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## Patience Is Not The Only Virtue: The Relationship Between Time Preferences, Class Attendance And Final Marks

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## Patience is **not** the only virtue: The relationship between time preference, class attendance and final marks

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Paper presented to HERSLEB, University of Melbourne, December 2012

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## Earlier study


- “Patience is a virtue” but not for first year economics students
  - Final marks increased with discount rate (impatience)
  - Paper presented at Australasian Teaching Economics Conference in July 2012
  - Delegates querying generalisability of results for this and other papers that evaluated T&L interventions
- So what about selectivity bias?
  - Can we identify it?
  - Can we correct for it?



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## Yes 😊


- We had population data
  - We had survey respondent data
  - We also had non-respondent data

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## Data collection

### Population

- Semester one and two 2011
- Economics 1 students
- Two metropolitan campuses
- N = 420
- Revised N = 412 (8 students enrolled in both semesters – only first semester enrolment included)

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## Data collection

### Population (N = 412)

- Student admin data (ethics approval required)

### Sample (n = 163)

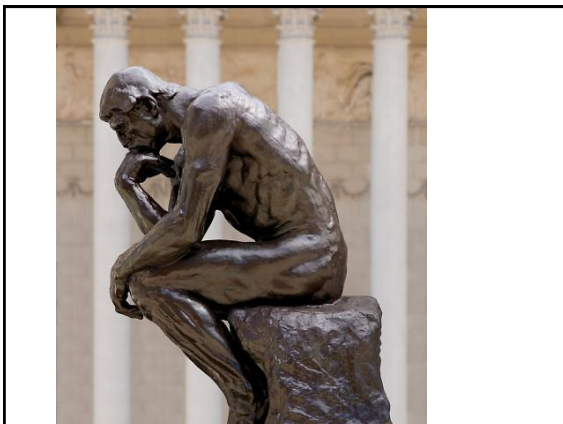
- In class surveys
  - 191 completed surveys (46.4%)
    - 163 surveys with discount rates (39.6%)

Characteristic	
Gender	1 = Male
Outer metropolitan campus	1 = Joondalup
Degree	1 = Bachelor of Business
Type of enrolment	1 = Full-time
Type of student	1 = International
Finance	1 = Enrolled in or already completed first year Finance unit
Parents' education level	1 = University

Characteristic	
Course Average	Weighted average mark (to date) for course of study
Final Mark	Final mark awarded for the unit
Postcode	Postcode of student's correspondence address
Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD)	Derived from postcode using ABS mapping

Other characteristics	
Characteristics from survey	
Discount Rate	The annual discount rate implied by the decision to switch (upper bound)
Parents' education level	1 = University
Characteristics from tutor records	
Tutorial Attendance	Number of Economics tutorials attended (out of 13) during the semester

Survey	
The survey included twenty choice statements:	
1. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$54.36 <input type="checkbox"/>
2. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$56.04 <input type="checkbox"/>
3. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$58.20 <input type="checkbox"/>
4. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$60.24 <input type="checkbox"/>
5. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$62.52 <input type="checkbox"/>
6. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$64.80 <input type="checkbox"/>
7. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$67.08 <input type="checkbox"/>
8. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$69.48 <input type="checkbox"/>
19. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$101.46 <input type="checkbox"/>
20. Paid one month from now: \$54 <input type="checkbox"/>	Paid 7 months from now: \$104.64 <input type="checkbox"/>



Comparison of students who completed the survey (n = 191) with those who didn't (n = 221)	
Students who completed the survey:	
<ul style="list-style-type: none"> <li>Were slightly older – (F = 8.85; p = 0.0031)</li> <li>Had higher final mark (55% cf 37%) – (F = 60.40; p = 0.000),</li> <li>Had higher course average (60% cf 48%) – (F = 42.39; p = 0.000),</li> <li>Attended more tutorials (on average 10 cf 6) – (F = 140.75; p = 0.000)</li> <li>Had parents with less education (43% cf 59%) – (chi sq = 8.3518; p = 0.004).</li> </ul>	

### Comparison of consistent surveys (n = 163) with inconsistent surveys (n = 28)

#### Students who completed consistent surveys:

- Had higher final marks (58% cf 42%)
  - (F = 18.49; p = 0.000)
- Had a higher course average (68% cf 48%)
  - (F = 24.00; p = 0.000)
- Lived at an address with a higher socio-economic index (IRSAD) score
  - (F = 5.85; p = 0.017)
- Were more likely to be studying part-time
  - (chi sq = 3.0927; p = 0.079)
- Were more likely to be domestic students
  - (chi sq = 8.3288; p = 0.004).

### Factors affecting final marks before correcting for selectivity bias

#### Final marks

- Increase with
  - Discount rate (b = 39.8244)
  - Tutorial attendance (b = 5.4560)
- Decrease with
  - Discount rate x tutorial attendance (b = -3.3876), that is, the positive effect of tutorial attendance on final marks is more than offset by the negative effect of high discount rates

### Correcting for selectivity bias

- Omitted variable problem - omitted variable can be proxied by inverse Mills ratio (Heckman 1979)
- The 'two steps' but taken together
  - Run the **selection (into the sample) equation** using **probit** with **all observations** to produce the constructed values of the inverse Mills ratio,  $\lambda$
  - Run the **outcome equation** using **ordinary least squares** where the RHS variables include the constructed values of the inverse Mills ratio,  $\lambda$ , with the **sample observations only**
  - $\lambda$  represents the **correlation between the unobservables** in the selection and outcome equations

### Factors affecting selection

#### Probit model

- n = 381; pseduo  $R^2 = 0.1263$ ; LL = -215.8726
- Age – older students are more likely to submit consistent surveys (b = 0.0319)
- Weighted course average – better (more able) students are more likely to submit consistent surveys (b = 0.0293)

### Factors affecting final marks after correction for selectivity bias (substantive model)

#### OLS model

- n = 381; Wald  $\chi^2 = 21.67$ ; LL = -741.7663
- lambda = -18.3601, that is unobserved characteristics that result in some students being less likely to be surveyed also contribute to some students having higher final marks

#### Final marks

- Increase with
  - Discount rate (b = 25.3955)
  - Tutorial attendance (b = 3.2693)
- Decrease with
  - Discount rate x tutorial attendance (b = -2.1443), that is, the positive effect of tutorial attendance on final marks is more than offset by the negative effect of high discount rates

### Much ado about nothing?

Comparison	OLS without correction for selectivity bias	OLS with correction for selectivity bias
Discount rate	b = 39.8244	b = 25.3955
Tutorial attendance	b = 5.4560	b = 3.2693
Interactive term	b = -3.3876	b = -2.1443

## Take home message

- Interventions can be evaluated with survey data
- But .. ensure there is a hold-out / control group
- Check for selection bias
  - May change which are the important variables and their sign
  - May change their magnitude
  - May not change anything much

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