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06. April 2008

Online at http://mpra.ub.uni-muenchen.de/14425/
MPRA Paper No. 14425, posted 06. April 2009 / 08:41

Are easy grading practices induced by low demand? Evidence from Italy

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Abstract. *In this paper we investigate whether grades are used by educational institutions as a competition variable to attract and retain students. Using a sample of almost 26,000 students enrolled at an Italian University, we document that grades vary significantly across degrees. After controlling for students' characteristics, class-size, classmates' quality and degree fixed effects, it emerges that students obtain better grades and are less likely to drop-out when their degree course experiences an excess of supply. We adopt an instrumental variable strategy to account for endogeneity problems and instrument the excess of supply by using the total number of universities offering each degree course. Our IV estimates confirm that the teaching staff on degree course facing low demand tend to set lower academic standards with the result that their students obtain better grades and have a lower probability of dropping out than they might otherwise.*

JEL: I2, J31, J64
Key words: grades, higher education, grading standards

1. Introduction

In a sense, educational institutions are "delegated" by society to evaluate students' skills and to signal them to the labour market. However, there is a large debate on whether these institutions have the right incentives to play this role: grades may not be awarded simply to signal student ability and productivity, but may be used as a variable to compete with other educational institutions. In fact, when employers cannot observe skills, schools and universities may have an interest in positively biasing evaluations in order to attract more students or reduce their own effort.

This kind of incentive may operate not only in private institutions, whose revenues are clearly based on enrolment, but also in public educational institutions where the allocation of state resources among schools, universities and departments is based fully or partially on the number of students enrolled or on the number of exams passed by students.

Economic literature has considered this problem with regards to primary and secondary education, focusing the attention mainly on the advantages of centralised examination systems (Bishop, 1996; Bishop, 1997; Bishop and Woessman, 2004; Woessman, 2005). The issue seems to be even more

[*] I would like to thank the editor Bernd Fitzenberger, two anonymous referees, Vincenzo Scoppa, Giorgio Brunello, Alessandra Antonelli for their very useful comments, the administration of University of Calabria for providing access to the data and Anna Russo, Monya Perricone and Alessandro Sole for providing assistance with the use of the data. The usual disclaimer applies.

relevant for post-secondary education, since grade inflation and grade divergence are well documented phenomena among both American and European Universities.

“Grade inflation” is a term coined to describe the tendency to inflate grades, that is to reduce the academic standards which lead to given levels of grades being awarded (Anglin and Meng, 2000; Mansfield, 2001; Shea, 1994; Stone, 1995; Ostrovsky and Schwarz, 2003), while grade divergence describes situations in which grading standards differ across universities, departments, and professors in the same field (Bagues, Sylos Labini and Zinoyeva, 2008; Becker, 1997; Boero et al., 2001; Shea, 1994).

Inconsistent grading may have a notable impact both inside and outside educational institutions. In fact, it is argued that grade inflation and grade divergence reduce the value of grades as signals of productivity and then the capacity of employers to select from the pool of graduates (Chan et al., 2007). In addition, students may be attracted, in their enrolment decisions and field choices, by departments that offer easy grading even though they might entail poor labour market perspectives (Bratti and Staffolani, 2001). This can generate mismatch between qualifications acquired by students and skills required in the labour market, with an excessive number of students graduating in fields for which there is little demand. Easy grading practices may also have negative effects on the educational system itself, since they negatively influence students’ incentives to provide effort in studying activities and in knowledge acquisition (Figlio and Lucas, 2003) and reduce pressure on college administrators to improve teaching quality (Bishop and Woessman, 2004).

Where the allocation of resources among universities and departments is based fully or partially on the number of enrolled students, grade inflation and divergence may also produce distributional effects. Distributional effects are also produced among students. In fact, as shown by Chan et al. (2007), the welfare of good students is negatively effected by grade inflation, whereas mediocre students obtain a higher level of welfare than they would otherwise. Other distributional issues emerge when grants, scholarships, honours of various sort and subsidised taxation schemes are awarded simply on the basis of students’ performance without taking into consideration the students’ field of study, the university attended and differences in curricula.

The tendency to inflate grades has been explained in several ways. Chan et al. (2007) explain grade inflation assuming that employers cannot perfectly distinguish between a situation in which an educational institution (a school or a university) is giving lots of good grades and a situation in which the institution has a large number of good students. This lack of information induces the educational institution to award high grades to some of its low-ability students too. De Paola and Scoppa (2007) point out that educational standards may be influenced by labour market conditions and that lower standards emerge when skills are scarcely rewarded. Freeman (1999) argues that universities and departments adopt grading policies which are inversely commensurate to the market benefits of their courses. In a similar vein, Dickens, 1984, and Staples, 1998, argue that easy grading practices are used to attract more students so as to avoid poorly attended courses being closed. In addition, university instructors may inflate their grades in order to avoid negative evaluations by students, since these evaluations are often considered by faculties in their promotion and tenure decisions (Krautmann and Sander, 1999).

In this work we propose a simple theoretical model showing that, when students positively evaluate high grades and when resources are allocated in relation to the number of students enrolled and the number of exams they pass, grading policies may be used by universities or departments as a competition variable to attract and retain students. In addition, we show that the incentive to inflate grades is higher for universities or degree courses facing low demand. This framework guides the empirical investigation which follows. We use a rich data set providing detailed information on grades obtained in each course by a sample of almost 26,000 students enrolled on different degree courses offered by a middle size Italian University and estimate the relationship between students' academic performance (in terms of grades obtained and probability of dropping out) and the demand for their degree course. Since, as a result of the reforms implemented in Italy during the early 90s, funds are partially allocated to universities and departments in relation to the number of students enrolled and to the number of exams passed by students[2], easy grading practices may well be used by among different degree courses to attract and retain students.

Students may positively evaluate high grades both because they have a taste for them (and easy grading standards usually imply a lower probability of failing exams) and because, in the absence of perfect information, high grades may lead to higher rewards in the labour market. As a consequence, enrolment decisions may be influenced by the difficulty of different degree courses as well as by students' preferences and ability (Bar et al. 2007). One may suggest that this kind of information is generally not available in advance of applying to university. However, students actually enrolled represent an important channel for information diffusion, especially when they reside in the same geographical area as prospective students[3].

Easy grading standards may also be aimed at avoiding students' dropping outs because degree courses experiencing low demanded may fear loss of resources or, in extreme cases, closure. While it is very rare that a university in Italy will decide to shut down a degree course because of low demand, the number of courses offered is strictly related to the number of students enrolled (especially after the first year when students have more opportunity to choose among different courses).

[2] See Perotti (2002) for a description of the Italian university financial system.
[3] The great majority of students enrolled at the University of Calabria are resident in the same region in which the University is located.

Studies considering these issues generally measure demand as the number of students enrolled in each degree course (Dickens, 1984; Staples, 1998) and, as a consequence, they are not able to disentangle class-size effects from effects due to endogenous grading standards. Thanks to the quality of our data set, we are able to overcome this problem. In fact, we have information on the class-size of courses attended by each student and on the number of places offered compared with the number of applications received for each degree course. We use this information to evaluate whether the grading standards adopted by different degree courses are influenced by the demand they enjoy compared to the number of places they offer, controlling for class-size effects.

We first estimate a simple OLS model of grades obtained by students in their first year exams. From our results it emerges that, controlling for class-size, classmates' quality and degree fixed effects, students obtain better grades when their degree course experiences an excess of supply. Since our analysis builds on information concerning individuals who decided to attend different degree courses, OLS estimates are consistent as long as these individuals do not select different degree courses according to their unobservable characteristics. Moreover, degree courses which experience an excess of supply may share some unobservable time variant features, for example, in terms of teaching quality. In order to overcome these problems, we instrument the excess of supply variable with the total number of Universities which offer each degree course using a Two-Stage Least Squares (TSLS) estimation. Our TSLS estimates confirm that students obtain better grades when their degree course experiences an excess of supply.

We also analyse, by estimating a probit model, whether aspects related to supply and demand effect the probability of students' dropping out. It emerges that students enrolled in degree courses which experience an excess of supply have a lower probability of dropping out of their academic studies. Two-Stage Probit estimates confirm this result.

The paper is organised in the following way. In Section 2 a simple theoretical model is proposed. In section 3 data are presented and some descriptive statistics are offered. In section 4 we document the fact that grades vary significantly across fields and across degrees and investigate whether grades obtained by students are influenced by the total demand for the degree course they have chosen. Section 5 presents Two-Stage Least Squares estimates. Section 6 is devoted to analysing the probability of students' dropping out in relation to demand-supply factors. In this section both Probit and Two-Stage Probit estimates are reported. Section 7 concludes.

2. Theoretical Set-up

In this section we present a simple model of students' choice of degree course. Let us assume that there are two horizontally differentiated degree courses $d = 1, 2$, located at the end points of a line segment, such as in Hotelling (1929). This line represents students' preferences for degree courses. In fact, students have different tastes regarding fields of study and they suffer a cost when they cannot choose their preferred degree course. More precisely, we assume that the cost relating to having chosen course 1 is represented by the distance at which the student's ideal course lies from the location of course 1, denoted by t, and that the cost relating to the distance of the student's ideal course from the location of course 2 is denoted by $1-t$. Students are homogeneous in every respect apart from cost t, which is uniformly distributed between 0 and 1. Each student enrols on a degree course.

As explained in the introduction, students may positively evaluate high grades for several reasons. To encompass this idea in our model, we simply assume that students obtain utility from grades they get during their university studies. In addition, we assume that that their utility depends positively on the economic and social payoffs (wage, status, etc) deriving from graduating in a certain field, which, for the sake of simplicity, are independent of grades. These payoffs, B_d, are field specific, since different degree courses may lead to different economic and social outcomes.

Let us suppose that the grade, g, obtained by student j, enrolled in degree course d, is equal to his effective skills, s, plus a term i, which corresponds to grade inflation,.Therefore: $g_{jd} = s + i_d$.

Students will only select the degree course 1 if the following condition holds:

[1] $$B_1 + s + i_1 - t > B_2 + s + i_2 - (1 - t)$$

where B_1 and B_2 denote payoffs obtained by subjects who have graduated in field 1 and 2 respectively, and i_1 and i_2 denote grade inflation chosen by the two different degree courses.

Taking into account the fact that students are homogenous in every respect, except for cost t, and that t is uniformly distributed, it is possible to find a threshold value of $\hat{t}$:

[2] $$\hat{t} = \frac{1 + B_1 - B_2 + i_1 - i_2}{2}$$

Only students with a cost t which is lower than the threshold value $\hat{t}$ will choose degree course 1. It is easy to show that when $B_1 = B_2$ and $i_1 = i_2$ half of the students enrol on degree course 1.

We assume that resources are allocated, by a central authority, to the two degrees courses in relation to the number of students enrolled and the average number of exams passed by those students. However, since in many countries resources are only partially allocated in relation to the number of students and the number of exams, we assume that total resources obtained by each degree course increase less than proportionately to the increase in the number of students enrolled and to the average number of exams they pass[4]. More precisely, the total amount of resources obtained by degree *d* takes the following form: $R = (Nr)^{\alpha} + (e(i_d)r)^{\beta}$ where *N* is the number of students enrolled, *r* the resources obtained for each student, $e(i_d)$ denotes the average number of exams passed by students, which is positively related to grade inflation i_d, and α and β are parameters taking values greater that zero and lower than 1. For the sake of simplicity, let us assume that $e(i_d) = i_d$.

When deciding its grading policy, each degree course takes into account the influence that this choice will have on the resources provided by the central authority. However, grade inflation may also generate costs, for example in terms of reputation. In order to take this aspect into account, we simply assume that degrees suffer a cost $c(i_d)$ from grade inflation. As a consequence, grade inflation is decided upon by each degree course in order to maximise the following utility function:

[3] $$U_d = (Nr)^{\alpha} + (i_d r)^{\beta} - c(i_d)$$

Now, let us consider the utility function of degree course 1. In this case the number of students enrolled is equal to $N = \int_0^{\frac{1+B_1-B_2+i_1-i_2}{2}} f(t)dt$. Solving the integral and substituting it into equation [3] leads to:

[4] $$U_1 = \left(\frac{1+B_1-B_2+i_1-i_2}{2}r\right)^{\alpha} + (i_d r)^{\beta} - c(i_d)$$

A similar equation can be obtained for degree course 2.

The optimal grade inflation policy adopted by degree course 1 satisfies the following first order condition (FOC):

[5] $$\frac{\partial U_1}{\partial i_1} = \alpha\left(\frac{1+B_1-B_2+i_1-i_2}{2}r\right)^{\alpha-1}\frac{r}{2} + \beta r(i_d r)^{1-\beta} - c'(i_1) = 0$$

The FOC implicitly represents the reaction function of degree course 1 with respect to variables chosen by its competitor (degree course 2). An analogous reaction function can be obtained for degree course 2.

Therefore, our model is defined by the two following implicit functions:

[4] These assumptions describe the Italian University funding system quite closely. In fact, since the 1993 reform in Italy (law 537/1993), each university is an autonomous entity with its own budget, which has to be allocated across different disciplines following a number of rules which state that a part of public funds has to be distributed on a historical basis and the rest is to be allocated via an “Equalization Component”. This component depends positively on the number of student enrolled weighted by discipline standard unit cost and on the number of exams passed by students enrolled (see Bagues et al., 2008 and Perotti, 2002)

[6] $$F_{i1} = \alpha\left(\frac{1+B_1-B_2+i_1-i_2}{2}r\right)^{\alpha-1}\frac{r}{2}+\beta r(i_1 r)^{\beta-1}-c^{'}(i_1)=0$$

[7] $$F_{i2} = \alpha\left(\frac{1+B_2-B_1+i_2-i_1}{2}r\right)^{\alpha-1}\frac{r}{2}+\beta r(i_1 r)^{\beta-1}-c^{'}(i_1)=0$$

Second-order conditions for a maximum require that $F_{i1i1}<0$ and $F_{i2i2}<0$ (which are satisfied given our assumptions) and that the determinant of the Hessian (composed by the second derivatives) is positive:

$$\begin{vmatrix} F_{i1i1} & F_{i_1 i2} \\ F_{i2i1} & F_{i2i2} \end{vmatrix} > 0$$

It is easy to verify that $F_{i1i1}F_{i2i2}-F_{i1i2}F_{i2i1}>0$ implying that the Jacobian J of this system with respect to the endogenous variables i_1 and i_2 does not vanish at the optimal values and allowing us to study the comparative static properties. Taking the total differentials of [6] and [7] and allowing the endogenous variables i_1 and i_2 to vary, together with all the relevant exogenous variables, we obtain:

[8]
$$F_{i1i1}\partial i_1 + F_{i1i2}\partial i_2 + F_{i1B_1}\partial B_1 + F_{i1B_2}\partial B_2 = 0$$
$$F_{i2i2}\partial i_2 + F_{i2i1}\partial i_2 + F_{i2B_1}\partial B_1 + F_{i2B_2}\partial B_2 = 0$$

The equation system in [8] can be written in matrix form as:

[9] $$\begin{vmatrix} F_{i1i1} & F_{i1i2} \\ F_{i2i1} & F_{i2i2} \end{vmatrix}\begin{vmatrix} \partial i_1 \\ \partial i_2 \end{vmatrix} = \begin{vmatrix} -F_{i1B_1}\partial B_1 - F_{i1B_2}\partial B_2 \\ -F_{i2B_1}\partial B_1 - F_{i2B_2}\partial B_2 \end{vmatrix}$$

We are now interested in showing how grading practices followed by each degree course are effected by demand conditions. We proceed by considering that an increase in B_1 produces an increase in demand for degree course 1 and then we investigate how the degree course adjusts its grading policy in response to this change.

Using Cramer’s rule to obtain $\partial i_1/\partial B_1$, and taking other exogenous variables as equal to zero, it is possible to show that an increase in B_1 produces a reduction in grade inflation i_1. In fact:

[10] $$\frac{\partial i_1}{\partial B_1} = \frac{-\overset{-}{F_{i1B_1}}\,\overset{-}{F_{i_2 i_2}} + \overset{+}{F_{i1i2}}\,\overset{+}{F_{i2B1}}}{\overset{+}{|J|}}$$

where:

$$F_{i1B1} = \alpha(\alpha-1)\left(\frac{1+B_1-B_2+i_1-i_2}{2}r\right)^{\alpha-2}\frac{r^2}{4}$$

$$F_{i2i2} = \alpha(\alpha-1)\left(\frac{1+B_2-B_1+i_2-i_1}{2}r\right)^{\alpha-2}\frac{r^2}{4}+\beta(\beta-1)r^2(i_1 r)^{\beta-2}$$

$$F_{i1i2} = -\alpha(\alpha-1)\left(\frac{1+B_1-B_2+i_1-i_2}{2}r\right)^{\alpha-2}\frac{r^2}{4}$$

$$F_{i1B2} = -\alpha(\alpha-1)\left(\frac{1+B_1-B_2+i_1-i_2}{2}r\right)^{\alpha-2}\frac{r^2}{4}$$

by substituting these equations into the numerator of equation [10], we obtain the following:

$$[11] \quad -F_{i1B_1}F_{i_2i_2}+F_{i1i2}F_{i2B1} = -\alpha(\alpha-1)\beta(\beta-1)\left(\frac{1+B_1-B_2+i_1-i_2}{2}r\right)^{\alpha-2}\frac{r^4}{4}(i_1 r)^{\beta-2} < 0$$

Equation [11] is negative, implying that an increase in B_1 has a negative effect on the grade inflation decided upon by degree course 1. As a consequence, an exogenous increase in demand for degree course 1 induces the degree course to adopt a tough grading policy.

We can, therefore, conclude that degree courses facing, for exogenous reasons, low demand tend to inflate their grades more compared to degrees enxperiencing higher demand. In the next section we will submit this theoretical prediction to empirical scrutiny by using data from an Italian University.

3. Data and Descriptive Statistics

Our empirical analysis relies upon individual-level data using a sample of 25,825 first-year undergraduate students enrolled at the University of Calabria, a middle-sized public university located in the South of Italy, collected between the academic years 2001-02 and 2006-07[5]. The University of Calabria currently has about 33,000 students, who are enrolled in different degrees and at different levels of the Italian University system. This system is, in line with the University Reform of 2001 following the 1999 EU Convention in Bologna, organised into two main levels constituted by First Level Degrees (legal duration of 3 years) and Second Level Degrees (a further 2 years duration). The reform reduced the original official duration for undergraduate courses from four or five years to three

[5] The university of Calabria was ranked second in the 2004 list of Italian public universities of similar size for the relative quality of its services, infrastructure, computerisation and financial support for students. See the ranking at http://www.repubblica.it/speciale/2004/censis/classifiche/mediatenei.html

years (introducing First Level Degrees) and has greatly increased the variety of curricula offered introducing a large number of new degrees.

The students in our sample are enrolled in different fields (Economics, Pharmacy, Engineering, Humanities, Mathmatics and the Natural Sciences, and Political Sciences) and on different First Level Degree courses (hereafter FLD) within the same fields. The number of FLD offered within the same field ranges from 3 (Political Sciences) to 12 (Humanities)[6].

In order to gain a FLD, students have to obtain a total of 180 credits (each successfully accomplished course gives a number of credits ranging from 1-10). From our dataset, information is available regarding grades obtained on each course, the date of each exam, year of enrolment, students' province of residence, type of high school attended by students and their final high school grade. Unfortunately, our dataset does not provide information on socio-economic and family background. However, the type of high school attended by students has been found to correlate highly with this missing information (see Checchi, 2006)[7].

Table 1 provides some descriptive statistics. About 54 percent of students are female. Students mainly come from two different types of high school: Lyceums (about 43%) and Technical and Vocational Schools (about 57%). Final high school grade (which we denote throughout the paper as *HSFinal*) ranges from 60 to 100, with a mean of about 84. The average ability (measured considering *HSFinal*) of students varies considerably across fields. Students with higher *HSfinal* tend to be enrolled in Engineering (for students enrolled in this field *HSfinal* has a mean of 87), while those with lower ability tend to be enrolled in Pharmacy (the mean of *HSFinal* is 79).

We only consider exams that they have undertaken during the first year of their degree in order to avoid selection problems which might emerge if students enrolled in the same FLD select courses characterised by different levels of difficulty. In fact, first year courses are compulsory introductory courses, whereas students have the possibility to choose between different courses offered by their FLD during the following years.

Our sample of students, composed of 25,825 individuals, passed a total number of 162,899 exams and obtained an average grade of 24 during the first year of their FLD course. Grades range from 18 -

[6] The fields which offer a relatively low number of FLD are Political Sciences, Pharmacy and Economics, with respectively 3, 4 and 5 different FLD. A relatively high number of FLD are offered by the Faculties of Humanities, Math and Sciences and Engineering. In these faculties, there can be found, respectively, 12, 9 and 9 different FLD (for more detailed information see Table 1A in the Appendix). However, students enrolled in the Faculty of Engineering only decide which FLD to undertake at the end of their first semester and, as a consequence, only exams undertaken during the second semester change according to the chosen FLD. For this reason, we exclude students enrolled in this faculty in some of our regressions.

[7] In Italy, after compulsory education, students can decide to follow a "generalist" schooling track (*Liceo*), which is usually chosen by students from "better" family backgrounds, or a more labour market oriented schooling track (*Istituti tecnici e professionali*), usually chosen by students from "worse" family backgrounds.

the minimum pass mark - to 30. We do not have information on exams that students failed[8].

Students attended their first year courses in classes of different sizes. We measure class-size by considering, for each year, the number of students enrolled in the same FLD and adjusting this number taking into account the maximum class-size admitted by law. The maximum number of students per class depends on the field of study (for example, the maximum class-size is of 230 students for Economics) and FLD with a high intake of students have to split them into different classes. As a consequence, this measure of class-size is only partially influenced by the total number of students enrolled in each FLD. As shown in Table 1, class size has a mean of 147, and takes values between 1 and 310.

In our analysis we also control for classmate quality. As first year courses are compulsory, this measure of students' quality considers the average ability (using *HSFinal*) of students that in the year *t* enrolled in the FLD chosen by student *j*.

Table 1. Descriptive statistics for the sample of students

Variables	*Mean*	*Std. Dev*	*Min.*	*Max.*	*Observations*
Average Grade in First year exams	23.92	2.884	18	30	25825
High School final grade	83.997	12.470	60	100	25825
Female	0.545	0.498	0	1	25825
High School Type: Lyceum	0.432	0.495	0	1	25825
Economics	0.235	0.424	0	1	25825
Pharmacy	0.067	0.250	0	1	25825
Engineering	0.243	0.429	0	1	25825
Humanities	0.256	0.437	0	1	25825
Maths and Natural Sciences	0.114	0.317	0	1	25825
Political Sciences	0.085	0.279	0	1	25825
Year of enrolment 2001-2002	0.164	0.370	0	1	25825
Year of enrolment 2002-2003	0.171	0.377	0	1	25825
Year of enrolment 2003-2004	0.177	0.382	0	1	25825
Year of enrolment 2004-2005	0.158	0.365	0	1	25825
Year of enrolment 2005-2006	0.173	0.378	0	1	25825
Year of enrolment 2006-2007	0.158	0.365	0	1	25825
Classmate Quality	83.997	5.200	70.200	98.087	25825
Class-size	147.331	57.737	1	310	25825
Drop-outs	0.145	0.352	0	1	21748
Excess-Supply	0.271	0 .444	0	1	25825
Supply-Demand	-0.374	0.639	-3.137	0.940	25825

Our data do not provide information on students who decided to drop out of university, however we have information on students who successfully undertook at least one exam during the second year of duration of their degree course. We use this information as a proxy for drop-out behaviour. About 14% of students drop-out in the second year, in fact 18,598 students passed at least

[8] The great majority of Italian Universities do not record failed exams.

one exam during the second year of their academic career from a total of 21,748 relevant students (students enrolled in year 2006-07 were excluded because they had not yet completed their second year when data were collected).

From data provided by the Administrative Office of the University of Calabria, we also have information on the number of places offered by each degree course each year and the number of applications received.

The Italian University system, with few exceptions[9], does not restrict enrolment, however, some minimum standards, in terms of minimum number of tenured professors[10] for number of places offered, were legally established by the 2001 University reform and have to be met by each degree course. As a result, each degree course is able to offer a certain number of places for new students according to the number of professors. Since the number of professors changes very slowly, the number of places offered is fairly stable over time. This is confirmed by the fact that it does not emerge from our data that the number of places offered by each FLD responds to the previous year's demand. In fact, if we regress the number of places offered by each FLD each year on the number of applications received in the previous year, we do not find any statistically significant effect once we control for degree and year specific effects[11].

By comparing the number of places offered and the number of applications received, we are able to understand whether a given FLD in a given year is experiencing an excess of supply, or not, and we may define a dummy variable D_Excess_Supply which assumes value 1 when the FLD for the year in which student *j* enrolled was experiencing an excess of supply and 0 otherwise. We also define a variable $Supply - Demand$ which measures the relative size of the excess of supply or demand, $Supply - Demand = \frac{Places\ \mathrm{Offered} - Applications}{Places\ \mathrm{Offered}}$.

On average the number of applications received each year for the FLD available at the University of Calabria is higher than the number of places on offer. However, as reported in Table 1, 27% of sample students are enrolled in FLD which experienced an excess of supply during the year in which they enrolled.

In table 1A in the Appendix, it is shown that FLD facing an excess of supply are common to all fields, although slightly more concentrated in the Maths and Natural Sciences. They are typically small FLD, with an average size of 129 students (while the average size of FLD that do not have an excess of

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9 A *numerus clausus* is imposed for Architecture, Medicine and Veterinary Science. None of these fields is on offer at the University of Calabria.

10 The minimum number of tenured professors for the number of places offered varies according to the fields of study.

11 Regression results are available upon request.

supply is of 243 students), and students enrolling are characterised by relatively lower ability. In fact, FLD receiving a number of applications which exceeds the number of places on offer admit students on the basis of their *HSFinal*. As a consequence, students who have obtained a low final grade at high school have a low probability of being accepted in FLD which experience an excess of demand. This leads to a negative correlation between D_Excess_Supply and *HSFinal*.

4. Differences in grades across degree courses. Are they due to differences in demand?

In this section we analyse whether grades vary significantly across different degree courses and whether it is possible to explain grading practices with regards to demand and supply factors.

Grades reflect both students' academic performance and the grading standards adopted by the university teaching staff in evaluating students. We start with the following simple model:

$$G_{jetd} = \alpha + \beta X_j + \chi D_t + \delta D_d + \phi Q_{td} + \varphi S_{td} + \nu S\_D + \varepsilon_{jetd} \qquad [12]$$

Where G_{jetd} is the grade obtained in exam *e* by student *j* enrolled in year *t* in the FLD *d*. X_j is a vector of individual characteristics (high school final grade, dummies for the type of high school attended, gender dummy and dummies for province of residence). D_t are dummies for year of enrolment that capture variation in unobserved characteristics over time. D_d are dummies for field of study (field or FLD according to the specification), which allow controling for the existence of time-invariant unobserved heterogeneity across fields or FLD. Q_{td} is the average quality of students attending degree course *d* together with student *i*, S_{td} is the average class-size of courses attended by student *j* enrolled in the degree *d*, S_D is a variable measuring supply/demand conditions for the degree course attended by student *j*, ε_{jetd} is an error term.

All variables have been standardised in order to make results comparable under different specifications and to render the interpretation of marginal effects more straightforward. All equations include province of residence dummies (not reported so as to save space). In all specifications, standard errors (reported in parentheses) are corrected for heteroskedasticity and since some of the variables of interest vary at degree level, we estimate our models clustering the standard errors at this level in order to avoid biased standard errors (Moulton, 1990).

In column 1 of Table 2, the results are shown of OLS estimations of equation (1), which include fixed effects by field of study and do not consider the variable S_D. We obtain results that are consistent with findings obtained by previous literature on grades. Students who have obtained higher grades at high school also tend to perform better in terms of grades obtained at university. Students who have attended a lyceum obtain the highest grades. The female dummy is not significant.

Class-size has a negative and statistically significant coefficient (at the 1% level), implying that students in larger classes obtain worse grades. An increase of one standard deviation in class-size reduces grades by a 0.049 standard deviation. This may be due to fact that students learn better in smaller groups, which allow greater interaction with instructors, and that instructors are able to make better evaluations of student performance by taking into account motivation and participation in addition to more objective criteria[12].

The coefficient attracted by the average ability of classmates is negative and significant at 10 per cent level, implying that students obtain lower grades in courses attended by students with higher ability. This result may suggest that instructors evaluate students on a relative basis and adjust their grading standards to the average level of ability encountered in the classroom[13].

Coefficients (not reported) attracted by year of enrolment dummies do not support the hypothesis of grade inflation: grades do not appear to increase over time.

We observe significant differences across different fields of study. Students enrolled in Humanities obtain better grades compared to all other students. Differences are particularly relevant with respect to students enrolled in Engineering, Pharmacy and Economics.

Significant differences in grades are also observed across different degree courses offered within the same field of study[14].

These results, showing significant differences in grades across fields and degree courses, are consistent with results obtained by Bagues, Sylos Labini and Zinoyeva (2008), who consider a sample of Italian graduates. They suggest that differences in grades are due to differences in grading standards, since graduates from fields and universities which award higher grades obtain lower earnings than graduates from fields or universities where grades are relatively low. Our data set does not provide information on outcomes obtained by individuals in the labour market, but some previous research

[12] The 2001 reform of the Italian University System defined both the maximum number of students that can be enrolled (given the number of permanent professors) and the maximum class size for each Degree Course. As a consequence, we are confident that class size can be treated as an exogenous variable.

[13] A number of works have analysed peer group interaction in education showing little or no effect (see for example Sacerdote, 2001 and Zimmerman, 2003). The negative effect we find in this study may depend on the fact that our measure of peer group is a very broad one and it may not be able to describe the student peer group adequately. In addition, grades may not represent an adequate measure of skills acquired by students.

[14] Estimations including degree dummies are available upon request.

(Romita, 2003) confirms, for graduates from the University of Calabria too, that students graduating from high grading FLD perform worse on the labour market.

However, it is not clear why certain fields or universities decide to set lower academic standards. As suggested in the previous sections, one possible answer is that educational institutions set their grading standards in relation to the demand they face. To investigate this aspect we include the dummy variable D_Excess_Supply among our regressors, measuring whether the degree chosen by student j is experiencing an excess of supply.

Results are reported in columns 2 and 3 of Table 2. In both specifications, it emerges that students enrolled in FLD which are experiencing an excess of supply obtain better grades.

As it is possible to see in column 2, controlling for class-size and for classmate quality, being enrolled in a FLD which is experiencing an excess of supply produces an improvement in students grades of 0.061 points (the effect is significant at a 5% level).

This is consistent with our theoretical model, showing that, when funds obtained by FLD are partially based on the number of students enrolled, FLD facing low demand are induced to adopt easy grading practices in order to attract students and in order to avoid losing resources[15].

Column 3 presents results obtained when excluding students enrolled in Engineering. Students enrolled in this field initially follow a common course and only select their FLD at the end of the first semester[16]. As a consequence, our measure of excess of supply is at field level for Engineering, rather than at FLD level. However, our main findings continue to hold true even when we exclude these students from our sample.

One may question whether our results are related to differences across degree courses. To control for the existence of time-invariant unobserved heterogeneity across FLD, we include FLD dummies instead of field dummies in our regressions. In this way we exploit the variations in D_Excess_Supply within the same FLD over time to estimate the effect of our interest. As shown in columns 4 and 5, which present results for the same specifications of the model discussed above, estimates do not change much when degree specific fixed effects are included. Results confirm that students obtain better grades when their FLD is experiencing an excess of supply.

[15] These findings also hold true when we consider the average grade gained in first year exams rather than grades obtained in each exam as a measure of student performance. Results are available upon request.

[16] Students enrolled in Engineering during the first semester attend common courses, while courses attended during the second semester depend on the FLD chosen.

Table 2. OLS estimates of grades including faculty or FLD specific fixed effects
Dependent Variable: grades obtained in first year exams.

Explanatory Variables	1	2	3	4	5	6	7
D_Excess_Supply		0.061**	0.070**	0.049**	0.033*		
		(0.028)	(0.035)	(0.022)	(0.018)		
Supply-Demand						0.009	
						(0.018)	
Excess_Supply							0.058**
							0.026
Excess_Demand							0.000
							0.021
High school final grade	0.285***	0.285***	0.277***	0.287***	0.279***	0.287***	0.287***
	(0.013)	(0.013)	(0.017)	(0.012)	(0.016)	(0.012)	(0.012)
Lyceum	0.275***	0.273***	0.246***	0.265***	0.230***	0.264***	0.264***
	(0.023)	(0.023)	(0.024)	(0.022)	(0.020)	(0.022)	(0.022)
Female	0.000	0.000	0.017	-0.001	0.009	-0.001	-0.001
	(0.016)	(0.016)	(0.016)	(0.014)	(0.013)	(0.013)	(0.014)
Average Classmates' Ability	-0.038*	-0.031	-0.023	0.004	0.011	0.011	0.004
	(0.021)	(0.021)	(0.024)	(0.017)	(0.015)	(0.016)	(0.018)
Class-size	-0.049***	-0.041**	-0.044*	-0.024	-0.010	-0.026	-0.023
	(0.016)	(0.017)	(0.025)	(0.016)	(0.020)	(0.017)	(0.016)
Field: Economics	-0.775***	-0.768***	-0.769***				
	(0.061)	(0.059)	(0.058)				
Field: Pharmacy	-0.879***	-0.878***	-0.869***				
	(0.059)	(0.056)	(0.058)				
Field: Engineering	-1.004***	-1.037***					
	(0.062)	(0.061)					
Field: Humanities	Benchmark	Benchmark	Benchmark				
Field: Maths and Natural Sciences	-0.779***	-0.797***	-0.794***				
	(0.070)	(0.068)	(0.076)				
Field: Political Sciences	-0.356***	-0.364***	-0.363***				
	(0.081)	(0.086)	(0.081)				
Year of enrolment Dummies	YES	YES	YES	YES	YES	YES	YES
FLD Dummies	NO	NO	NO	YES	YES	YES	YES
Province of residence Dummies	YES	YES	YES	YES	YES	YES	YES
Adjusted R_Squared	0.212	0.213	0.217	0.222	0.230	0.222	0.222
Observations	162899	162899	118062	162899	118062	162899	162899
Clusters	42	42	33	42	33	42	42
Number of students	25825	25825	19555	25825	19555	25825	25825

Notes: A constant is included in all regressions. Standard errors (corrected for heteroskedasticity) and incorporating clustering grouped by FLD are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant at the 1, 5, and 10 percent levels respectively

In column 6, instead of considering the dummy D_Excess_Supply among regressors, we include a variable measuring the relative size of the excess of supply/demand, $Supply - Demand = \frac{Places\ offered - Applications}{Places\ offered}$, to investigate whether the extent of the excess of supply/demand matters. It emerges that this variable produces a positive but not statistically significant effect on grades[17].

In order to analyse whether grades react asymmetrically to excesses of supply and demand, we have created two variables: the first one $Excess\_Supply$ if equal to $Supply - Demand$ when

[17] We have checked the sensitivity of our estimates to outliers. Nothing of relevance happens when we remove extreme cases.

$Supply - Demand > 0$ and 0 otherwise, while the other $Excess\_Demand$ is equal to $-(Supply - Demand)$ when $Supply - Demand < 0$ and 0 otherwise. The results are reported in column 7 and it emerges from them that $Excess\_Supply$ produces a positive and statistically significant effect on grades, while $Excess\_Demand$ does not produce a statistically significant effect.

These results imply that grading practices are sensitive to changes in the relative size of the excess of supply, because, as explained above, degree courses facing difficulties in filling places may be worried about losing students. On the other hand, grading practices are not influenced by the relative size of the excess of demand, since FLD can simply reject applications rather than adjust their grading policy.

5. Two-Stage Least Square Estimates

The estimates shown in the previous section are based on the assumption that the excess of supply experienced by a given degree course is not correlated with the error term, which includes unobservable characteristics of individuals enrolled on different degree courses and (once we control for FLD fixed effects) unobservable time-variant degree characteristics.

A selection bias could be introduced if students choosing different FLD differ in some unobservable characteristics. For instance, students enrolled in FLD for which there is high demand may have higher unobservable ability or higher motivation, they may also put more effort into their studying activity since they know that there are a large number of people who are interested in their field of study and in working in similar occupations. This will create a downward bias in the estimated effect on grades of the variable measuring the excess of supply. On the other hand, students who enrol in FLD for which there is high demand may have lower unobservable ability or motivation. This would create an upward bias.

In addition, to the extent that unobserved time-variant features of FLD degree influence grades obtained by students this could introduce omitted variable bias. For example, the quality of the teaching staff may differ when an FLD is facing an excess of supply, may be because it is possible to involve only the best teachers in teaching activity.

In these cases, the association observed between the outcome variable and the explanatory variable of interest may be misleading as it may partly reflect omitted factors which are related to both variables. In short, our result (positive association of high grades with excess of supply for a FLD) might be explained by more highly motivated students enrolling in FLD with low demand, or it may be related to higher teaching staff quality when the degree faces low demand.

In this section, in order to address these potential sources of bias, we estimate the model explaining differences in grades in relation to the varying levels of demand for degree courses by using Two-Stage Least Squares and taking the total number of Italian universities offering each degree course[18] (*Total_Univ)* as an instrument of the excess of supply[19].

This variable, measuring the total supply of the degree course, should positively effect the probability that the same degree offered by the University of Calabria might face an excess of supply, but should not directly influence the grades obtained by students enrolled in the degree course we are considering. In fact, the number of Universities offering a certain degree should not be related to variations in the teaching staff quality for that degree. Similarly, the fact that a large number of Universities offer a certain degree course (implying that there is more likely to be an excess of supply) should not be related to whether students choosing that degree course at the University of Calabria are characterised by higher unobserved ability. As a consequence, while the *Total_Univ* variable should influence the probability that a degree course might face an excess of supply, it should not be related to unobserved characteristics of the specific degree course we are considering.

First of all, in order to check that our instrument is not 'weak', we have tested whether the instrument in the first stage regression is significantly different from zero (see Panel B of Table 3). In the first-stage regression in which the endogenous variable, D_Excess_Supply, is regressed on the instrument and all other exogenous variables, the F-statistics, for the test of whether the instrument coefficient is equal to zero, are always well above the threshold value of 10 suggested by Stock and Watson (2003)[20].

To check whether it is necessary to use an instrumental variable estimator, we run the Durbin–Wu–Hausman test to verify the endogeneity of D_Excess_Supply in OLS. We take the residuals from the first stage regression and insert them, as explanatory variables, into an 'augmented' structural equation. In all the specifications, which control for FLD fixed effects, this variable is significantly different from zero showing that OLS is not consistent and suggesting the use of TSLS.

Two-Stage Least Squares Estimations are shown in Table 3. To correct for correlations of error terms across observations, we estimate standard errors using the White-Huber procedure by cluster at FLD level. Panel B shows results from First Stage regressions. In all the specifications it emerges that *Total_Univ* greatly determines the variable measuring the excess of supply faced by degree courses offered by the University of Calabria. An increase in the number of Universities offering a given

[18] Using a linear regression for the first-stage estimates generates consistent second-stage estimates even with a dummy endogenous variable (Angrist and Krueger, 2003).
[19] These data are provided by the Ministero dell'Università e della Ricerca. See http://offf.miur.it/index.html
[20] The F-statistics range form 12 to 77 according to the specification adopted.

degree course positively effects the occurrence of an excess of supply. In fact, students who want to enrol on a certain degree course have may choose between a number of different institutions which offer it.

Panel A shows Two-Stage Least Squares estimations. By controlling for FLD fixed effects, we find that D_Excess_Supply coefficients are always positive and highly significant. In column (1), student grades increase of 0.19 points when his FLD experiences an excess of supply. A similar effect is found when we exclude students enrolled in Engineering from our regression (see column 2).

Table 3. TSLS estimates of student's grades Dependent Variable: grades obtained at first year exams

Explanatory Variables	(1)	(2)	(3)	(4)
	Panel A: Two-Stage Least Squares			
D_Excess_Supply	0.195*** (0.030)	0.170*** (0.059)		
Supply-Demand			0.070*** (0.059)	0.184*** (0.044)
High school final grade	0.288*** (0.013)	0.278*** (0.012)	0.287*** (0.009)	0.278*** (0.016)
Lyceum	0.266*** (0.022)	0.230*** (0.020)	0.264*** (0.022)	0.227*** (0.020)
Female	0.000 (0.013)	0.009 (0.013)	0.000 (0.013)	0.011 (0.012)
Classmate Ability	-0.013 (0.015)	0.009 (0.015)	0.034*** (0.021)	0.086*** (0.031)
Class-size	-0.006 (0.020)	-0.005 (0.024)	-0.008 (0.019)	-0.006 (0.020)
FLD Dummies	*YES*	*YES*	*YES*	*YES*
Year of enrolment Dummies	*YES*	*YES*	*YES*	*YES*
	Panel B: First Stage Regressions			
	D_Excess_Supply	D_Excess_Supply	$Supply - Demand$	$Supply - Demand$
High school final grade	0.001 (0.001)	0.001 (0.001)	0.002* (0.001)	0.004** (0.002)
Lyceum	-0.011*** (0.001)	-0.005*** (0.001)	-0.005*** (0.001)	-0.013*** (0.003)
Female	-0.008*** (0.001)	-0.003* (0.001)	-0.003* (0.001)	-0.016** (0.003)
Classmate Ability	0.111*** (0.002)	0.017*** (0.001)	-0.359*** (0.003)	-0.405*** (0.003)
Class-size	-0.125*** (0.002)	-0.035*** (0.002)	-0.296*** (0.003)	-0.372*** (0.004)
Total_Univ	0.233*** (0.006)	0.011*** (0.000)	0.022*** (0.000)	0.024*** (0.00)
FLD Dummies	YES	YES	YES	YES
Year of enrolment Dummies	YES	YES	YES	YES
Province of residence Dummies	YES	YES	YES	YES
Adjusted R2	*0.220*	*0.223*	*0.220*	*0.348*
Observations	*162899*	*118062*	*162899*	*118062*
Number of students	25825	19555	25825	19555

Notes: A constant is included in all regressions. Standard errors (corrected for heteroskedasticity) and incorporating clustering grouped by FLD are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant at the 1, 5, and 10 percent level respectively

These effects are larger than those which emerge from OLS estimates suggesting that students exhibit lower unobservable ability when their degree course faces an excess of supply. This is consistent with the idea that FLD which experience an excess of supply are not in the condition to select between applications and may end up accepting less motivated students who may have decided not to apply to their preferred FLD because of their low probability of being accepted.

In columns 3 and 4 , we consider the variable $Supply - Demand$ measuring the relative size of the excess of supply-demand rather than considering the dummy variable D_Excess_Supply. This variable takes negative values when the degree course faces an excess of demand and positive values when it is experiencing an excess of supply. As shown in columns (3) and (4), which are based respectively on the full sample and on the sample excluding students enrolled in Engineering, it emerges that, once we control for endogeneity problems, the extent of the excess of supply/demand matters for students' grades and grades tend to increase when the excess of supply increases. An increase of one standard deviation in the excess of supply improves students' grades by a 0.70 standard deviation.

6. The effect of degree courses for which there is low demand on probability of students' dropping out

As explained in the introduction, teachers may be mainly interested in avoiding students' dropping-out when deciding upon their grading practices. Unfortunately we do not have information on whether students have decided to drop out of their university studies. However, we observe whether students successfully undertook exams during the second year of their degree course. As students who did not pass at least one exam during their second year of degree course are likely to be students who have decided to drop out, we use this information to measure drop-out behaviour and define a dummy variable *Drop-out* which takes value 1 when the student did not pass any exam during the second year of his academic studies and 0 otherwise[21].

We estimate by Maximum Likelihood, the following probit model in which the probability of dropping out of university studies is related to a set of conditional variables[22]:

[21] We recognize that this is a rough measure of drop-outs, since we do not know whether students have effectively left their studies or if they are behind in their academic studies They may also be students who have decided to transfer to another university, although, this is a minor problem because generally only a few students transfer to other universities.

[22] We are not able to consider students who enrolled in year 2007 in this analysis since these students were still enrolled at the first year of their degree course in the year in which our data were collected and, therefore, we cannot observe whether they were able to undertake exams the year after.

[13] $$P(Drop\_out = 1 \mid x) = \phi(\alpha + \beta X_j + \chi D_t + \delta D_d + \phi Q_{td} + \varphi S_{td} + vS\_D + \varepsilon_{jyd})$$

Our estimates are reported in Table 5[23].

The probability of dropping out is higher for students who have a low *HSFinal*. An increase of one standard deviation in the high school final grade leads to a reduction in the probability of dropping out of about a 0.07 standard deviation. Having attended a lyceum produces a similar effect. Females have a lower probability of dropping out. In addition it emerges that students who have attended courses in larger classes have a higher probability of taking exams in the following year. A negative but not statistically significant effect also emerges from classmate quality.

Being enrolled in a degree course experiencing an excess of supply reduces the probability of dropping out by about 2 percentage points. The same result is true when we exclude students enrolled in Engineering from our sample (column 2).

In column (3) are reported results obtained when instead of considering the dummy *D_Excess _Supply* we include among the regressors the $Supply - Demand$ variable measuring the relative size of the excess of supply/demand. A negative but not statistically significant effect emerges.

Table 4. Probit estimates for students' dropping-out Dependent Variable: Drop-out

Explanatory Variables	*1*	*2*	*3*	*4*
D_Excess_Supply	-0.022***	-0.014***		
	0.008	0.010		
Supply-Demand			-0.007	
			0.005	
Excess_Supply				-0.024***
				0.010
Excess_Demand				0.002
				0.006
High school final grade	-0.066***	-0.056***	-0.067***	-0.066***
	0.005	0.005	0.005	0.005
Lyceum	-0.065***	-0.065***	-0.065***	-0.065***
	0.006	0.006	0.006	0.006
Female	-0.037***	-0.037***	-0.038***	-0.038***
	0.006	0.006	0.006	0.006
Classmate Ability	-0.008	-0.010*	-0.014**	-0.010
	0.005	0.005	0.007	0.007
Class-size	-0.016**	-0.013**	-0.017**	-0.018**
	0.007	0.006	0.008	0.008
FLD Dummies	YES	YES	YES	YES
Year of enrolment Dummies	YES	YES	YES	YES
Province of residence Dummies				
Pseudo R-squared	0.090	0.081	0.090	0.096
Log pseudo-likelihood	-8130	-6115	-8133	-8089
Observations	21749	16374	21749	21749
Clusters	42	33	42	42

Notes: Marginal effects are reported. A constant is included in all regressions. Standard errors (corrected for heteroskedasticity) and incorporating clustering grouped by FLD are reported in parentheses. The symbols ***, ** indicate that coefficients are statistically significant at the 1, 5 percent level respectively

[23] Very similar results are obtained when using a linear probability model.

In column (4) we investigate whether the probability of dropping out is influenced asymmetrically by excesses of supply and demand. Analogously to the results shown for grades, it emerges that $Excess\_Supply$ produces a negative and statistically significant effect on the probability of dropping out, while $Excess\_Demand$ produces a positive but not statistically significant effect.

We now turn our attention to the bias that may derive from endogeneity problems in our variable of interest. In Table 6 we present Two-Stage Probit estimates, using the total number of Italian Universities ($Total\_Univ$) offering each degree course as an instrument.

We follow a two step approach, in the first step a linear probability model for the endogenous regressor is estimated on the full vector of control variables and the instrument (Angrist, 2001) and, in next stage, a probit model for drop-out outcome is estimated on the full set of controls and the predicted values for the endogenous regression from the first stage[24]. The standard errors for these estimations are bootstrapped[25].

In controlling for FLD fixed effects, it emerges from the Two-Stage Probit estimates that the variable *D_Excess_Supply* produces a negative and highly statistically significant effect on student dropping out probability. In column (1), dropping out probability diminishes by about 8 percentage points when students are enrolled in a FLD where there is an excess of supply. A similar effect is found when we exclude from our regression students enrolled in Engineering (see column 2)[26].

In column 3 the results when we consider the relative size of the excess of supply/demand are reported. The coefficient of the variable $Supply - Demand$ is negative and statistically significant implying that endogenity problems are especially relevant when we consider the relative size of the excess of supply/demand as a dependent variable, possibly because students enrolled on degree courses experiencing differing levels of excess/demand are heterogeneous in terms of unoberserved characteristics.

[24] Since we have a model with a binary outcome and a binary endogenous regressor, we cannot estimate a IV probit model as it requires the endogenous regressor to be continuous.
[25] 100 replications.
[26] We obtain very similar results using a TSLS estimation procedure.

Table 5. Two-Stage Probit estimates for students' dropping-out

Explanatory Variables	*1*	*2*	*3*
D_Excess_Supply	-0.085***	-0.075***	
	0.041	0.003	
Supply-Demand			-0.022***
			0.010
High school final grade	-0.066***		-0.066***
	0.002	-0.056*** 0.002	0.005
Lyceum	-0.066***	-0.054***	-0.065***
	0.004	0.005	0.004
Female	-0.038***	-0.046***	-0.037***
	0.006	0.005	0.006
Classmate Ability	-0.001	-0.000	-0.002
	0.006	0.006	0.007
Class-size	-0.025**	-0.022***	-0.009
	0.008	0.009	0.008
FLD Dummies	YES	YES	YES
Year of enrolment Dummies	YES	YES	YES
Pseudo R-squared	0.096	0.081	0.096
Log pseudo-likelihood	-8133.	-6116	-8129
Observations	21749	16374	21749
Clusters	42	33	42

Notes: See Table 4.

6. Concluding remarks

Many European countries, including Italy, are increasingly linking university funding to the number of students enrolled and to the number of exams passed. This system may induce educational institutions to use grades strategically to attract students. In order to illustrate this idea, we have provided a simple theoretical framework showing that, when students positively evaluate high grades and when resources are allocated in relation to the number of students enrolled and the number of exams they pass, grading policies may be used by educational institutions not only to signal student ability and productivity to the labour market, but also as a variable to use in order to attract more students and obtain more funding. This strategy in absence of perfect information and with a signalling value of the level of education attained may imply only a small cost in terms of reputation for the educational institutions. We show that the incentive to inflate grades is higher for universities or degree courses facing low demand.

This theoretical prediction has been submitted to empirical scrutiny by using a large sample of students enrolled at an Italian university. Studies considering this issue are not generally able to disentangle class-size effects from effects due to attempts by the teaching staff to attract more students. In fact, degree courses in low demand are also characterised by smaller classes. We are able to overcome this problem thanks to the quality of our data set which provides information on both the class-size of courses attended by each student and on the number of applications received and the number of places offered by each degree course. When controlling for class-size, classmate quality and degree fixed effects, we show that students obtain better grades and have a lower dropping out probability when their degree course faces an excess of supply. This consistently with our theoretical predictions.

These findings hold true also when, in order to deal with omitted variable problems, we estimate our model using Two-Stage Least Squares and Two-Stage Probit respectively for estimates concering students' grades and their dropping out probability. We instrument the variable measuring the excess of supply/demand with the total number of Italian universities offering each degree course. Coefficients emerging form these estimates are higher than the OLS and Probit coefficients, suggesting that the latter are negatively biased, possibly because students enrolled in degrees experiencing an excess of supply are less motivated than students enrolled in other degrees. In fact, since FLD which receive a higher number of applications than places on offer only select students with high ability (measured with *HSFinal*), students enrolling in FLD with an excess of supply may be, at least partially, students whose applications have been rejected by more popular FLD (or who have decided not to apply to their preferred FLD because of their low probability of being accepted). As a consequence, FLD with low demand may end up with relatively unmotivated students, whose aspirations and abilities are not well suited to the degree course.

Our analysis casts doubts on all those policies which presume that grading standards are based on common standards (for example on the legal value given to university degrees in Italy) and which consider student academic performance to be a proxy for the skills generated by educational institutions. Probably, as a result of these policies and the rules governing the allocation of funds, educational institutions do not use grades to signal student ability to the labour market, but, instead adopt them in an opportunistic way.

Clearly these findings refer to just one university and it is not possible to derive general conclusions. However, as argued by Sylos-Labini et al. (2008), grade divergence is a phenomenon characterising the whole Italian University system and our study is an attempt to understand what causes this heterogenity in grading standards. We have suggested a mechanism based on demand/supply factors, however alternative explanations for why such heterogeneity occur cannot be excluded.

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Table 1 A. List of FLD

	*Excess of supply**	*High school final grade*	*Average number of places offered*	*Average number of applications*
Economics Faculty				
Degree in Law and Economics	No	90.935	258	620
Degree in Economics and Social Sciences	Yes	79.042	140	118
Degree in Statistics	Yes	84.729	75	64
Degree in Economics and Business Administration	No	87.715	564	659
Degree in Economics	Yes	83.366	206	197
Pharmacy Faculty				
Degree in Nutritional Science	No	86.563	118	210
Degree in Pharmaceutical Information	No	78.799	110	110
Degree in Environmental Toxicology	Yes	76.716	103	52
Degree in Technology of Cosmetic Products	Yes	79.222	103	85
Humanities				
Degree in History	Yes	74.155	106	138
Degree in Philosophy and Human Sciences	Yes	78.905	112	125
Degree in Philosophy and Communication Sciences	No	88.367	175	395
Degree in Philosophy	Yes	78.329	105	75
Degree in Literature	Yes	84.753	191	207
Degree in Foreign Languages	No	86.473	157	213
Degree in Arts, Music and Spectacle	Yes	77.897	182	242
Degree in Education Sciences	No	82.190	180	305
Degree in History and Conservation of Arts …	No	82.547	150	200
Degree in Linguistic Mediation	No	91.581	100	178
Degree in Primary Education	Yes	77.782	250	226
Degree in Conservation of Cultural Goods	Yes	81.741	260	297
Maths and Natural Sciences				
Degree in Chemistry	Yes	85.444	55	37
Degree in Physics	Yes	88.296	55	36
Degree in Informatics	No	87.863	78	178
Degree in Maths	Yes	86.110	60	43
Degree in Natural Sciences	Yes	81.949	76	48
Degree in Biology	No	95.271	122	320
Degree in Geology	Yes	82.685	83	87
Degree in Conservation and Restoration Technology	Yes	83.035	72	78
Degree Materials Science	Yes	79.430	40	24
Political Sciences				
Degree in Political Sciences	Yes	84.565	250	331
Degree in Social Services	No	89.582	90	252
Degree in Administration	Yes	78.010	215	223

*Excess of Supply in at least one of the years going from 2001-02 to 2006-07.