their success in the subject depends on their effort, ability and personal responsibility (internal locus of control). Therefore, the following is proposed:

H1a: Ceteris paribus, older students will achieve a higher grade/overall result in Financial Accounting than younger students.

Another demographic characteristic that appears to affect academic success is the gender of the student. Castagnetti and Rosti (2009) applied the ordinary least squares technique to a sample of Italian university students studying in different areas of knowledge, and encountered differences in their academic performance. Women are more successful, which may be due to the greater effort made by them. This evidence is consistent with Mutchler et al (1987) in the area of accounting. However, this result may be biased, as the authors do not take into consideration the effects of the different teaching and grading strategies applied in the different groups analysed. Controlling for these effects, Lipe (1989) did not find empirical evidence of a gender effect on students' success. Neither did Tyson (1989) when controlling for the previous ability of students. This result is consistent with Jackling and Anderson (1998) and Byrne and Flood (2008), who did not find significant differences according to the gender of the student.

On the contrary, authors such as Kherfi (2008) and Lopus (1997) did find differences in university academic performance according to the gender of the student, with men being more successful. According to Lumsden and Scoott (1983) this may be a consequence of the type of exam used. Anderson et al (1994) and Lumsden and Scoott (1987) point out that multiple choice exams favour male students while essay-style exams benefit female students. To isolate this effect, in this study, students are graded on an exam containing multiple choice type questions and essay-style questions. The following hypothesis is proposed:

H1b: Ceteris paribus, there are no differences in the academic performance of male and female students in Financial Accounting.

2.2 Economic factors

Previous international literature establishes the economic situation of the student's family as a relevant factor in achieving academic success since, as Ishitani (2006) and Garcia and San Segundo (2001) demonstrates, the probability of students dropping out is higher in those students from more humble backgrounds. To lessen the effect of the family's economic situation some countries, including Spain, provide study grants. In this respect, Marcenaro and Navarro (2007) state that allocating grants to students with a poorer performance encourages

their academic success, possibly because continuing their university education depends on their grant being renewed, and thus they must pass the subjects in which they are enrolled.

This result contrasts with the grant policy introduced in some countries, among them Spain, whereby grants are allocated to students from more humble backgrounds who have successfully passed a large number of the credits taken in the previous university year, which is a guarantee of the future academic success of the student, as outlined by Jones et al (2010) and Park and Kerr (1990). The following is proposed:

H2: Ceteris paribus, students with grants will achieve a higher grade/overall result in Financial Accounting than students without grants.

2.3 Academic factors

Several authors, Dolado and Morales (2009), Jones et al (2010), Marcenaro and Navarro (2007), Eskew and Faley (1988), Pozo and Stull (2006) and Arquero et al (2009) have highlighted, through research in different areas of knowledge, that students' prior knowledge is one of the most important factors influencing learning outcomes. This factor is defined in Rankin et al (2003) as the entirety of a person's knowledge available before a certain learning task. Therefore, we can structure prior knowledge into conceptual knowledge and metacognitive knowledge.

According to Winne (1995), conceptual knowledge includes facts, principles, rules, framework and basic skills which the student may have acquired during secondary education. In this vein, previous studies have analysed the relation between prior knowledge of accounting from secondary school and performance in accounting courses. A lot of the authors Arquero et al (2009), Hartnett et al (2004), Rohde and Kavanagh (1996) and Eskew and Faley (1988) find that students with prior knowledge of accounting are more likely to pass the subject of Financial Accounting in university than those students who do not have prior knowledge. According to Rankin et al (2003), this could be because there is a close correspondence between secondary school and university curricula. The following is proposed:

H3a: Ceteris paribus, students who have studied accounting in secondary school will achieve a higher grade/overall result in Financial Accounting than students who have not studied it.

On the other hand, metacognitive knowledge takes into account cognitive ability and students' effort to learn within the instructional situation. As a proxy for cognitive ability, Arquero et al (2009), Rankin et al (2003) and Heales (2005) use a student's tertiary education entrance score. This measure is calculated by taking into account the grades obtained by students in secondary school and the mark obtained in the university entrance examination. Using these measures, previous studies by Escudero (1984), Perez Juste et al (1991), Garcia (2000), Garcia and San Segundo (2001), Dolado and Morales (2009) and Kherfi (2008) reveal that students with a greater intellectual capacity, meaning, with higher university entrance grades and a higher average grade, respectively, achieve a significantly better academic performance in university.

H3b: Ceteris paribus, students with a higher tertiary education entrance grade will achieve a higher grade/overall result in Financial Accounting than students with a lower tertiary education entrance grade.

Furthermore, the effort invested by the student in the subject also influences their academic performance as stated by Rankin et al (2003). As proxy of the effort made by students, some authors, Jones et al (2010) and Park and Kerr (1990), used study and/or class attendance hours and the number of credits obtained. The results obtained indicate that students who have passed more credits and who dedicate more time to learning activities achieve better results. However, in general, according to Byrne and Flood (2007), students spend less time than that recommended by professors to complete individual tasks. McKenzie et al (2004) consider it essential that students develop time-management skills and use them efficiently when carrying out learning activities. To verify if the effort made by students during the year results in them obtaining a better result the following hypothesis is proposed:

H3c: Ceteris paribus, students who have obtained a higher number of credits will achieve a higher grade/overall result in Financial Accounting than students who have obtained fewer credits.

Those students who do not make enough of an effort may not pass the subject of Financial Accounting, and will have to repeat the subject. The expected results of repeating students are better than those of classmates who have just entered university, since they are familiar with the teaching method and the grading procedure applied throughout the year and this could encourage them to feel more motivated about achieving their goal – passing the subject. Therefore, the following is proposed:

H3d: Ceteris paribus, repeating students will obtain better academic results than classmates who have enrolled in university for the first time.

Another academic characteristic that may influence students passing a subject is the degree being studied, as demonstrated by Griliches and Mason (1972). Nevertheless, this statement contrasts with that contributed by Marcenaro and Navarro (2007) who, when controlling for differences in the cut-off grades of each degree, did not find significant differences between the qualifications obtained by students of medicine, economic and business studies, psychology, philosophy and arts. Therefore, the following is proposed:

H3e: Ceteris paribus, there are no differences between the grades in Introduction to Accounting obtained by students enrolled in the different degrees offered.

2.4 Institutional factors

Budget restrictions have led to some universities having to reduce spending. Among the spending affected is expenditure on staff. This has led to the introduction of staff contracting measures which promote (1) an increase in the number of professors with non-tenure-track positions compared to professors with tenured and tenure-track positions, since the cost is

significantly lower, as indicated in Bettinger and Long (2010), and/or (2) making professors with non-tenure-track positions redundant, which would lead to an increase in the ratio of students to teachers, and consequently, reduced groups and elimination of teaching in certain time-slots. These measures may influence students' academic performance and lead to them selecting major subjects that are related to the area of study in later years, as highlighted by various authors.

In this regard, Ehrenberg and Zhang (2005) demonstrate that an increase in the percentage of professors with non-tenure-track positions compared to the number of professors with tenure-track positions has a significantly negative impact on the results obtained by the students. This impact is more pronounced when it involves full-time non-tenure-track professors rather than part-time non-tenure-track professors. Nevertheless, the contracting of full-time professors (with tenure-track and non-tenure-track positions) has a significantly positive effect on the results obtained by the students and on them continuing in the field of study, compared to the contracting of part-time non-tenure-track professors. This could promote student integration, as outlined by Jacoby (2006) and Jaeger and Eagan (2011).

This may be due to: (1) the different training levels of the full-time and part-time professors, since, according to Benjamin (2003), the percentage of doctorate professors among full-time professors is higher than the percentage of doctorate professors among part-time professors; (2) the reduced amount of time professors are available to attend to students, interact with them and implement changes in their teaching methods according to Benjamin (2002) and Umbach (2007); (3) the lack of motivation of this group of professors who earn much lower salaries than full-time professors, according to Jacoby (2005); (4) the inefficiency of the subject coordinators to assign them teaching hours in subjects related to the development of skills in a particular occupation, according to Bettinger and Long (2010).

H4a: Ceteris paribus, students who attend Financial Accounting classes given by full-time professors obtain better grades than those who attend classes given by part-time professors.

Another institutional characteristic that may condition students' academic success is the time at which they attend class. Kherfi (2008), using a discrete selection model, found that students from Sharjah who attend class in the first morning time-slot obtain worse results than other students who attend class in other time-slots. This could be due to students lacking sleep, making it difficult to retain knowledge, or to the fact that these groups contain a larger number of students with lower intellectual capacity, since the timetable is organised according to the university entrance exam grade or average grade, with the best students choosing the most attractive time-slots.

H4b: Ceteris paribus, students who attend Financial Accounting class in the morning obtain worse grades than those who attend class in the afternoon.

Moreover, students' selection of timetables may bring about differences in the size of the groups created, which may have an effect on the academic performance of the students. In this regard, Arias and Walker (2004), Fenollar et al (2007) and Kokkelenberg et al (2008) found that students who attend larger classes obtain worse results than those students enrolled in small classes. According to McKeachie (1986), this could be due to the fact that the latter: (1) have more possibilities of interacting with the professor in the classroom, (2) feel less inhibited about participating in class debates and (3) can use combinations of learning methods which help to develop more complex skills according to the taxonomy of Bloom (1956), without this involving an excessive work load for the professor. Nevertheless, in those subjects in which the educational aim is to acquire knowledge, as highlighted in Kennedy and Siegfried (1997), Fleisher et al (2002) and Kherfi (2008), the size of the class would not be particularly relevant, as stated by Pascarella and Terenzini (1991).

On the contrary, Hill (1998) found a significantly positive relation between the size of the class and the academic performance of students. According to McKeachie (1986) this could be due to the fact that the professor is more motivated and prepares the class better when giving a lecture to a large number of students, which would improve teaching and the academic performance of the students.

The aim of the subject of Financial Accounting taught in the *Universitat Autònoma de Barcelona* is that students develop higher order skills from Bloom's (1956) taxonomy. To achieve this, professors arrange the subject, differentiating between theoretical classes, aimed at the students developing more basic levels of knowledge, and practical classes, aimed at students developing higher order skills. The larger groups are divided, placing a similar number of students in all the practical classes. Since the differences in the number of students per class occur in the theoretical classes the following hypothesis is proposed:

H4c: Ceteris paribus, students who attend more crowded classes obtain better grades than those who attend smaller classes.

3. Empirical test

3.1 Sample selection

To analyse the factors that affect the academic performance of university students we have a database containing information relating to 3,219 students enrolled for four consecutive academic years (from 2005-2009) in the subject of Financial and Analytical Accounting. The subject is taught in the degrees of Economics, Business Administration and Management and the double degree of Business Administration and Management and Law at the *Universitat Autònoma de Barcelona*. The database was provided by the Student Records Service of the *Universitat Autònoma de Barcelona*, thereby eliminating possible problems associated with data

provided by students, as highlighted in Maxwell and Lopus (1994) and Becker and Powers (2001).

In this way, we have a complete sample, in that it only contains those students for whom we have complete information. Thus, for each student we have information regarding their academic performance in the subject of Financial Accounting obtained at the end of the academic year, the group in which they are enrolled, the degree they are studying (Degree in Economics, Degree in Business Administration and Management, or double Degree in Business Administration and Management and Law), the professor responsible for the group, the professor's commitment to the university (full-time or part-time), whether the student receives a grant or not, student's gender, university entrance exam grade, pre-university studies specialisation, number of times the student has enrolled in the subject and the teaching strategy employed in the groups.

3.2 Measurement of variables

Bearing in mind the available information, we consider the variables discussed below as potential determinants of the academic performance achieved by accounting students, since they are very similar to those used in the aforementioned previous literature.

3.2.1 Dependent variable

The dependent variable (AP) is the overall final grade obtained for all assessment items by each student, as in Eskew and Faley (1988), Rankin et al (2003), Kherfi (2008) and Hartnett et al (2004), which enables us to avoid the aggregation effect and consider the influence of individual characteristics of students on their academic performance, as outlined by Kennedy and Siegfried (1997).

Assessment comprised four multiple-choice tests during the year (1.125 points for each test), homework completed during the year (1 point as a whole) and an end of semester exam (2.25 points for each exam). The test, homework, exams and other teaching and learning materials are exactly the same in all classes. This may reduce the professor bias according to Gratton-Lavoie and Stanley (2009) and Arias and Walker (2004).

According to Walstad (2001) this measure enables professors to (1) adapt to students' preferences regarding being assessed on work done outside of class or sitting a certain type of exam and (2) address concerns about error in measurement as a result of relying on one indicator and (3) adjust to that stipulated in the Royal Decree 1125/2003, of 5th September, by which the European credit system is established as well as the qualification system in official, nationally recognised university degrees, by assessing the academic performance of students on a scale of 0 to 10 points, passing the subject with 5 or more points, as in Dolado and Morales (2009).

3.2.2 Independent variables

To analyse the effect of students' level of maturity on their academic performance in the subject of Financial Accounting, the AGE variable will be introduced as a proxy, indicating the number of years that have passed since the birthdate of the student and the 30th of June of the year in which they studied the subject 2006, 2007, 2008, 2009.

Since previous studies reveal discrepancies in the academic performance of students according to gender, the dummy variable GENDER will be introduced having a value of 1 if the student is male and 0 if the student is female.

One of the requirements to study university studies is to have previously passed the secondary education final exams (*Bachillerato*). Therefore, during the first year of university, study grants are distributed among those students with fewer economic resources. As a proxy of the economic situation of the student's family the dummy variable GRANT will be used, having the value of 1 if the student receives a grant during the academic year in which they attend Financial Accounting classes and 0 if not.

The dummy variable REPEAT will indicate if the student is a new entrant in the university or a student repeating the subject, having the value of 1 in the case of repeats and 0 otherwise.

Students who studied accounting in pre-university studies obtain better results in accounting according to Arquero et al (2009), Hartnett et al (2004). Therefore, in this work the dummy variable BUSINESS will be introduced, having the value of 1 if the student has studied pre-university studies in administration and finance (the curriculum of which includes subjects from accounting) and 0 if not. The dummy variable SOCIAL will also be introduced, having the value of 1 if the student studied Social Science as a specialisation in the last cycle of secondary school (the curriculum of which allows the student to choose one subject from the economics and business area) and 0 if not.

To measure the effect of students' prior skills on their academic performance the variable ENTRANCE, referring to the university entrance exam grade, will be introduced into the model as a proxy.

The effort made by the student during the academic year will be analysed using the variable CREDITS which will indicate the number of credits passed by the student during the year, without considering the credits corresponding to passing the subject of Financial Accounting.

The dummy variable DEGREE will indicate the degree being studied by the student, having the value of 1 if the student is enrolled in the Degree of Business Administration and Management and 0 if they are enrolled in the Economics Degree.

The dummy variable PROFESSOR will indicate the professional status of the professor in the university, having the value of 1 if the professor is exercising an academic career in the university and 0 if the professor combines teaching in the university with a position in a private company.

Since the time at which the student attends class may influence academic performance, the dummy variable AFTERNOON will be included in the model, having the value of 1 if the student attends class in the afternoon and 0 if they attend classes in the morning.

Differences in the size of the class attended by students may cause differences in their grades. Therefore, the variable SIZE will be introduced in the analysis indicating the number of students enrolled in each group during the period considered.

These variables are summarised in Table 1. To verify that there are not multicollinearity problems between the variables proposed, a matrix indicating correlation coefficients between independent variables has been created. The results, which are summarised in table 2, indicate that no multicollinearity problems exist, according to Sharme and James (1981). Although not presented in Table 2 the variance inflation factor (VIF) for each regressor was calculated and examined. The results were lower than ten, thereby confirming the absence of multicollinearity problems.

4. Results

4.1 Summary statistics

Panels A and B of Table 2 provide summary statistics. The mean academic performance for Financial Accounting was 5.26 of a possible total of 10 points with results ranging from 0 to 10. More than half the students who sat the exams and tests for the subject during the period considered managed to pass. Nevertheless, 35.26% of enrolled students did not sit the tests and exams. As regards the demographic characteristics of the students, the average age of students in the Financial Accounting subject is 21 years of age. Half of the students from the sample, during the period considered, were more than 20 years old, with the youngest being 18 years old, and the eldest being 56 years old. The percentage of male and female students studying this subject was quite balanced. Therefore there is no gender difference in terms of preference for the subject. As regards economic factors, only approximately 14% of the students received study grants during the period considered.

With regard to academic factors, approximately half of the students enrolled in the subject were studying the Degree in Business Administration and Management while the other half were studying Economics Degrees. A lot of these students, some 68.10%, studied Social Science as a specialisation in the last cycle of secondary school and as a result have had the opportunity to be introduced to accounting. The grade obtained in the pre-university educational level is 6.31 points, with more than half of the students obtaining a grade above 6 points, and with a lowest grade of 5. This relatively low grade could indicate poor effort from the student during the pre-university phase which may continue in their university phase. Thus, enrolled students passed an average of 31.25 credits; half of the students did not pass more than 31.50 credits out of the total number of credits which is, on average, 68.5 credits. These figures reveal a high school

failure rate. More specifically, the rate of repeating students in the subject reaches 37.34% of the enrolled students for the period considered.

Approximately 73% of the enrolled students attended class in the morning, while 62.60% of students attended classes given by professors who are not exercising an academic career in the university, combining university teaching with their work in a private company. The average size of the classes was 106.81 students. The smallest class comprised 63 students and the largest class was made up of 152 students.

4.2 Multivariate regression analysis

To analyse the factors that influence the academic success of students, a linear function of explanatory variables is proposed. Since the dependent variable is censored, with its value oscillating between 0 and 10 points, the use of the ordinary least squares technique is not relevant as demonstrated by Loucks (1994), Chou and Cebula (1996), Greene (2000) and Maddala and Nelson (1975), since we would obtain inconsistent estimators. In this case, a standard technique consists of estimating a Tobit model put forward by Tobin (1958), which we define as follows:

$$\begin{aligned} y_i^* &= \alpha + \beta' x_i + u_i \quad && si \quad \underline{y} < y_i^* < \overline{y} \\ y_i^* &= \overline{y} && si \quad y_i^* > \overline{y} \\ y_i^* &= \underline{y} && si \quad y_i^* < \underline{y} \end{aligned} \qquad [1]$$

Where y_i^* is the performance obtained by the student; $\overline{y}$ is the maximum score that a student can obtain (10 points); $\underline{y}$ is the minimum score that a student can obtain (0 points); β' is a k-dimensional vector of unknown parameters; x_i is a vector that contains all the explanatory variables of students' academic performance; u_i are the residuals characterised by following a normal distribution with zero mean and standard deviation $\sigma_i=\sigma$.

Therefore, the standard Tobit model assumes homoscedasticity and normality in the residual distribution, obtaining consistent estimators when both assumptions are met. Nevertheless, previous research by Arabmazar and Schmidt (1981) and Greene (2000), shows that in the presence of heteroscedasticity and non-normality, the Tobit model produces inconsistent and biased estimators. Therefore, we verified if the mentioned specification problems appeared in our model, using the *likelihood ratio* test described in Petersen and Waldman (1981) to analyse the heteroscedasticity of the residuals and the conditional moment test with bootstrapped critical values proposed by Drukker (2002) to test the normality assumption.

We used the likelihood ratio test to analyze the null hypothesis of homoscedasticity ($\alpha=0$), considering a Tobit model with multiplicative heteroscedasticity, in which we specify that $\sigma_i=\sigma\exp(\gamma' x_i)$. This statistic is distributed asymptotically as chi-squared with 15 degrees of freedom. The value of the sample (LR=127.2083; p-value=0.000) exceeds the critical value at a

significance of 1%. Therefore, we cannot accept the null hypothesis of homoscedasticity. The conditional moment test shows that the conditional moment (200.09) is larger than the 1% bootstrapped critical value (15.68), which implies that the null hypothesis of normality can be rejected at any level below 1%.

The evidence of the heteroscedasticity of the residuals indicates that the estimators, obtained using the Tobit maximum likelihood method, are inconsistent. To overcome these difficulties, the censored least absolute deviations model (CLAD) proposed by Powell (1984) is used, which enables us to obtain consistent and robust estimators in the presence of heteroscedasticity, non-normality, censored dependent variable and large sample size, as pointed out by Deaton (1997). The standard errors of the estimations were obtained using the *bootstrap* technique.

The results obtained by estimating the CLAD model are shown in Table 4, together with the results from the estimation of the Tobit model. These results show that the estimations performed on the models present differences in size and level of significance. This informs us that non-compliance with the assumptions of homoscedasticity and normality in the Tobit model could lead us to either underestimate or overestimate the effect of certain variables on academic performance. In this vein, the BUSINESS, ENTRANCE, CREDITS, REPEAT and SIZE variables were positive and significant and the AGE, YEAR and AFTERNOON variables were negative and significant in the two models, although the degree of significance and the absolute value of the estimated coefficients are different in the two models.

In this way, both models reveal evidence of significant discrepancies in the academic performance of students according to age, with younger students acquiring more skills and abilities in accounting than older students, as demonstrated by Clark and Ramsay (1990). Therefore, delaying entry to university by one year would involve the student obtaining approximately 0.26 points less in the subject of accounting, according to the CLAD estimator. This could be due to the fact that younger students maintain the study rhythm and habits acquired in secondary education, while older students may find it more difficult to adapt to university life, undertake study tasks and/or combine daily family and professional responsibilities with their learning process in the university.

Like Marcenaro and Navarro (2007), we find that students benefiting from grants are significantly more productive than those who do not receive study grants, increasing their academic performance by 0.41 points on average according to the CLAD estimator (no significant differences found when using the Tobit estimator). This could be because students receiving grants during their first year in university come from humble families which need a grant in order for the student to continue their studies. Therefore, they are more motivated regarding achieving their aim, which is to obtain a good academic record so that they can have their grant renewed.

Obtaining a good academic record proves to be significantly more feasible for those students who previously studied accounting in vocational training higher education courses in Administration and Finance than for their classmates coming from the Social Science specialisation in secondary school or other secondary education studies, which could point to the existence of a close correspondence between secondary school and university curricula. This result is consistent with the empirical evidence provided by Arquero et al (2009), Hartnett et al (2004), Rohde and Kavanagh (1996) and Eskew and Faley (1988).

Students' cognitive ability, measured by means of the variable ENTRANCE, also seems to influence productivity. Thus, those students who demonstrate greater skills in pre-university studies obtain a better academic performance. More specifically, a one point increase in the university entrance grade means an increase of approximately 0.70 points in the academic performance of the subject of Financial Accounting, using as a base the CLAD model which provides efficient and robust estimators. Said result is consistent with previous studies carried out by Dolado y Morales (2009), Byrne y Flood (2008) y Kherfi (2008).

The effort made by students during the year, measured using the variable CREDITS, also seems to have a positive and significant influence on the productivity of the student in the subject, taking into account the CLAD and Tobit estimators. Thus, those students who passed a greater number of credits during the year obtained a better academic performance. This result is consistent with the contributions made by Jones et al (2010) y Park y Kerr (1990). The students who did not manage to pass the Financial Accounting credits in previous exams increase their productivity by 1.14 points compared to new entrants, according to the CLAD estimator. This may be due to the fact that the student is more familiar with the material and the type of exam given in the subject.

The time at which students attend class significantly influences their productivity. In this regard, students who attend class in the afternoon obtain approximately 0.50 points less in their academic performance than those students who attend class in the morning, according to the CLAD estimator. This result contradicts the empirical evidence encountered by Kherfi (2008), which may be because the morning timetable established by the *Universitat Autònoma de Barcelona* starts at an attractive time for students (9.00 to 10.00 in the morning). Those students who have better academic records can choose the morning time-slot, while students who work may be more interested in attending classes in the afternoon, combining professional obligations with academic responsibilities, which may result in poorer academic performance since they have less time to carry out the exercises given in class.

Unlike Arias and Walker (2004) and Kokkelenberg et al (2008), in this work we find empirical evidence that class size has a positive and significant influence on the students' productivity (using both the Tobit and CLAD estimators), which, according to McKeachie (1986) could be due to the fact that the professor feels more motivated and prepares the classes better when

giving a lecture to a large number of students. This would improve the teaching and the academic performance of the students.

In light of the differences emerging from our estimations of the Tobit and CLAD models, and in order to provide the study with greater robustness, we apply the Hausman* test described by Melenberg and Van Soest (1996) and Greene (2000). This test enables two models to be compared when we have an estimator that is consistent and efficient under the null hypothesis but inconsistent under the alternative (Tobit estimator), and another estimator that is consistent under both hypotheses but inefficient under the null hypothesis (CLAD estimator). From these estimations, we construct the Wald statistic as follows:

$$W = \left(\hat{\beta}_{Tobit} - \hat{\beta}_{CLAD}\right)' \left[Var\left(\hat{\beta}_{Tobit} - \hat{\beta}_{CLAD}\right)\right]^{-1} \left(\hat{\beta}_{Tobit} - \hat{\beta}_{CLAD}\right) \sim \chi^2(R) \quad [2]$$

where R represents the range $\mathrm{Var}\left(\hat{\beta}_{Tobit} - \hat{\beta}_{CLAD}\right)$. The statistic obtained a value of 269.79, while the critical value was 30.58; we therefore reject the null hypothesis of no significant differences between the two models.

5. Summary and conclusions

The education level of the population may influence a country's productive capacity, and consequently, its economic growth, according to Sakamota and Powers (1995). As a result, professionals and academics are keen to determine the factors that affect students' productivity, in order to assign resources efficiently. This would help to (1) improve the quality of university teaching and the preparation of future professionals, and facilitate their incorporation into the job market, and (2) reduce the public spending that financing this level of education incurs.

In spite of this, we are not aware of any previous work that analyses the determinants of Spanish students' performance in Financial Accounting using an education production function. Considering the fact that students' academic performance is censored, we applied the technique of estimating a censored least absolute deviations model such as ours which provides robust, consistent estimators, characterised by the presence of heteroscedasticity, non-normality, censored dependent variables and large sample size.

In this vein, the CLAD estimation technique shows that obtaining study grants, previous study of accounting in secondary school, intellectual ability, effort made during the year, experience in the subject, class size and the academic year in which the student enrolled have a positive and significant influence on academic productivity. On the contrary, students' level of maturity, the time at which they attend class and the academic year in which they have enrolled negatively influence academic productivity.

Moreover, students who have received study grants obtain significantly better results than those who do not receive them, which may be because the renewal of the grant is linked to the student

* Newey (1987) recommends using the Hausman test to compare Tobit estimations with CLAD estimations.

obtaining good results, *ceteris paribus* the family's economic situation. As a result, the grant allocation policy positively contributes to improving the educational level of students from humble backgrounds and, consequently, of the active population when these finish their studies, which could promote the economic growth of a country.

Therefore, the Departments of Education of the different autonomous regions, the Ministry of Education and the universities should ensure that study grants are increased, or at least maintained, so that the population with less economic resources who are in a position to undertake university studies can do so. These public grants could be complemented by grants from private companies or foundations. The State and the Autonomous Governments could promote an increase in the number of private study grants by increasing the tax deductions companies receive by giving grants, while universities could start or increase collaborations with private companies as highlighted by Frasquet et al (2011). This would promote private investment in universities and negotiation regarding the allocation of private grants within the student community.

Students who studied the specialisation of Administration and Finance or Administration in secondary school, the study plans of which contain accounting subjects, obtain significantly better results than the other classmates who did not study these specialisations. This factor has the greatest influence according to the model proposed, thereby revealing the importance of informing and advising students correctly when they are in secondary school, so that they choose specialisations in the final cycle of secondary education or vocational training that are more related to the university studies they would like to and/or can study. Furthermore, this would enable students to access the university degree they want to study as a first option, since the university entrance exam grade is considered on the basis of the relation the specialisation studied in secondary school has with the university degree chosen.

The university entrance exam grade is a relevant factor in students' productivity. Thus, students who have a high entrance exam grade obtain significantly better results than those who have a lower entrance exam grade. This highlights the importance of pre-university education as regards the academic success of students in university. Therefore, educational reforms should be aimed not only at improving quality indices at university level, but also at achieving better standards in earlier educational levels.

Students who have passed a greater number of credits during the year are more productive in the subject of accounting. Moreover, students who have made a greater effort in other subjects have done the same in the subject of accounting. This could be due to the fact that said students have developed time-management skills and they use their time efficiently to carry out their learning activities, enabling them to pass the credits in which they have enrolled.

Students who have not passed the credits corresponding to the subject of Financial Accounting in the first exam sitting obtain significantly better results when they enrol in later exam sittings,

compared to new entrants. This could be because the student knows how the subject operates, and is more familiar with the class materials and the type of exam given.

On another note, students who attend class in the afternoon are less productive than those who attend class in the morning. This may be because students who go in the afternoon have (1) a lower intellectual ability and/or (2) professional and family obligations, meaning they have less time to carry out the exercises given by the professor and to study the subject within the given time frame. To resolve this inconvenience, subject coordinators and professors could modify the teaching guides, considering the possibility of introducing and using alternative methodologies which render the learning process of these students more flexible, promoting individual work through the use of ICT.

The size of the class students attend positively influences their academic performance. This may be because professors feel more motivated and prepare their classes better when they give a lecture to a large number of students, resulting in improved academic performance of these students. This result has important implications for the decision-making of those professors in charge of managing and administrating the faculty's teaching tasks. In this way, the professor student ratio could be increased in the theoretical part of the subject without this affecting the students' productivity. This would mean that professors could be assigned to those subjects that require smaller classes, or the teaching hours of Financial Accounting professors could be reduced in order to increase their dedication to research and/or management.

As regards the limitations of this work, the empirical evidence provided, although potentially important, may have a limited external validity, since as in the case of Rohde and Kawanagh (1996) and Al-Twaijry (2010) the sample has been taken from one university only. Nevertheless, in a similar manner to Eskew y Faley (1988), this research focuses on a state, public university that is large if we consider the number of students enrolled. Therefore, we can assume that the sample used could be representative of students who enrol in the subject of Financial Accounting in universities with similar characteristics.

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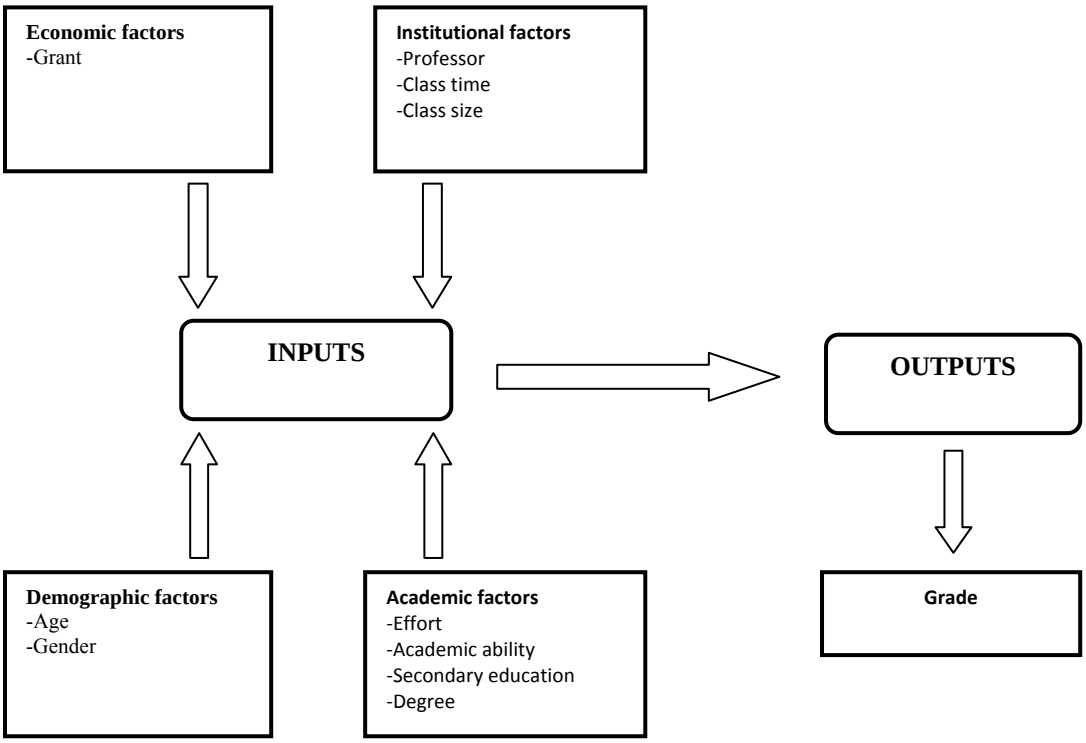
Figure 1 Theoretical framework



Formulated by author.

Table 1

Measurement of dependent and independent variables

Variable	Hypothesis	Sign/variable name	Measure
Dependent			
Result for student		AP	Total result for student for exam and assessment items
Independent			
Level of maturity	H1a	AGE	Indicates the age of the student in years
Gender	H1b	GENDER	1=male; 0=female
Economic situation	H2a	GRANT	1=grant; 0=no grant
Secondary school accounting	H3a	BUSINESS/SOCIAL	1=studied the specialisation indicated in secondary education: 0 = did not study it.
Previous skills	H3b	ENTRANCE	University entrance exam grade (5-10 points)
Effort	H3c	CREDITS	Number of credits the student has passed during the year minus the credits passed in the subject of Financial Accounting.
Motivation	H3d	REPEAT	1=repeat; 0= no repeat
Academic degree	H3e	DEGREE	1= studying the academic degree indicated; 0= is not studying it.
Professional status of the professor	H4a	PROFESSOR	1= the professor is exercising an academic career in the university; 0= the professor's main professional commitment is in a private company.
Time	H4b	AFTERNOON	1= the student attends class in the afternoon; 0= the student attends class in the morning.
Class size	H4c	SIZE	Number of students making up a group.

Table 2
Correlation Matrix for Regression Variables

	AP	AGE	GENDER	ENTRANCE	YEAR2006	YEAR2007	YEAR2008	PROFESSOR	AFTERNOON
AGE	-0.1744*								
GENDER	-0.1546*	0.1037*							
ENTRANCE	0.4370*	-0.1913*	-0.1894*						
YEAR2006	0.0380*	0.0218	-0.0077	-0.0333*					
YEAR2007	-0.0563*	-0.0133	-0.0054	-0.0132	-0.3351*				
YEAR2008	-0.0495*	0.0148	-0.0074	0.0054	-0.3411*	-0.3206*			
PROFESSOR	0.2059*	-0.2292*	-0.1222*	0.3215*	-0.0108	-0.0472*	-0.0167		
AFTERNOON	-0.1601*	0.3455*	0.0696*	-0.1830*	-0.0249	-0.0023	-0.0163	-0.4704*	
SIZE	-0.1538*	0.1170*	0.0860*	-0.2247*	0.2572*	-0.1832*	-0.0953*	-0.3783*	0.4404*
DEGREE	0.2847*	-0.1282*	-0.1756*	0.5684*	-0.0254	0.0018	0.0171	0.2662*	-0.0796*
REPEAT	-0.1406*	0.3396*	0.0713*	-0.2930*	0.0177	-0.0450*	0.0078	-0.3432*	0.3053*
CREDITS	0.6231*	-0.2258*	-0.1422*	0.4348*	-0.0257	-0.0399*	0.0423*	0.2825*	-0.1993*
GRANT	0.1230*	-0.1649*	-0.1492*	0.1418*	-0.0275	-0.0191	-0.0104	0.1296*	-0.1190*
BUSINESS	0.0346*	0.0821*	-0.0329*	0.0876*	-0.0568*	0.0165	0.0284	-0.0089	0.0617*
SOCIAL	0.0777*	-0.2600*	-0.1623*	0.0686*	-0.0138	0.0015	0.0134	0.0732*	-0.1312*

	SIZE	DEGREE	REPEAT	CREDITS	GRANT	BUSINESS
DEGREE	-0.1873*					
REPEAT	0.1753*	-0.1525*				
CREDITS	-0.2633*	0.3009*	-0.2875*			
GRANT	-0.0337*	0.0990*	-0.2877*	0.1314*		
BUSINESS	0.0234	0.0658*	-0.0516*	-0.0333*	0.0513*	
SOCIAL	-0.0583*	0.1064*	-0.0586*	0.0270	0.1207*	-0.1554

*Significat at the 0.10 level (two tailed)

Table 3

Dependent and independent variable descriptive statistics for variables used during testing

Panel A: Continuous variable. Descriptive statistics

Variable	Mean	Median	Std Dev	Min	Max
AP	5.26	5.40	1.82	0.2	10
AGE	21.00	20.10	3.04	18.03	55.80
ENTRANCE	6.31	6.23	0.83	5	9.73
CREDITS	31.25	31.50	22.04	0	183
SIZE	106.81	107.00	17.54	63	152

Panel B: Dichotomous and Categorical variable. Descriptive statistics

VARIABLE	CODE	FREQUENCY	PERCENTAGE BY CATEGORY
GENDER	0	1471	45.70
	1	1748	54.30
GRANT	0	2772	86.11
	1	447	13.89
BUSINESS	0	3183	98.88
	1	36	1.12
SOCIAL	0	1027	31.90
	1	2192	68.10
REPEAT	0	2017	62.66
	1	1202	37.34
DEGREE	0	1621	50.36
	1	1598	49.64
PROFESSOR	0	2015	62.60
	1	1204	37.40
AFTERNOON	0	2349	72.97
	1	870	27.03

Table 4

Academic Performance

		Tobit			CLAD		
Variable	**Marginal Effects**	**Coefficient**		**Standard Error**	**Coefficient**		**Standard Error**
AGE	-0.0045	-0.0529	**	0.0230	-0.2598	**	0.1477
GENDER	-0.0288	-0.3407	***	0.1198	-0.1330		0.1247
GRANT	0.0200	0.2432		0.1737	0.4101	***	0.1364
BUSINESS	0.1081	2.3028	***	0.5475	2.4361	***	0.5655
SOCIAL	0.0385	0.4418	***	0.1327	0.2349		0.1542
ENTRANCE	0.0642	0.7530	***	0.0901	0.6990	***	0.0754
CREDITS	0.0090	0.1059	***	0.0032	0.1017	***	0.0045
REPEAT	0.0825	1.0212	***	0.1425	1.1441	***	0.2905
DEGREE	0.0240	0.2820	**	0.1413	0.0400		0.1486
PROFESSOR	-0.0213	-0.2464	*	0.1465	-0.1388		0.1442
AFTERNOON	-0.0565	-0.6352	***	0.1670	-0.4968	**	0.2301
SIZE	0.0006	0.0067	*	0.0040	0.0134	***	0.0044
YEAR2006	-0.0009	-0.0125		0.1632	-0.0302		0.1481
YEAR2007	-0.0353	-0.3993	**	0.1673	-0.5257	***	0.1949
YEAR2008	-0.0785	-0.8584	***	0.1645	-0.7839	***	0.1653
Constant		-5.2221	***	0.9139	-0.5771		3.0470
N. observations		3,219					
Left-Censured		1,134					
Right-Censored		1					
Log Likelihood		6,135.42					
Pseudo R		0.1251			0.2346		

Statistical significance at the 1%, 5% and 10% levels is denoted by ***, **, *, respectively.