

Differential Grading Standards and University Funding: Evidence from Italy

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Motivation

- How should public university contracts be determined?
 - ☐ Funding based on the number of graduates or the number of exams passed by students
- Potential problems:
 - ☐ Differences in the quality of the output
 - ☐ Differences in the quality of the input
 - ☐ Universities may react strategically



- In many European countries some part of university public funding is related to the *number* of students (input) and/or graduates (output)

Countries	Funding	Admission	Quality Assessment Effect on Funding
Flanders (Belgium)	Input	open	no
France	Input	open	no
Germany	Input	open	no
Portugal	Input	binding numerus clausus	no
UK	Input	selective	yes
Denmark	Output	binding numerus clausus	no
Italy	Mixed	open	no
Netherlands	Mixed	open	no
Spain	Mixed	open	no
Sweden	Mixed	selective	no



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In this paper:

- We show that in Italy there exist differential grading standards across disciplines and universities.
- We discuss the implications of the existence of differential grading standards for university financing.



Background literature

In the US:

- *Grade inflation* – perceived deterioration in the educational standards (Kilevzon, 1981; Sabot and Wakeman-Linn, 1991)
- *Grade divergence* – divergence of grading standards across different disciplines (Sabot and Wakeman-Linn, 1991; Freeman, 1999)
- Freeman (1999) analyzes a sample of 10800 graduates from 648 US colleges
 - ☐ Graduates from high-grading disciplines have lower earnings
 - ☐ Institutional constraints prevent, within each university, a flexible money pricing for courses with different expected earnings



Background literature

In Europe:

- Germany: average grades vary widely across universities (German Science and Humanities Council, 2004)
- Italy: Grades tend to vary significantly across disciplines and regions (Boero et al., 2001)
- It is not well understood, however, whether these differences in grades across institutions stem from quality differences or rather from differential grading standards



Data

- Survey on University-to-Work Transition run in 1998, 2001, and 2004 on individuals graduated in 1995, 1998, and 2001 respectively
 - ☐ The target samples represent respectively the 25%, 28.1%, and 24.7% of the total graduates
 - ☐ Response rates 64.7%, 53.3%, and 67.6%
 - ☐ Total number of respondents 17326, 20844 and 26006
- Universities Indicators (e.g. number of students, professors, funding...)



Table 1: Descriptive Statistics - Individual Characteristics

	Mean	Min	Max
<i>1. Predetermined Individual Characteristics</i>			
Gender (Share of females)	0.532	0	1
Age	27.587	21	75
When an individual was 14 years old his father was:			
- working	0.960	0	1
- looking for a job	0.004	0	1
- a pensioner	0.017	0	1
- other	0.019	0	1
When an individual was 14 years old his mother was:			
- working	0.494	0	1
- looking for a job	0.004	0	1
- a pensioner	0.020	0	1
- other	0.482	0	1
When an individual was 14 years old his father's highest educational title was:			
- elementary license or none	0.190	0	1
- secondary education license	0.236	0	1
- higher education diploma	0.340	0	1
- university degree	0.226	0	1
- no answer	0.008	0	1
When an individual was 14 years old his mother's highest educational title was:			
- elementary license or none	0.250	0	1
- secondary education license	0.259	0	1
- higher education diploma	0.350	0	1
- university degree	0.135	0	1
- no answer	0.006	0	1

(continued)



Table 1: (continued)

	Mean	Min	Max
Father's sector of work			
- agriculture	0.050	0	1
- industry	0.260	0	1
- services	0.672	0	1
- no answer	0.018	0	1
Number of siblings	1.313	0	4
Nationality:			
- Italian	0.991	0	1
- European Union	0.006	0	1
- Extra-communitarian	0.003	0	1
Type of high school:			
- scientific lyceum	0.413	0	1
- classic lyceum	0.193	0	1
- technical industrial institute	0.062	0	1
- technical institute for geometers	0.034	0	1
- technical commercial institute	0.128	0	1
- other type of technical institute	0.030	0	1
- teachers school or institute	0.062	0	1
- language lyceum	0.036	0	1
- professional institute	0.029	0	1
- art lyceum or institute	0.013	0	1
High school grade	49.085	36	60
Military service obligations:			
- exempt	0.219	0	1
- before university	0.039	0	1
- other	0.742	0	1

(continued)



Table 1: (continued)

	Mean	Min	Max
2. College-related individual characteristics			
Number of extra years taken to graduate after the end of the official program duration (median value, 4 stands for 4 and more years)	2	0	4
University grade	103.628	66	110
Moved from other course	0.107	0	1
Second degree	0.014	0	1
Studied in the region of birth	0.793	0	1
Studied in the province of birth	0.519	0	1
Studied in the town of birth	0.412	0	1
Moved from own town to study	0.300	0	1
3. Graduates' Post-Graduation Performance			
Passed profession qualification exam	0.452	0	1
In the labour force	0.843	0	1
Employed if in the labour force	0.853	0	1
Employed in a job which requires university degree if in the labour force	0.644	0	1
Wage	1135.786	77.468	10000



The determinants of grades

$$G = \mathbf{X}\boldsymbol{\beta} + \mathbf{D}_t\alpha + \mathbf{D}_f\gamma + \mathbf{D}_u\delta + \varepsilon$$

\mathbf{X} - Individual characteristics

\mathbf{D}_t - Dummy variables for year of graduation

\mathbf{D}_f - Dummy variables for field of study (discipline)

\mathbf{D}_u - Dummy variables for university



Table 3 Individual characteristics and performance in university

1. Pre-determined individual characteristics				
Female	0.753***	(0.095)	- technical institute for geometers	-1.458*** (0.167)
Age	-0.170***	(0.011)	- technical commercial institute	-1.544*** (0.102)
Father was:			- other type of technical institute	-1.516*** (0.172)
- working	0.008	(0.268)	- teachers school or institute	-0.882*** (0.122)
- looking for a job	0.001	(0.525)	- language lyceum	-1.181*** (0.141)
- a pensioner	0.177	(0.351)	- professional institute	-2.223*** (0.181)
Mother was:			- art lyceum or institute	-1.524*** (0.237)
- working	0.158**	(0.073)	- other	-1.092*** (0.416)
- looking for a job	0.394	(0.407)	High school grade	0.303*** (0.004)
- a pensioner	0.496**	(0.236)	Military service obligations:	
Father education:			- exempt	-0.077 (0.093)
- elementary license or none	Benchmark		- before university	0.085** (0.033)
- secondary education license	-0.010	(0.093)	2. College-related individual characteristics	
- higher education diploma	-0.037	(0.108)	Moved from other course	0.021 (0.095)
- university degree	0.054	(0.127)	Second degree	1.184*** (0.420)
Mother education:			Studied in the region of birth	0.262*** (0.100)
- secondary education license	0.013	(0.089)	Studied in the town of birth	0.687*** (0.078)
- higher education diploma	-0.056	(0.103)	Moved from own town to study	0.020 (0.073)
- university degree	0.269**	(0.134)	3. Province of birth characteristics	
Father's sector of work			GDP*(10)	0.064 (0.082)
- agriculture	-0.797**	(0.384)	Unemployment	0.054*** (0.019)
- industry	-0.352	(0.364)	Population*(10,000)	-0.003 (0.003)
- services	-0.307	(0.358)	4. Other Dummies and controls	
Number of siblings	-0.030	(0.037)	Province of origin	Yes
Nationality:			Course fixed-effect	
- European Union	1.996**	(0.811)	Discipline fixed-effect	Yes
- Extra-communitarian	2.783***	(0.795)	University fixed-effect	Yes
Type of high school:			Extra years taken to graduate	Yes
- classic lyceum	0.332***	(0.086)	University grade	
- technical industrial institute	-1.158***	(0.155)		
			(Pseudo) R squared	0.403
			Number of observations	61844



□ Motivation
■ Background literature

□ Data
■ Results I

□ Results II
■ Conclusions

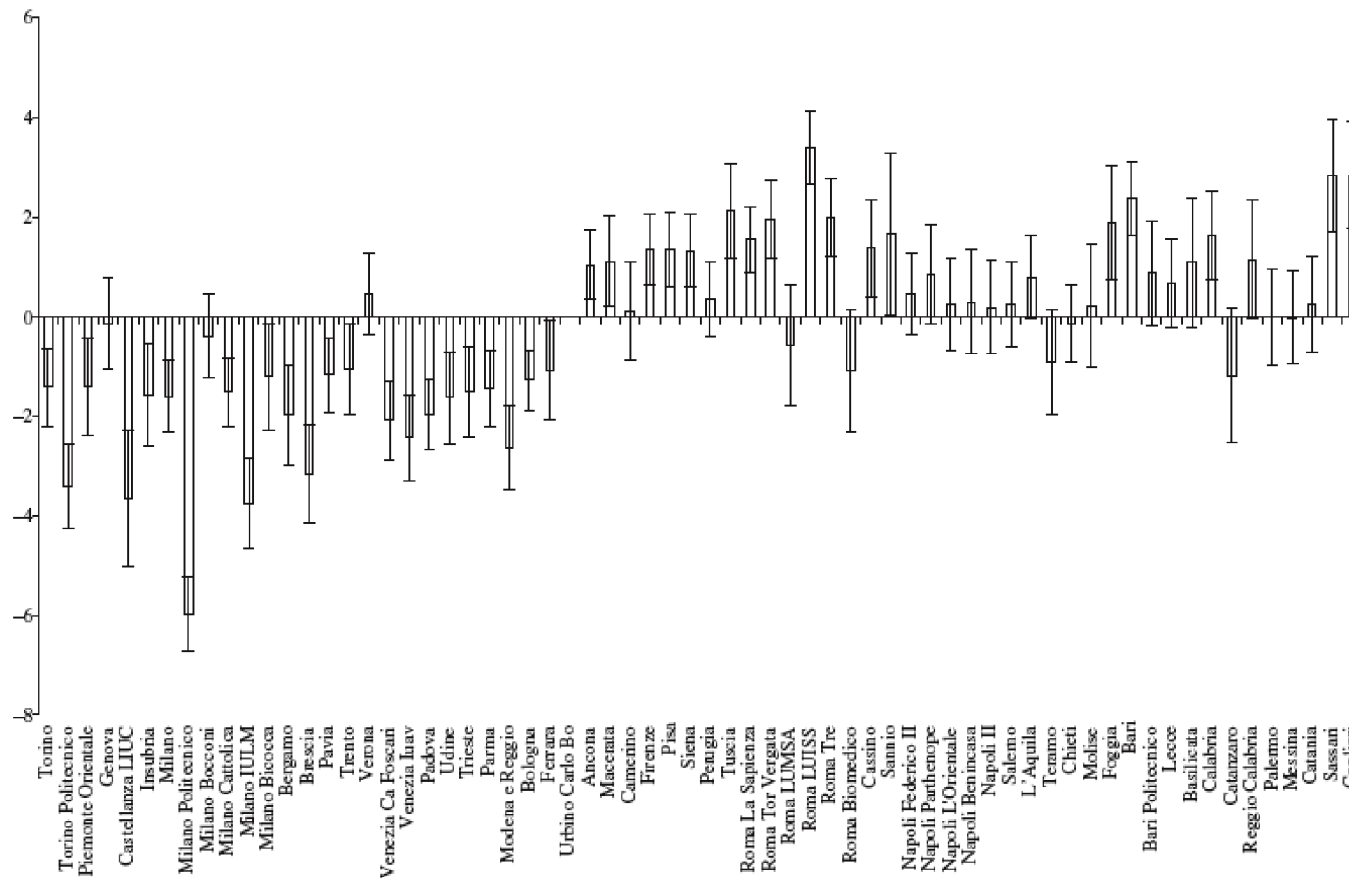


Figure 1 Grades across universities

Notes: Bars' length represent university dummies obtained from a OLS regression, where dependent variable is grades. Controls include individual characteristics, discipline and time taken to graduate. Universities are ordered by official code, university of Urbino is the benchmark. The error bars indicate the confidence intervals at the 5% significance level.

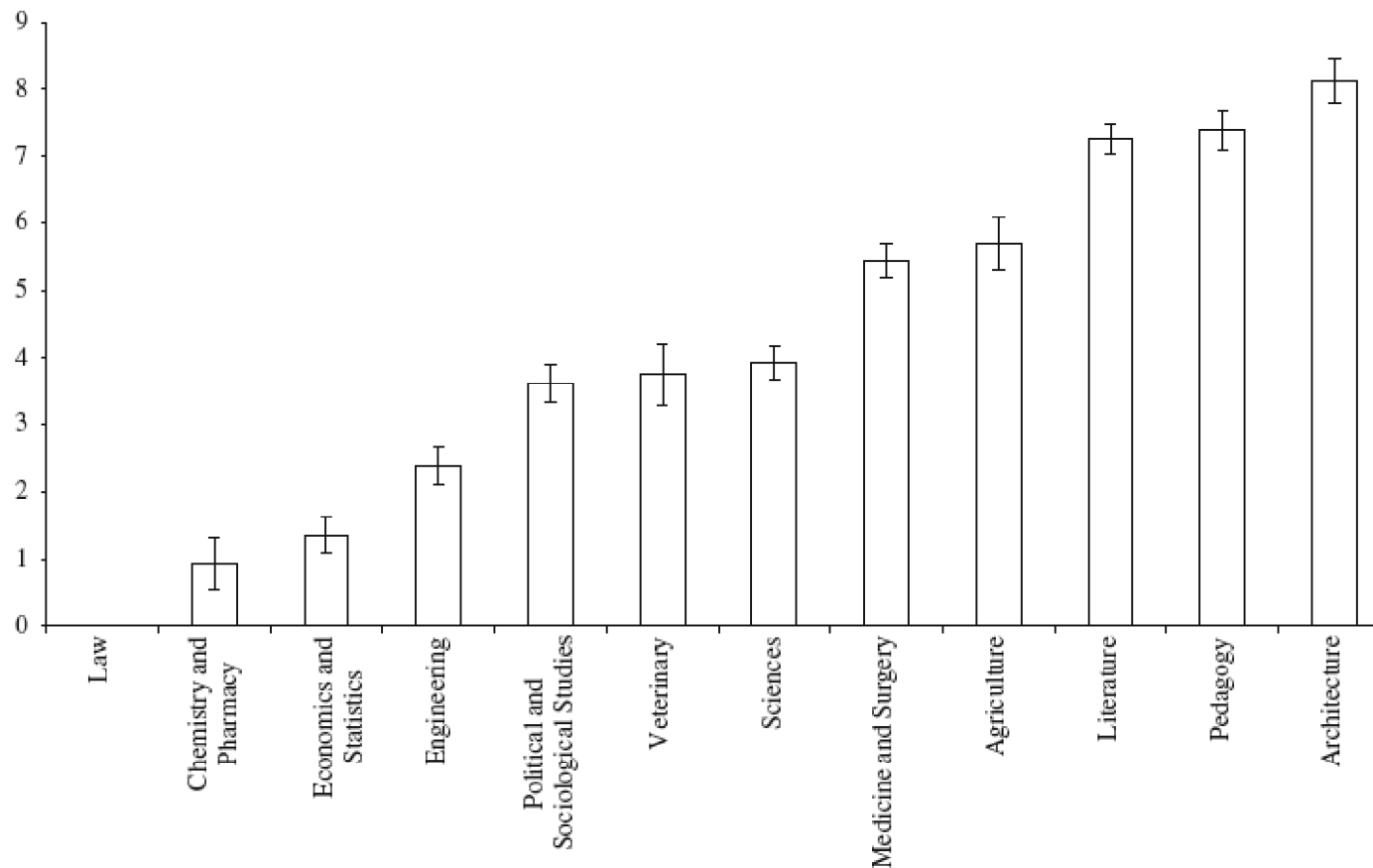


Figure 2 Grades across fields

Notes: Bars' length represent discipline dummies obtained from a OLS regression, where dependent variable is grades. Right hand side controls include individual characteristics, university and time taken to graduate. Law is the benchmark. The error bars indicate the confidence intervals at the 5% significance level.



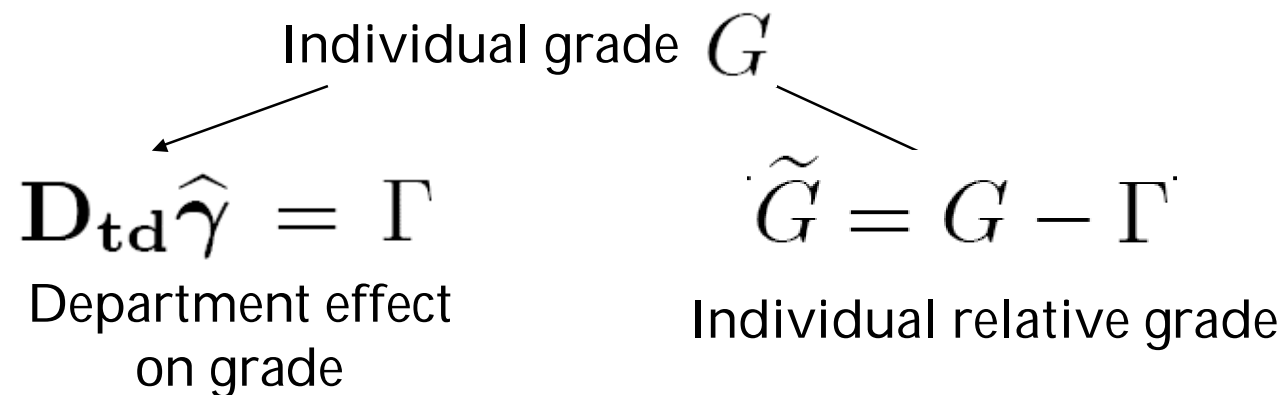
Differences in quality or differences in grading standards?

- Two proxies of quality:
 - ☐ Graduates' labor market performance
 - ☐ The outcomes of external professional qualification exams
 - Required for a number of professional occupations
 - Mainly graduates in chemistry and engineering



1. $G = \mathbf{X}\beta + \mathbf{D}_{td}\gamma + \alpha + \varepsilon$

\mathbf{D}_{td} -Dummy variables for department d in year t



2. $L = \mathbf{X}\beta + \mathbf{D}_t\alpha + \eta\tilde{G} + \mu\Gamma + \varepsilon$



Table 4 The effect of grades on labour market outcomes

	(1) Employment		(2) Employment		(3) Knowledge match		(4) Knowledge match		(5) Log wage		(6) Log wage	
	Probit		Probit		Probit		Probit		OLS		OLS	
Individual relative grade	0.003*	(0.002)	0.003	(0.002)	0.010***	(0.002)	0.010***	(0.001)	0.003***	(0.001)	0.004***	(0.001)
Department	-0.020***	(0.006)	0.005	(0.004)	0.006	(0.004)	-0.014***	(0.003)	0.001	(0.001)	-0.009***	(0.001)
effect on grade												
Controls												
Year of graduation	Yes		Yes		Yes		Yes		Yes		Yes	
Extra years taken to graduate	Yes		Yes		Yes		Yes		Yes		Yes	
Individual characteristics [‡]	Yes		Yes		Yes		Yes		Yes		Yes	
Province of origin*	Yes		Yes		Yes		Yes		Yes		Yes	
(High-school grade)												
Province of origin	Yes		Yes		Yes		Yes		Yes		Yes	
characteristics [‡]												
Discipline dummies	Yes				Yes				Yes			
University dummies			Yes				Yes				Yes	
Observations	42,819		42,819		40,051		40,051		31,040		31,040	
(Pseudo) <i>R</i> -square	0.1614		0.1431		0.0780		0.0684		0.2335		0.2081	

Notes: *Significant at 10%; **significant at 5%; ***significant at 1%. For probit regressions marginal effects at mean values are reported. Standard errors in parentheses. Students from private universities and departments with constrained admission are excluded. [‡]Variables listed in Table 3 are included among the regressors.



Table 6: The Effect of Grades on Performance in External Qualification Exams

Individual relative grade	0.002*** (0.001)
Department effect on grade	-0.008** (0.004)
Controls:	
Year of graduation	Yes
Extra years taken to graduate	Yes
Individual characteristics [‡]	Yes
Province of origin*(High school grade)	Yes
Province of origin characteristics [‡]	Yes
Course dummies	Yes
Department dummies*(Year of graduation)	
Observations	16261
(Pseudo) R square	0.2018

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Marginal effects at mean values are reported. Standard errors in parentheses. Students from private universities and departments with constrained admission are excluded. [‡] Variables listed in Table 3 are included among the regressors.



Should we worry about differential grading standards?

■ Public Funding

- ☐ Funding system based partially on the number of exams passed by students (FTE students), introduced in 1995
- ☐ Which universities are favored?
 - Favours those universities with lower grading standards
 - However, this indicator does not take into account the initial quality of students, favouring universities where the quality of new students is relatively better.

$$L = \alpha + \mathbf{X}\beta + \mathbf{D}_f\gamma + \eta FTE + \varepsilon$$



Table 7 The relationship between the share of FTE students and labour market performance

	(1) Employment	(2) Knowledge match	(3) Log wage	(4) Qualification exams
	Probit	Probit	OLS	Probit
FTE students [†]	-0.032* (0.018)	-0.032* (0.018)	-0.006 (0.004)	0.013 (0.031)
Controls				
Year of graduation	Yes	Yes	Yes	Yes
Extra years taken to graduate	Yes	Yes	Yes	Yes
Individual characteristics [‡]	Yes	Yes	Yes	Yes
Province of origin* (High-school grade)	Yes	Yes	Yes	Yes
Province of origin characteristics	Yes	Yes	Yes	Yes
Discipline dummies	Yes	Yes	Yes	
Course dummies				Yes
Observations	13,579	13,579	10,424	5233
(Pseudo) <i>R</i> -square	0.1667	0.1667	0.2151	0.1814

Notes: *Significant at 10%; **significant at 5%; ***significant at 1% Standard errors in parentheses. The coefficient shows the effect of an increase of 10 Full Time Equivalent Students in 1995. All variables listed in Table 3 are included among the regressors. Only students that graduated in 1998 from a public universities and from a department with open entry have been considered.



Summary of results

- Differential grading standards
 - ☐ Average grades vary both across disciplines and across universities
 - ☐ Graduates from high-grading degrees perform significantly worse in the labor market and in professional qualification exams. This suggests that there exist differential grading standards across departments
- The university funding mechanism based on the number of exams passed by students favors universities that generate lower value added





Discussion and further research

Hypotheses:

☐ Incentives generated by funding system

- The negative relationship between grades and labor market performance has increased over time



☐ Relative (instead of absolute) evaluation of student performance coupled with very heterogeneous population of students in different schools



- Evidence from OECD PISA standardized exams



☐ Motivation
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☒ Data
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☐ Results II
☐ Conclusions

Thank you for your attention!



Table 5: The (Puzzling) Relationship between Grades and Wages

	(1)	(2)	(3)
	1995	1998	2001
University grade [†]	0.007 (0.010)	-0.004 (0.006)	-0.017** (0.008)
Controls:			
Year of enrolment	Yes	Yes	Yes
Extra years taken to graduate	Yes	Yes	Yes
Individual characteristics [‡]	Yes	Yes	Yes
Province of origin			
Province of origin characteristics [‡]	Yes	Yes	Yes
Observations	8700	10697	11643
R-squared	0.1481	0.1543	0.1271

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors in parentheses. Students from private universities and departments with constrained admission are excluded. [†] The coefficient shows the effect of a 10 point increase in grade. [‡] Variables listed in Table 3 are included among the regressors.





OECD PISA 2003 mathematics scores and university grades

