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

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Earlier study

• “Patience is a virtue” but not for first year economics students  
  – Final marks increased with discount rate (impatience)  
  – 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?

Yes 😊

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

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)

Sample (n = 163)  
• In class surveys  
  – 191 completed surveys (46.4%)  
  – 163 surveys with discount rates (39.6%)
Characteristics from student admin data

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>1 = Male</th>
<th>1 = Joondalup</th>
<th>1 = Bachelor of Business</th>
<th>1 = Full-time</th>
<th>1 = International</th>
<th>1 = Enrolled in or already completed first year Finance unit</th>
<th>1 = University</th>
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</thead>
<tbody>
<tr>
<td>Gender</td>
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<td>Outer metropolitan campus</td>
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<td>Parents' education level</td>
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Characteristics from survey

<table>
<thead>
<tr>
<th>Characteristic</th>
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</thead>
<tbody>
<tr>
<td>Discount Rate</td>
<td>The annual discount rate implied by the decision to switch (upper bound)</td>
</tr>
<tr>
<td>Parents' education level</td>
<td>1 = University</td>
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</tbody>
</table>

Characteristics from tutor records

<table>
<thead>
<tr>
<th>Characteristic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorial Attendance</td>
<td>Number of Economics tutorials attended (out of 13) during the semester</td>
</tr>
</tbody>
</table>

Survey

The survey included twenty choice statements:

1. Paid one month from now: $54  □        Paid 7 months from now: $54.36   □
2. Paid one month from now: $54  □        Paid 7 months from now: $56.04   □
3. Paid one month from now: $54  □        Paid 7 months from now: $58.20   □
4. Paid one month from now: $54  □        Paid 7 months from now: $60.24   □
5. Paid one month from now: $54  □        Paid 7 months from now: $62.50   □
6. Paid one month from now: $54  □        Paid 7 months from now: $64.80   □
7. Paid one month from now: $54  □        Paid 7 months from now: $67.08   □
8. Paid one month from now: $54  □        Paid 7 months from now: $69.48   □
9. Paid one month from now: $54  □        Paid 7 months from now: $71.98   □
10. Paid one month from now: $54 □        Paid 7 months from now: $74.46 □
11. Paid one month from now: $54 □        Paid 7 months from now: $76.98 □
12. Paid one month from now: $54 □        Paid 7 months from now: $79.48 □
13. Paid one month from now: $54 □        Paid 7 months from now: $81.98 □
14. Paid one month from now: $54 □        Paid 7 months from now: $84.46 □
15. Paid one month from now: $54 □        Paid 7 months from now: $86.98 □
16. Paid one month from now: $54 □        Paid 7 months from now: $89.48 □
17. Paid one month from now: $54 □        Paid 7 months from now: $91.98 □
18. Paid one month from now: $54 □        Paid 7 months from now: $94.46 □
19. Paid one month from now: $54 □        Paid 7 months from now: $96.98 □
20. Paid one month from now: $54 □        Paid 7 months from now: $99.48 □

Comparison of students who completed the survey (n = 191) with those who didn't (n = 221)

Students who completed the survey:
• Were slightly older  
  – (F = 8.85; p = 0.0031)
• Had higher final mark (55% cf 37%)  
  – (F = 60.40; p = 0.000),
• Had higher course average (60% cf 48%)  
  – (F = 42.39; p = 0.000),
• Attended more tutorials (on average 10 cf 6)  
  – (F = 140.75; p = 0.000)
• Had parents with less education (43% cf 59%)  
  – (chi sq = 8.3518; p = 0.004).
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 (IRISAD) 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

Factors affecting selection

Probit model
- n = 381; pseudo R² = 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)

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, λ
  - Run the outcome equation using ordinary least squares where the RHS variables include the constructed values of the inverse Mills ratio, λ, with the sample observations only
- λ represents the correlation between the unobservables in the selection and outcome equations

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

OLS model
- n = 381; Wald chi² = 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?
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