Present-biased preferences and academic achievements

Iris Franz

Adjunct Instructor at University of Denver

Outline

- Introduction/literature review
- Data collection method
- Data details
- Regression models and expectations
- Regression results
- Discussion
- Conclusion

Introduction: Self control issues

- Self-control
  - The ability to delay gratification & carry out costly action promptly
  - Example: studying hard and getting good grades, staying on a diet, meeting project deadlines, living within one's means
  - Self-control is an asset and a key to success

Introduction: Self-control & present-biased preference

- Example:
  - Whether to do unpleasant yardwork on Saturday, 5/1 for 7 hours, or yardwork on Saturday, 5/8 for 8 hours.
- Suppose today is 3/1. What is your choice?
- Now comes 5/1. Now what do you choose?
- Time inconsistency
- Present-biased preferences:
  - "When considering trade-offs between two future moments, present-biased preferences give stronger relative weight to the earlier moment as it gets closer." (O'Donoghue and Robin, 1999)
- Different from classical exponential discounting
- This study looks at **students' time inconsistency**
- Data collection authorized by the Human Subject Committee of the UST

Literature

- Middle school students with higher self-control scores tend to have higher GPAs (Chamorro-Premuzic and Furnham, 2003; Duckworth and Seligman, 2006; Tangney et al., 2004)
- Self-control outdoes IQ in predicting academic achievements (Duckworth and Seligman, 2005)
- Drawback of the literature:
  - Self-control measurement was done with laboratory experiment unrelated to academic work
    - Duckworth and Seligman (2005): choose between a small immediate *monetary* reward ($1 now) and a large reward later ($2 later) to measurement self-control
    - Tangney et al. (2004) and Duckworth and Seligman (2006) use hypothetical statement such as “Sometimes I feel like smashing things” and “Do you save regularly?” to measure self-control ability.
  - No measurement in present-biased preference
- This study:
  - Measures present-biased preference
  - Measurement directly related to academic work
  - First-hand field data outside of the lab that reflect the reality better.

Subjects

- Students who took principles of microeconomics (ECON 1332) and principles of macroeconomics (ECON 1331) from taught by the author, spring 2015 to spring 2017 at the Univ. of St. Thomas at Houston

Semester	Class Title	Section	Meeting Days and time
Spring 2015 Spring 2015	Principles of micro Principles of micro	Section B Section C	TTH 9:35-10:50am TTH 11:00am-12:15pm
Fall 2015 Fall 2015	Principles of macro Principles of macro	Section A Section B	TTH 9:35-10:50am TTH 11:00am-12:15pm
Spring 2016 Spring 2016 Spring 2016	Principles of micro Principles of micro Principles of micro	Section B Section C Section N	TTH 9:35-10:50am TTH 11:00am-12:15pm TTH 3:35pm-4:50pm
Fall 2016 Fall 2016	Principles of macro Principles of macro	Section A Section B	TTH 9:35-10:50am TTH 11:00am-12:15pm
Spring 2017 Spring 2017	Principles of micro Principles of micro	Section B Section C	TTH 9:35-10:50am TTH 11:00am-12:15pm

Homework

- Each semester, 5 homework assignments were given on Blackboard (Bb)
- Assignments contained 10-15 multiple choice questions only
- Each assignment became available on a Tuesday at 12:30pm, and was due the following Sunday on 11:59pm.
- Each assignment was timed for 150 minutes, open book, open neighbor
- Each student was allowed two attempts, the second one is optional. The higher score counts.
- After each attempt, Bb indicates the number of mistakes, without indicating which answer was wrong.
- Answers were displayed after the due date.

Data collection procedure

- On the Tuesday when the assignment became available, students were given a short questionnaire in class to indicate which day the would attempt the assignment.
- The instructor guaranteed that she would not look at their study plan, and this promise was honored.
- Students did not have to "commit" to their plan.
- After the semester was over, unbeknownst to the students, the author, also the instructor, checked which day that the student actually worked on each assignment.
- *Pi*: the day that the student indicate (on the questionnaire) that he/she planed to start working on Homework *i*.
- *Ai*: the actual day that the student worked on Homework *i*, according to Blackboard record
- Coding: Tuesday=2, Wednesday=3, …. Sunday=7

Procrastination

- Example: P_1= 5, and A_1= 7, then D_1= 7-5 = 2

	Delay < 0	Delay = 0	Delay > 0	Total number of assignments
Count	115	366	872	1349
Percentage	8.23%	27.13%	64.64%	100.00%

Data

- Missing observations of D_i
- $D_i = A_i - P_i$, *So* D_i is missing if:
  - P_i is missing: student was absent from a class
  - A_i is missing: missing assignments
  - *Issue: underestimation of* D_i.
- *Partial remedy of underestimation*
  - *Two ways to treat missing assignment:*
    1. *Record missing assignment as missing data*
    2. *Record missing assignment as* $A_i = 8$
- Demographic information: gender, race, major, etc., were collected in a separate survey, also approved by the Human Subject Committee.

Homework: Summary statistics

Missing asgmts recorded as missing data

Variable	Mean	Std.Dev	N
HW Score	78.668	28.247	1349
Actual	5.266	1.791	1275
Delay	1.172	1.705	1154
Male	0.434	0.496	1349
Junior/Senior	0.279	0.449	1349
Asian	0.123	0.329	1349
Black	0.058	0.233	1349
Hispanic	0.405	0.491	1349
White	0.244	0.43	1349
EMP	0.011	0.105	1349
Biz major	0.235	0.424	1349
Other major	0.148	0.355	1349
Micro	0.678	0.467	1349

Missing asgmts recorded as "submitted on Monday"

Variable	Mean	Std.Dev	N
HW Score	78.668	28.247	1349
Actual	5.491	1.884	1349
Delay	1.338	1.815	1196
Male	0.434	0.496	1349
Junior/Senior	0.279	0.449	1349
Asian	0.123	0.329	1349
Black	0.058	0.233	1349
Hispanic	0.405	0.491	1349
White	0.244	0.43	1349
EMP	0.011	0.105	1349
Biz major	0.235	0.424	1349
Other major	0.148	0.355	1349
Micro	0.678	0.467	1349

Econ grade: Summary statistics

If record missing asgmts as submitted on Monday

Variable	Mean	Std.Dev	N
EconGrade	3.081	0.812	255
Actual (mean)	5.274 5.439	1.284 1.308	255
Actual (median)	5.361 5.486	1.622 1.66	255
Delay (mean)	1.178 1.327	1.077 1.15	255
Delay (median)	1.133 1.263	1.277 1.37	255
~~Missing asgmts~~	~~0.404~~	~~0.719~~	~~255~~
Male	0.412	0.493	255
Junior/Senior	0.282	0.451	255
Asian	0.125	0.332	255
Black	0.063	0.243	255
Hispanic	0.435	0.497	255
White	0.239	0.427	255
EMP	0.012	0.108	255
Biz major	0.227	0.42	255
Other majors	0.141	0.349	255
Microeconomics	0.663	0.474	255

Regression models

$$HomeworkScore = \alpha_0 + \alpha_1 A + \alpha_2 D + \boldsymbol{X}\alpha + u \quad (1)$$

(?) (-)

- *A*: the actual day the homework was first attempted
- *D*: delay days
- $\boldsymbol{X}$: a vector of control variables (race, gender, major, etc.)

$$EconGrade = \beta_0 + \beta_1 A + \beta_2 D + \beta_3 M + \boldsymbol{X}\beta + \varepsilon \quad (2)$$

(?) (-) (-)

- *A*: the mean or median of the actual day
- *D*: the mean or median of delay days
- *M*: number of missing assignments (not in the 2nd set of regressions, where missing assignments were recorded as "submitted on Monday")

REGRESSION RESULTS

Homework score: missing asgmts recorded as **missing data**

	Homework Score	Homework Score	Homework Score
Actual	-0.761*** (-2.99)		-0.258 (-0.77)
Delay		-0.778*** (-2.81)	-0.599* (-1.71)
Male	-0.795 (-0.84)	-1.304 (-1.31)	-1.171 (-1.20)
Junior/Senior	0.231 (0.21)	-0.170 (-0.15)	-0.00949 (-0.01)
Asian	3.862*** (2.28)	3.515** (1.98)	4.406** (2.33)
Black	3.533 (1.66)	4.530** (1.97)	4.461** (2.07)
Hispanic	2.943** (2.20)	3.570*** (2.53)	3.500** (2.54)
White	1.831 (1.27)	0.973 (0.64)	1.161 (0.78)
EMP	9.506** (2.23)	9.769** (2.21)	9.861** (2.29)
Business major	-0.397 (-0.33)	-0.373 (-0.30)	-0.100 (-0.08)
Other majors	1.778 (1.27)	2.118 (1.44)	2.001 (1.40)
Microeconomics	2.158** (2.20)	2.513** (2.46)	2.093** (2.09)
cons	86.79** (42.90)	84.29** (49.37)	85.37** (39.80)
N	1230	1115	1113

Homework score: missing asgmts recorded as **submitted on Monday**

	Homework Score	Homework Score	Homework Score
Actual	-5.667*** (-14.48)		-2.724** (-5.30)
Delay		-4.782*** (-12.18)	-2.948*** (-5.67)
Male	-1.378 (-0.91)	-2.283 (-1.52)	-1.663 (-1.12)
Junior/Senior	-0.185 (-0.11)	-1.094 (-0.62)	-1.216 (-0.70)
Asian	6.828** (2.53)	6.950*** (2.59)	6.077** (2.29)
Black	11.55** (3.39)	9.173*** (2.63)	10.07** (2.92)
Hispanic	4.667** (2.23)	5.329** (2.54)	4.558** (2.19)
White	4.460** (1.97)	4.470** (1.97)	3.392 (1.50)
EMP	6.210 (0.91)	3.829 (0.58)	3.666 (0.56)
Business major	-1.070 (-0.56)	-0.540 (-0.29)	-0.689 (-0.37)
Other majors	4.699** (2.07)	4.232* (1.89)	4.230 (1.91)
Microeconomics	3.297** (2.11)	2.066 (1.34)	2.870* (1.88)
cons	105.3*** (32.57)	86.11*** (33.13)	97.07*** (29.43)
N	1349	1196	1196

HW score: missing asgmts recorded as **missing data with individual fixed effects**

	Homework Score	Homework Score	Homework Score
Actual	-0.162 (-0.51)		0.724 (1.62)
Delay		-0.498 (-1.64)	-0.153** (-2.57)
Male	-0.276 (-0.12)	-0.457 (-0.18)	-0.648 (-0.27)
Junior/Senior	5.730** (2.08)	6.269** (2.18)	6.228** (2.24)
Asian	13.15*** (2.75)	12.26** (2.45)	12.69*** (2.62)
Black	7.526 (1.18)	8.344 (1.25)	8.951 (1.38)
Hispanic	8.808** (2.49)	8.720** (2.32)	8.572** (2.36)
White	7.876* (1.95)	6.468 (1.51)	6.551 (1.58)
EMP	7.913 (0.92)	4.885 (0.55)	5.106 (0.59)
Business major	-1.522 (-0.50)	-0.839 (-0.26)	-0.741 (-0.24)
Other majors	-0.663 (-0.20)	-0.0474 (-0.01)	0.0532 (0.02)
Microeconomics	3.971** (2.14)	3.027 (1.58)	2.967 (1.60)
cons	56.65*** (6.27)	58.65*** (6.47)	55.36*** (6.13)
N	1230	1115	1113

HW score: missing asgmts recorded as **submitted on Monday, with individual fixed effects**

	Homework Score	Homework Score	Homework Score
Actual	-5.620*** (-11.46)		-2.678*** (-3.78)
Delay		-4.104*** (-9.07)	-2.380*** (-3.72)
Male	0.686 (0.19)	1.043 (0.28)	1.329 (0.35)
Junior/Senior	7.627* (1.71)	3.899 (0.90)	3.696 (0.86)
Asian	33.35*** (4.36)	31.24*** (4.05)	29.54*** (3.85)
Black	12.93 (1.36)	9.588 (0.94)	8.479 (0.84)
Hispanic	17.02*** (2.99)	12.97** (2.21)	13.23** (2.27)
White	21.01*** (3.35)	18.78*** (2.93)	18.43*** (2.90)
EMP	9.934 (0.68)	14.16 (1.00)	12.10 (0.86)
Business major	-8.622* (-1.74)	-4.980 (-1.02)	-4.511 (-0.93)
Other majors	4.701 (0.86)	6.554 (1.18)	6.263 (1.13)
Microeconomics	3.293 (1.11)	1.599 (0.55)	2.075 (0.72)
cons	79.97*** (5.45)	60.18*** (4.25)	73.19*** (5.06)
N	1349	1196	1196

EconGrade: missing asgmts recorded as **missing data**

	EconGrade	EconGrade	EconGrade	EconGrade	EconGrade	EconGrade
Actual (mean)	-0.0565 (-1.52)		-0.0138 (-0.32)			
Delay (mean)		-0.107** (-2.48)	-0.0990** (-1.97)			
Actual (median)				-0.0342 (-1.17)		0.00463 (0.13)
Delay (median)					-0.0837** (-2.31)	-0.0870** (-1.99)
Missing asgmts	-0.420*** (-6.41)	-0.407*** (-6.29)	-0.405*** (-6.18)	-0.426*** (-6.53)	-0.414*** (-6.42)	-0.415*** (-6.38)
Male	-0.0133 (-0.14)	-0.0326 (-0.35)	-0.0290 (-0.31)	-0.0151 (-0.16)	-0.0355 (-0.38)	-0.0374 (-0.39)
Junior/Senior	0.0263 (0.25)	0.0257 (0.24)	0.0260 (0.24)	0.0283 (0.26)	0.0212 (0.20)	0.0206 (0.19)
Asian	0.0150 (0.08)	0.0277 (0.15)	0.02332 (0.13)	0.0214 (0.12)	0.0396 (0.22)	0.0417 (0.23)
Black	-0.295 (-1.34)	-0.265 (-1.21)	-0.259 (-1.18)	-0.307 (-1.39)	-0.272 (-1.24)	-0.274 (-1.25)
Hispanic	0.179 (1.24)	0.201 (1.40)	0.198 (1.37)	0.180 (1.24)	0.200 (1.39)	0.201 (1.39)
White	0.140 (0.88)	0.166 (1.06)	0.162 (1.03)	0.148 (0.93)	0.171 (1.09)	0.172 (1.09)
EMP	1.069** (2.51)	0.984** (2.32)	0.981** (2.30)	1.092** (2.56)	0.994** (2.33)	0.994** (2.33)
Business major	-0.212* (-1.79)	-0.209* (-1.78)	-0.211* (-1.79)	-0.209* (-1.76)	-0.204* (-1.73)	-0.203* (-1.72)
Other majors	0.0683 (0.49)	0.0578 (0.42)	0.0599 (0.43)	0.0694 (0.50)	0.0572 (0.41)	0.0559 (0.40)
Micro	-0.267*** (-2.70)	-0.286*** (-2.93)	-0.281*** (-2.85)	-0.276*** (-2.80)	-0.287*** (-2.94)	-0.288*** (-2.93)
cons	3.655*** (15.26)	3.482*** (21.85)	3.541*** (14.45)	3.546*** (16.80)	3.453*** (21.93)	3.433*** (15.79)
N	255	255	255	255	255	255

EconGrade: missing asgmts recorded as **submitted on Monday**

	EconGrade	EconGrade	EconGrade	EconGrade	EconGrade	EconGrade
Actual (mean)	-0.155*** (-4.10)		-0.0886 (-1.95)			
Delay (mean)		-0.187*** (-4.46)	-0.131*** (-2.60)			
Actual (median)				-0.102*** (-3.41)		-0.0519 (-1.42)
Delay (median)					-0.138*** (-3.90)	-0.102** (-2.33)
Male	0.00941 (0.09)	-0.0444 (-0.44)	-0.0165 (-0.16)	-0.00878 (-0.08)	-0.0512 (-0.50)	-0.0338 (-0.33)
Junior/Senior	0.0236 (0.20)	0.0179 (0.15)	0.0188 (0.16)	0.0319 (0.27)	0.0223 (0.19)	0.0262 (0.22)
Asian	0.0465 (0.24)	0.0951 (0.50)	0.0537 (0.28)	0.0671 (0.35)	0.140 (0.73)	0.101 (0.53)
Black	-0.159 (-0.69)	-0.152 (-0.66)	-0.131 (-0.57)	-0.174 (-0.75)	-0.150 (-0.65)	-0.140 (-0.60)
Hispanic	0.187 (1.23)	0.230 (1.52)	0.209 (1.39)	0.196 (1.27)	0.246 (1.61)	0.227 (1.49)
White	0.200 (1.22)	0.266 (1.63)	0.229 (1.39)	0.236 (1.42)	0.298 (1.81)	0.275 (1.66)
EMP	1.030** (2.28)	0.938** (2.08)	0.924** (2.06)	1.078** (2.37)	0.941** (2.06)	0.952** (2.09)
Business major	-0.220* (-1.68)	-0.212* (-1.63)	-0.216 (-1.67)	-0.213 (-1.61)	-0.206 (-1.57)	-0.207 (-1.58)
Other majors	0.179 (1.14)	0.141 (0.90)	0.154 (0.99)	0.177 (1.12)	0.146 (0.92)	0.156 (0.99)
Microeconomics	-0.278*** (-2.66)	-0.324*** (-3.13)	-0.296*** (-2.85)	-0.298*** (-2.82)	-0.324*** (-3.10)	-0.308*** (-2.95)
cons	3.987*** (15.52)	3.409*** (20.41)	3.807*** (14.46)	3.703*** 16.38	3.314*** (20.25)	3.551*** (15.22)
N	255	255	255	255	255	255

Prior update

- Bayesian statistician:

  Prior (belief) $\rightarrow$ Data $\rightarrow$ update the prior to form a posterior.
- Question: do students update their prior?
- Students had 5 opportunities to observe their behaviors and update their prior. Do they become better predictor of their own behavior?
  - Homework 1 questionnaire: Indicated “I will attempt homework 1 on Wednesday”
  - But then attempted Homework 1 on Friday
  - Then I know that I have delayed for two days.
  - Homework 2 questionnaire: I would indicate a later day, because I know that I will procrastinate.
- No.

ANOVA

- If students updated their priors, then “delay” should have a downward trend.
- But in fact it has an upward trend!

	Missing asgmts as missing data	Missing asgmt as submitted on Mon.
Homework 1	0 (.)	0 (.)
Homework 2	-0.0728 (-0.48)	-0.00755 (-0.05)
Homework 3	0.213 (1.36)	0.390** (2.42)
Homework 4	0.172 (1.10)	0.426*** (2.65)
Homework 5	0.481*** (3.06)	0.653*** (3.83)
_cons	1.024*** (9.61)	1.066*** (9.50)

Conclusion

- The present-biased preferences are negatively correlated with academic performance.
  - Starting working on homework late is not such a big issue.
  - Delaying working on an assignment is.
- Implication to instructors:
  - Procrastinate causes poor performance: incentive, such as extra credit, for early submission
  - Poor performance causes procrastination: plenty of practices in class to keep students on the top things.
- Implication to employers:
  - If procrastination is a habit you carry from school to work, then employers are doing the right thing to check the transcript, and perhaps grades for micro-and-macroeconomics.

- Thank you!
- Please send comments and criticisms to
  - irisfranz@gmail.com