The Incidence of Student Financial Aid: Evidence from the Pell Grant Program

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Background and Motivation

- Affordability and access to higher education
  - Large private returns, positive externalities, credit constraints
  - Rationale for need-based student aid

- Federal Pell Grant Program
  - $35 billion provided to 9.5 million low-income students (2011)

- Effectiveness of need-based aid depends on whether it "sticks"
  - Tax incidence framework

- Shift in the organization of higher education
 - Growth of the for-profit sector

Overview

- ## Framework:
  - Schools observe students' ability to pay and outside aid
  - Offer schedule of prices via:
    - Overall tuition
    - Individual discounts (scholarships)
- ## Data: National Postsecondary Student Aid Survey (NPSAS)
- ## Questions:
  - What is the economic incidence of need-based aid?
    - How much of every Pell $1 is passed-through to schools?
  - Does behavior vary across sectors (control, selectivity)?
    - Can we say something about schools' objectives from their response?

Contributions

- Estimate the economic incidence of need-based aid
  - Regression discontinuity (RD) and regression kink (RK) designs
  - On average, students' prices fall by $0.84 for every $1 of Pell Grant aid
  - $0.16 passed-through to schools

- Highlight a general vulnerability of the RD design
  - RD does not identify pass-through of outside student aid
  - "Treatment" of Pell Grant receipt is multidimensional

- Develop a combined RD/RK estimator
  - Allows for separate identification of treatment dimensions
 - Applicable in other circumstances

The Pell Grant Program

Legend: Maximum Pell Grant (nominal) — Maximum Pell Grant (2011$)

COA
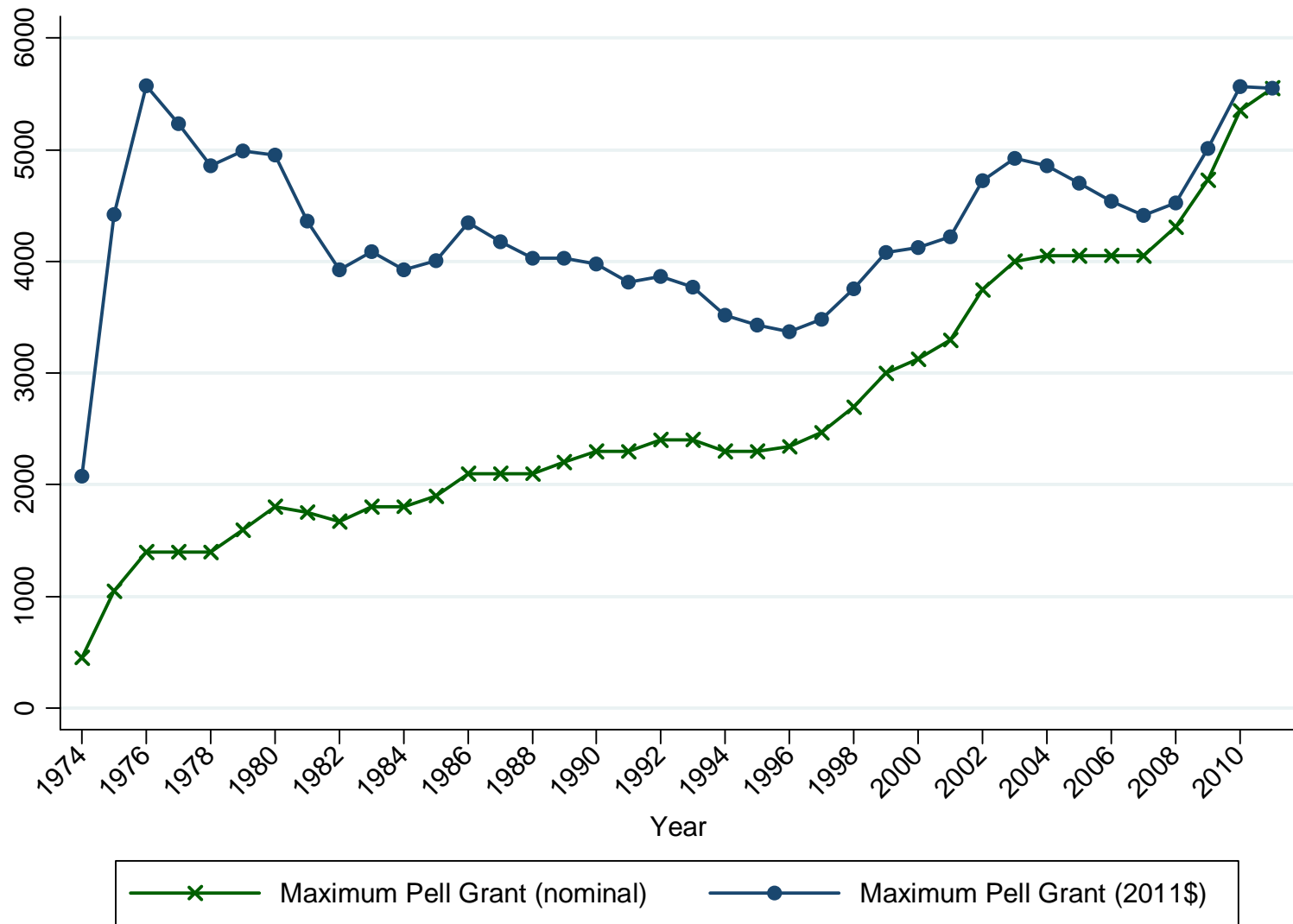
The Pell Grant Program

- Variation in maximum award not exogenous

  – 75% of eligible students receive less than maximum

- Statutory award for student *i* in year *t* depends on both her expected family contribution (EFC) and the maximum award

$$Pell_{it} = \max\{\ (maxPell_t - EFC_{it}),\ 0\}$$

- Students with $Pell_{it} \in \left[200,399\right]$ receive $400

- EFC is a nonlinear function of dependency status, income, assets, family size, number of siblings also attending college

EFC worksheet

The Empirical Distribution of Pell Grant Aid
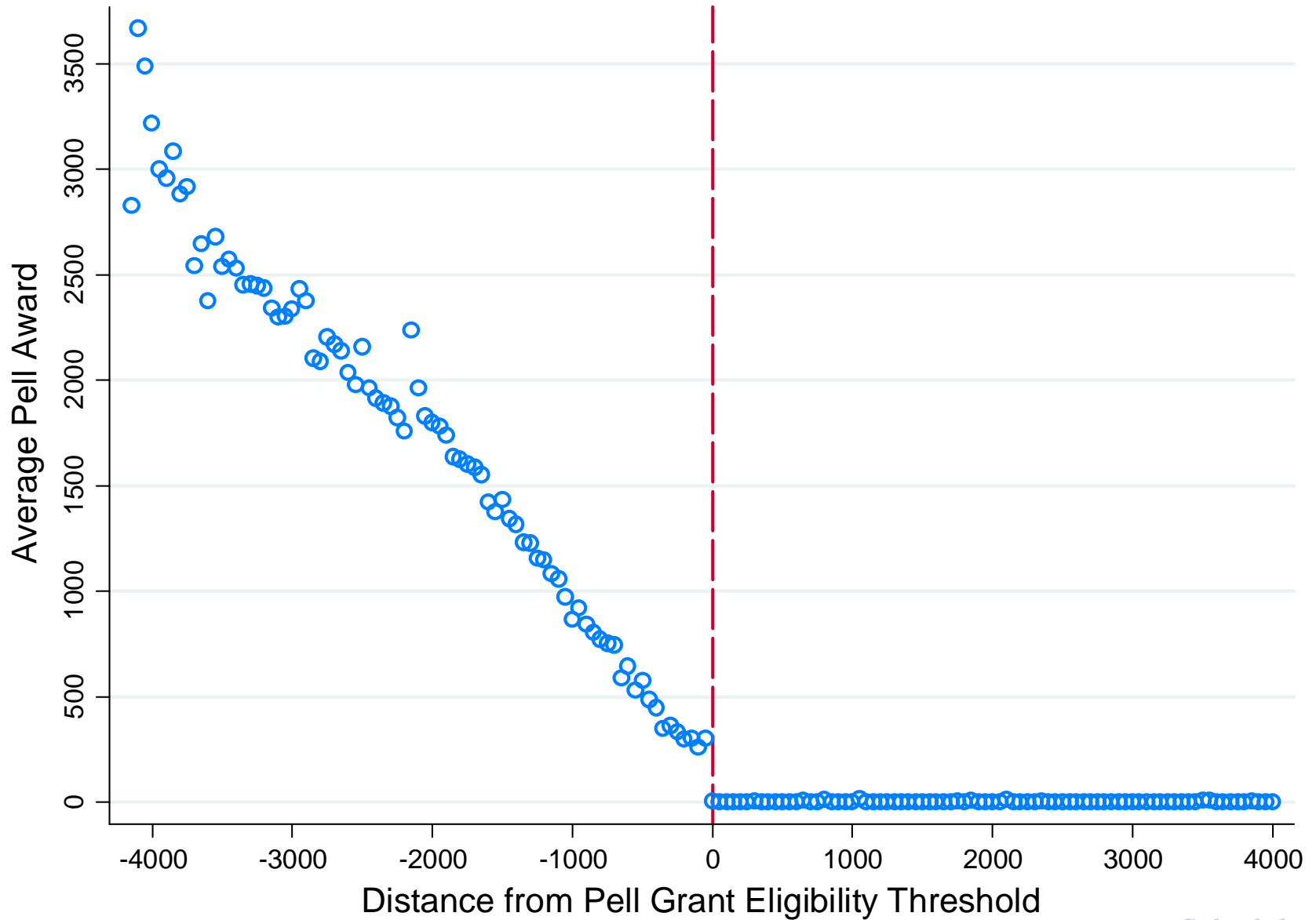
Schedules

The Regression Kink Design

- Analogous to RD design
  - Identification from discontinuous change in <u>derivative</u> (versus change in <u>level)</u> of endogenous regressor (Nielsen et al., 2010; Card et al., 2009)

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- Key identifying assumption:
  - Conditional on unobservables, density of EFC is continuously differentiable at threshold for Pell Grant eligibility

    => Individuals cannot perfectly sort

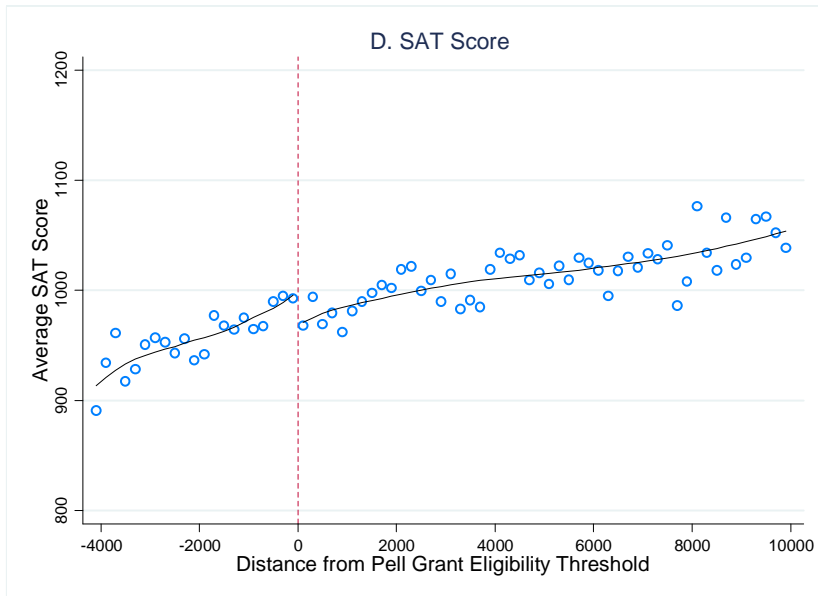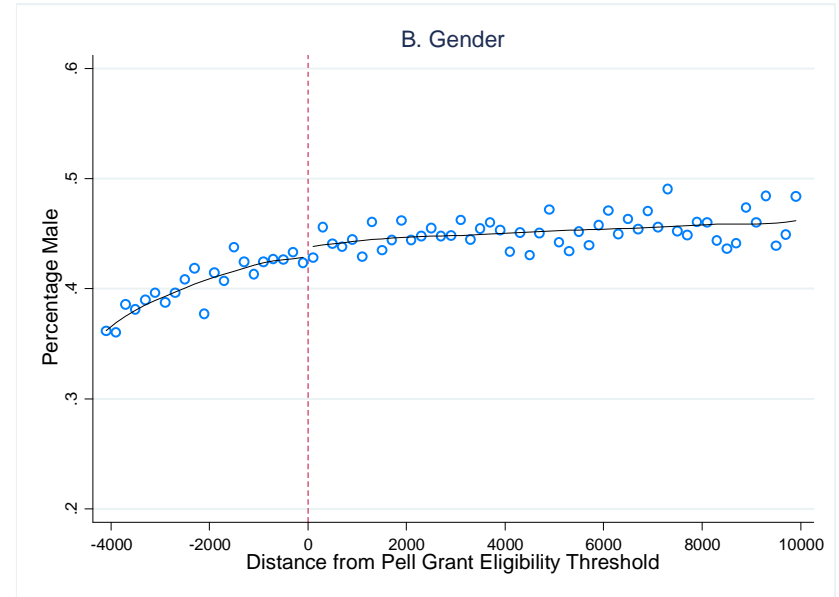# The RK Design: Testable Implications

- Density of EFC continuous and smooth at threshold
- Distribution of observable characteristics also continuous and smooth

These conditions are satisfied.

Testing Identifying Assumptions: Density of EFC
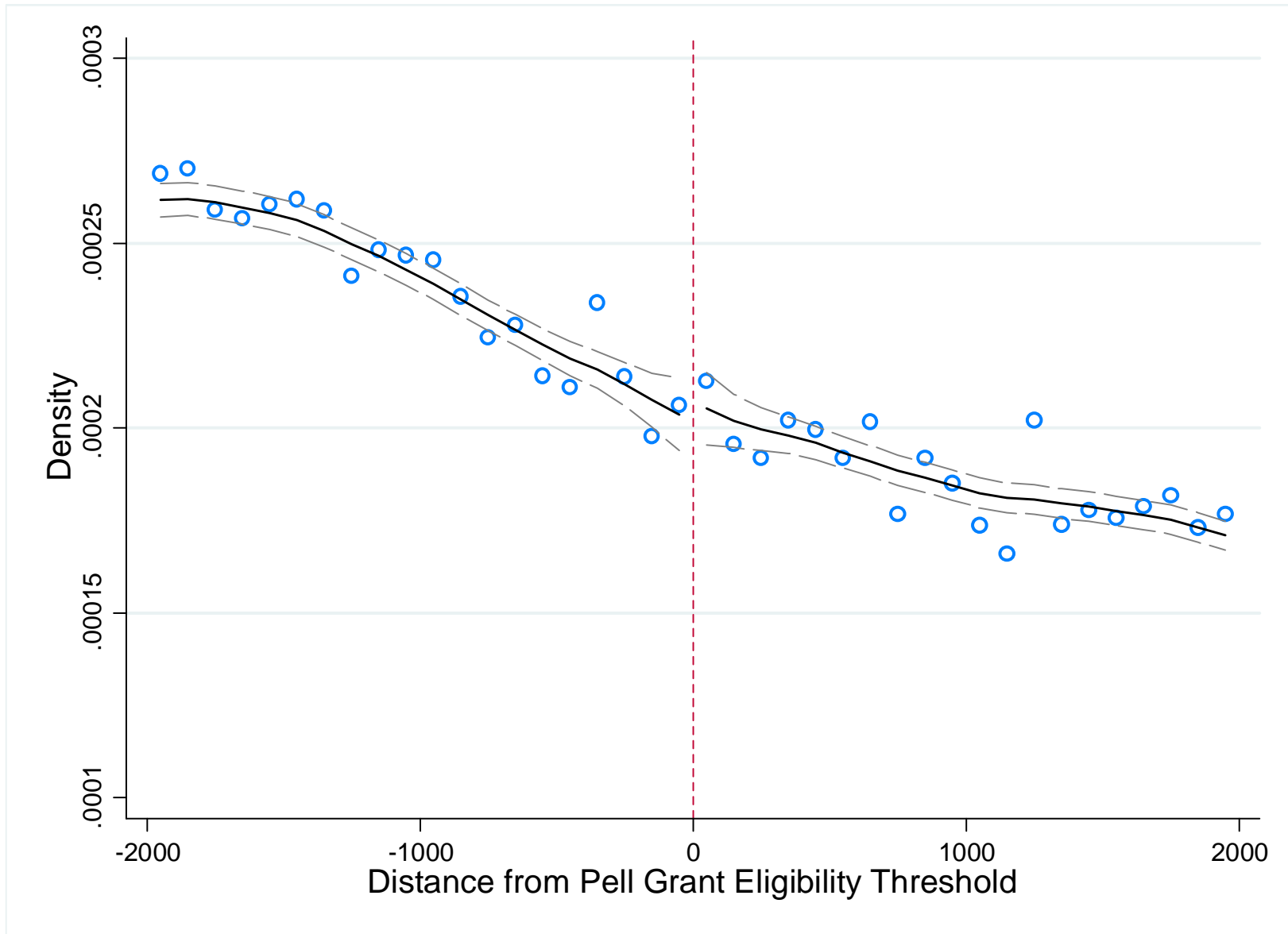
Distribution of Observable Characteristics at Cut-Off for Pell Grant Eligibility
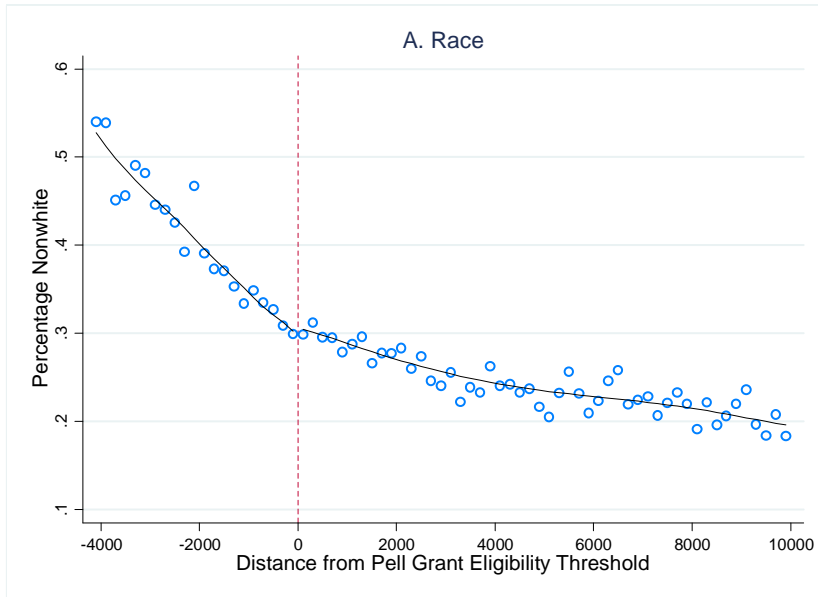
Conceptual Framework: RD and RK Designs
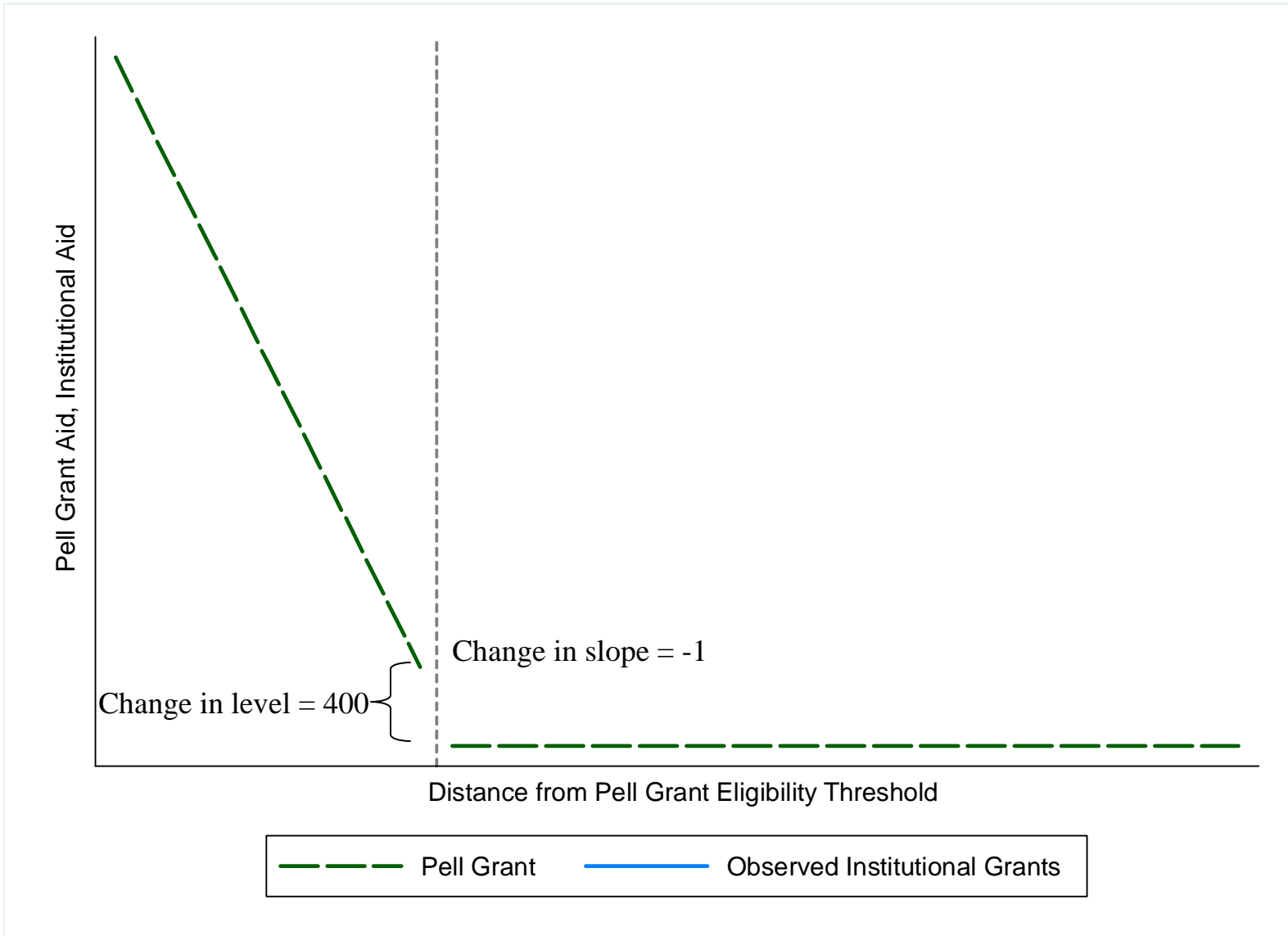
Change in slope = -1

Change in level = 400

Pell Grant Aid, Institutional Aid

Distance from Pell Grant Eligibility Threshold

Pell Grant — Observed Institutional Grants

Conceptual Framework: RD and RK Designs
1. No Crowd Out

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Conceptual Framework: RD and RK Designs
2. Full Crowd Out

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Distance from Pell Grant Eligibility Threshold

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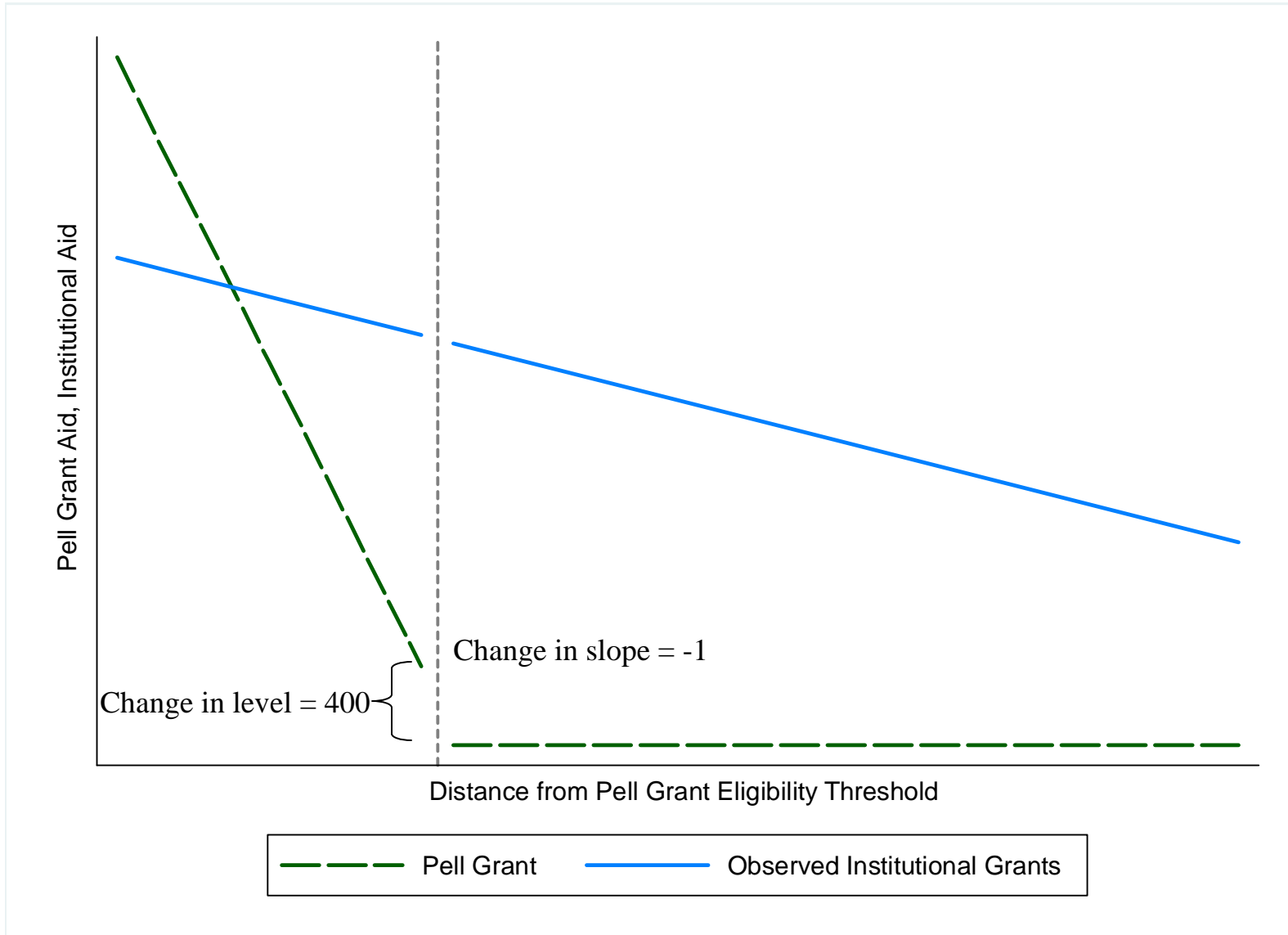
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Conceptual Framework: RD and RK Designs
2. Full Crowd Out

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Pell Grant Aid, Institutional Aid

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RK Estimator $= \dfrac{1}{-1} = -1$

Change in level = -400

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Pell Grant Aid, Institutional Aid

Distance from Pell Grant Eligibility Threshold

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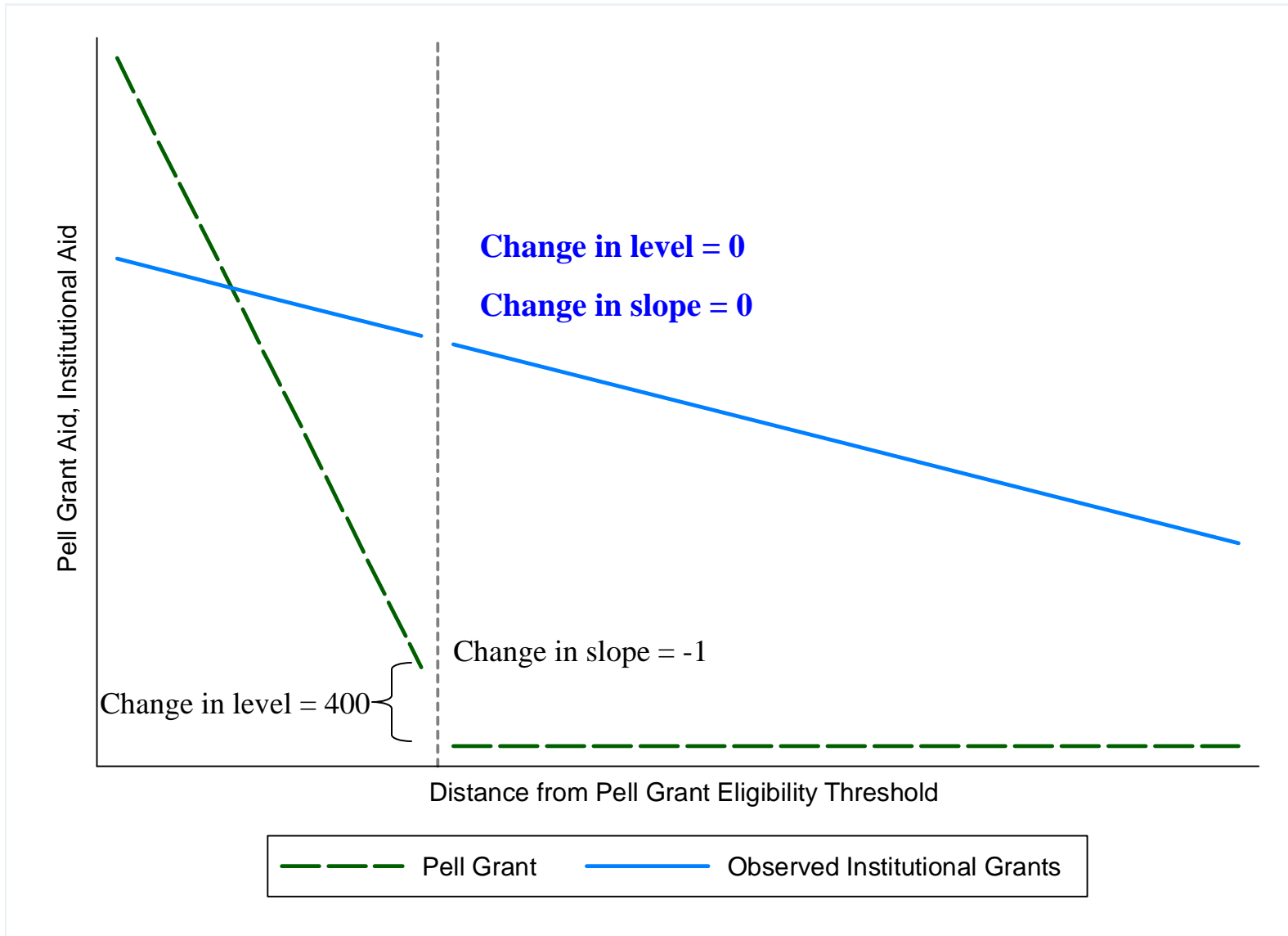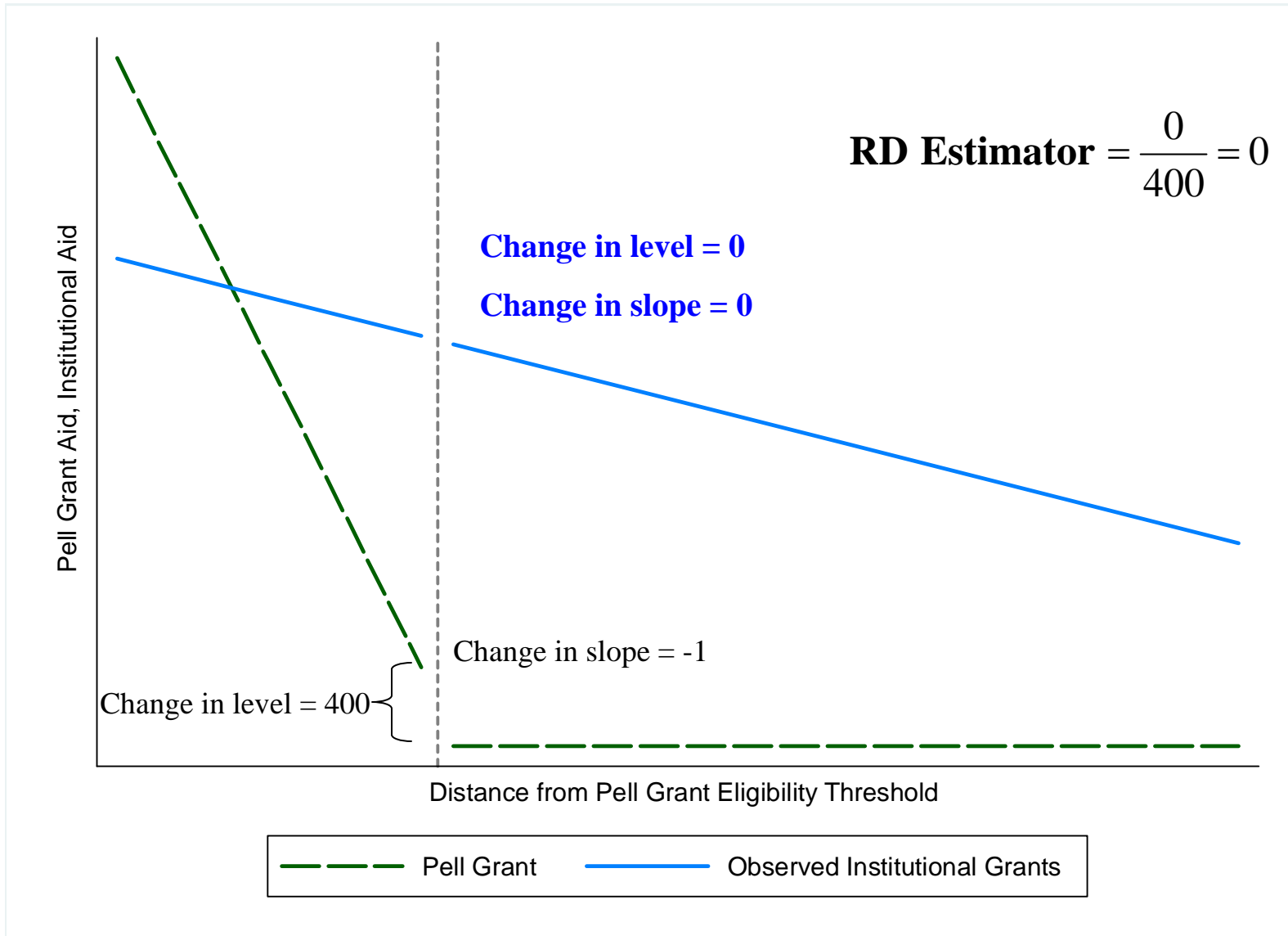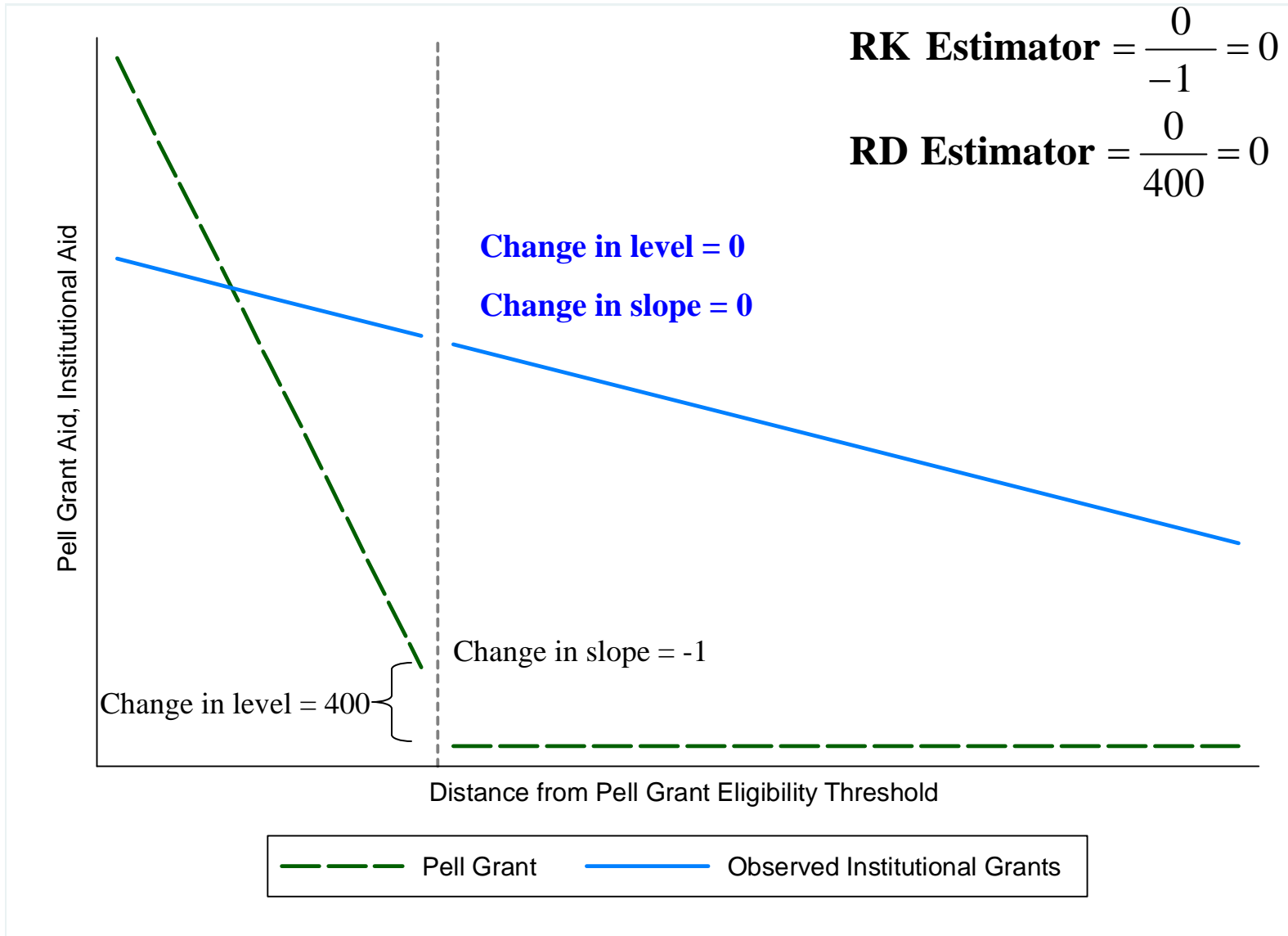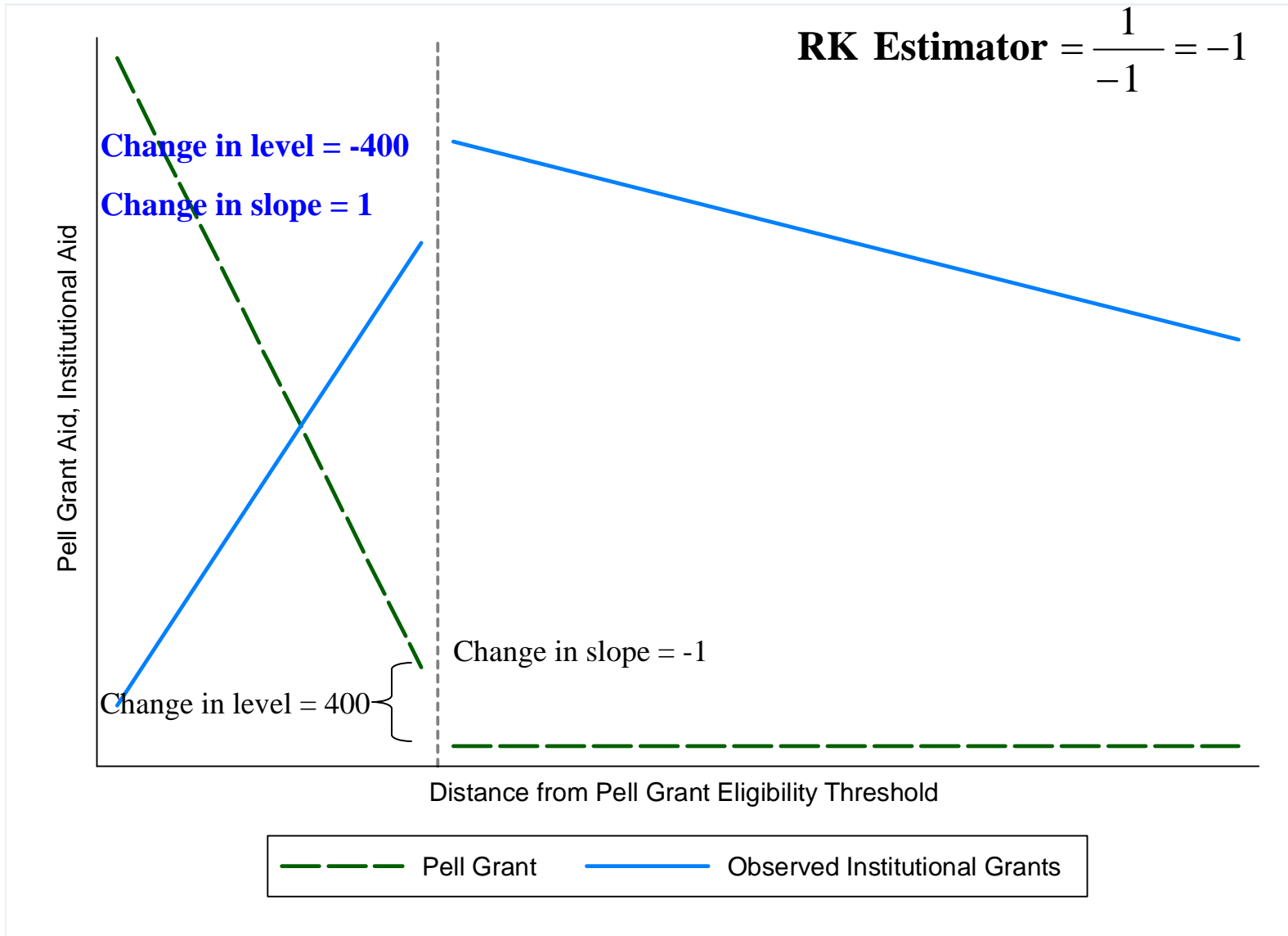
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The Relationship between Institutional Aid and Pell Grants

Local linear regression
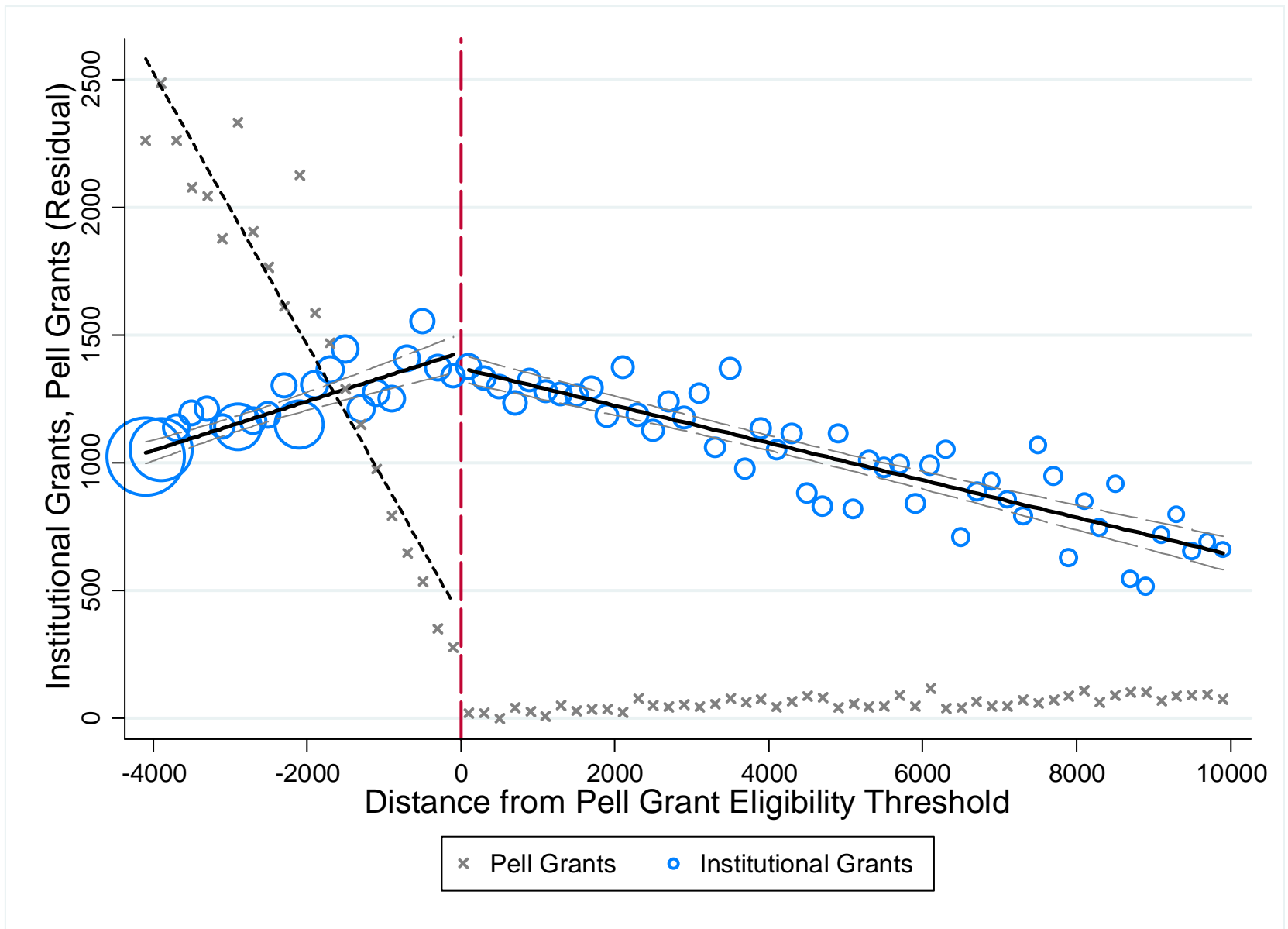
Parametric RD and RK Estimation

- DGP: $Y = f(Pell, \tau) + g(EFC) + U$

- Where: $f(Pell, \tau) = \tau_1 Pell$

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(First Stage)

$$Pell_{it} = \eta \cdot \mathbf{1}\big[E\tilde{F}C_{it} < 0\big] + \lambda \cdot \mathbf{1}\big[E\tilde{F}C_{it} < 0\big] \cdot \big(E\tilde{F}C_{it}\big) + \sum_{\rho} [\psi_{\rho} \cdot \big(E\tilde{F}C_{it}\big)^{\rho}] + \theta_j + \theta_t + \upsilon_{ijt}$$

(Reduced Form)

$$y_{ijt} = \beta \cdot \mathbf{1}\big[E\tilde{F}C_{it} < 0\big] + \gamma \cdot \mathbf{1}\big[E\tilde{F}C_{it} < 0\big] \cdot \big(E\tilde{F}C_{it}\big) + \sum_{\rho} [\pi_{\rho} \cdot \big(E\tilde{F}C_{it}\big)^{\rho}] + \delta_j + \delta_t + \varepsilon_{ijt}$$

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- RK estimator: $\hat{\tau}_{RK} = \dfrac{\hat{\gamma}}{\hat{\lambda}}$

- RD estimator: $\hat{\tau}_{RD} = \dfrac{\hat{\beta}}{\hat{\eta}}$

Parametric RK Estimates

$\hat{\gamma} = 0.15 \ (0.031)$

$\hat{\lambda} = -0.70 \ (0.007)$

Institutional Grants, Pell Grants (Residual)

Distance from Pell Grant Eligibility Threshold

× Pell Grants   ○ Institutional Grants
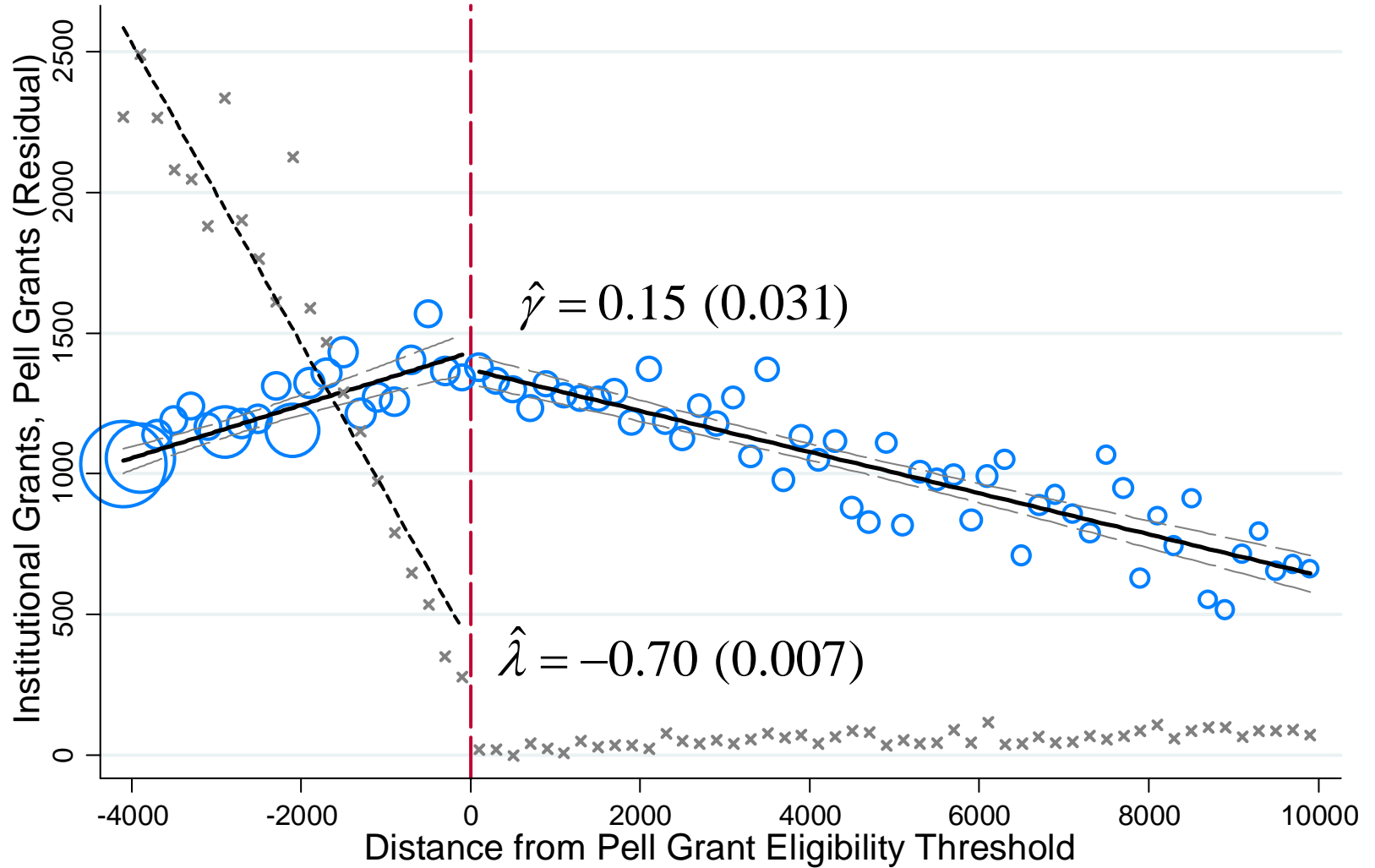
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$\hat{\tau}_{RK} = -0.22 \ (0.044)$
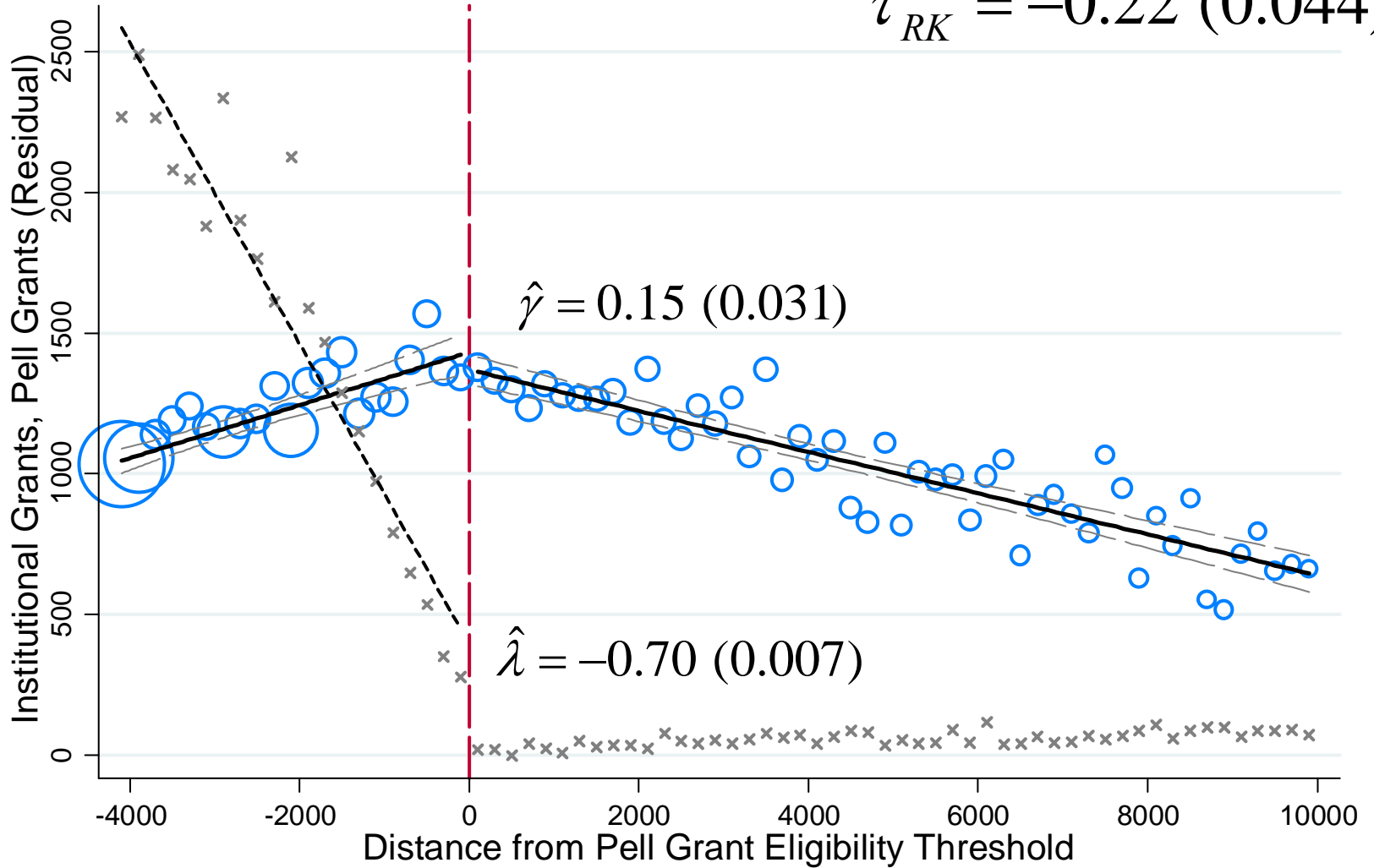
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Parametric RD Estimates

$\hat{\tau}_{RK} = -0.22\ (0.044)$

$\hat{\beta} = 128\ (42.6)$

$\hat{\eta} = 398\ (12.5)$

Institutional Grants, Pell Grants (Residual)

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Robustness Tests
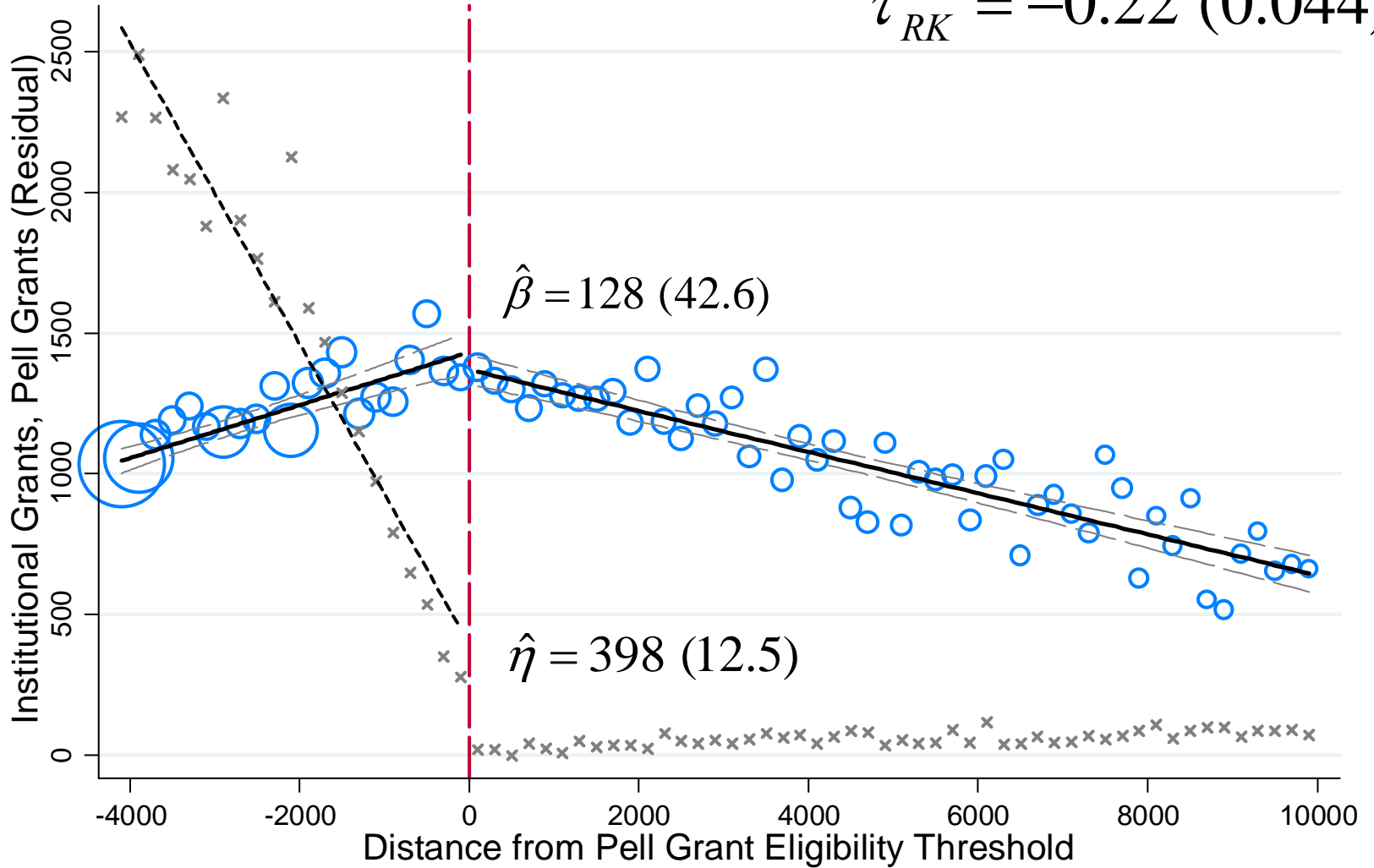
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$\hat{\eta} = 398\ (12.5)$

Institutional Grants, Pell Grants (Residual)

Distance from Pell Grant Eligibility Threshold
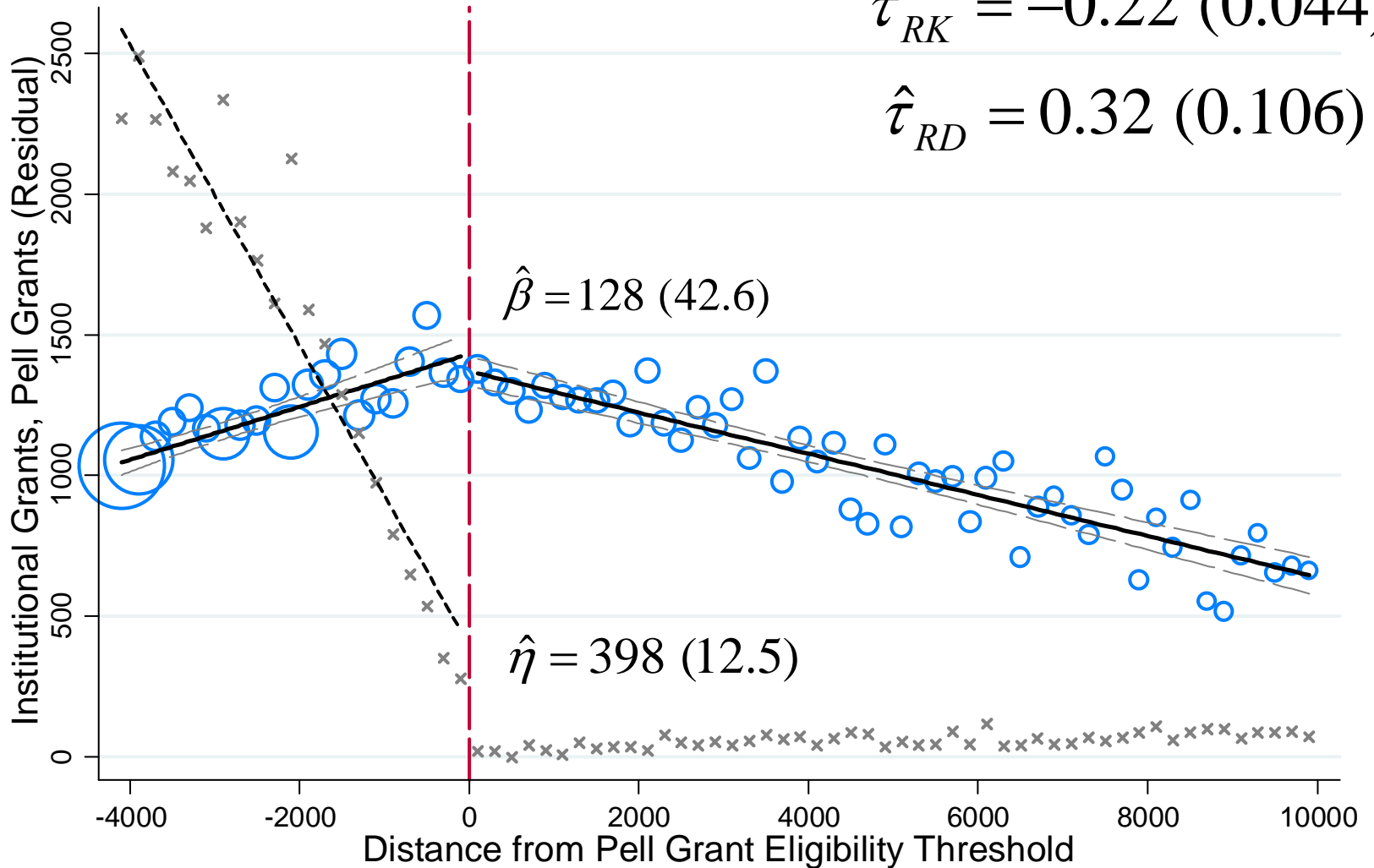
× Pell Grants   ○ Institutional Grants

Robustness Tests

What do these parameters identify?
A model of firm behavior

- Schools practice price discrimination
    - N student groups with demand $Q_i(p_i)$
    - p_i is price paid by students in group i
    - Constant marginal cost c
    - Subsidy s
- Profit maximizing monopolist solves:

$$\max_{p_1,\ldots,p_N} \pi = \sum_{i=1}^{N} Q_i(p_i)(p_i - (c-s))$$

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$$\frac{dp_i}{ds} = -\mu_i + (c - s)\underbrace{\frac{d\mu_i}{ds}}$$

curvature of demand

What do these parameters identify?

DGP: $Y = f(Pell, \tau) + g(EFC) + U$

Where: $f(Pell, \tau) = \tau_1 Pell$

- If changes in μ_i are small: $\tau_{RK} = \tau_{RD} = \tau_1 \approx \dfrac{dp_i}{ds}$
- As long as there is no inflection point in log demand:
  - RD and RK should have same sign

Understanding Differences in RD and RK Estimates

- Public institution pricing inconsistent with profit-maximization
  - Unless student demand has very specific features
- Alternative framework:
  - Schools have preferences over the characteristics of students
  - Receiving a Pell Grant affects how a school treats you
- "Treatment" of Pell Grant receipt affects pricing in two ways
  - Outside aid + label

An Alternative Model of Firm Behavior

- Schools have preferences over the characteristics of students
  - Receiving a Pell Grant affects how a school treats you
  - α_i is the weight given to students in group i

$$\max_{p_1,\ldots,p_N} W = \sum_{i=1}^{N} \alpha_i(s) Q_i(p_i) \ \ s.t. \ \sum_{i=1}^{N} Q_i(p_i)(p_i - (c-s)) \geq 0$$

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$$\frac{dp_i}{ds} = \left(-\mu_i + (c-s)\frac{d\mu_i}{ds} \right) - \left(\mu_i \frac{d\tilde{\alpha}_i}{ds} + \tilde{\alpha}_i(s)\frac{d\mu_i}{ds} \right)$$

pass-through   willingness to pay

An Alternative Model of Firm Behavior

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$\underbrace{\hphantom{}}$ pass-through $\underbrace{\hphantom{}}$ willingness to pay

Implications:

1. Pass-through smaller than in case of profit maximization

2. If "label" does not depend on size of Pell Grant:

$$p_i \approx \tau_0 \mathbf{1}[s_i > 0] + \tau_1 s_i + u_i$$

RD Estimation with a Multidimensional Treatment

DGP: $Y = f(Pell, \tau) + g(EFC) + U$

Where: $f(Pell, \tau) = \tau_0 \mathbf{1}[Pell > 0] + \tau_1 Pell$

The "treatment" of Pell Grant receipt has two dimensions:

(1)   Additional dollar of outside aid (pass-through)

(2)   "Pell Grant recipient" label (willingness to pay)

RD Estimation with a Multidimensional Treatment

DGP: $\quad Y = f\big(Pell, \tau\big) + g\big(EFC\big) + U$

Where: $\quad f\big(Pell, \tau\big) = \tau_0 \mathbf{1}\big[Pell > 0\big] + \tau_1 Pell$

RD Estimator:

$$\tau_{RD} = \frac{\lim\limits_{\varepsilon\uparrow 0} E\big[Y \mid EFC = efc_0 + \varepsilon\big] - \lim\limits_{\varepsilon\downarrow 0} E\big[Y \mid EFC = efc_0 + \varepsilon\big]}{\lim\limits_{\varepsilon\uparrow 0} E\big[Pell \mid EFC = efc_0 + \varepsilon\big] - \lim\limits_{\varepsilon\downarrow 0} E\big[Pell \mid EFC = efc_0 + \varepsilon\big]}$$

$$\tau_{RD} = \tau_1 + \frac{\tau_0}{Pell\big(efc_0\big)}$$

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Where: $\quad f(Pell, \tau) = \tau_0 \mathbf{1}[Pell > 0] + \tau_1 Pell$

RK Estimator:

$$\tau_{RK} = \frac{\lim\limits_{\varepsilon \uparrow 0} \dfrac{\partial E[Y \mid EFC = efc_0 + \varepsilon]}{\partial efc} - \lim\limits_{\varepsilon \downarrow 0} \dfrac{\partial E[Y \mid EFC = efc_0 + \varepsilon]}{\partial efc}}{\lim\limits_{\varepsilon \uparrow 0} \dfrac{\partial E[Pell \mid EFC = efc_0 + \varepsilon]}{\partial efc} - \lim\limits_{\varepsilon \downarrow 0} \dfrac{\partial E[Pell \mid EFC = efc_0 + \varepsilon]}{\partial efc}}$$

$$\tau_{RK} = \tau_1$$

RD Estimation with a Multidimensional Treatment

Implications:

- RD estimates "reduced form": $\tau_{RD} = \tau_1 + \dfrac{\tau_0}{Pell(efc_0)}$

- RK estimates impact of additional dollar: $\tau_{RK} = \tau_1$

RD Estimation with a Multidimensional Treatment

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- RD + RK allows for separate estimation of pricing response to outside aid and willingness to pay for Pell Grant recipients:

$$\hat{\tau}_1 = \hat{\tau}_{RK}$$
$$\hat{\tau}_0 = \left(\hat{\tau}_{RD} - \hat{\tau}_{RK}\right) \cdot Pell(efc_0)$$

Treatment Dimensions

	Pass-Through	Willingness to Pay
A. All institutions	-0.219	260.5
	(0.044)**	(50.06)**
Observations	133,270	

Notes: Each column within a panel represents a separate regression. Standard errors clustered at institution level in parentheses; ** p<0.01, * p<0.05, + p<0.1.

Heterogeneity by Sector: Public Institutions
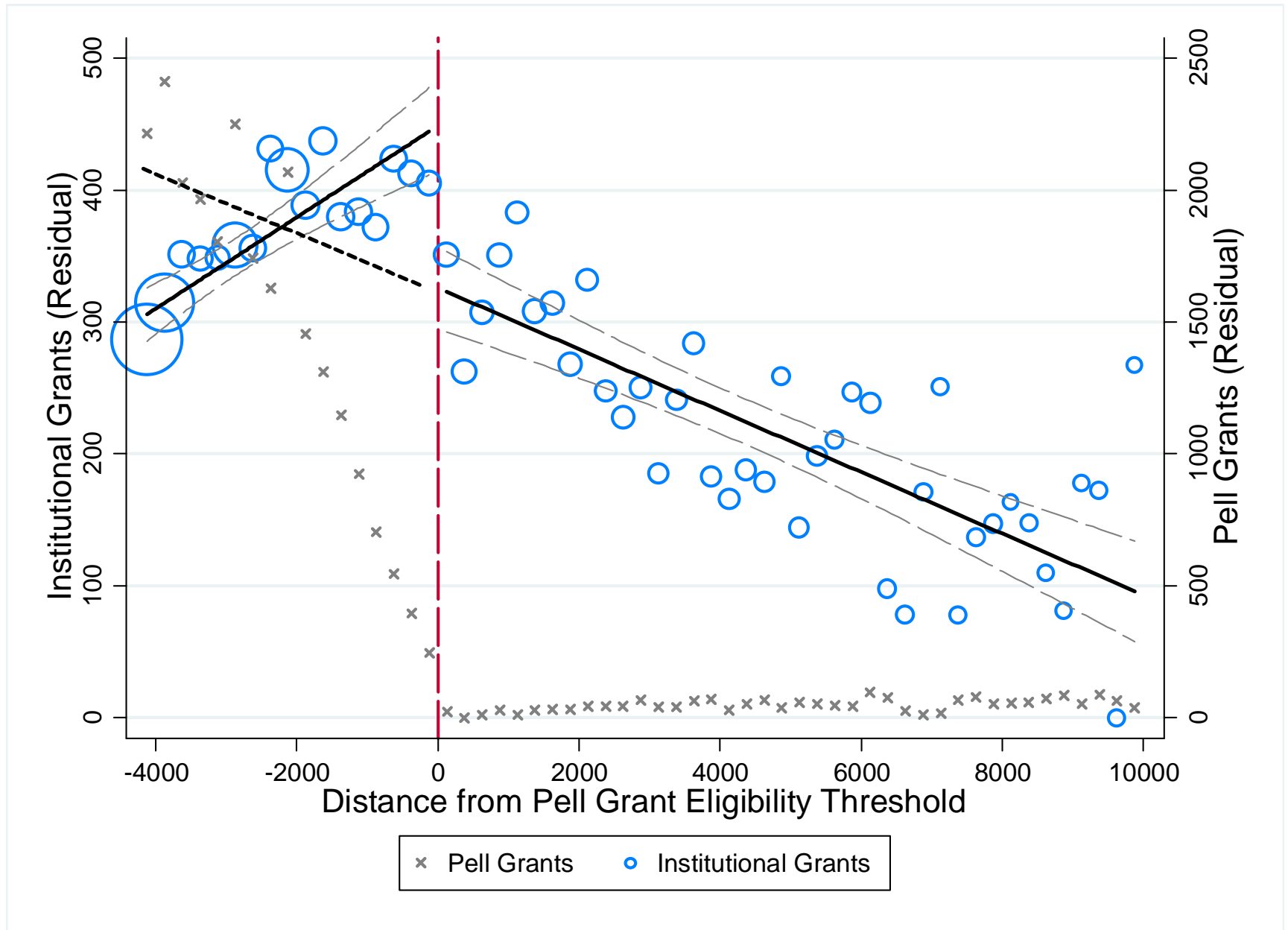
Heterogeneity by Sector: Nonselective Private Institutions

Heterogeneity by Sector: Selective Nonprofits

Scatter plot with x-axis "Distance from Pell Grant Eligibility Threshold" ranging from -4000 to 10000, and y-axis "Institutional Grants, Pell Grants (Residual)" ranging from 0 to 5000. Legend: × Pell Grants, ○ Institutional Grants.

Heterogeneity by Sector: Treatment Dimensions

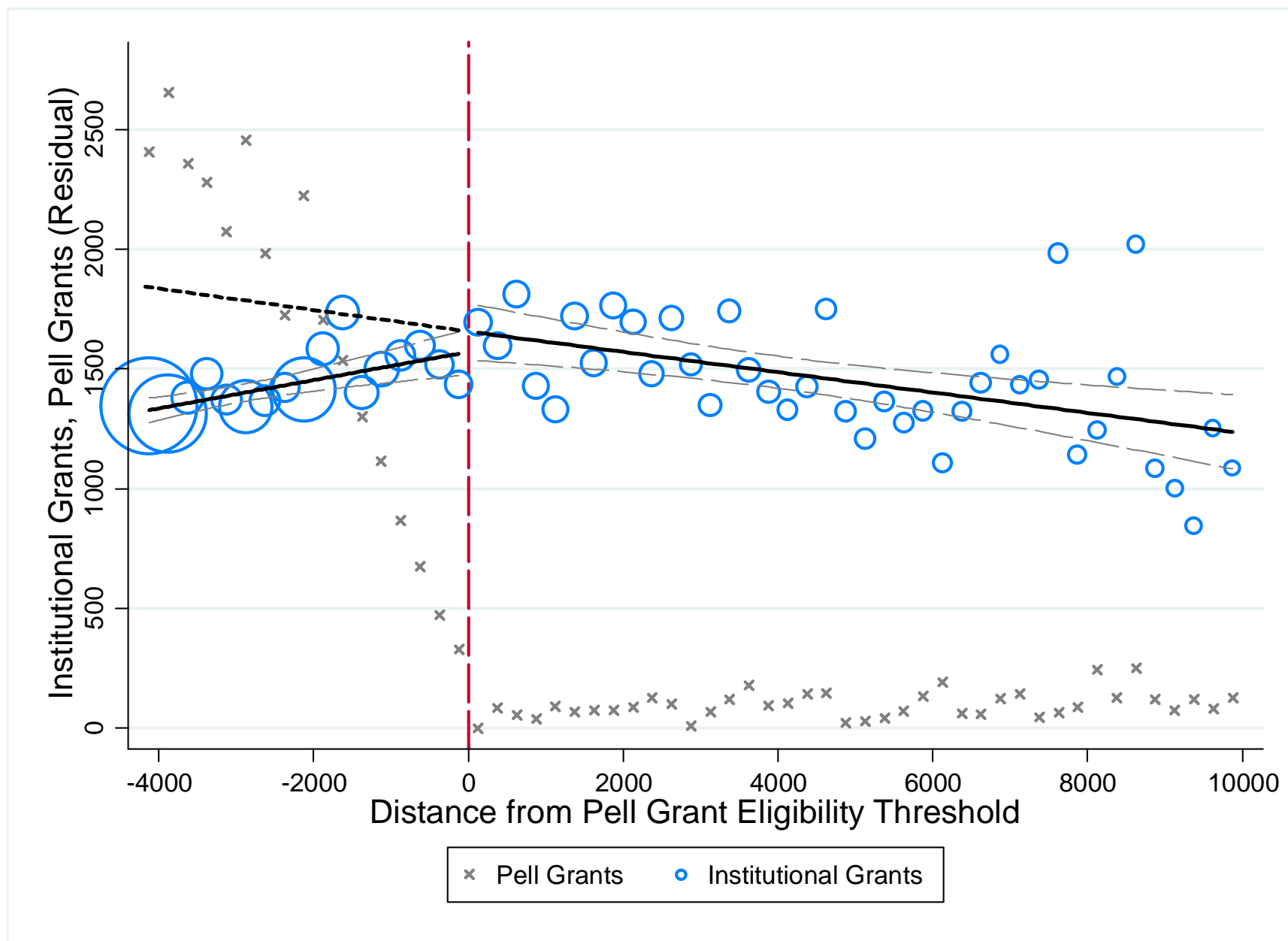|	Pass-Through	Willingness to Pay
A. All institutions	-0.219	260.5
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Observations	133,270	
B. By sector		
Public Nonselective	-0.179	318.3
	(0.017)**	(63.31)**
Public Selective	-0.173	618.9
	(0.032)**	(101.5)**
Nonprofit Nonselective	-0.154	-193.3
	(0.060)*	(216.6)
Nonprofit Selective	-0.687	97.23
	(0.101)**	(248.3)
For-profit	-0.133	84.67
	(0.029)**	(80.84)
Observations	133,270	

Notes: Each column within a panel represents a separate regression. Standard errors clustered at institution level in parentheses; ** $p<0.01$, * $p<0.05$, + $p<0.1$.
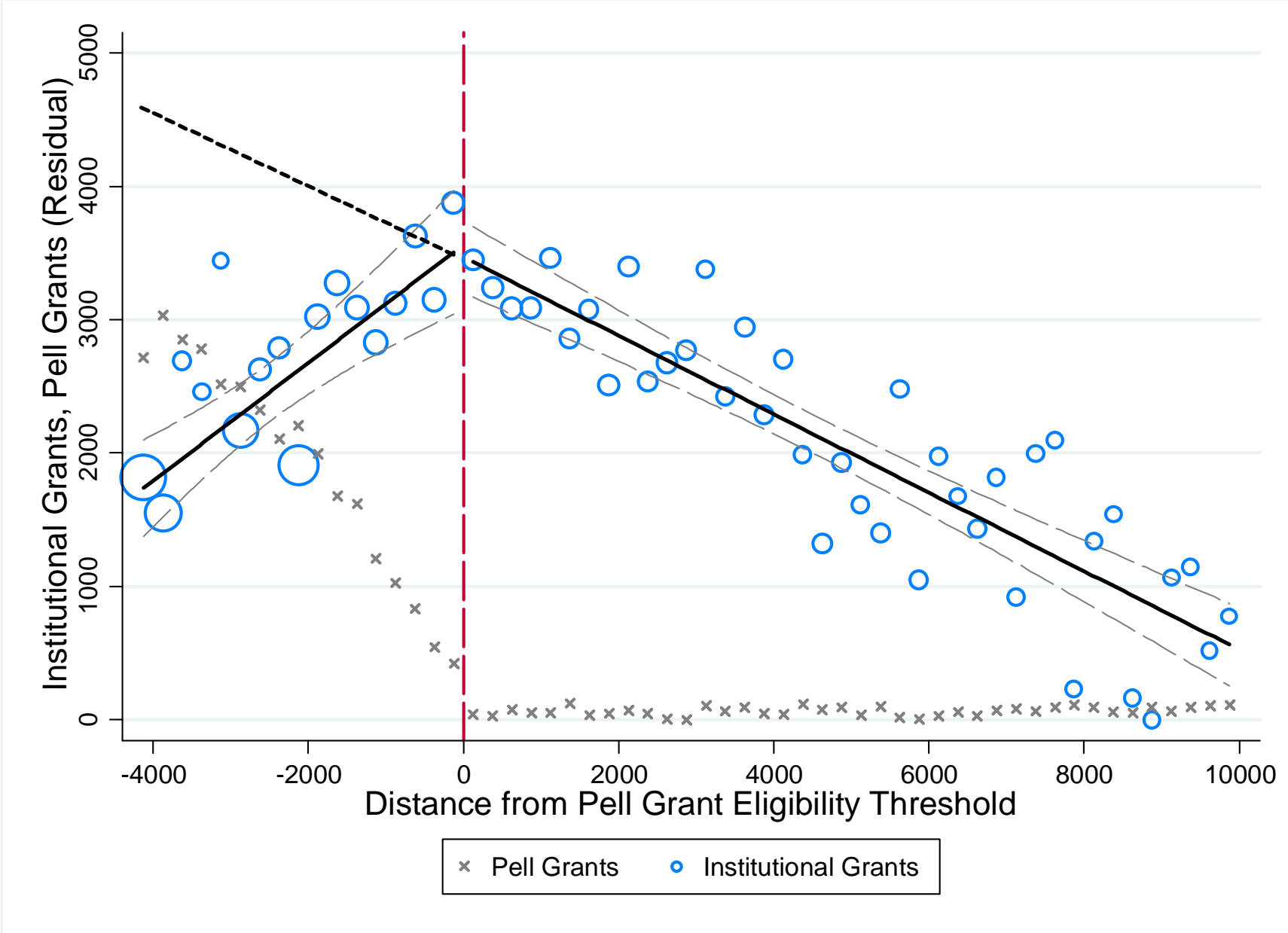
Alternative Explanations

- ## Quality upgrading?
  - No discontinuities in revenue/FTE, expenditures/FTE on instruction, institutional aid, student services, Federal student loan default rates

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- ## Mechanical relationship?
  - Over 90 percent of students have unmet need
  - $10,000 on average; $20,000 for selective nonprofit students

Unmet need

Quality Upgrading

SectionXyear estimates

Alternative Explanations

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- Mechanical relationship?
  - Over 90 percent of students have unmet need
  - $10,000 on average; $20,000 for selective nonprofit students

- Heterogeneous treatment effects?
  - Eligibility threshold moves as maximum Pell Grant increases
  - Estimated crowd-out and willingness to pay consistent across years

Unmet need

Quality Upgrading

SectionXyear estimates

Estimating Total Crowd-Out
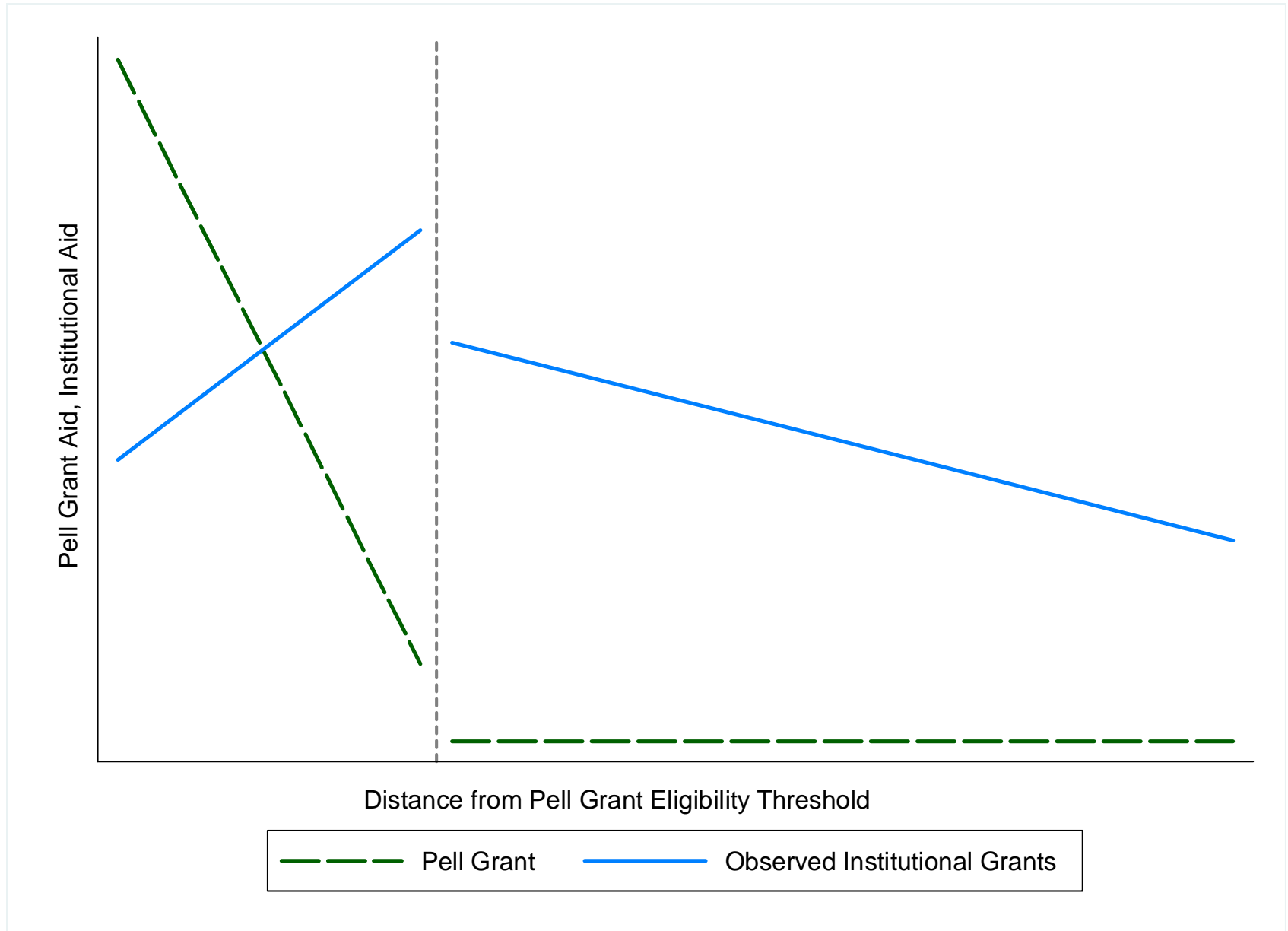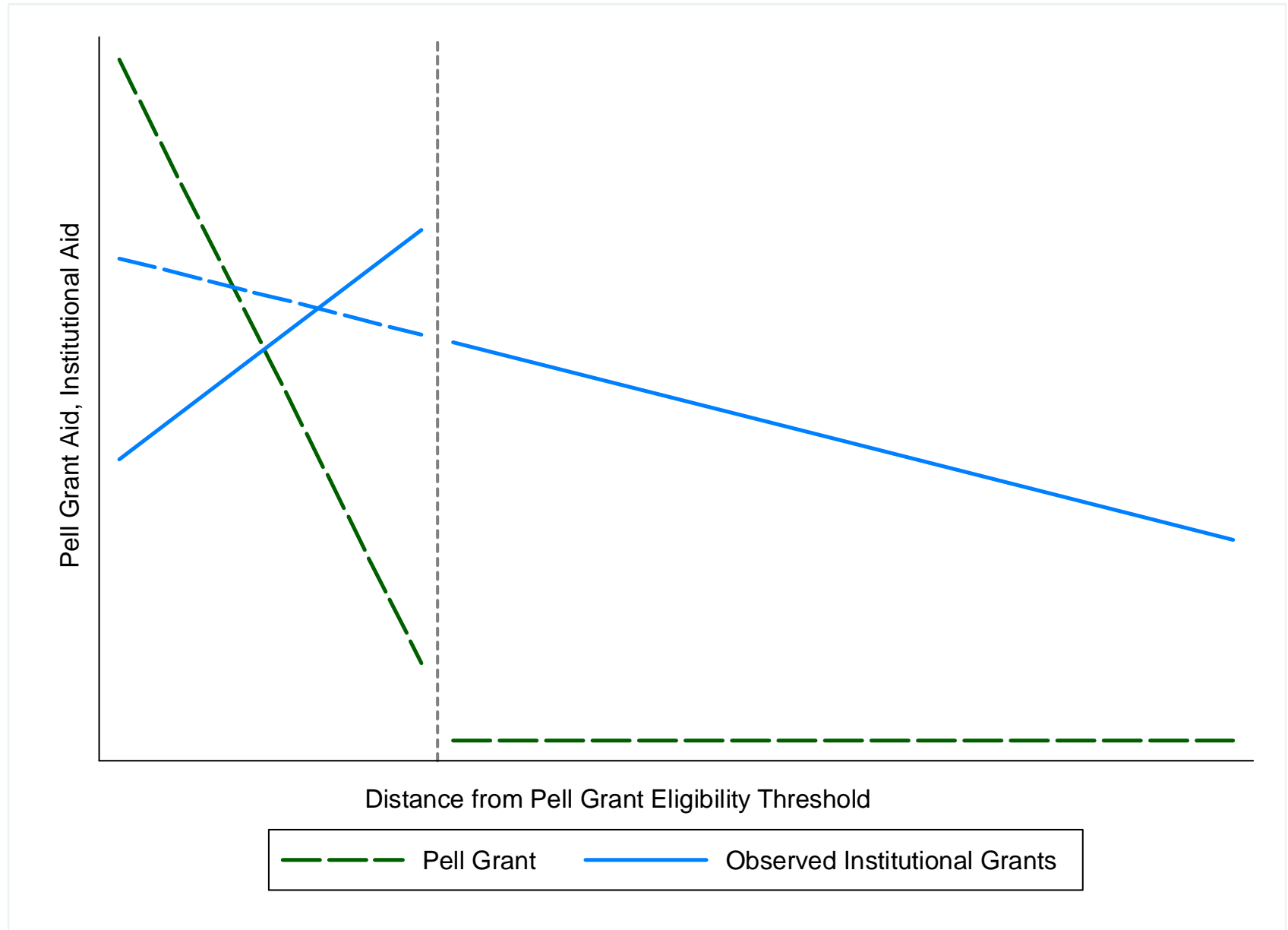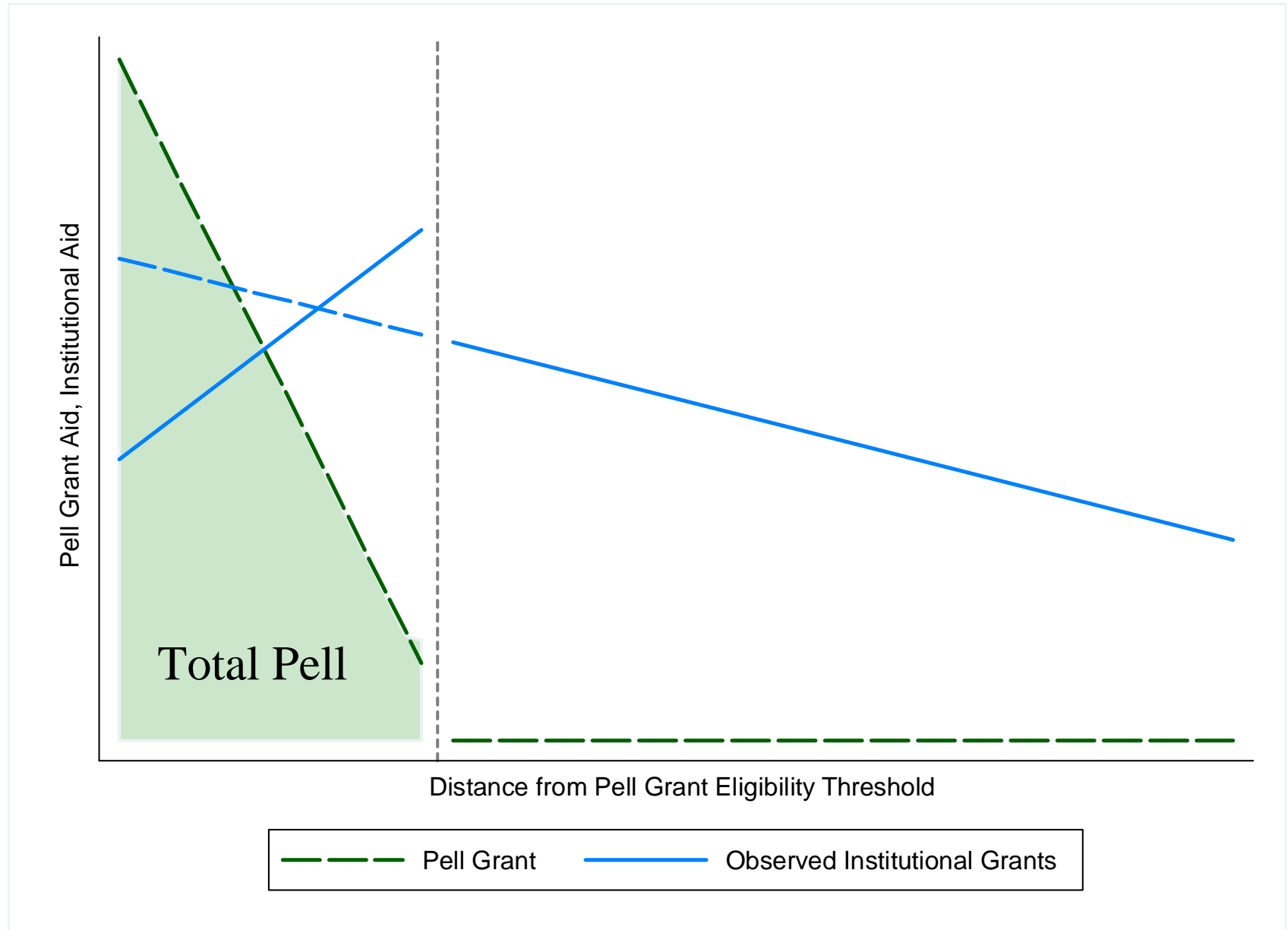
Distance from Pell Grant Eligibility Threshold

Pell Grant Aid, Institutional Aid

- - - Pell Grant   —— Observed Institutional Grants

Estimating Total Crowd-Out

Total Pell

Pell Grant Aid, Institutional Aid

Distance from Pell Grant Eligibility Threshold

- - - Pell Grant   ——— Observed Institutional Grants

Estimating Total Crowd-Out

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Pell Grant Aid, Institutional Aid

Distance from Pell Grant Eligibility Threshold

Pell Grant — — — Observed Institutional Grants

Estimating Total Crowd-Out

Estimating Total Crowd-Out

Pell Grant Aid, Institutional Aid (y-axis)

Distance from Pell Grant Eligibility Threshold (x-axis)

A

B

Total Pell

Legend: Pell Grant — — — Observed Institutional Grants
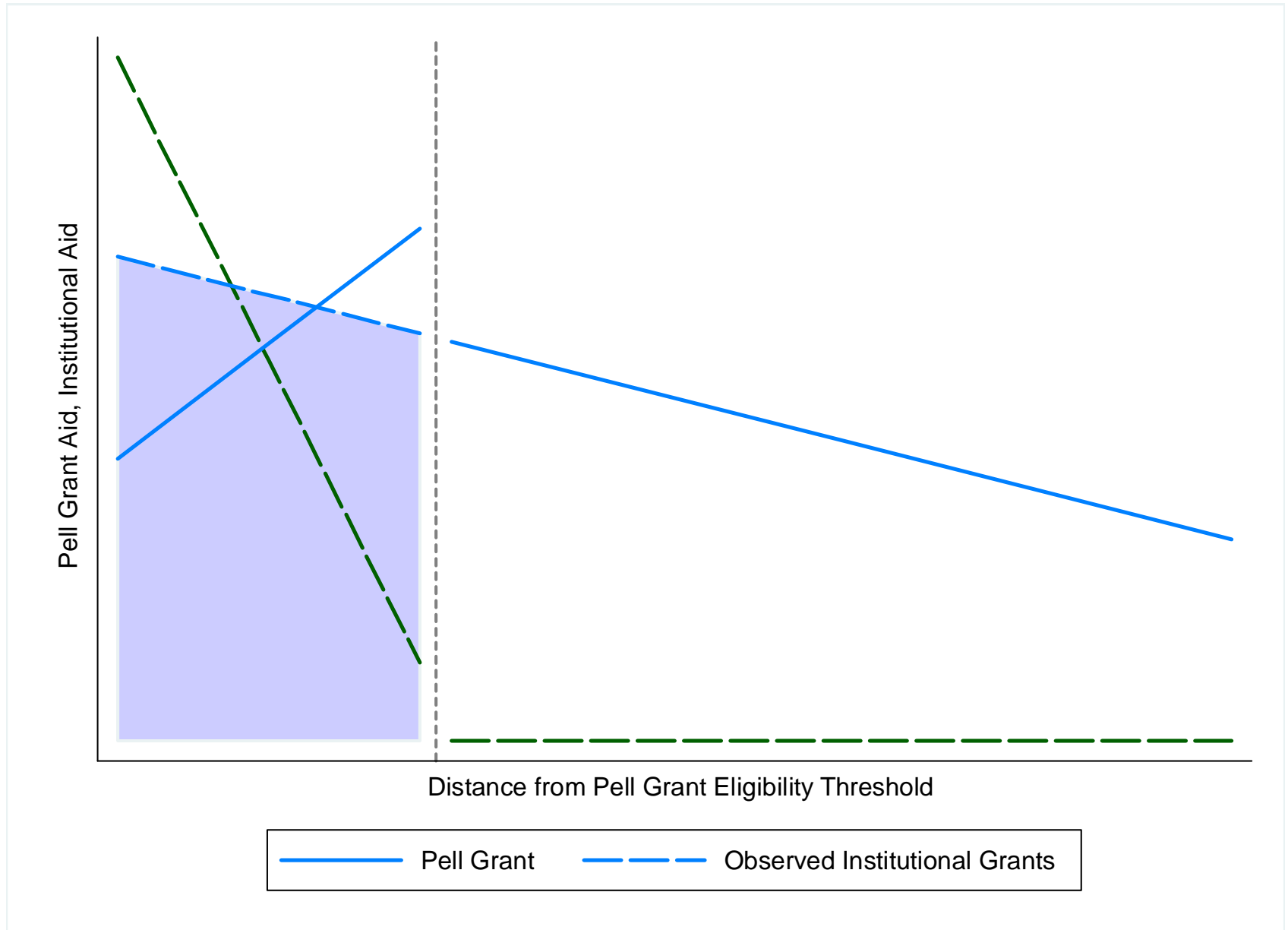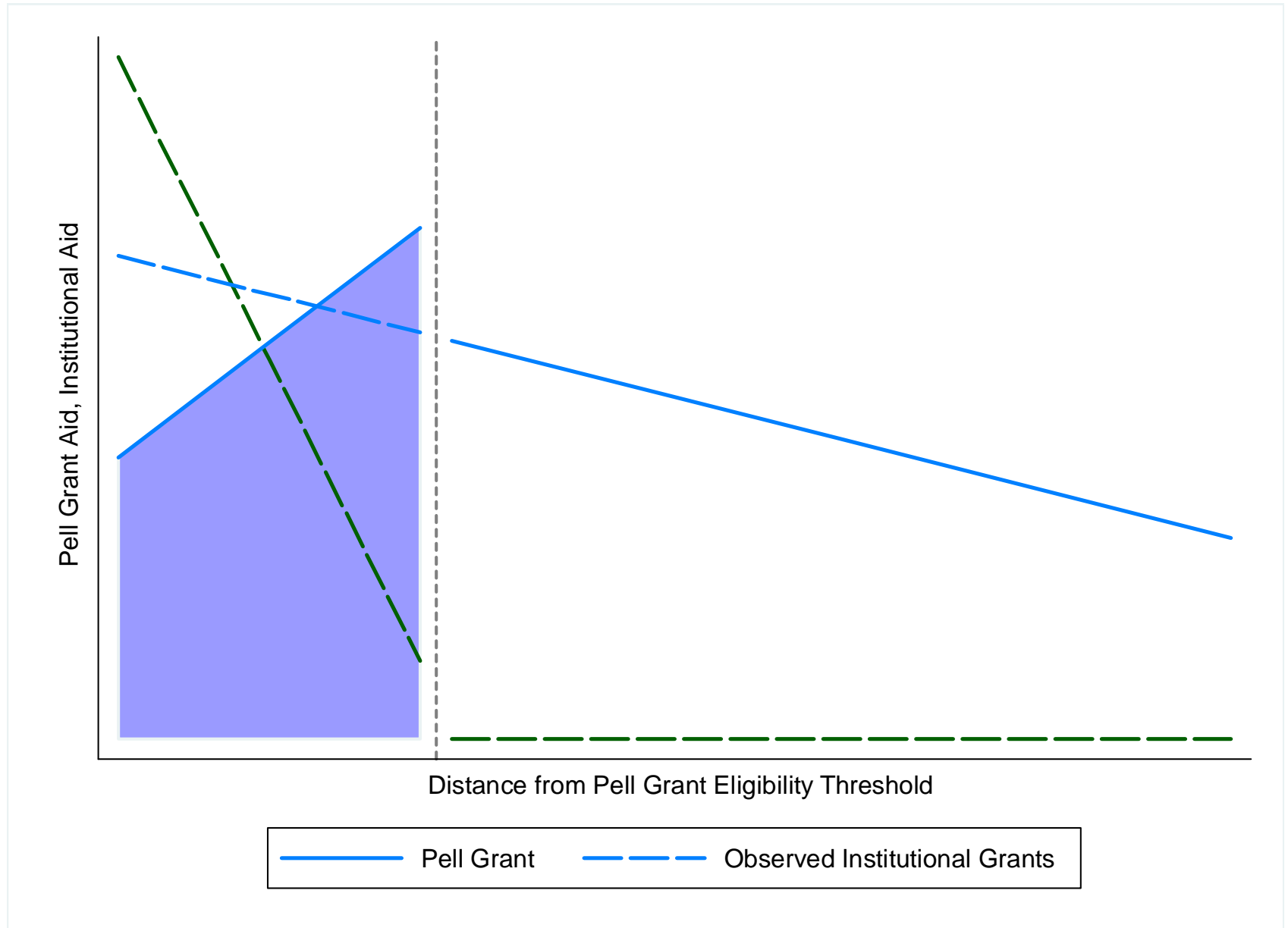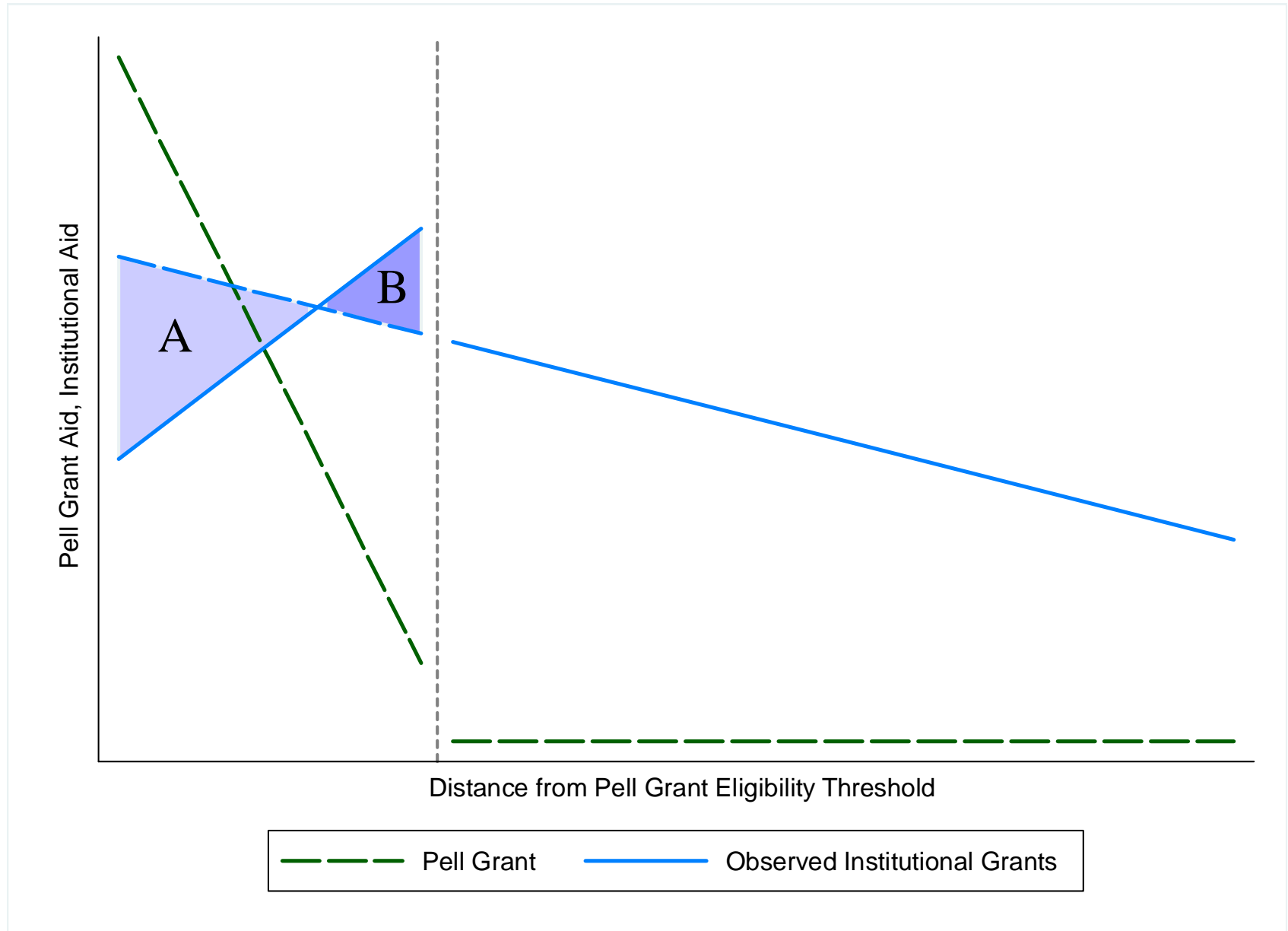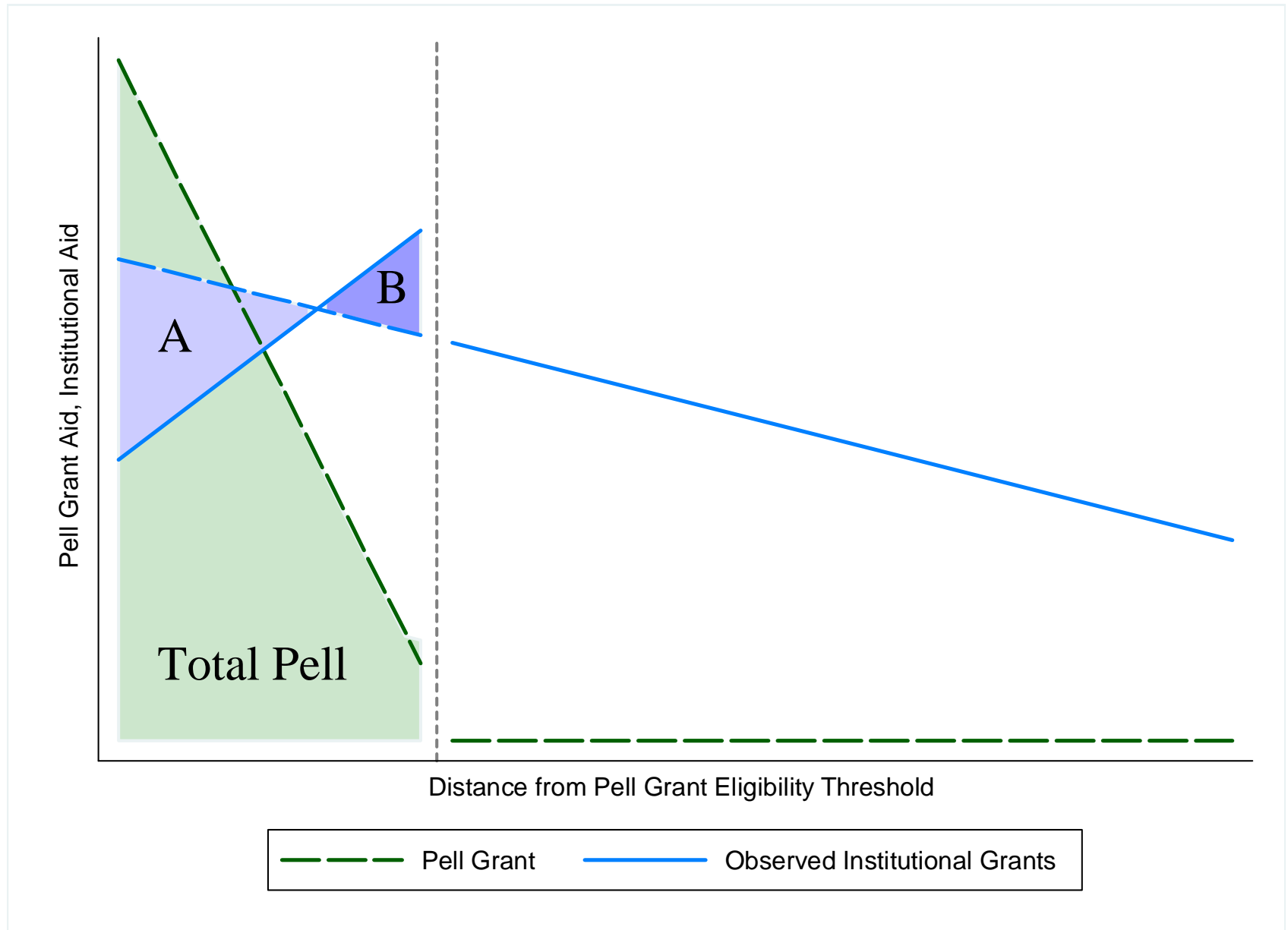
Estimating Total Crowd-Out

	Pass-through	95% CI
All Institutions	0.163	[0.114, 0.212]
Public Institutions	0.031	[0.002, 0.060]
Nonselective Private Institutions	0.176	[0.062, 0.290]
Selective Nonprofit Institutions	0.787	[0.563, 1.011]

Remaining Questions

- Where does the money go?
  - Public schools redistribute among Pell Grant eligible
  - Suggestive evidence that for-profits retain as profits
- How to value "product"?
  - No large impacts on probability of attending college
  - Small degree of upgrading for marginally eligible students
- What happens in the long-run?
  - Estimates represent short-run incidence of Pell Grant aid
  - Supply of public, selective nonprofit institutions relatively fixed
  - Cellini (2010) shows for-profit entry responds to Pell Grant generosity
  - In long-run, will increased entry drive rents lower?

Conclusions

- Two dimensions to treatment
  - "Pell Grant recipient" label, extra dollar of outside aid
  - Willingness to pay, pass-through
- RD estimates represent "reduced form"
- Combined RD/RK to separately identify dimensions
  - Insight into industrial organization of higher education
  - Methods can be used in other circumstances

Conclusions

- Differences in objectives across sectors
    - Public schools value Pell Grant status
    - For-profit schools behave no differently than nonselective nonprofits
- Differences in market power
    - Pass-through significantly higher in selective nonprofit sector
- Students' prices fall by $0.84 for every $1 in Pell Grant aid
    - In 2011, $35 billion in Pell Grant subsidies
    - $5 to $6 billion passed-through to institutions via price discrimination

Additional Slides

The Pell Grant Program

1980: Max Pell = $4950 (58% of COA)

2009: Max Pell = $5015 (27% of COA)

Maximum Pell Grant (2011$)   Pct of COA
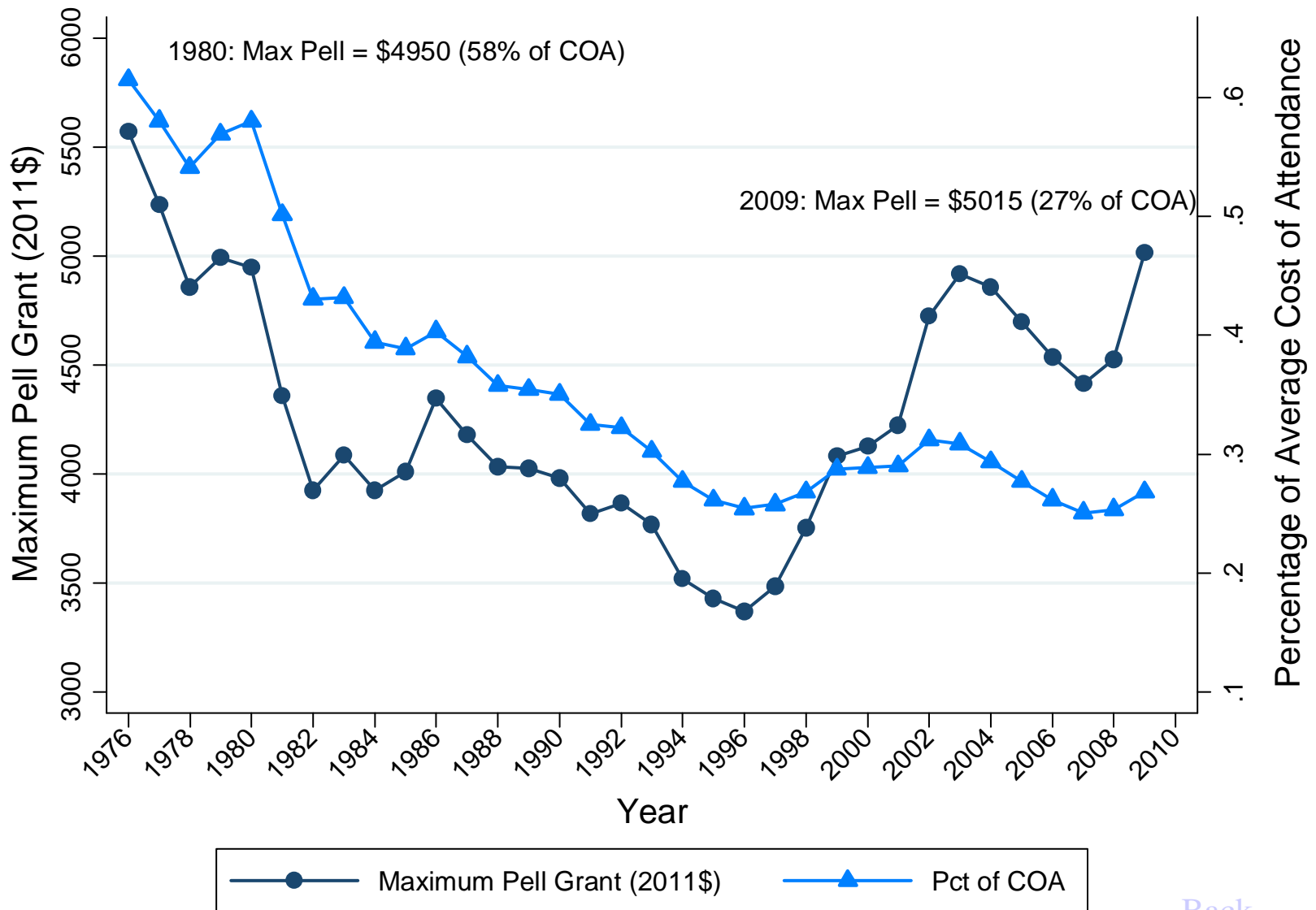
Calculating Dependent Students' EFC

2007-2008 EFC FORMULA A: DEPENDENT STUDENT

REGULAR WORKSHEET Page 1 — A

PARENTS' INCOME IN 2006

1.	Parents' Adjusted Gross Income (FAFSA/SAR #79) If negative, enter zero.	
2. a.	Father's/stepfather's income earned from work (FAFSA/SAR #82)	
2. b.	Mother's/stepmother's income earned from work (FAFSA/SAR #83) +	
	Total parents' income earned from work =	
3.	Parents' Taxable Income (If tax filers, enter the amount from line 1 above. If non-tax filers, enter the amount from line 2.)*	
4.	Untaxed income and benefits:	
	• Total from FAFSA Worksheet A (FAFSA/SAR #84)	
	• Total from FAFSA Worksheet B (FAFSA/SAR #85) +	
	Total untaxed income and benefits =	
5.	Taxable and untaxed income (sum of line 3 and line 4)	
6.	Total from FAFSA Worksheet C (FAFSA/SAR #86) –	
7.	TOTAL INCOME (line 5 minus line 6) May be a negative number. =	

ALLOWANCES AGAINST PARENTS' INCOME

8.	2006 U.S. income tax paid (FAFSA/SAR #80) (tax filers only) If negative, enter zero.	
9.	State and other tax allowance (Table A1) If negative, enter zero. +	
10.	Father's/stepfather's Social Security tax allowance (Table A2) +	
11.	Mother's/stepmother's Social Security tax allowance (Table A2) +	
12.	Income protection allowance (Table A3) +	
13.	Employment expense allowance:	
	• Two working parents: 35% of the lesser of the earned incomes, or $3,200, whichever is less	
	• One-parent families: 35% of earned income, or $3,200, whichever is less	
	• Two-parent families, one working parent: enter zero +	
14.	TOTAL ALLOWANCES =	

*STOP HERE if the following are true: line 3 is $20,000 or less and either the parents are eligible to file a 2006 IRS Form 1040A or 1040EZ (they are not required to file a 2006 Form 1040), or they are not required to file any income tax return, or anyone included in the parents' household size (as defined on the FAFSA) received benefits during the base year from any of the designated means-tested Federal benefit programs. If these circumstances are true, the Expected Family Contribution is automatically zero.

AVAILABLE INCOME

	Total income (from line 7)	
	Total allowances (from line 14) –	
15.	AVAILABLE INCOME (AI) May be a negative number. =	

PARENTS' CONTRIBUTION FROM ASSETS

16.	Cash, savings & checking (FAFSA/SAR #87)	
17.	Net worth of investments** (FAFSA/SAR #88) If negative, enter zero.	
18.	Net worth of business and/or investment farm (FAFSA/SAR #89) If negative, enter zero.	
19.	Adjusted net worth of business/farm (Calculate using Table A4.) +	
20.	Net worth (sum of lines 16, 17, and 19) =	
21.	Education savings and asset protection allowance (Table A5) –	
22.	Discretionary net worth (line 20 minus line 21) =	
23.	Asset conversion rate × .12	
24.	CONTRIBUTION FROM ASSETS If negative, enter zero. =	

PARENTS' CONTRIBUTION

	AVAILABLE INCOME (AI) (from line 15)	
	CONTRIBUTION FROM ASSETS (from line 24) +	
25.	Adjusted Available Income (AAI) May be a negative number. =	
26.	Total parents' contribution from AAI (Calculate using Table A6.) If negative, enter zero.	
27.	Number in college in 2007-2008 (Exclude parents) (FAFSA/SAR #67) ÷	
28.	PARENTS' CONTRIBUTION (standard contribution for nine month enrollment)*** If negative, enter zero. =	

**Do not include the family's home.
***To calculate the parents' contribution for other than nine month enrollment, see page 11.

continued on the next page

EFC Formula, 2007-2008 — 9

REGULAR WORKSHEET Page 2 — A

STUDENT'S INCOME IN 2006

29.	Adjusted Gross Income (FAFSA/SAR #35) If negative, enter zero.	
30.	Income earned from work (FAFSA/SAR #38)	
31.	Taxable Income (If tax filer, enter the amount from line 29. If non-tax filer, enter the amount from line 30.)	
32.	Untaxed income and benefits:	
	Total from FAFSA Worksheet A (FAFSA/SAR #40)	
	Total from FAFSA Worksheet B (FAFSA/SAR #41) +	
	Total untaxed income and benefits =	
33.	Taxable and untaxed income (sum of line 31 and line 32)	
34.	Total from FAFSA Worksheet C (FAFSA/SAR #42) –	
35.	TOTAL INCOME (line 33 minus line 34) May be a negative number. =	

ALLOWANCES AGAINST STUDENT INCOME

36.	2006 U.S. income tax paid (FAFSA/SAR #36) (tax filers only) If negative, enter zero.	
37.	State and other tax allowance (Table A7) If negative, enter zero. +	
38.	Social Security tax allowance (Table A2) +	
39.	Income protection allowance + 3,000	
40.	Allowance for parents' negative Adjusted Available Income (If line 25 is negative, enter line 25 as a positive number in line 40. If line 25 is zero or positive, enter zero in line 40.) +	
41.	TOTAL ALLOWANCES =	

STUDENT'S CONTRIBUTION FROM INCOME

	Total income (from line 35)	
	Total allowances (from line 41) –	
42.	Available income (AI) =	
43.	Assessment of AI × .50	
44.	STUDENT'S CONTRIBUTION FROM AI If negative, enter zero. =	

STUDENT'S CONTRIBUTION FROM ASSETS

45.	Cash, savings & checking (FAFSA/SAR #43)	
46.	Net worth of investments* (FAFSA/SAR #44) If negative, enter zero.	
47.	Net worth of business and/or investment farm (FAFSA/SAR #45) If negative, enter zero. +	
48.	Net worth (sum of lines 45 through 47) =	
49.	Assessment rate × .20	
50.	STUDENT'S CONTRIBUTION FROM ASSETS =	

EXPECTED FAMILY CONTRIBUTION

|		
	PARENTS' CONTRIBUTION (from line 28)	
	STUDENT'S CONTRIBUTION FROM AI (from line 44) +	
	STUDENT'S CONTRIBUTION FROM ASSETS (from line 50) +	
51.	EXPECTED FAMILY CONTRIBUTION (standard contribution for nine month enrollment)** If negative, enter zero. =	

*Do not include the student's home.
**To calculate the EFC for other than nine month enrollment, see the next page.

10 — EFC Formula, 2007-2008

Back

The Pell Grant Program

Pell award amounts in nominal dollars
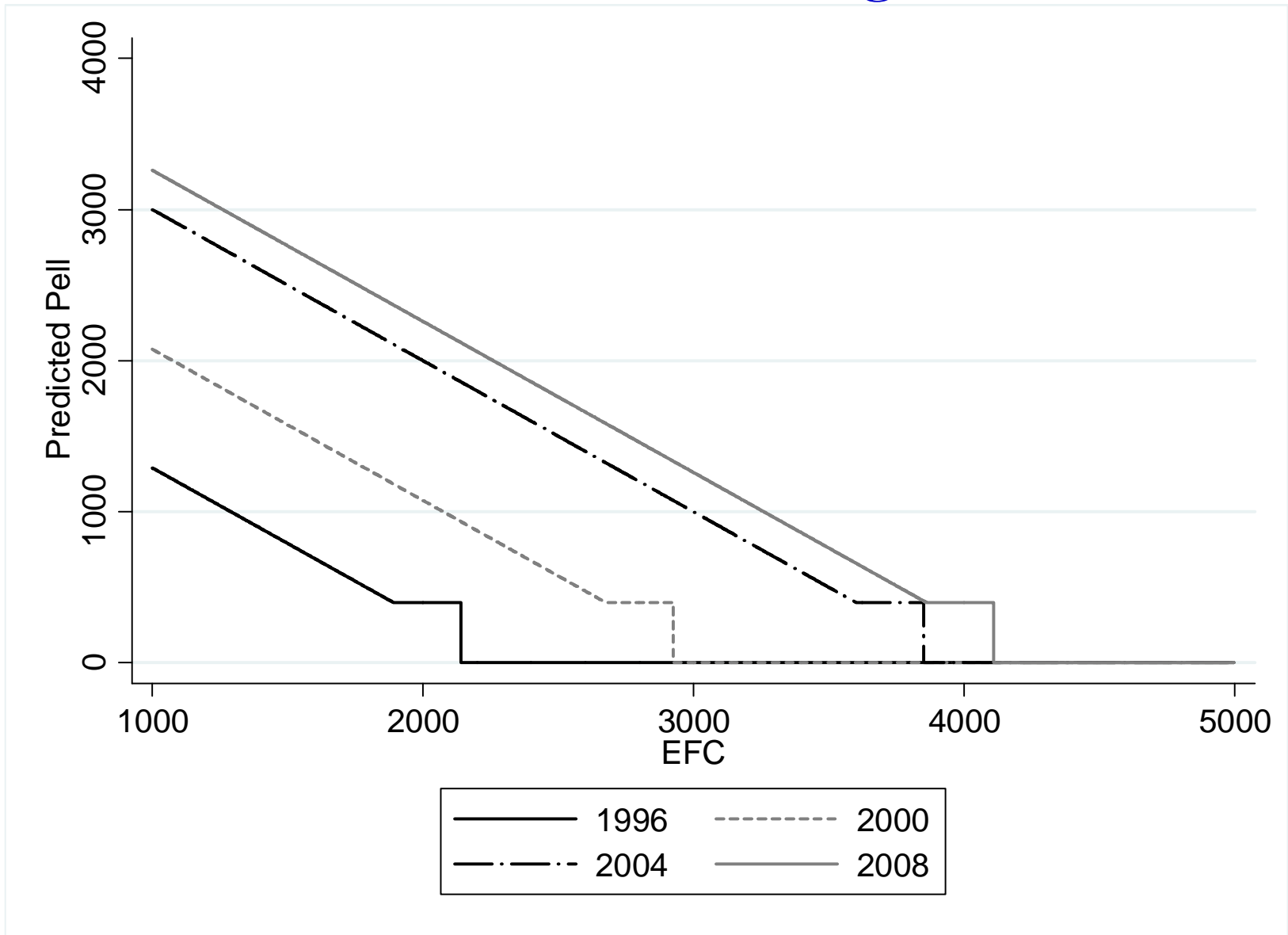
The Relationship between Institutional Aid and Pell Grants
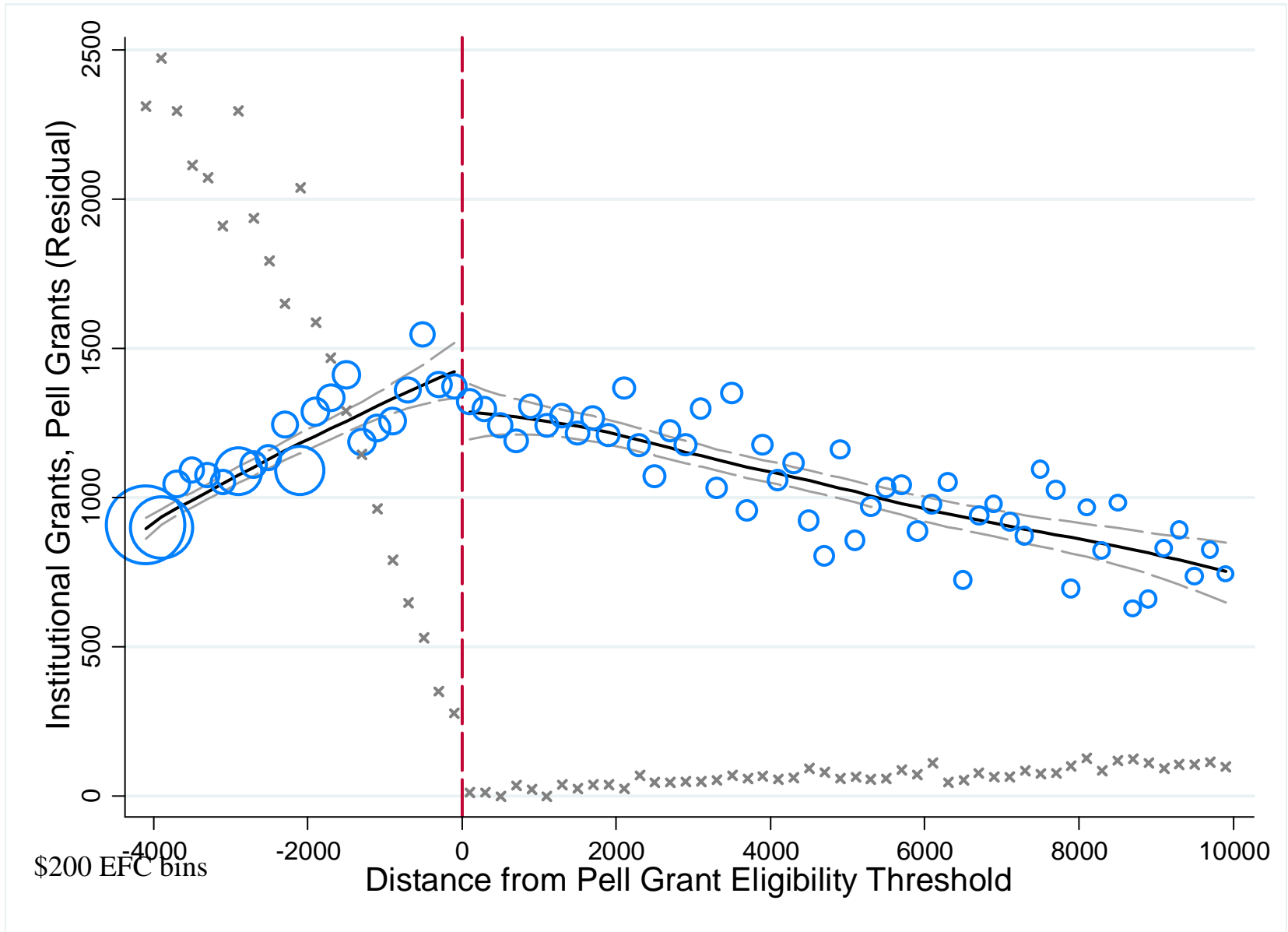
RD & RK Estimates: Varying Windows and Polynomials

	Polynomial of Order:	IV (RK) (1)	IV (RD) (2)
A. (EFC - k_t) in [-4100,10000]	One	-0.294 (0.024)**	0.298 (0.109)**
	Two	-0.219 (0.044)**	0.323 (0.106)**
	Three	-0.028 (0.070)	0.315 (0.174)+
Optimal Degree		2	2
Observations		133,270	133,270
B. (EFC-k_t) in [-4000,4000]	One	-0.173 (0.031)**	0.307 (0.184)+
	Two	-0.135 (0.107)	0.337 (0.209)
	Three	-0.153 (0.110)	0.438 (0.475)
Optimal Degree		1	1
Observations		87,290	87,290

Notes: Each cell represents a separate regression. Standard errors clustered at institution level in parentheses; ** $p<0.01$, * $p<0.05$, + $p<0.1$.

Treatment Dimensions by Sector and Year

	1996	2000	2004	2008
Public				
Pass-through	-0.088	-0.016	-0.066	-0.115
	(0.051)+	(0.027)	(0.023)**	(0.019)**
Willingness to pay	688.5	184.0	658.2	487.1
	(355.9)+	(142.4)	(408.9)	(141.7)**
Private Nonselective				
Pass-through	-0.245	-0.124	-0.117	-0.172
	(0.053)*	(0.107)+	(0.064)+	(0.061)**
Willingness to pay	166.9	-446.3	-621.9	-11.16
	(353.0)	(722.0)	(514.3)	(313.6)
Nonprofit Selective				
Pass-through	-1.893	-1.041	-0.835	-0.687
	(0.606)**	(0.241)**	(0.178)**	(0.141)**
Willingness to pay	1720	901.7	929.5	867.7
	(932.4)+	(675.1)	(1248)	(572.5)
Observations	21,630	22,760	37,550	51,330

Notes: Each column represents a separate regression. Standard errors clustered at institution level in parentheses; ** $p<0.01$, * $p<0.05$, + $p<0.1$.

Heterogeneity by Sector and Student Characteristics

	Nonwhite (1)	White (2)	Independent (3)	Dependent (4)	Female (5)	Male (6)
Public						
Pass-through	-0.207	-0.183	-0.073	-0.232	-0.208	-0.195
	(0.031)**	(0.021)**	(0.013)**	(0.024)**	(0.021)**	(0.027)**
Willingness to pay	670.6	338.6	361.8	471.5	452.7	465.2
	(115.9)**	(50.19)**	(88.61)**	(74.89)**	(61.01)**	(79.16)**
Private Nonselective						
Pass-through	-0.134	-0.150	-0.009	-0.171	-0.145	-0.165
	(0.047)**	(0.0500)**	(0.030)	(0.053)**	(0.044)**	(0.049)**
Willingness to pay	-27.17	-68.76	-147.3	-185.3	-11.58	-136.1
	(159.0)	(142.0)	(116.5)	(196.2)	(139.6)	(164.6)
Nonprofit Selective						
Pass-through	-0.438	-0.982	0.144	-0.609	-0.665	-0.716
	(0.163)**	(0.138)**	(0.128)	(0.115)**	(0.131)**	(0.146)**
Willingness to pay	-704.5	441.5	-505.2	18.36	-117.2	373.9
	(704.6)	(256.6)+	(375.6)	(309.7)	(339.6)	(367.3)
Observations	49,360	83,910	59,090	74,180	78,140	55,130

Notes: Each column represents a separate regression. Standard errors clustered at institution level in parentheses; ** $p<0.01$, * $p<0.05$, + $p<0.1$.

No Evidence of Quality Upgrading

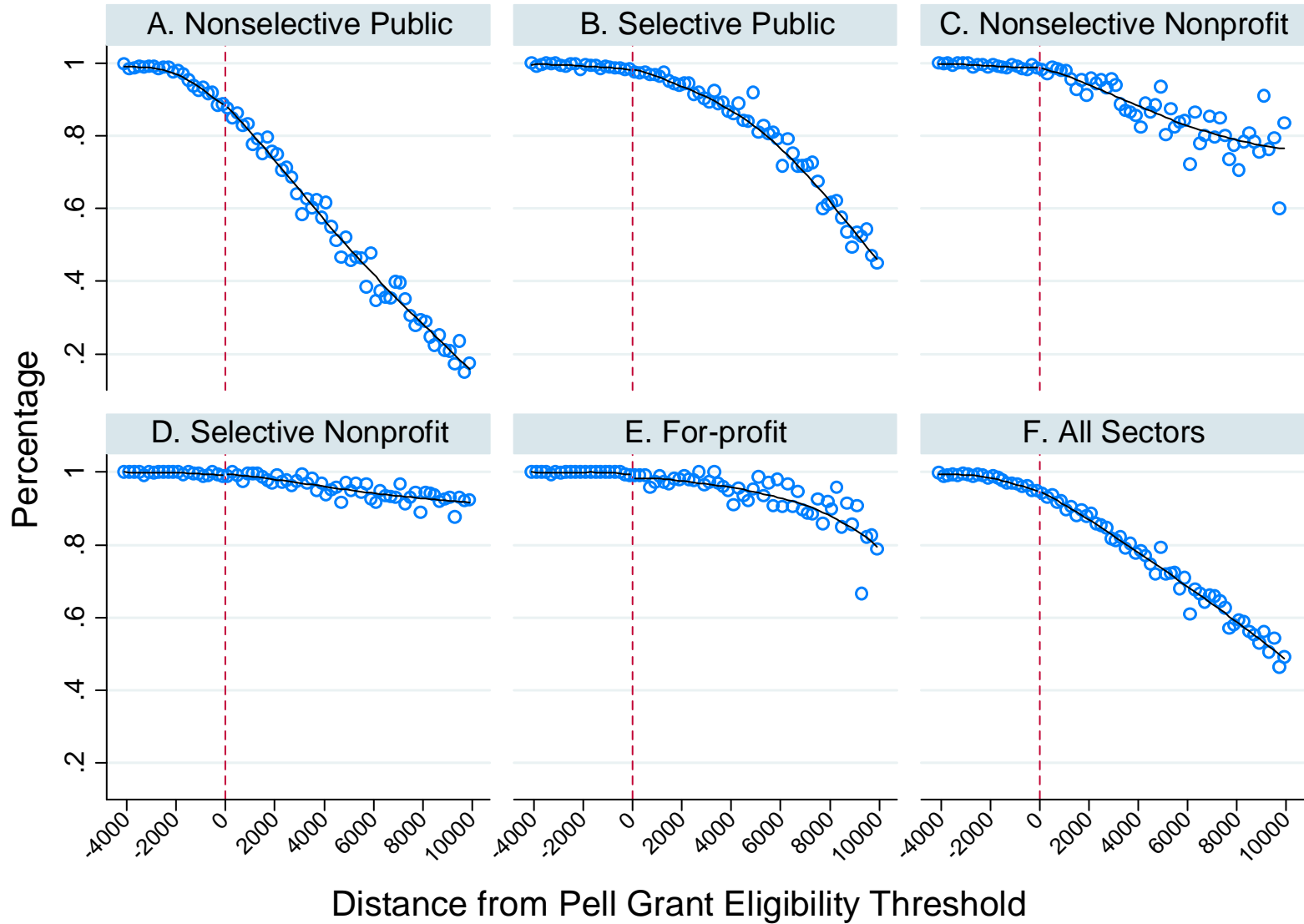| | Tuition/FTE | Revenue/FTE | Institutional Expenditures/FTE on: | | | CDR |
			Grants	Instruction	Student Services	
	(1)	(2)	(3)	(4)	(5)	(6)
A. All Sectors						
Mean of depvar	$10,619	$19,038	$1,061	$6,214	$5,748	6.55
* Pell Grant Aid	-0.027	-0.030	0.004	-0.035	0.008	0.0003
	(0.142)	(0.198)	(0.015)	(0.060)	(0.072)	(0.0001)**
Observations	66,950	77,470	66,940	83,810	84,630	128,800

Notes: Each column within a panel represents a separate regression. Standard errors clustered at institution level in parentheses; ** $p<0.01$, * $p<0.05$, + $p<0.1$.

No Evidence of Quality Upgrading

| | Tuition/FTE | Revenue/FTE | Institutional Expenditures/FTE on: | | | CDR |
| | | | Grants | Instruction | Student Services | |
	(1)	(2)	(3)	(4)	(5)	(6)
B. By Sector						
Nonselective Public						
Mean of depvar	$5,160	$13,629	$1,086	$5,051	$3,828	8.2
* Pell Grant Aid	-0.089	-0.153	0.014	-0.023	-0.047	-0.0001
	(0.040)*	(0.074)*	(0.008)+	(0.024)	(0.025)+	(0.00007)
Selective Public						
Mean of depvar	$7,839	$25,364	$1,495	$8,412	$5,503	4.5
* Pell Grant Aid	0.082	0.070	0.022	0.139	0.034	0.0003
	(0.059)	(0.170)	(0.013)+	(0.064)*	(0.036)	(0.0001)**
Nonselective Nonprofit						
Mean of depvar	$15,247	$22,260	$799	$6,138	$7,872	7.1
* Pell Grant Aid	-0.043	0.120	0.033	0.008	0.116	0.0001
	(0.155)	(0.259)	(0.030)	(0.088)	(0.093)	(0.0004)
Selective Nonprofit						
Mean of depvar	$22,449	$32,393	$1,500	$9,489	$10,288	3.2
* Pell Grant Aid	0.088	0.071	0.038	-0.038	0.064	0.0003
	(0.175)	(0.288)	(0.051)	(0.097)	(0.112)	(0.0001)**
For Profit						
Mean of depvar	$14,409	$15,860	$353	$3,522	$8,545	10.1
* Pell Grant Aid	-0.231	-0.277	-0.006	0.022	-0.228	-0.001
	(0.133)+	(0.161)+	(0.013)	(0.057)	(0.156)	(0.0003)**
Observations	66,950	77,470	66,940	83,810	84,630	128,800

Notes: Each column within a panel represents a separate regression. Standard errors clustered at institution level in parentheses; ** $p<0.01$, * $p<0.05$, + $p<0.1$.

Any Unmet Need

Total Unmet Need

Distance from Pell Grant Eligibility Threshold