University dropouts: supply-side issues in Italy

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Abstract

High student dropout rates are a longstanding issue in Italian universities. University dropouts may be explained by supply side characteristics of Italian universities as well as by students' individual characteristics. However, existing contributions have focused on the latter group of characteristics. Our econometric analysis uses a fixed effects model and data collected along seven years for Italian universities, starting from 2001. Results show that some supply side features have a relevant impact on dropout rates. Hence, corrective measures aimed at reorganizing the structure of courses and the location of university remote branches might help in reducing dropouts.

JEL classifications: I23; C33; H52

Keywords: Italian universities; dropouts; fixed effects model

1. Introduction

High university dropout rates in Italy has been a widely observed and documented phenomenon for many years. A large number of Italian students, compared to their OECD counterparts, leave university before completing their degree courses. Only about one third of students who enrol get a university degree and significant numbers of dropouts occur during the first year of their studies. Moreover, Italian students who graduate tend to be, on average, slower than other OECD students in completing their degree courses (OECD 2013; MIUR 2011).

On one hand, a body of international literature exists on dropout issues. However, the study of university degree attainment has traditionally focused on demand-side characteristics; i.e., preparation of students attending college, financial constraints, gender, commitment and other individual circumstances (Bound and Turner 2011; Harrison 2006; Bennett 2003; Mackie 2001; Smith and Naylor 2001). Supply-side determinants of university student dropouts have received clear consideration only recently; thus, the kind of colleges students attend and the resources available within those institutions have been identified as the most important characteristics in explaining changes in college completion (Bound, Lovenheim, and Turner 2010).

On the other hand, analyses of dropouts from Italian universities lack a broad approach. Most papers take a look at the performance of Italian students considering only the demand side and studies on the issue of Italian dropouts are sometimes limited to local research carried out in one or two universities.

The aim of this study is to investigate university dropouts in Italy, taking a broader perspective. Firstly, the present study takes into account all Italian universities, excluding only distance learning ones, as their nature and structure is different from the traditional ones; in addition, little data is available as they have a relatively short history. The proposed analysis of university dropouts considers both components that recent literature has underscored with regard to completion issues (Bound, Lovenheim, and Turner 2010; Aina, Baici, and Casalone 2011): university characteristics (e.g., number of degree courses and decentralised teaching branches of each university) and student characteristics (e.g., students' performances in previous educational stages and school background).

The crucial hypothesis this work intends to test is whether first year university students dropouts are due to characteristics of the supply side of degree courses, rather than to characteristics of the demand side, i.e. student population. Therefore, this study on dropouts from Italian universities evolves along both university and student characteristics, whereas existing research has neglected the former in the analysis of high dropout rates in Italy.

The rest of this paper is organized as follows. Section 2 provides a literature review of contributions regarding dropouts, focussing on the Italy. Section 3 gives an overview of the Italian university system, highlighting some key changes occurred in recent years. Section 4 moves on to econometric analyses, based on estimations of a fixed effects model and a generalised least squares model corrected for heteroskedasticity; in particular, this section presents methodology and results. Section 5 concludes and provides policy suggestions.

2. Literature review

Researchers' interest in understanding university dropouts has produced a fair amount of analyses, which have taken a number of directions. First of all, some studies have posed the question whether low dropout rates are socially desirable: on the one hand, many authors suggest that university dropouts should be avoided (Turner 2004); on the other hand, some authors argue that public policies should not try to influence dropout rates, as trying to reduce those rates might reduce social welfare.[1]

The relatively high level of dropout rates calculated for Italian university students, has been considered in various contributions, that may be grouped according to two different analytical approaches. The first approach considers dropout rates across the entire Italian university system, and focuses on a relatively small group of demand side variables; the second approach considers case studies of Italian universities.

Research taking the first approach includes Di Pietro and Cutillo (2008), who examine the impact on students' behaviour of various ministerial regulations, introduced in recent years, regarding duration, structure and content of degree courses offered by Italian universities. Those changes have been widely debated, especially after 2001, when Italian degree courses were fundamentally reformed by the introduction of three-year university degrees. The authors conclude that the 2001 regulations had a positive impact on dropout rates.[2] Similar results are obtained also by D'Hombres (2007), who includes the motivational impact of the reform on student behaviour: as a university degree can be obtained after a relatively shorter period than in the past, students would be more prone to complete their courses and graduate. Cingano and Cipollone (2007) use data from a representative sample of secondary school graduates and local supply of university courses to show that family and educational background are relevant determinants of continuation probability.

A study of the impact of regional labour market conditions on university dropout rates in Italy was carried out by Di Pietro (2006), whose empirical analysis supports the hypothesis of a negative relationship between regional unemployment rates and university dropout rates. In addition, some studies have investigated the relationship between completion rates and labour markets, demonstrating that changes in unemployment rates have a significant impact on individual time-to-degree (Messer and Wolter 2010; Aina, Baici, and Casalone 2011).

Published articles concerned with dropout rates in individual Italian universities are quite limited. Belloc, Maruotti, and Petrella (2010) studied university dropouts by using data from the Department of Economics of Università di Roma La Sapienza. Their results show that high dropout probability is related to high secondary school graduation marks and low performance at university, suggesting that the students who dropout are either unsuited to, or dissatisfied with, their chosen course. Moreover, the authors find that student characteristics, such as nationality and income, have a statistically significant impact on dropout rates.

Finally, a study by Schizzerotto (2003) analyses dropouts from Università di Milano Bicocca. The author finds that crucial factors are: age of students at the time of enrolment; secondary school educational background and graduation marks; distance between universities and students homes. The study also shows that dropout probabilities are different across departments;[3] moreover, dropout probabilities show a decrease after academic year 2001-02.[4]

3. The Italian university system

The Italian university system has gone through a number of legislative and regulatory changes in recent years. These changes have partially re-shaped the system, which now consists of a greater number of public and private universities than it was in the past, as well as new distance learning universities. Moreover, for many years, the legislation has favoured a proliferation of decentralised structures, mostly devoted to teaching activities rather than research activities, as well as the creation of new types of degrees courses.

Courses offered by Italian universities can be grouped in standard five-year degree courses (which have a duration closer to that of courses offered before the 2001 reform) and three-year-degree courses (so-called ’short’ degrees). The first group of degrees includes *laurea magistrale* (LMG, a five-year degree course), *laurea quadriennale* (CDL, a four-year degree course), *scuole di specializzazione* (LSCU, schools that prepare for a few specific professions) and *laurea specialistica* (LS, usually a two-year degree course which can be taken after a three-year degree course). The second group includes *diploma universitario* (CDU, a course which awards university diploma) and *scuola diretta a fini speciali* (SDFS, which is similar to LSCU, but at a lower educational level).

Reforms have accompanied significant increases in the demand for university level education. In the years immediately after the 2001-02 university reform, the number of ’short’ degree courses has been increasing significantly. However, this number has been more stable afterwards, and has been accompanied by a slow and steady increase in the number of standard degree courses.[5]

Over the same period, the number of degree courses taught in decentralized university branches has grown disproportionately to the number of remote branches itself. This has been matched by increasing numbers of permanent teaching staff; however, the number of assistant professors increased after 2002, whereas the numbers of full and associate professors have slightly declined since 2004-05.

Recently, universities have implemented Law no. 240/2010 (so-called Gelmini reform), which has introduced major changes in university governance. In particular, university departments are currently in charge of research as well as teaching activities. Instead, in the time span covered by our research, teaching activities were governed by faculties.

The presence and relative weight of specific faculties have changed between academic years 2001-02 and 2007-08 (Table 1). Some of them have grown significantly: for instance, faculties of Communications sciences, which were almost non-existent in 2001-02, could be found in 6% of Italian universities by 2006-07. Faculties of Psychology have increased steadily: they were in 12,5% of universities in 2001-02, increasing to 22,1% by 2007-08. Engineering was in 37,5% of universities in 2001-02 and has been in half of them since 2004-05. On the other hand, some faculties have reduced in numbers. For instance, faculties of Sociology were in 87,5% of Italian universities in 2001-02, decreasing to 71,3% in 2007-08 (similarly with Economics and Architecture).

Table 1. Faculties in Italian universities and their relative weight over time (%)

Faculty	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008
Agricultural studies	25	31.5	31.7	31.1	29.1	27.7	26.7
Architecture	25	27.4	28.6	27	25.3	24.1	24.4
Heritage studies	0	2.7	1.6	2.7	3.8	4.8	4.7
Biological sciences	0	4.1	3.2	4.1	5.1	6	5.8
Chemistry	0	1.4	0	1.4	1.3	1.2	1.2
Design	12.5	1.4	1.6	2.7	3.8	3.6	4.7
Economics	87.5	73	73.4	72	71.3	71.4	71.3
Pharmacology	25	39.7	39.7	39.2	36.7	35.4	34.1
Law	62.5	68.5	73	68.9	69.6	71.1	70.9
Engineering	37.5	55.6	53.2	54.8	52.6	51.2	50.6
Literature and philosophy	75	61.6	63.5	62.2	60.8	57.8	57
Foreign languages and literature	62.5	27.4	27	27	26.6	25.3	25.6
Medicine	42.9	52.8	54.8	52.1	48.7	47.6	45.9
Psychology	12.5	13.7	15.9	16.2	19	20.5	22.1
Environmental studies	12.5	2.7	3.2	2.7	2.5	2.4	1.2
Communications studies	0	5.5	6.3	5.4	5.1	6	5.8
Education	50	37	36.5	35.1	35.4	36.1	38.4
Mathematics/Physics/Biology	75	60.8	62.5	60	56.3	53.6	50.6
Sports sciences	12.5	12.9	15	15.5	14.5	13.8	13.3
Political sciences	25	42.5	42.9	41.9	40.5	39.8	39.5

Statistics	0	6.8	6.3	6.8	6.3	6	5.8
Sociology	25	6.9	11.3	11	10.3	9.8	10.6
Veterinary science	12.5	19.2	19	18.9	17.7	16.9	16.3
Other	0	5.4	4.3	9.1	10.3	11.5	11.1

4. Methodology and results

The analysis is focused on university student dropout rates. This phenomenon, when it is not determined by students' personal motivations, might signal a general dissatisfaction towards courses or tuition offered by universities (Belloc, Maruotti and Petrella 2010; Bound, Lovenheim, and Turner 2010), so that action might be required to improve them.

Individual universities constitute the observed units. At first, the estimation strategy selected was a fixed effects model, as it allows to isolate the characteristics of each university. In the regression equation, in fact, an error term is included, and assumed to be constant over time (Hsiao 1986; Arellano 2003).

The model specification is:

$$Y_{ij} = (\alpha + \delta_i) + X_{ij}\,\beta + \varepsilon_{ij}$$

The deterministic part of the equation is compounded by the constant term and an element δ varying for each unit i. δ_i can be interpreted as 'university effect' (i.e., the unobserved individual factors), and ε_{it} is the residual term. The estimator has been obtained by applying OLS to a transformed model, which takes into account mean deviation.[6]

The regression coefficients and the university effect can be interpreted as policy relevant effects with further assumptions: (*i*) ε_{ij} ~ i.i.d. $N(0, \sigma^2_e)$ that implies that the error terms are identically and independently distributed, with mean 0 and variance σ^2; (*ii*) exogenity of the covariates x_{ij}, e.g. $cov(e_{ij}, x_{kij}) = 0$ for $k = 1,\ldots, p$.

In the fixed effects (FE) model, no assumptions are made about the error term, so that university effects are treated as nuisance.[7] The FE model does not consider variability across individuals ('within' transformations) and between individuals, because individual components y_i and x_i are subtracted by each observation y_{it} and x_{it}. Instead, the Generalized Least Squares (GLS) estimator, in a model with random effects, uses information on within and between variability. We can assume the presence of heteroskedasticity as well as autocorrelation in the panel data. In this case the GLS estimator

$$\hat{\beta}_{GLS} = (X'\Omega^{-1}X)^{-1} X'\Omega^{-1}Y$$

can be employed.

The dataset used in the analysis has been built with MIUR[8] and ISTAT[9] data, related to 76 Italian universities with the exclusion of distance learning universities. The observation period considers, for each university, the time span between the implementation of the 2001 reform (which introduced ’short degrees’) and the academic year 2007-08. The panel is unbalanced: while most universities present 7 observations, some universities (e.g., Bolzano, Cagliari, and Catanzaro, which have implemented the reform since academic year 2001-02) present 8 observations. Descriptive statistics are presented in Table 2.

Table 2. Descriptive statistics

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Publicly/privately owned universities	537	0.86	0.34	0	1
University and type of courses					
Number of university remote campuses	465	4.11	4.6	0	27
Number of sites in the same province	464	0.57	0.49	0	1
Number of sites outside the province	464	0.66	0.48	0	1
3 year courses	464	50.06	42.95	1	257
3 year courses including university diploma and SDFS	467	65.53	56.46	1	313
Total number of courses (including 4 year courses)	466	117.07	98.98	1	552
Courses taught in university remote campuses	506	22.06	32.58	0	211
3 year courses/total courses	463	0.44	0.11	.2	1
Doctoral courses	278	209.12	201.96	3	1053
Doctoral courses with scholarships	278	113.90	111.14	2	560
Teaching staff					
Full Professors	521	256.45	271.61	1	1471
Associate Professors	522	251.97	254.54	1	1360
Assistant Professors	513	309.86	342.32	1	2065
Overall teaching staff	513	825.63	862.25	5	4817
Number of no credits students					
Number of new enrolled students with no credits	180	0.17	0.11	0.001	1.007
Number of Architecture/Engineering students with no credits	352	0.15	0.12	0	1.01
Number of Economics/Statistics/Political sciences students with no credits	470	0.17	0.13	0	1.59
Number of Chemistry/Physics/Science students with no credits	312	0.20	0.13	0	1
Number of Literature/Linguistics/Educational sciences students with no credits	415	0.16	0.12	0	1.01
Number of Medicine students with no credits	273	0.072	0.09	0	1
New enrolled students' high school					
Architecture/Engineering students from lyceum	352	452.73	640	0	3773
Architecture/Engineering students from other high schools	352	19.70	41.85	0	410
Chemistry/Physics/Science students from professional/technical high schools	312	158.27	145.67	0	708
Chemistry/Physics/Science students from lyceum	312	171.96	164.09	0	887
Chemistry/Physics/Science students from other high schools	312	5.84	7.67	0	47
Literature/Foreign lang./Education students from professional/technical high schools	541	256.56	361.94	0	2518
Literature/Foreign lang./Education students from lyceum	541	416.81	577.5	0	2935
Literature/Foreign lang./Education students from other high schools	541	16.5	27.43	0	147
Economics/Statistics/Political sciences students from professional/technical high schools	540	509.47	546.96	0	3793
Economics/Statistics/Political sciences students from lyceum	540	466.19	526.9	0	3254
Economics/Statistics/Political sciences students from other high schools	540	27.71	44.48	0	270
Medicine students from professional/technical high schools	273	286.22	294.02	2	2492
Medicine students from lyceum	273	245.79	200.36	5	1232
Medicine students from other high schools	273	15.51	18.23	0	137
New enrolled students' diploma grade					
Architecture/Engineering students with diploma grade 90-100	366	299.51	394.87	0	2328
Economics/Statistics/Political sciences students with diploma grade 90-100	482	283.15	269.44	0	1543
Chemistry/Physics/Science students with diploma grade 90-100	335	89.62	83.30	0	335
Literature/Foreign lang./Education students with diploma grade 90-100	428	229.24	245.65	0	1219
Medicine students with diploma grade 90-100 males	273	16.9	18.84	0	137
Medicine students with diploma grade 90-100 females	273	71.14	48.04	0	245

The dependent variable in the estimations is represented by the number of new enrolled students who did not obtain credits out of the total number of students enrolled at the first year.[10]

Regressors relate, on one hand, to university characteristics, such as number of remote branches, their location of (inside/outside the province where the main campus is located), type of courses offered over the total courses (three-year degrees vs. university diplomas); on the other hand, to students' background (high school attended and final grade).

Results of fixed effects model and generalized squared models, considering heteroskedasticity and panel specific auto-correlation are reported in Table 3.

Table 3. Estimation results

Dependent variable: quota new enrolled students with no credits	**Fixed effects**	**GLS with heteroskedasticity**	**GLS with panel specific autocorrelation**
3 years degree courses/total number of courses	0.212 (0.352)	0.165 (0.125)	0.270*** (0.078)
Average course at university remote campuses	-0.014 (0.011)	-0.005*** (0.001)	-0.008*** (0.002)
Number of university remote campuses	0.052*** (0.015)	0.0002 (0.002)	0.0001 (0.001)
Remote campuses in the same province	-0.154** (0.065)	-0.054*** (0.016)	-0.071*** (0.014)
Number of students grade 90-100	-0.572 (0.721)	-0.298* (0.182)	-0.217* (0.131)
Number of students from lyceum	0.227 (0.348)	0.486*** (0.125)	0.544*** (0.087)
Number of students from profess./technical schools	0.184 (0.290)	-0.043 (0.102)	-0.110* (0.065)
Lecturer/students	0.378 (0.397)	-0.555*** (0.079)	-0.560*** (0.068)
PhD with scholarship/total number PhD	-0.455 (0.305	-0.074 (0.074)	-0.164*** (0.054)
Constant	0.247 (0.341)	0.257** (0.119)	0.275*** (0.059)
	F- Test = 2.12 Prob > F = 0.041 σ^2 u = 0.2103; σ^2 e = 0.086; ρ = 0.8491 F-Test all u_i = 0: 2.84 Prob > F = 0.0008	Wald χ^2 = 61.45 Prob > χ^2 = 0.000	Wald χ^2 = 142.67 Prob > χ^2 = 0.000
*** significant at 99%; ** significant at 95%; *significant at 90%			

The FE model does not show significant coefficients, except for the number of university remote campuses and their location in the same province of the main campus. However, the signs of the estimated coefficients are confirmed by the GLS regressions.

The number of three-year degree courses, out of the total number of courses offered by the university (university diplomas, special schools, etc.), is positively correlated with the share of students who did not get any credit; the coefficient is significant in the third estimation carried out (i.e., the higher the number of three-year degree courses over other courses, the higher the number of new enrolled students who do not obtain credits). This conclusion might be interpreted as an excessive fragmentation of teaching programmes and should be verified by considering, instead, the share of students who decide to move to a similar course after the first year.

The results related to remote campuses are interesting and allow to draw some policy implications. Among the regressors, we considered the average number of courses taught at remote campuses, their number for each observed unit and their location within the same province. Overall, it could be said that the higher the number of remote branches (i.e., high fragmentation on the supply side), the higher the share of dropouts.[11] Instead, when remote campuses are located within the same province and offer many courses, the percentage of students who do not get credits is likely to be lower. One of the objectives of the reform was to enlarge access to university education, by allowing universities to establish remote campuses. However, what was observed was merely a re-location of students, while the number of students per university has not changed significantly.[12]

Other supply variables relate to teaching staff (number of lecturers/number of new enrolled students) and postgraduate programmes (PhD courses with scholarships). Both of them are significant and inversely correlated with dropouts. A higher ratio lecturer/students is therefore seen as a quality indicator. The prospect to start a PhD programme could be seen as an incentive for students to proceed with their courses without dropping out, although this evidence should be confirmed by the percentage of graduated students who apply for a PhD after graduation.

Information about students' background should verify the positive correlation between good performance at school and at university. Moreover, a grammar school (as the lyceum) is usually expected to provide a strong background for further academic studies, while this is not always the case for a professional/technical school. A positive correlation between university dropouts and number of students coming from the latter (instead of grammar school) should confirm this hypothesis. Similarly, high school graduation marks should corroborate the intuitive proposition that students who did well at high school are likely to succeed at university. This second hypothesis is confirmed by results, so that students who obtained diplomas with grades between 90 and 100 (the highest) achieved credits during their first year at university. However, the share of students who attended the lyceum is positively correlated with inactivity at university; such a result might be a signal of a general worsening in the education level reached by students before they enrol to university.

The magnitude of estimated coefficients suggests that variables related to demand (students' background) impact on new enrolled students' dropouts more than those related to supply.

These results represent, however, only a preliminary analysis and need to be confirmed by further investigations focused on single university departments.

5. Concluding remarks

The aim of this research was to study whether characteristics of Italian universities, which represent the supply side of university education, might have an impact in determining dropouts, thus broadening the analysis of university dropout rates beyond the more traditional research that focuses on demand side characteristics (e.g., students' abilities, motivation and financial resources).

A model with fixed effects has been applied to take into account peculiarities of each observed unit. In Italy, dropout rates seem to be influenced mainly by students' background (in line with the main findings in existing literature). However, some supply-side factors, such as a high number of university remote campuses and geographical fragmentation, also have an influence. It is likely that the existence of a nearby university remote campus may encourage some students to enrol, even though they would have not enrolled if universities were located far from their hometown; for instance, they may have enrolled because a nearby campus is a relatively cheap option. Those students may be less motivated and less able to gain university course credits, compared to students who attend universities far away from home. Therefore, a less dispersed university organization, focused around a core unit, might offer a more effective academic environment for students and help to reduce dropout rates. Finally, the number of lecturers over new enrolled students is inversely correlated with dropouts.

Our analysis of the Italian case confirms that university resources play a role in dropouts. Furthermore, it is possible to conclude that demand side factors (students' characteristics such as their background) are relevant in explaining dropouts at a general level. In addition, university related factors do have a significant impact on the probability of dropout, especially when considering university organizational aspects, such as fragmentation on the supply side, deriving from the institution of three-year courses or establishment of remote campuses.

This study could be extended in a number of ways. With regard to teaching staff, further analysis could also consider indicators of teaching quality that might be identified in advance.[13] The role of temporary teaching staff, who usually work on a short term contract basis, may be worth of further analysis as well. Future work should take into account university financial resources (e.g., tuition fees and government transfers) as well as macroeconomic variables, such as employment prospects. Information about students' university fee payments (possibly together with other major expenses) and opportunity costs might explain their dropouts; indeed, students could opt to enter the labour market. A regular update of the data and analysis could highlight drawbacks and attractiveness of university courses. Last not least, as distance learning grows, it could be interesting to collect data on dropouts from universities offering that kind of service and to compare dropout rates in the cases of distance learning universities and traditional ones.

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Notes

[1] For instance, students may rationally choose not to complete their studies when they see better opportunities in the job market (see, e.g., Montmarquette, Mahseredjian, and Houle [2011]). It might be argued that the lower the amount of university education costs borne by students, the lower is their private cost of dropout; thus, social costs of dropouts are likely to be higher.

[2] Di Pietro (2004) analyses the determinants of dropouts in Italy by using a bivariate probit model and taking into account the absence, in most cases, of barriers to enrolment (i.e., the so-called '*numerus clausus*').

[3] See Boero, Laureti, and Naylor (2005), whose study relates to the Universities of Cagliari and Tuscia.

[4] See also Cappellari and Lucifora (2009). Perotti (2008) criticizes the observation of lower dropout probabilities after 2001 and focuses on so called 'quick graduates', that is, students who switched to shorter degree courses after the 2001 reform (i.e., three year courses). This increased artificially the number of students who graduated after 2001. See also Broccolini and Staffolani (2005) for the case of Università Politecnica delle Marche.

[5] See data published by MIUR, the Italian Ministry of Education, at http://www.statistica.miur.it.

[6] In performing hierarchical analyses, the FE model is particularly well suited if the main interest is in a policy relevant inference analysis that considers individual characteristics, but with unclear data selection process. When information about the selection process is available, the random effects model should be selected (Clarke et al. 2010).

[7] The estimates with fixed effects approach are not precisely weighted and can be very unreliable where n_j is small, or 'within' universities variance is large relative to between universities variance. Wooldridge (2002), by making a comparison between fixed and random effects approaches, outlines how the two estimators are not equal, but can be very close.

[8] Data is published at http://statistica.miur.it/ustat/Statistiche/IU_home.asp.

[9] Data is published at http://www.istat.it/ambiente/contesto/infoterr/azioneB.html. ISTAT is the Italian institute for national statistics.

[10] Data on the number of credits obtained in each year by the whole population of university students is not available. Some of the students, who obtain credits during the first year, choose to sit those exams that they consider the easiest ones, before dropping out. We believe our analysis would not change substantially if that data were available.

[11] The number of remote branches differs widely from one university to another (for instance, Università di Aosta, a small one, has no remote campuses; Università Cattolica del Sacro Cuore, in Milan, has 27 remote branches).

[12] For instance, Università Cattolica del Sacro Cuore had 13 university remote branches and 7262 new enrolled students in academic year 2001-02; in 2007-08, the number of university remote campuses doubled, but new enrolled students were 8385.

[13] For instance, by looking at criteria adopted by Italian agencies such as ANVUR and CIVR (two national agencies involved in the evaluation of universities and academic research).