The Pell and the Poor:
A Regression Discontinuity Analysis of On-Time College Enrollment

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Why is this topic important?

- **Biggest federal financial aid program**
  - The Pell Grant is considered the foundation of federal financial aid to pay college costs.
  - Other federal, state, and institutional grants use Pell-eligibility as the marker for eligibility
- **Lots of money spent on Pell Grant**
  - In SY2009-10, approximately $18.8 billion was allocated to fund the Pell Grant (Mitchem, 2009).
- **More education = public and private benefits**
  - A plethora of public and private benefits emerge from increased education, including increased income, improved individual health, more active citizenry, less welfare costs, and greater levels of happiness.

What is my research question?

Does having an *Expected Family Contribution* (*EFC*) that falls at or below the federal government cutoff for eligibility for a Pell Grant cause on-time high school graduates who have completed a Free Application for Federal Student Aid (*FAFSA)* to have a higher probability of enrolling in college on-time in comparison to students just above the cutoff?

What data do I use?

The Educational Longitudinal Study of 2002 (ELS: 2002)

Key features:

- Restricted access data from the 2002, 2004, and 2006 survey years
- The most recent national, longitudinal dataset with the necessary variables to track: income, financial aid, HS completion, and college enrollment
- Stratified random sampling design
- Contains financial data from the Free application for Federal Student Aid (FAFSA)
- Weights allow for generalizing findings back to U.S. population

Who is in my sample?

- Of the 16,197 students in the original ELS:2002 dataset, 5,260 students were included in my sample
  - These students were:
    - On-time high school graduates
    - FAFSA-completers
  - Of the students in my sample, 2,239 (43%) were Pell-eligible

What are the sample's summary statistics?

- 86% of all students in my sample entered at least a two-year college the first semester after high school.

- Of those, 1,961 students (or 23%) were Pell-eligible.

- Pell-eligible students, on average, are:
  - More often Black and Hispanic
  - Poorer
  - Worse prepared academically
  - Concentrated in K-12 schools with greater poverty

What measures do I use?

Question Predictors:

- *CEFC$_i$*
  - Re-centered on cut score recommended for reclassification ($3850)
  - Continuous predictor used as forcing variable (Imbens & Lemieux, 2008)
- *ATORBELOW3850$_i$*
  - Dichotomous predictor (1=if EFC $\leq$ $3850; 0 otherwise)

Outcome:

- *ONTIMECOLL$_i$*
  - Dichotomous outcome (1=enrolled fall after HS graduation PT or FT in a 2- or 4-yr school; 0 otherwise)

Covariates:

  - A range of demographic, financial, academic, and peer group characteristics, as well as state controls
  - This vector of covariates is represented by the symbol *Z_i.*

How do I answer my research question?

- Regression Discontinuity design
  - Sharp discontinuity, meaning clear cut point
  - Logistic regression model

$Logit\ (ONTIMECOLL_i = 1) = B_0 + B_1\ CEFC_i + B_2 ATORBELOW3850_i + B_3 CEFC_i x ATORBELOW3850_i + \gamma' \mathbf{Z}_i$

What are my preliminary findings?

1. Pell-eligibility status does not increase the probability that a low-income student on the margin of receiving financial aid will enroll in college on-time.

   – This is the case in uncontrolled and controlled models.

   – Pell-eligibility parameter estimates dependent on choice of analytic window, but are always small and never statistically significant.

2. English as a first language and higher ACT scores are significant predictors of college enrollment

How is this discontinuity illustrated?

Figure 1. Fitted Probability that an On-time High School Graduate Enrolls in College On-Time, by CEFC and Pell-Eligibility.
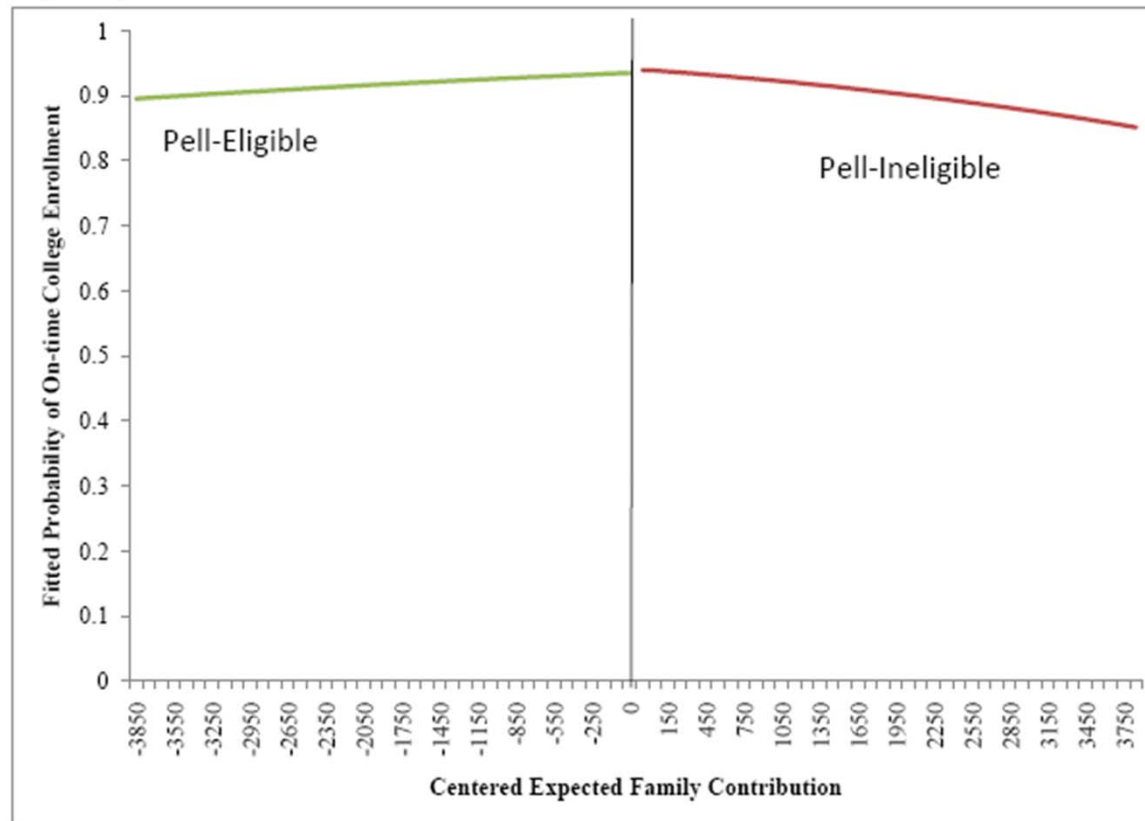
What are the parameter estimates for my uncontrolled model?

Table 1. Regression-discontinuity estimates of the causal impact of being at, or below, the maximum federal *EFC* value of $3,850 versus being above the federal *EFC* value of $3,850 on on-time college enrollment for on-time high school graduates in the United States, for several analytic-window widths around the Pell Grant cut off.

Window Width (EFC range in dollars)	Number of Students In Each Window	Predictor: ATORBELOW3850		Predictor: CEFC	Predictor: CEFCx ATORBELOW3850	-2LL Statistic	-2LL/ Number of Students
		Estimate	Standard Error	Estimate	Estimate		
{3700, 4000}	103	-1.35	1.86	-.009	.01	44.76	.435
{3550, 4150}	155	-1.06	1.25	-.001	-.007	61.78	.399
{3350, 4350}	260	-.04	.95	-.001	-.0002	114.01	.439
{3100, 4600}	385	-.43	.84	-.0007	.0009	173.57	.451
{2850, 4850}	496	-.40	.75	-.001	.002	250.34	.505
{2600, 5100}	623	-.53	.64	-.0007	.0004	300.97	.483
{2350, 5350}	748	-.22	.59	-.0005	.001	381.22	.510
{2100, 5600}	876	-.17	.53	-.0002	.0003	442.24	.505
{1850, 5850}	997	.025	.51	-.0003	.0006	529.69	.531
{1600, 6100}	1132	-.14	.47	-.0003	.0005	606.59	.536
{1350, 6350}	1261	-.51	.45	-.0006**	.0007*	703.69	.558
{1100, 6600}	1389	-.36	.43	-.0006**	.0007**	801.12	.577
{850, 6850}	1514	-.23	.40	-.0003*	.0005*	861.77	.569
{500, 7100}	1669	-.27	.38	-.0003*	.0004*	946.25	.567
{350, 7350}	1757	-.14	.37	-.0003	.0003	1001.69	.570
{100, 7600}	1912	-.06	.35	-.0003*	.0004*	1122.18	.587
{0, 7700}	1922	-.08	.35	-.0003*	.0004**	1132.38	.589

Note: ~p<.10; *p<.05; **p<.01, one-sided test

What are the parameter estimates for my controlled model?

Table 2. Taxonomy of logistic regression models that display the fitted relationship between on-time college enrollment (versus not enrolling in college on-time) and being at or below the Federal *EFC* cutoff score of $3,850 for Pell eligibility for 997 on-time high school graduates across the United States (with a window width of 1850-5850 *EFC*), including covariates.

	Baseline M1	M2
Intercept	2.8202***	-2.438*
CEFC	-0.00025	0.0003
ATORBELOW3850	0.0254	0.6438
CEFC×ATORBELOW3850	0.0006	0.0001
Demographic Controls		
Gender		0.2831~
Race		0.0443
English as 2nd+ Language		-0.6880*
Parental education		0.0773
Financial Controls		
Contributing to others		0.0868
Family income		<-0.0001
Pell cost of attendance		0.0001
Academic Controls		
ACT scores		0.1996***
Algebra II or above		0.2292
School and State Controls		
% FRL in high school		0.0344
State unemployment rate		0.0067
R^2	0.0026	0.0598
-2LL	529.69	768.673

Key: ~$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$

Why might these findings exist?

- FAFSA complexity and aid uncertainty may impede my ability to find an effect
  - Complexity and uncertainty lead many low-income students who would likely be eligible for the Pell Grant to not apply (which biases my estimates downward)

- Pell amount may be too small to make a difference (minimum award = $400)
  - Must increase the ratio of Pell funds to tuition and fees

What are avenues for future research?

- Examine the Pell as a % of college tuition/fees to determine whether grant size or % of net cost has a greater impact on low-income students' decision to enroll.

- Exploit smaller discontinuities in the Pell formula to identify the effects of the grant at varying aid amounts on low-income students' decision to enroll.

- Study whether the Pell impacts students' choice of institution.

What are limitations and potential threats to validity?

- FAFSA-completers are a small, already motivated portion of general low-income student population

- Imperfect EFC variable
  - Federal methodology
  - Institutional methodology

- Analysis does not separate Pell effects based on amount of aid award

Questions or comments?

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Thank you for your attendance and participation!

Appendix A: Sample Statistics

Table 3. Sample Descriptive Statistics by Pell-eligibility for 5,260 On-time High School Graduates

	Federal *EFC* ≤ $3,850 (n=2239)	Federal *EFC* > $3,850 (n=3021)
Demographics		
Male	.401	.458
White	.432	.738
Black	.218	.064
Asian	.141	.076
Hispanic/Latino	.153	.071
Other Race	.013	.007
English is Second+ Language	.745	.923
Parental Education		
Some high school	.078	.009
High school graduate	.223	.095
Some college	.364	.294
College graduate	.206	.315
Advanced degree	.128	.285
Academic Preparation		
GPA (0.01-2.00)	.091	.027
GPA (2.01-3.00)	.411	.285
GPA (3.01-4.00)	.681	.827
Highest math Algebra II or above	.840	.931
Other		
High School 0-30% FRPL	.648	.868
High School 31-75% FRPL	.273	.121
High School 76-100% FRPL	.079	.012
Contributes to others' finances	.180	.054

Source: Educational Longitudinal Study of 2002

Appendix B: Characteristics of Students' Higher Education Institutions

Table 4. Characteristics of first higher education institution attended by Pell-eligibility status for on-time college enrollees (n=5260).

	Pell Ineligible	Pell Eligible	Total
Public, 4-yr +	1481 (63%)	881 (37%)	2362 (45%)
Private, not-for-profit, 4-yr +	855 (68%)	397 (32%)	1252 (24%)
Private, for-profit, 4-yr +	34 (43%)	45 (57%)	79 (2%)
Public, 2-yr	597 (42%)	814 (58%)	1411 (27%)
Private, not-for-profit, 2-yr	14 (54%)	12 (46%)	26 (<1%)
Private, for-profit, 2-yr	31 (34%)	60 (66%)	91 (<1%)
Highly selective, 4-yr	975 (75%)	324 (25%)	1299 (25%)
Moderately selective, 4-yr	1080 (64%)	618 (36%)	1698 (32%)
Inclusive, 4-yr	191 (43%)	254 (57%)	445 (8%)
Selectivity not classified	774 (43%)	1042 (57%)	1816 (35%)
Open admissions	672 (41%)	967 (59%)	1639 (31%)

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