Procrastination, Academic Success and the Effectiveness of a Remedial Program

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PROCRASTINATION

- Many economic decisions, such as investments in human capital, saving, health-related activities, originate costs and benefits that occur at different points in time.

- A large literature shows that individuals tend to be present-biased (Laibson, 1997; O'Donoghue and Rabin, 1999; DellaVigna, 2009).

- Investments in human capital are activities in which the tendency to procrastinate can be particularly harmful.

  Techniques to manage procrastination are suggested in the websites of many universities worldwide: Harvard University, University of Buffalo, Cornell University etc.

Related Literature

- Little evidence on the relationship between procrastination and educational performance.

- Mischel, Shoda and Rodriguez (1989) analyze self-control in 4-year old children and relate their ability to delay gratification with their future scholastic performance;

- Wong (2008) show how students' performance in two college courses is negatively correlated to students' self-reported tendency to procrastinate;

- Ariely and Wertenbroch (2002) find that students facing exogenously imposed deadlines perform better than students who set autonomously deadlines, while students facing no deadlines at all show the worst academic performance.

AIM OF our PAPER

- We analyse the effects of procrastination on student performance.
- Using data from a large sample of Italian undergraduates, we measure procrastination with the actual behaviour of students when finalizing their university enrolment procedure.
- Firstly, we show that procrastination is a strong predictor of students' educational achievements.
- Secondly, we investigate, using a Regression Discontinuity Design, the effects of a remedial program on students' performance in relation to their propensity to procrastinate.

Data and Descriptive Statistics

- Our empirical analysis relies upon individual-level data using a sample of (3335) undergraduate students enrolled in the academic year 2009-2010 at the University of Calabria, a middle-sized public university located in the South of Italy

- We observe a number of students' characteristics (gender, province and municipality of residence, year of high school completion) and measures of students' ability (high school grade, students' performance in a placement test).

- We also have information on students' careers at university.

How to measure procrastination

- Self-reported measures of procrastination (surveys asking subjects about their tendency to accomplish a task immediately or to delay it).
- Students' behavior in turning term papers.

- **In our work** we exploit the fact that in the University we consider, the admission decision is notified to all the applying students at the same time (through the university official website) and students have available seven weekdays to accomplish the enrollment procedure, which requires some bureaucratic tasks and the payment of an initial fee through bank or post office

Our measure of procrastination

- Starting from the 1st to the 24th August 2009, our sample students have applied for their preferred Degree program at the University of Calabria.

- The University has evaluated students' applications and the list of admitted students was communicated to students through publication on the University website on September 9th.

- Starting from the publication of admission decisions, admitted students had 7 weekdays to accomplish the enrolment procedure.

- The enrolment procedure requires students to fill in a number of forms and to pay a first small part of the university fees (320 euros).

Our measure of procrastination

- Students who did not complete their enrolment process were excluded and places left vacant were filled either with students who were ranked lower in the first stage or by re-opening the application procedure.

- Given this procedure, a number of places on Degree courses, that were assigned to students after the first selection, ended up vacant after the conclusion of the first stage of enrolment.

- We exclude these students from our analysis and only consider students whose enrolment was completed within the first deadline.

- Students enrolled later may have ended up on different Degree courses from those that they would have chosen as a first choice or might have other unobservable differences with respect to regularly enrolled students.

Our measure of procrastination

- We observe the day in which students have accomplished their enrolment procedure. We build a measure of Procrastination considering how this date was close to the deadline.

- Procrastination takes values from 1 (for students who have accomplished their enrolment procedure the first admissible day) to 7, for students accomplishing the procedure the last admissible day. Procrastination takes an average value of 4 days.

- 12.4% of students enroll within the two days following notification (No Procrastination);
- 43% of students enroll in the 3rd or 4th day following notification (Slight Procrastination);
- 44.5% of students needs five or more days to complete their enrolment (Heavy Procrastination).

Our measure of procrastination

- This measure of procrastination is a reasonable behavioral counterpart of survey questions asking students about their tendency to "complete assignments immediately", "complete before deadline", or "at the last possible moment".

- Similar measures of procrastination are used by Reuben, Sapienza and Zingales (2007).

- To assess whether our indicator of procrastination reflects a typical student attitude, we also conducted a survey among a sample of students who were asked to rate their tendency to procrastinate. Results confirm that students who take longer to accomplish the enrolment procedure are also more likely to show a higher tendency to procrastinate.

- We also present some robustness checks showing that neither motivation nor the availability of information or whealth are driving our results

Table 1. Descriptive Statistics

Procrastination	3335	4.275	1.557	1	7
No Procrastination	3335	0.124	0.329	0	1
Slight Procrastination	3335	0.431	0.495	0	1
Heavy Procrastination	3335	0.445	0.497	0	1
Female	3335	0.645	0.479	0	1
High School Grade	3335	83.087	11.454	60	100
Lyceum	3335	0.486	0.500	0	1
Age	3335	19.987	3.615	18	55
Total Credits	3335	49.598	38.896	0	126
Economics	3335	0.331	0.471	0	1
Pharmacy	3335	0.138	0.345	0	1
Humanities	3335	0.233	0.423	0	1
Math and Natural Sciences	3335	0.144	0.351	0	1
Political Sciences	3335	0.154	0.361	0	1
Test Score	3335	-1.146	14.992	-50	46.83
Test Score std	3335	-0.096	1.059	-3.851	3.414
Older student	3335	0.265	0.442	0	1
Effective Treatment (Hours /100)	3335	0.555	0.635	0	1.6
Assigned Treatment	3335	0.586	0.493	0	1

PROCRASTINATION AND STUDENTCHARACTERISTICS

- Our measure of procrastination behaves in line with predictions made by previous literature.
- students' tendency to procrastinate correlates negatively with our measures of ability, High School Grade
- we do not find any statistically significant correlation between family income and procrastination.

Procrastination and High School Student Performance

OLS estimates. Dependent variable: High School Grade

	(1)	(2)	(3)	(4)	(5)
Procrastination	-0.852***	-0.734***	-0.822***		
	(0.127)	(0.122)	(0.131)		
Slight Procrastinat				-1.641***	-1.844***
				(0.607)	(0.648)
Heavy Procrastinat				-3.355***	-3.677***
				(0.607)	(0.653)
Student Characteristics	NO	YES	YES	YES	YES
Municipal Fixed Effects	NO	NO	YES	NO	YES
Observations	3335	3335	3325	3335	3325

PROCRASTINATION AND ACADEMIC SUCCESS

- We investigate the relationship between:
- procrastination and students' performance at university

- The idea is that students who procrastinate devote less time and effort to studying activities (postponing costly activities) and, as a consequence, obtain a worse performance.

Procrastination and Student Performance at University

Each day of waiting is connected to five credit points less in the first two years of the degree

OLS estimates. Dependent variable: Number of credits.

	(1)	(2)	(3)	(4)	(5)
Procrastination	-5.178***	-3.606***	-3.527***		
	(0.422)	(0.431)	(0.412)		
Slight Procrastination				-3.640*	-4.833**
				(2.132)	(2.039)
Heavy Procrastination				-12.874***	-13.169***
				(2.157)	(2.063)
Student Charact and Ability	NO	YES	YES	YES	YES
Municipal Fixed Effects	NO	YES	YES	YES	YES
Observations	3335	3325	3325	3325	3325

ROBUSTNESS

Unfortunately, we do not have additional controls for students' characteristics for the cohort of students enrolled in 2009–2010.

However, we have much richer data from the previous cohort (students enrolled in 2008–2009).

For these students, we have information on both family income and, thanks to an on-line survey proposed to students at the moment of their enrollment, we have some additional information on student's family background, motivation and internet use.

Our results are robust to all these controls

Procrastination and the Effectiveness of Remedial Courses

The cohort of students we consider were involved in a remedial program promoted by the regional government and financed by the European Social Fund.

The project was aimed at improving students' basic competences through an intensive training program offering a number of courses in subjects such as mathematics and language skills.

The effects of this program were evaluated in De Paola and Scoppa (2014).

Here, we investigate whether these effects differ according to students' tendency to procrastinate.

Assignment to remedial courses

Assignment to remedial courses was based on the results obtained by students at a placement test.

In each field of study (5 fields), students performing below a certain cutoff score were required to enroll in the remedial courses.

We build a variable, Test Score, as the percentage of correct answers given by student in the placement test.

To make homogeneous students' scores across fields of study we subtract the threshold level fixed by each faculty to assign students to remediation.

A score of +1 indicates that the student is placed just above the threshold and he/she is not required to attend the remedial courses, while a score of 0 or a negative score indicates that the student is below the threshold and must attend the remedial courses.

We define the dummy variable Assigned Treatment , which takes the value of one if student i has been assigned to the remedial courses and zero otherwise.

Assignment to remedial courses

Students assigned to treatment were highly recommended to attend the courses, but attendance was not compulsory.

We build the variable Effective Treatment as the number of hours of remedial courses attended by student i.

58.6% of sample students were assigned to remedial courses (Assigned Treatment).

Since courses were strongly recommended but were not compulsory, compliance of students with the assignment rule was only partial.

Some of the students assigned to the treatment have decided to not participate to the educational program ("no-shows");
A few students who were assigned to the "control group" shifted to the treatment group by deciding to attend the remedial courses.

The average number of hours of remedial courses attended by students assigned to the treatment was 94 (out of 160) (to make easier to interpret the coefficients, we divide by 100 the number of hours).

Empirical strategy

Instrumental Variable estimation strategy using the exogenous assignment to the treatment as an instrument for the effective participation in the remedial courses.

We estimate the following model:

$$Y_i = \beta_0 + \beta_1 EfTr_i + \beta_2 EfTr_i * (\text{Procr}) + \beta_3 \text{Procr} + \beta_4 f\left(TestScore_i\right) + \beta_5 X_i + \mu_k + \varepsilon_i$$

$$EfTr_i = \pi_0 + \pi_1 AsTr_i + \pi_2 AsTr_i * (\text{Procr}) + \pi_3 \text{Procr} + \pi_4 g\left(TestSc_i\right) + \pi_5 X_i + \mu_k + \upsilon$$

Balance Checks. Regression Discontinuity Estimates. Procrastination

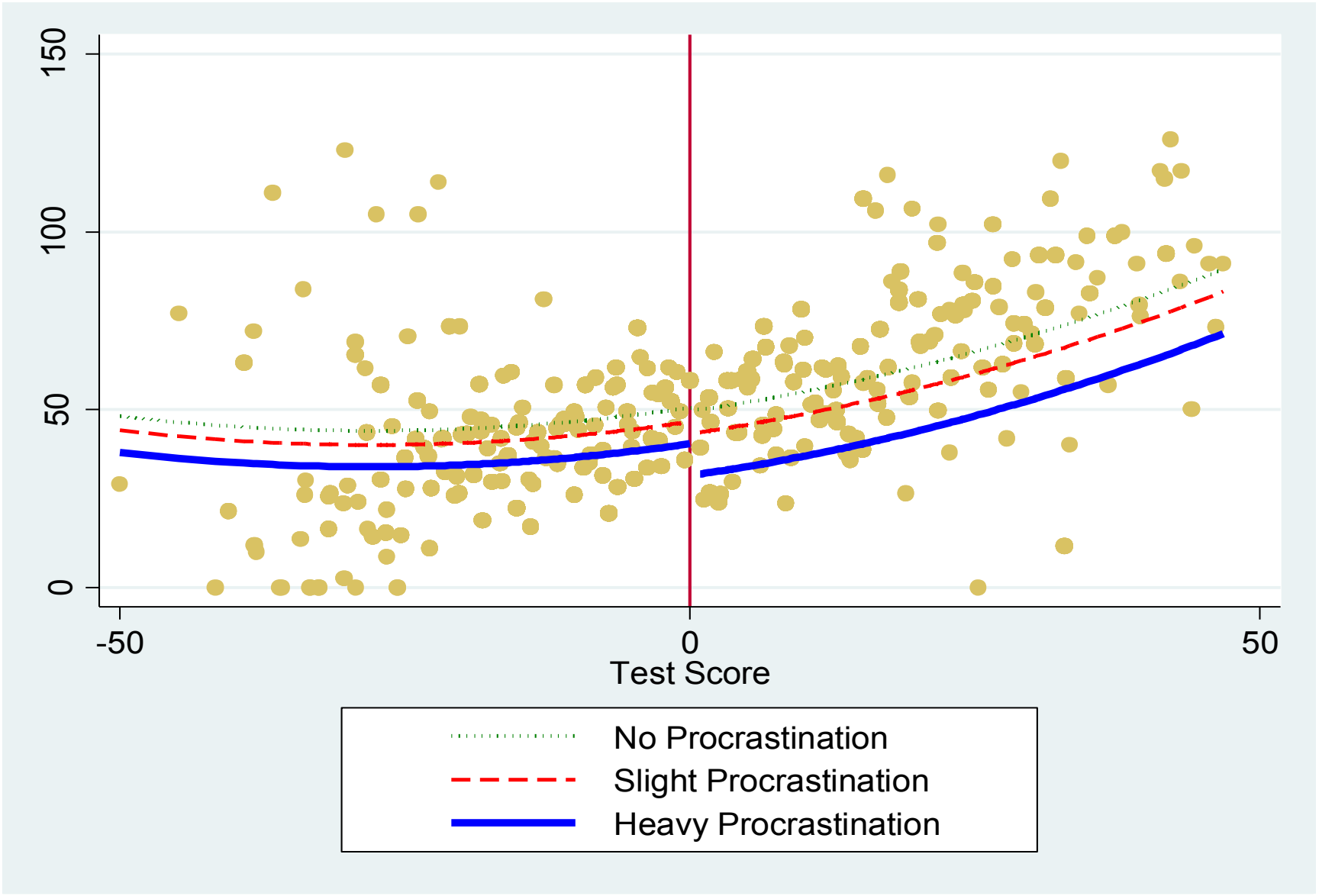
	(1)	(2)	(3)	(4)	(5)	(6)
Assigned Treatment	0.202**	0.197**	0.050	0.069	-0.105	-0.206
	(0.089)	(0.089)	(0.107)	(0.140)	(0.165)	(0.187)
Test Score	-0.001	-0.001	-0.012**	-0.011	-0.042**	-0.056*
	(0.003)	(0.003)	(0.006)	(0.012)	(0.020)	(0.030)
(Test Score)^2		-0.000	-0.000*			
		(0.000)	(0.000)			
(Test Score)^3			0.000**			
			(0.000)			
Observations	3335	3335	3335	1692	1260	970

Intention to Treat Effects

	(1)	(2)	(3)	(4)	(5)	(6)
Assigned Treatment	5.053**	5.391***	6.669***	6.012***	7.130**	8.591**
	(2.017)	(2.004)	(2.423)	(2.026)	(2.804)	(3.599)
AssigTreat*Procr	1.612**	1.554**	1.562**	1.528**	1.575**	1.585**
	(0.773)	(0.772)	(0.772)	(0.773)	(0.773)	(0.773)
Procrastination	-4.595***	-4.527***	-4.516***	-4.521***	-4.521***	-4.530***
	(0.604)	(0.604)	(0.605)	(0.605)	(0.605)	(0.605)
Test Score	0.475***	0.470***	0.566***	0.755***	0.595*	1.167
	(0.073)	(0.071)	(0.124)	(0.103)	(0.311)	(0.712)
(Test Score)^2		0.008***	0.009***		0.005	-0.033
		(0.002)	(0.002)		(0.008)	(0.043)
(Test Score)^3			-0.000			0.001
			(0.000)			(0.001)
AssigTreat*Test Score				-0.518***	0.125	-0.626
				(0.130)	(0.388)	(0.850)
AssigTreat *Test Score^2					0.012	0.036
					(0.011)	(0.053)
AssigTreat *Test Score^3						-0.001
						(0.001)
Observations	3335	3335	3335	3335	3335	3335

Remedial Courses and Procrastination. Intention to Treat effects

	(1)	(2)	(3)	(4)	(5)	(6)
Assigned Treatment	0.310	0.998	2.397	1.716	2.798	4.237
	(3.678)	(3.672)	(3.953)	(3.700)	(4.209)	(4.722)
Ass.Treat*(Slight Procr.)	2.622	2.321	2.328	2.188	2.414	2.463
	(3.748)	(3.729)	(3.730)	(3.737)	(3.730)	(3.733)
Ass.Treat*(Heavy Procr.)	8.513**	7.990**	8.016**	7.857**	8.112**	8.175**
	(3.797)	(3.787)	(3.787)	(3.798)	(3.790)	(3.791)
Slight Procrastination	-6.359**	-6.305**	-6.227**	-6.227**	-6.260**	-6.332**
	(2.612)	(2.602)	(2.607)	(2.608)	(2.607)	(2.611)
Heavy Procrastination	-18.457***	-18.117***	-18.039***	-18.064***	-18.080***	-18.153***
	(2.724)	(2.723)	(2.729)	(2.731)	(2.730)	(2.732)
Test Score	0.469***	0.464***	0.570***	0.745***	0.592*	1.173*
	(0.073)	(0.071)	(0.124)	(0.103)	(0.310)	(0.711)
Observations	3335	3335	3335	3335	3335	3335


150
100
50
0
-50
0
50
Test Score
No Procrastination
Slight Procrastination
Heavy Procrastination

Fuzzy Regression Discontinuity: IV estimates

	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Two-Stage Least Squares Estimates			
Effective Treatment	6.507***	6.903***	9.365***	1.487	2.312	5.082
	(2.477)	(2.457)	(3.251)	(4.390)	(4.373)	(4.967)
EfTreat(Procr)	2.242**	2.194**	2.330**			
	(0.917)	(0.916)	(0.925)			
EfTreat*(Slight Procr)				2.309	1.918	1.577
				(4.098)	(4.078)	(4.095)
EfTreat*(Heavy Procrast.)				9.505**	8.927**	8.947**
				(4.240)	(4.226)	(4.226)
Procrastination	-4.608***	-4.542***	-4.527***			
	(0.606)	(0.606)	(0.607)			
Slight Procrastination				-6.322**	-6.268**	-6.145**
				(2.609)	(2.600)	(2.607)
Heavy Procrastination				-18.487***	-18.152***	-18.036***
				(2.721)	(2.721)	(2.727)
Test Score	0.516***	0.513***	0.678***	0.506***	0.504***	0.677***
	(0.084)	(0.082)	(0.154)	(0.084)	(0.082)	(0.153)
Test Score^2		0.008***	0.009***		0.008***	0.009***
		(0.002)	(0.002)		(0.002)	(0.002)
Test Score^3			-0.000			-0.000

Fuzzy Regression Discontinuity Estimates. Local Linear Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	–10 /+10	–7/+7	–5/+5	–10 /+10	–7/+7	–5/+5
Effective Treatment	12.006**	14.121**	20.399**	-1.685	2.887	3.644
	(5.308)	(6.898)	(8.886)	(8.686)	(11.268)	(14.147)
Effect Treat *(Procrast)	2.597*	2.728	4.445*			
	(1.458)	(1.859)	(2.430)			
Effect Treat*(Slight Procrast)				13.234*	9.856	14.228
				(7.149)	(8.942)	(11.526)
EffectTreat*(Heavy Procrast)				18.474**	16.162*	24.884**
				(7.210)	(9.066)	(11.570)
Procrastination	-4.343***	-4.349***	-4.820***			
	(0.843)	(1.004)	(1.242)			
Slight Procrastination				-13.455***	-11.721***	-15.446***
				(3.862)	(4.492)	(5.791)
Heavy Procrastination				-22.371***	-21.698***	-26.467***
				(3.928)	(4.634)	(5.913)
Observations	1692	1260	970	1692	1260	970

Concluding remarks

In this paper we focus the attention on the relationship between present biased preferences and human capital investments.

We add to this literature by both:

- analyzing the relationship between procrastination attitudes and academic success
- investigating how students with different attitudes toward procrastination react to a policy requiring them to attend some remedial courses.

- We find that one day of delay in accomplishing the enrollment procedure is associated with a reduction of about 5 of credits acquired by students in their first two years at university.

- The negative correlation between procrastination and academic performance becomes particularly worrying for students who heavily procrastinate (more than 5 days of delay): these students acquired about 13 credits less.

Concluding remarks

- The way to handle procrastination problems and which educational policies are more beneficial to procrastinators are important issues.

- We have investigated whether a policy requiring students to attend some remedial courses at the beginning of the academic year has produced different effects according to students' propensity to procrastinate.

- We find that students with the strongest tendency to procrastinate are those who mostly benefit from the remedial program.