CRDCN Webinar Series

Rising student employment: the role of tuition fees

with Christine Neill
February 24, 2016
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Our speaker today: Christine Neill

- Christine Neill is associate professor in the Department of Economics at Wilfrid Laurier University.
- Her research to date has focused on university financing, student loan policies, and individuals' education decisions.
- Currently, she is examining how the switch to full-day kindergarten in Ontario's French language schools has changed students' test scores and their parents' propensities to work outside the home.
- Today’s presentation is based on her article “Rising student employment: the role of tuition fees,” *Education Economics*, 23:1, 101-121.
Do tuition fee increases increase student work?

Christine Neill
Wilfrid Laurier University

CRDCN Webinar, February 24 2016
University students are working more

Full-time university students’ in-semester work
University students are working more

Full-time university students’ in-semester work
University tuition fees: 1979-2015

Provincial average undergraduate tuition fees plus compulsory ancillary fees, StatsCan TLAC.
Research goal

- Examine causes of increase in percentage of students working while studying
  - Interesting labour supply problem
  - Further evidence on credit constraints
  - Policy implications for student loan programs, and general financing of university education

- Look at responses to tuition fee increases on other dimensions than enrolments
Why does student’s part-time work matter?

- Affects their education
  - Working may mean less time for study (Stinebrickner & Stinebrickner, 2003)
  - Potentially lower lifetime income

- Affects work experience
  - Working may also be an investment (Light, 2001)

- Mitigates effect of credit constraints
  - Keane and Wolpin (2001)
  - Policy issues in student loan program
Focus on in-semester work

Returning university students’ summertime work

- % working
- Average hours if working (RHS)

- % working over years:
  - 1979
  - 1981
  - 1983
  - 1985
  - 1987
  - 1989
  - 1991
  - 1993
  - 1995
  - 1997
  - 1999
  - 2001
  - 2003

- Average hours if working:
  - 50
  - 45
  - 40
  - 35
  - 30
  - 25
  - 20
  - 15
  - 10
  - 5
  - 0
All returning students, 20-24yo, % working

Men

Women
Higher fees are the only major economic variable that seems to explain increase in students’ work. But response is not nearly enough to cover increased costs due to fee increases. Larger responses not necessarily among the groups of students we’d think of as credit constrained.
Theory – effects of fees on work while studying (static model)

- Higher tuition fees reduce disposable income of students
  - Increasing hours of work
  - Reducing lifetime benefits of studying relative to working
Combining work and study: a very little theory

- Suppose you can’t work at all while studying
  - Fewer choices -> worse off
  - If credit constrained, may not be able to study at all

- Allowing students to work while studying should
  - Increase numbers of students at university
    - Especially (but not only) among those who are credit constrained
Combining work and study: a very little theory

- Tuition fees only matter (much) for an individual student’s decision to work if there are credit constraints
  - Should pay for fees out of lifetime income; balance out opportunity cost of time
  - If there are credit constraints,
    - higher fees may force some students to work more in order to stay in
    - Others may be forced to drop out
- Compositional effects vs individual effects
Factors affecting work/study

- Factors affecting probability of work conditional on studying (from theory) are
  - $w_1$: Wages for PT work (+)
  - $\eta$: Return to work experience (+)
  - $\sigma$: Return to intensity of study (-)
  - $t$: Tuition fees (+)
    - Only matters much if there are credit constraints
  - Relative length of study period and post-study period

- Other factors:
  - Labour market conditions (unemployment rates)
  - Composition of the university population
  - Expectations of standard of living (?)
Empirical strategy

- Using individual level data, conditional on being a full-time student:

\[ W_{ipt} = \alpha + \beta \text{Fee}_{pt} + X_{pt} \gamma + D_i \delta + Y_t \rho + P_p \lambda + P Y_{pt} \tau + \varepsilon_{ipt} \]

- \( W_{ipt} = 1 \) if working (also use usual hours of work)
- \( \text{Fee}_{pt} = \) real provincial average tuition + compulsory fees
- \( X_{pt} = \) province-year level controls
- \( D_i = \) dummy variables for individual characteristics
- \( Y_t = \) year dummies
- \( P_p = \) province dummies
- \( P Y_{pt} = \) Province-specific time trends

- OLS/LPM; standard errors are robust, adjusted for clustering at province-year level
Empirical strategy

- Two main approaches
  - Estimate probability of working (and hours of work) conditional on being a full-time university student
  - Estimate MNL model of decision to not to study, to study and not work, and to study and work

- Robustness checks
  - Probit/Tobit
  - Quantile regressions
  - Serial correlation
Data from on 18-24 year old full-time university students from LFS master files from 1979-2011

- Identifies students who are usually resident in a province who attend any university full time (not necessarily in that province)

- Detailed results for December shown (comparison with other months)

- Why the master files?
  - Need as much family information as possible, to try to get at issue of credit constraints. Master files allow a match of children to parents (with reservations)
Data – family background

- The LFS is a household-based survey
  - Includes responses to LFS questions for parents
  - No wage/income information until 1997

- Sample divided into four “parental background” groups:
  - No information on parental education
    - Mostly because the individual was living independently of their parents
  - Parent/s have high school or less
  - Parent/s have some post-secondary, not uni
  - Parent/s have a university degree

- Also have a group with one or more individuals in household unemployed
## Summary statistics – 1979-2011
(individual data, Dec LFS)

<table>
<thead>
<tr>
<th></th>
<th>University students (18-24 yo)</th>
<th>All 18-24 yos</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not working</td>
<td>Working</td>
</tr>
<tr>
<td>Number of observations</td>
<td>68,408</td>
<td>450,525</td>
</tr>
<tr>
<td>% working full time</td>
<td>0.022</td>
<td>0.382</td>
</tr>
<tr>
<td>% working part time</td>
<td>0.382</td>
<td>0.253</td>
</tr>
<tr>
<td>Usual hours worked</td>
<td>0</td>
<td>15.7</td>
</tr>
<tr>
<td>Average hourly earnings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% female</td>
<td>0.500</td>
<td>0.592</td>
</tr>
<tr>
<td>Average age</td>
<td>20.7</td>
<td>20.9</td>
</tr>
<tr>
<td>% with someone in family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unemployed</td>
<td>0.077</td>
<td>0.076</td>
</tr>
<tr>
<td>% living at home</td>
<td>0.734</td>
<td>0.731</td>
</tr>
<tr>
<td>By parental education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>0.266</td>
<td>0.269</td>
</tr>
<tr>
<td>High school or less</td>
<td>0.175</td>
<td>0.170</td>
</tr>
<tr>
<td>At least one parent has some PSE</td>
<td>0.235</td>
<td>0.274</td>
</tr>
<tr>
<td>At least one parent has a BA</td>
<td>0.325</td>
<td>0.286</td>
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</table>
### LPM estimates (December)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition fee (log)</td>
<td>0.090</td>
<td>0.090</td>
<td>0.090</td>
</tr>
<tr>
<td></td>
<td>(0.0235)**</td>
<td>(0.0237)**</td>
<td>(0.0238)**</td>
</tr>
<tr>
<td>Student loan limit (log)</td>
<td>-0.016</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0364)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.099</td>
<td>0.098</td>
<td>0.098</td>
</tr>
<tr>
<td></td>
<td>(0.0063)**</td>
<td>(0.0062)**</td>
<td>(0.0062)**</td>
</tr>
<tr>
<td>Parental education:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS or less</td>
<td>0.043</td>
<td>0.043</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0090)**</td>
<td>(0.0090)**</td>
<td></td>
</tr>
<tr>
<td>Some PSE</td>
<td>0.062</td>
<td>0.062</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0087)**</td>
<td>(0.0087)**</td>
<td></td>
</tr>
<tr>
<td>Uni degree</td>
<td>-0.005</td>
<td>-0.005</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0090)</td>
<td>(0.0090)</td>
<td></td>
</tr>
<tr>
<td>Minimum wage</td>
<td>-0.005</td>
<td>-0.006</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(0.0063)</td>
<td>(0.0063)</td>
<td>(0.0064)</td>
</tr>
<tr>
<td>UR of HS grads</td>
<td>0.081</td>
<td>0.078</td>
<td>0.079</td>
</tr>
<tr>
<td></td>
<td>(0.1422)</td>
<td>(0.1411)</td>
<td>(0.1415)</td>
</tr>
<tr>
<td>UR of Uni grads</td>
<td>-1.487</td>
<td>-1.405</td>
<td>-1.410</td>
</tr>
<tr>
<td></td>
<td>(0.3505)**</td>
<td>(0.3492)**</td>
<td>(0.3481)**</td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td>68408</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>0.034</td>
<td>0.0373</td>
<td>0.0373</td>
</tr>
</tbody>
</table>

Standard errors, robust and clustered at the province level, are in parentheses. All regressions include province and year FE, and province-specific time trends.

Doubling fees => 6% pt more students working

Women 10% pts more likely to work than men
Kids whose parents have HS or less / some PSE more likely to work than ‘unknown’ education category

Higher UR(uni), less work
Effect of (log) tuition fees on percentage of students working, by month

Blue squares are point estimates. Bars indicate 95% confidence interval.
By sex:

Dots are point estimates. Bars indicate 95% confidence interval.
By parental education:

Parental education unknown

HS or less

Some Post-secondary

University degree

Dots are point estimates. Bars indicate 95% confidence interval.
Effect of (log) tuition fees on hours of work of full-time students, by month

Standard errors, robust and clustered at the province-year level, are in parentheses.
By sex:

Dots are point estimates. Bars indicate 95% confidence interval.
By parental education:

Parental education unknown

HS or less

Some Post-secondary

University degree

Dots are point estimates. Bars indicate 95% confidence interval.
How much of the change in work does tuition fees explain?

Method 1:
- Tuition fees increased by around $2000 in real terms in 1990s (from $2000 to $4000)
- The estimated effects suggest this explains
  - A 6% pt increase in probability of working
    - Actual increase over 1990s was 5% pts
  - An increase in average hours worked of 1.1 hours per week
    - Actual increase over 1990s was 1 hour

Method 2:
- Graph the estimates of year fixed effects in a model with and without tuition fees
Estimated year fixed effects

Because more women are enrolling in university and women are more likely to work, the ‘unexplained’ rise in work decreases when I include a female dummy variable.
Including tuition fees helps explain quite a bit of growth in students’ work over 1990s. Min wages and unemployment rates do not – they work in the opposite direction, if anything.
Individual-level heterogeneity

- Changes in tuition fees may affect composition of student body
  - Then, estimates of impact of fees on students’ work conditional on being a student biased
  - Direction of the bias is unclear
Compositional issues - % working by sex:

Since women are increasing % of students, % working goes up for all students faster than for either men or women – purely compositional
Women work fewer hours than men,

Note: 15 hours per week is in the danger zone for academic performance
Dealing with compositional issues empirically:

- Control for individual characteristics (especially sex, parental education where it is known)
- Use MNL
  - Includes all individuals
  - IIA assumption?
- Look at relatively homogeneous sub-groups whose enrolment rates don’t change in response to fees
Heterogeneity – subsample approach

- Tuition fees have little effect on enrollment rates of students who have at least one parent with a university degree (Neill, 2008)

- This group has a relatively large predicted probability of work effect, but not much on the hours of work front
  - Remains true when use IV strategy to account for possible endogeneity of tuition fees
Robustness checks

- **Probit / Tobit**
  - Results are more precisely estimated with a slightly stronger effect of fees

- **Quantile regressions**
  - Results overall confirm the average results
  - But suggest there may be some effect of fees on hours of work of students whose parents have some post-secondary education
Conclusions

- Tuition fees are the only economic variable that can explain any of the trend increase in students’ work in the past two decades
  - Work hasn’t risen enough to offset increases in tuition fees

- Family background matters:
  - Low education: not much effect on enrolment or work
    - Student loans? But limited evidence
  - Middle education: large enrolment effect, little work probability effect, but some hours of work effect
  - High education: no enrolment effect, quite large work effect

- Implied elasticity of labour supply is larger than typical estimates
  - Suggests lack of intertemporal substitutability of labour supply, perhaps due to credit constraints?
Policy implications?

- Taxback rates on part time employment income for CSLP probably not helpful
  - Restricts choices / reduces income
  - CSL/OSAP no longer has PT work clawback (2015 budget) – as of 2016-17?

- The relationship is not linear in real fees (log).
  - There are real costs to students working too many hours
What could be done better?

- Don’t have parental income information, or parental background for a lot of the students
  - Would be nice to use LAD for family income data … but not generally available in RDCs
  - Can get at university and college attendance (via tuition/education tax credits, contemporaneous); potentially student loan use (student loan interest credit, looking forward); parental income (matching back in time); employment income (though not separately by month, nor hours of work?)
  - Also allows us to use panel data, to some extent
    - Work experience is somewhat persistent
- Use recent changes to examine effect of PT work clawback changes on student work and enrolment (need to wait a few years)
Questions?
Extras
Identification

- Individual-level controls:
  - Controls for observed composition of student body

- Province and year FE:
  - Identification is from deviations from the province’s average fee and enrollment rate compared with other provinces’ average fees and enrollment rates in that year

- Province-specific time trends:
  - Somewhat smaller effects if do not include these.
Tuition fees and compositional effects

Suppose students with highest value from university are also students who tend to spend more time on paid work.

Coefficient estimate biased upward due to compositional effects.

Tuition fees increase – this increases propensity to work for all students.

But also leads some students to drop out.

Not enrolled

Enrolled

Benefits(Uni)

P(working|Uni)
Serial correlation: empirical strategy

- Recent papers (Bertrand et al., 2004; Hansen, 2004) highlight serial correlation as a potential concern in grouped quasi-experimental empirical strategies
  - Particularly DiD

- One solution: clustering standard errors at the province level
  - Allows for arbitrary forms of serial correlation
  - But low power
  - Estimates of tuition fee impacts remain statistically significant
Hansen’s solution: estimate the model in two stages:

\[ E_{ipt} = D_i\delta + (Y_t P_p) \zeta_{pt} + \varepsilon_{ipt} \]

\[ \zeta_{pt} = \alpha + \beta F_{ept} + X_{pt} \gamma + Y_t \rho + P_p \lambda + \nu_{pt} \]

\( \zeta_{pt} \) = coefficients on province-year dummies from individual-level equation

Results:
- AR coefficients never estimated statistically significant
- FGLS estimates very close to LPM, statistically significant
IIA and Multinomial Probit

- IIA assumption in MNL makes it unattractive
- Alternative: MNP
- Problem:
  - “identification … is extremely tenuous in the absence of exclusion restrictions. This … is important because formal identification of multinational probit models does not require exclusion restrictions”
- Exclusion restriction here: something that affects decision to attend university, but not the decision to work while in university
  - The theoretical model in the paper has nothing that would meet this criterion
## Quantile regressions

Effect of tuition fees on quantiles of hours worked, December

<table>
<thead>
<tr>
<th></th>
<th>90th</th>
<th></th>
<th>80th</th>
<th></th>
<th>70th</th>
<th></th>
<th>60th</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Coeff</td>
<td>Std err.</td>
<td>Coeff</td>
<td>Std err.</td>
<td>Coeff</td>
<td>Std err.</td>
<td>Coeff</td>
<td>Std err.</td>
</tr>
<tr>
<td>Basic</td>
<td>1.57</td>
<td>0.98</td>
<td>1.33</td>
<td>0.77</td>
<td>1.54</td>
<td>0.85</td>
<td>1.36</td>
<td>0.93</td>
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<tr>
<td>Trends</td>
<td>2.83</td>
<td>1.11</td>
<td>2.98</td>
<td>0.91</td>
<td>3.93</td>
<td>0.98</td>
<td>2.61</td>
<td>1.15</td>
</tr>
<tr>
<td>By parental ed</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>10.18</td>
<td>2.97</td>
<td>7.23</td>
<td>2.16</td>
<td>5.30</td>
<td>2.06</td>
<td>1.04</td>
<td>2.35</td>
</tr>
<tr>
<td>&lt;HS</td>
<td>2.42</td>
<td>1.74</td>
<td>1.90</td>
<td>1.77</td>
<td>1.54</td>
<td>1.82</td>
<td>3.77</td>
<td>2.42</td>
</tr>
<tr>
<td>Some PSE</td>
<td>2.92</td>
<td>1.96</td>
<td>5.17</td>
<td>1.85</td>
<td>6.07</td>
<td>1.02</td>
<td>3.12</td>
<td>1.84</td>
</tr>
<tr>
<td>&gt;=BA</td>
<td>-1.83</td>
<td>2.10</td>
<td>-1.16</td>
<td>1.71</td>
<td>1.98</td>
<td>1.88</td>
<td>1.63</td>
<td>2.02</td>
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</table>
## LPM vs IV estimates

<table>
<thead>
<tr>
<th></th>
<th>LPM Coeff</th>
<th>LPM Std error</th>
<th>IV Coeff</th>
<th>IV Std error</th>
<th>Hausman t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>No Trends</td>
<td>0.121</td>
<td>0.054</td>
<td>0.089</td>
<td>0.101</td>
<td>-0.608</td>
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<tr>
<td>Trends</td>
<td>0.132</td>
<td>0.059</td>
<td>0.129</td>
<td>0.081</td>
<td>-0.037</td>
</tr>
<tr>
<td>Hours</td>
<td></td>
<td></td>
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<tr>
<td>No Trends</td>
<td>0.564</td>
<td>0.865</td>
<td>0.312</td>
<td>1.628</td>
<td>-0.291</td>
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<tr>
<td>Trends</td>
<td>0.486</td>
<td>0.946</td>
<td>1.308</td>
<td>1.390</td>
<td>0.869</td>
</tr>
</tbody>
</table>

- Estimated only for individuals who have at least one parent with a university degree
- No statistically significant difference between the LPM and IV estimates
  - Suggests endogeneity not a concern here
Extensive vs intensive returns to education

Year 1

Year 2
Extensive vs intensive returns to education

Year 1

hrs of study

S_L

S_H

R_H

R_L

r
FT University Enrollment rate – administrative data vs LFS

% of 18-24 year old population

LFS

Administrative

Enrollment rates, by parental education
Living arrangements of full time university students

- With parents
- Unattached
- Married
- Other
Percentage of 18-24yo population enrolled in university full time, by province
Percentage of 17-24yo population enrolled in university full time, by province
Static labour supply model

Income \( wT + A \)

Leisure (\( l \))
Comparison of actual wages of university students and minimum wage

- Male university students
- Female university students
- Minimum wage
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