The Economic Incidence of Federal Student Grant Aid

Web Appendices - Not for Publication

January 2017

Appendix A: RD Estimation with a Multidimensional Treatment

This appendix provides a general example of how a multidimensional treatment affects RD estimates. Additionally, I show how using a combined RD/RK design allows for estimation of more than one treatment dimension. Finally, I illustrate how this approach is applied in the case of the Pell Grant Program.

Let Y be the outcome of interest, where $Y = y(T, X, U)$. T is the continuous and potentially endogenous "treatment" of interest. X and U are covariates, where X is observable, U is unobservable, and both are determined prior to the realization of T. Finally, T is a deterministic function of X, $T = T(X)$, and the data generating processes for Y and T are:

$$Y = f(T, \tau) + g(X) + U \tag{A.1}$$

$$T = \beta_0 \mathbf{1}[X \leq x_0] + \beta_1 X \cdot \mathbf{1}[X \leq x_0] + h(X) \tag{A.2}$$

Where $h(X)$ is continuously differentiable in the neighborhood of x_0. In this case, the deterministic relationship between T and X leads to both a change in the level and in the first derivative at x_0.[1] Finally, $F_U(u)$ is the cumulative density (CDF) function of U and $F_{X|U}(x|u)$ is the conditional CDF of X.

Under the following identifying assumptions, the RD estimator approximates random assignment in the neighborhood of x_0 (Hahn, Todd and der Klauuw 2001; Lee and Lemieux 2010):

RD1 (Regularity): $y(t, x, u)$ is continuous in x in the neighborhood of x_0 and $f_U(x_0) > 0$.

RD2 (First Stage): T is a known function, continuous on $(-\infty, x_0)$ and (x_0, ∞), but $\lim_{\varepsilon \uparrow 0} \mathrm{E}[T|X = x_0 + \varepsilon] \neq \lim_{\varepsilon \downarrow 0} \mathrm{E}[T|X = x_0 + \varepsilon]$.

RD3 (Continuous conditional density of the assignment variable): $f_{X|U}(x|u)$ is continuous in x in the neighborhood of x_0 $\forall u$. This condition means that agents have imperfect control over X and rules

[1] In the following discussion, I assume that treatment effects do not vary with X or U, but this assumption could be relaxed without affecting my main conclusions.

out sorting in response to the treatment.

Consider two different forms of $f(T,\tau)$:

$$f(T,\tau) = \tau_1 T \tag{A.3}$$

$$f(T,\tau) = \tau_0 \mathbf{1}[T>0] + \tau_1 T \tag{A.4}$$

If equation (A.3) describes $f(T,\tau)$, the "treatment" has only one dimension and the RD estimator identifies τ_1:

$$\tau_{RD} = \frac{\lim_{\varepsilon\uparrow 0} \mathrm{E}[Y|X=x_0+\varepsilon] - \lim_{\varepsilon\downarrow 0} \mathrm{E}[Y|X=x_0+\varepsilon]}{\lim_{\varepsilon\uparrow 0} \mathrm{E}[T|X=x_0+\varepsilon] - \lim_{\varepsilon\downarrow 0} \mathrm{E}[T|X=x_0+\varepsilon]} = \tau_1$$

If instead, the treatment is multidimensional and equation (A.4) describes $f(T,\tau)$, the RD estimator equals $\tau_1 + \frac{\tau_0}{T(x_0)}$.[2]

When the treatment has two dimensions, the RD estimator only recovers the reduced form impact of these dimensions and it is not possible to separately identify τ_1 and τ_0. However, since the deterministic relationship between T and X also results in a discontinuous change in the slope of $T(X)$ at x_0, these dimensions can be identified using a combined RD/RK approach. In addition to **RD1** through **RD3**, the RK design requires the following identifying assumptions (Card et al., 2012):

RK1 (Regularity): $\frac{\partial y(t,x,u)}{\partial x}$ is continuous in x in the neighborhood of x_0.[3]

RK2 (First Stage): T is continuously differentiable on $(-\infty, x_0)$ and (x_0, ∞), but $\lim_{\varepsilon\uparrow 0} \frac{\partial \mathrm{E}[T|X=x_0+\varepsilon]}{\partial x} \neq \lim_{\varepsilon\downarrow 0} \frac{\partial \mathrm{E}[T|X=x_0+\varepsilon]}{\partial x}$.

RK3 (Continuously differentiable conditional density of the assignment variable): $f_{X|U}(x|u)$ is continuously differentiable in x in the neighborhood of x_0 $\forall u$.

If these conditions are met, regardless of whether $f(T,\tau)$ takes the form of equation (A.3) or equation (A.4),

[2] To see this, note that numerator of the RD estimator equals:

$$\lim_{\varepsilon\uparrow 0} \mathrm{E}[\tau_0 \mathbf{1}[T>0] + \tau_1 T + g(X) + U|X=x_0+\varepsilon] - \lim_{\varepsilon\downarrow 0} \mathrm{E}[\tau_0 \mathbf{1}[T>0] + \tau_1 T + g(X) + U|X=x_0+\varepsilon]$$

Given **RD1** and **RD3**, $\lim_{\varepsilon\uparrow 0} \mathrm{E}[g(X)+U] = \lim_{\varepsilon\downarrow 0} \mathrm{E}[g(X)+U]$. By assumption, $\lim_{\varepsilon\uparrow 0} \mathrm{E}[h(X)] = \lim_{\varepsilon\downarrow 0} \mathrm{E}[h(X)]$. Therefore, the RD numerator can be written as:

$$\tau_0 \left[\lim_{\varepsilon\uparrow 0} \mathrm{E}[\mathbf{1}[T>0]|X=x_0+\varepsilon] - \lim_{\varepsilon\downarrow 0} \mathrm{E}[\mathbf{1}[T>0]|X=x_0+\varepsilon] \right] + \tau_1 \left[\lim_{\varepsilon\uparrow 0} \mathrm{E}[T|X=x_0+\varepsilon] - \lim_{\varepsilon\downarrow 0} \mathrm{E}[T|X=x_0+\varepsilon] \right]$$

And the RD estimator equals: $\tau_1 + \frac{\tau_0}{\lim_{\varepsilon\uparrow 0} \mathrm{E}[T|X=x_0+\varepsilon] - \lim_{\varepsilon\downarrow 0} \mathrm{E}[T|X=x_0+\varepsilon]} = \tau_1 + \frac{\tau_0}{\beta_0+\beta_1 x_0} = \tau_1 + \frac{\tau_0}{T(x_0)}$

[3] Card et al. (2012) include the additional assumption that $\frac{\partial y(t,x,u)}{\partial t}$ is continuous in t. If the treatment is multidimensional, this condition may not hold. Comparisons of RD and RK estimators allows for a test of whether this condition is met.

the RK estimator will identify τ_1:[4]

$$\tau_{RK} = \frac{\lim\limits_{\varepsilon \uparrow 0}\left[\frac{\partial \mathrm{E}[Y|X=x_0+\varepsilon]}{\partial x}\right] - \lim\limits_{\varepsilon \downarrow 0}\left[\frac{\partial \mathrm{E}[Y|X=x_0+\varepsilon]}{\partial x}\right]}{\lim\limits_{\varepsilon \uparrow 0}\left[\frac{\partial \mathrm{E}[T|X=x_0+\varepsilon]}{\partial x}\right] - \lim\limits_{\varepsilon \downarrow 0}\left[\frac{\partial \mathrm{E}[T|X=x_0+\varepsilon]}{\partial x}\right]} = \tau_1$$

Furthermore, if the treatment has two dimensions, as described in equation (A.4), the RD and RK estimators can be combined to identify both τ_0 and τ_1. The RK estimator identifies τ_1, and $\tau_{RD} = \tau_1 + \frac{\tau_0}{T(x_0)}$. Combining these two terms allows for identification of τ_0:

$$\tau_0 = (\tau_{RD} - \tau_{RK}) \cdot T(x_0) \tag{A.5}$$

If $f(T, \tau)$ has higher order terms, then $\tau_{RD} = \frac{\tau_0}{T(x_0)} + \tau_1 + \tau_2 T(x_0) + ... + \tau_p T(x_0)^{p-1}$ and $\tau_{RK} = \tau_1 + \tau_2 T(x_0) + ... + \tau_p T(x)^{p-1}$ where p is the order of polynomial in T. Thus, using a combined RD/RK approach, it is always possible to identify τ_0 - the discrete change in the outcome that occurs when $T > 0$, but it is not possible to separately recover higher order terms without discontinuities in higher order derivatives of T.

A.1 Multiple treatment dimensions: the Pell Grant Program

In the case of the Pell Grant Program, $Y = y(Pell, EFC, U)$ represents institutional aid. Since not every student submits an application for federal aid, Pell Grant aid is not completely determined by a student's EFC, and the RD/RK designs will be fuzzy. The data generating processes for Y and $Pell$ are:

$$Y = f(Pell, \tau) + g(EFC) + U \tag{A.6}$$

$$Pell = \pi(400 - (EFC - efc_0))\,\mathbf{1}[EFC < efc_0] \tag{A.7}$$

Where efc_0 is the cut-off for Pell Grant eligibility, $\pi \in \{0, 1\}$is a random variable, and $\mathrm{E}[\pi] > 0$ (i.e., π represents the probability a student applies for federal aid). Although π may depend on EFC, since the decision to apply for for financial aid is determined prior to Pell Grant receipt, I assume $\pi = \pi(EFC)$ is

[4] To see this, first note that the RK numerator equals:

$$\lim_{\varepsilon \uparrow 0}\left[\frac{\partial \mathrm{E}[\tau_0 \mathbf{1}[T>0] + \tau_1 T + g(X) + U|X = x_0 + \varepsilon]}{\partial x}\right] - \lim_{\varepsilon \downarrow 0}\left[\frac{\partial \mathrm{E}[\tau_0 \mathbf{1}[T>0] + \tau_1 T + g(X) + U|X = x_0 + \varepsilon]}{\partial x}\right]$$

By assumptions **RK1** and **RK3**, $\lim\limits_{\varepsilon \uparrow 0}\left[\frac{\partial \mathrm{E}[g(X)+U|X=x_0+\varepsilon]}{\partial x}\right] = \lim\limits_{\varepsilon \downarrow 0}\left[\frac{\partial \mathrm{E}[g(X)+U|X=x_0+\varepsilon]}{\partial x}\right]$. Furthermore, $\lim\limits_{\varepsilon \uparrow 0}\left[\frac{\partial \mathrm{E}[\mathbf{1}[T>0]|X=x_0+\varepsilon]}{\partial x}\right] = \lim\limits_{\varepsilon \downarrow 0}\left[\frac{\partial \mathrm{E}[\mathbf{1}[T>0]|X=x_0+\varepsilon]}{\partial x}\right] = 0$ and by assumption, $\lim\limits_{\varepsilon \uparrow 0}\left[\frac{\partial \mathrm{E}[h(X)|X=x_0+\varepsilon]}{\partial x}\right] = \lim\limits_{\varepsilon \downarrow 0}\left[\frac{\partial \mathrm{E}[h(X)|X=x_0+\varepsilon]}{\partial x}\right]$. Therefore, the RK numerator equals: $\tau_1\left(\lim\limits_{\varepsilon \uparrow 0}\left[\frac{\partial \mathrm{E}[T|X=x_0+\varepsilon]}{\partial x}\right] - \lim\limits_{\varepsilon \downarrow 0}\left[\frac{\partial \mathrm{E}[T|X=x_0+\varepsilon]}{\partial x}\right]\right)$, and the RK estimator equals: $\tau_{RK} = \tau_1$.

continuous and smooth in the neighborhood of efc_0.

My model suggests that Pell Grant aid may affect institutional aid provision through two dimensions: by altering a school's willingness to pay (τ_0) and through schools' ability to capture outside aid due to the pass-through of demand increases (τ_1): $f(Pell, \tau) = \tau_0 \mathbf{1}[Pell > 0] + \tau_1 Pell$. The RD estimator is equal to:

$$\tau_{RD} = \tau_1 + \tau_0 \left(\frac{\lim_{\varepsilon \uparrow 0} \mathrm{E}[\mathbf{1}[Pell > 0] | EFC = efc_0 + \varepsilon]}{\lim_{\varepsilon \uparrow 0} \mathrm{E}[Pell | EFC = efc_0 + \varepsilon] - \lim_{\varepsilon \downarrow 0} \mathrm{E}[Pell | EFC = efc_0 + \varepsilon]} \right)$$

Since $\frac{\lim_{\varepsilon \uparrow 0} \mathrm{E}[\mathbf{1}[Pell>0] | EFC = efc_0 + \varepsilon]}{\lim_{\varepsilon \uparrow 0} \mathrm{E}[Pell | EFC = efc_0 + \varepsilon] - \lim_{\varepsilon \downarrow 0} \mathrm{E}[Pell | EFC = efc_0 + \varepsilon]} = \frac{\lim_{\varepsilon \uparrow 0} \Pr[\pi = 1 | EFC = efc_0 + \varepsilon]}{\lim_{\varepsilon \uparrow 0} \mathrm{E}[\pi(400 - (EFC - efc_0)) | EFC = efc_0 + \varepsilon]} = \frac{1}{400}$, as in the sharp case, $\tau_{RD} = \tau_1 + \frac{\tau_0}{Pell(efc_0)}$, where $Pell(efc_0) = 400$. Following the arguments presented in the previous section, and assuming that $f(Pell, \tau)$ does not include any higher order terms, the regression kink estimator identifies τ_1 and $\tau_0 = (\tau_{RD} - \tau_{RK}) \cdot 400$.

Appendix B: Data and Sample Construction

This appendix provides further details regarding data sources, sample construction, and variable definitions.

B.1 Data Sources

My primary data source is the National Postsecondary Student Aid Survey (NPSAS). The Department of Education's National Center for Education Statistics (NCES) collects NPSAS data on a three to four year cycle; my sample includes students in the last four NPSAS waves, which cover the 1995-96, 1999-00, 2003-04, and 2007-08 (hereafter, 1996, 2000, 2004, and 2008) academic years. The most recent wave of the NPSAS, which covers the 2011-12 academic year, is excluded from my analyses. This is due to the discontinuous decrease in the density of students immediately below the Pell Grant eligibility threshold, which would indicate a potential violation of the key identifying assumption for the RD design. I expand upon this issue in Appendix D.

For each NPSAS wave, a stratified random sample of Title IV-eligible institutions is first drawn. From these institutions, a sample of degree-seeking students are selected into the NPSAS. Researchers must apply for an IES/NCES restricted-use data license to access NPSAS data.[5]

I also use data from the publicly available Integrated Postsecondary Education Data System (IPEDS) and the 2001 *Barron's Profiles of American Colleges* to classify institutions as either selective or nonselective. Specifically, from the IPEDS, I obtain information on whether the school offers associates' degree programs,

[5] http://nces.ed.gov/pubsearch/licenses.asp provides details on how to apply for a NCES restricted-use data license.

is classified as "inclusive" (i.e., open admissions), and the percentage of applicants that were admitted. The *Barron's Guide* categorizes schools (primarily four-year public and nonprofit institutions) by selectivity based on acceptance rates, college entrance exam scores, and the minimum class rank and grade point average required for admission.

B.2 Defining Sectors of Higher Education

Sectors of higher education are defined by selectivity (nonselective and more selective) and control (public, private nonprofit, and private for-profit). Public schools are either operated by publicly elected or appointed officials or receive the majority of their funding from public sources. Private institutions receive the majority of funding from private sources and are run by privately appointed individuals. Nonprofit institutions are exempt from federal taxes but are subject to the "non-distribution constraint" which prohibits a school from distributing revenue to its controlling body in excess of regular wages and other operating expenses (Hansmann 1980); income from activities unrelated to the provision of education is subject to taxation. For-profit schools pay corporate income taxes and are allowed to distribute profits to owners or shareholders.

Nonselective public institutions are public institutions that meet one of the following criteria: 1) classified as community colleges in the IPEDS, 2) classified as offering associate's degree programs in the IPEDS, 3) classified as "inclusive" in the IPEDS, 4) classified as less competitive or non-competitive by the Barron's Guide, or 5) not listed in the Barron's Guide and admit more than 75 percent of applicants.

More selective public institutions are public schools that meet one of the following criteria: 1) classified as 4-year institutions by the IPEDS and competitive, very competitive highly competitive, or most selective by the Barron's Guide, or 2) are missing Barron's Guide information, do not meet any of the criteria for being classified as a nonselective institution, and admit less than 75 percent of applicants.

Nonselective nonprofit institutions are private, nonprofit schools that meet one criteria used for nonselective public institutions. More selective nonprofit institutions are private, nonprofit schools that meet one of the criteria used for selective public institutions. For-profit institutions are all nonselective.

When schools switch sectors, I use the most recent sector.

B.3 Sample Selection

To create my analysis sample, I first eliminate all students attending non-degree granting institutions, as these schools are ineligible to disburse federal student aid. Likewise, I eliminate students attending schools that do not participate in Title IV, regardless of an institution's degree-granting status. I exclude students attending institutions located outside of the 50 U.S. states (and the District of Columbia) and students

enrolled in theological seminaries and faith-based institutions from my sample.

Furthermore, I exclude students with the following characteristics:

- Students who received institutional aid classified as an athletic scholarship.
- Students younger than 17 or older than 45.
- Students attending multiple institutions in the study year.
- Students who were not enrolled at any time during the fall semester.
- Students who were not U.S. citizens or permanent residents.
- Students classified as graduate/professional students at any point during the year.
- Undergraduate students pursuing a graduate or professional degree or enrolled in a school that only offers graduate or professional degrees.
- Students who were enrolled in school for less than 3 months or were missing enrollment length information.
- Oversampled SMART grant recipients (2008 NPSAS only).
- Students with missing information on their state of residence or listed as having a permanent address outside of the 50 U.S. states and the District of Columbia.

B.4 NPSAS Variables

This section describes all transformations of NPSAS variables. Unless otherwise stated, all monetary values discussed in the text and included in regression specifications are adjusted for inflation (2013$).

For the small number of observations with missing institutional aid amounts, I assume these students received no institutional aid.

In 2008, a small number of observations are missing information on Pell Grant aid received during the school year. First, I assume these students received no Pell Grant aid during the year if they are listed as having received $0 in cumulative lifetime Pell Grant aid. If the first year of Pell Grant receipt is listed as 2007, missing values of Pell Grant aid are replaced by the cumulative amount of Pell Grant aid received as of 2008. Students with a missing value of Pell Grant aid after these imputations are dropped.

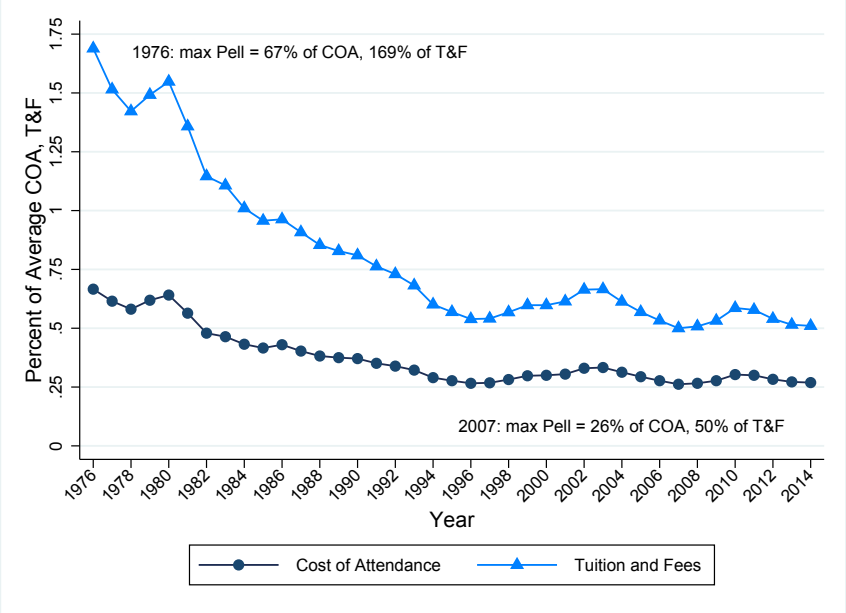
I classify students as "in-state" if a student's state of legal residence is the same as the state where the school is located. In 2004, I use the cumulative math and verbal SAT scores to calculate students' overall

scores; in other years, the total score is reported. I set SAT scores to be missing for upper year students or students with a score below 400 (the lowest possible score during my sample period).

To construct measures of school quality, I use information from the IPEDS linked to NPSAS institutions to measure revenue and expenditures, including tuition and total revenue per full-time equivalent (FTE) student and institutional grants, instruction-related expenditures, and expenditures on student services per FTE. I use prior-year revenue and expenditure data to create these measures. Unfortunately, the IPEDS did not collect revenue and expenditure data for the majority of schools before 2000. Thus, when examining these measures of quality, my sample is limited to students attending institutions in 2004 and 2008.

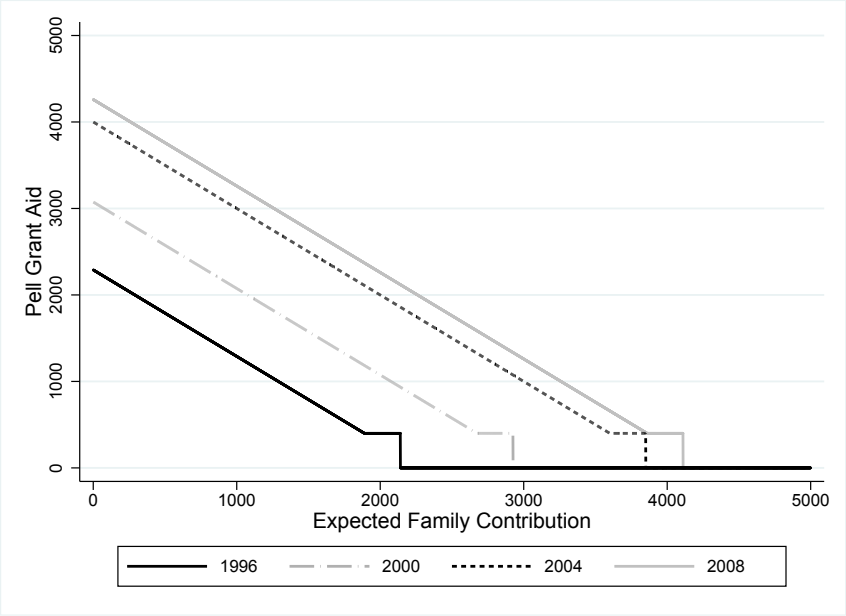
Appendix C: Additional Figures and Tables

Figure C.1: The Purchasing Power of the Maximum Pell Grant



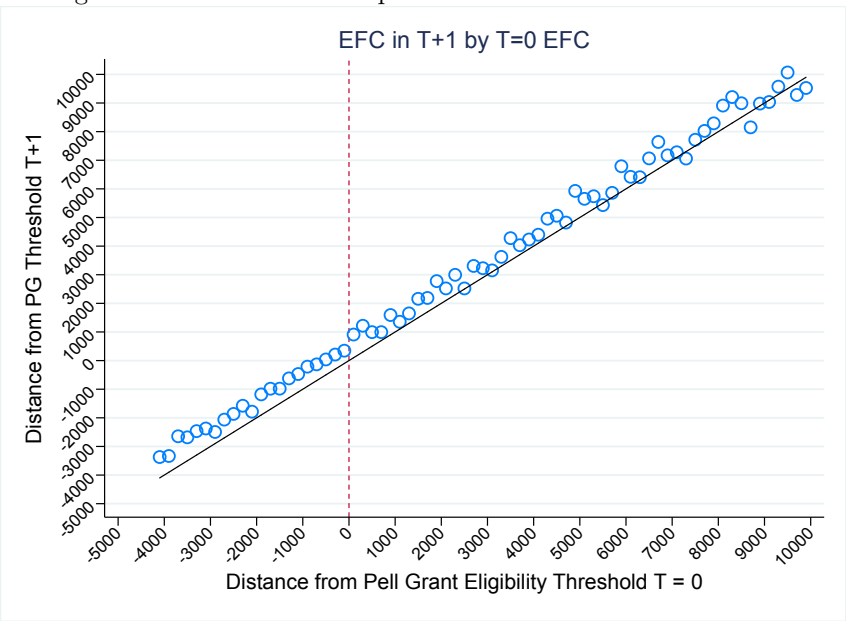
Source: Average cost of attendance and tuition and fees from Snyder, de Brey and Dillow (2016) (Table 330.10). Maximum Pell Grant from U.S. Department of Education (2016). *Notes:* Each marker represents the maximum Pell Grant as a percentage of the average cost of attendance (circles) or average tuition and fees (triangles) in a given year.

Figure C.2: Pell Grant Award Schedule, NPSAS Sample Years



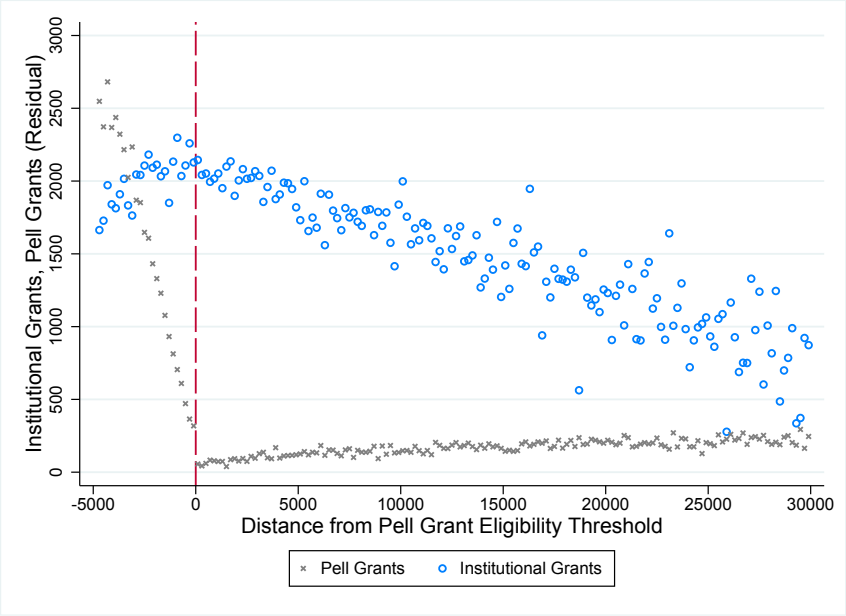
Notes: Each line represents the statutory (nominal) Pell Grant that a full-time, full-year student with a given EFC would receive in the specified year.

Figure C.3: The Relationship between Current and Future EFC



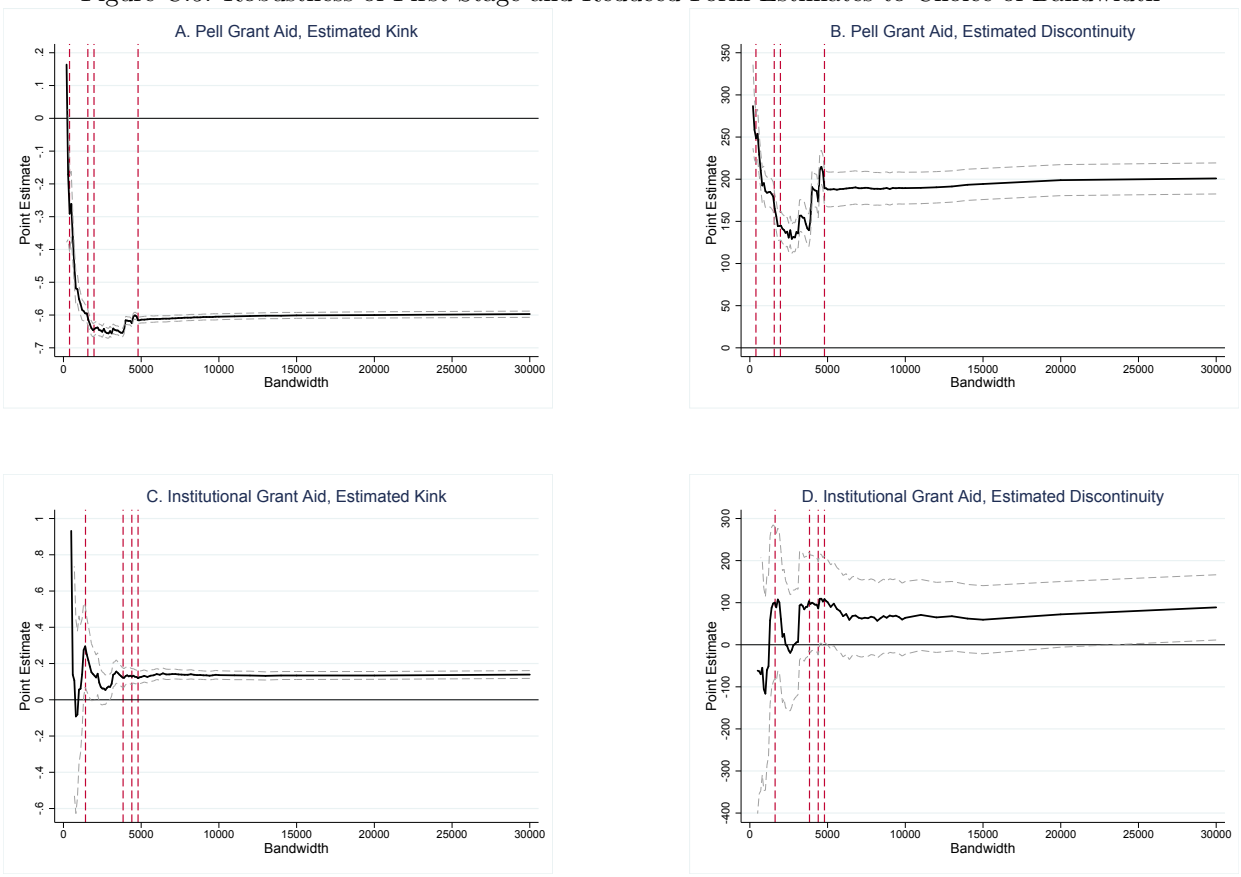
Source: 1996, 2000, 2004, and 2008 NPSAS. See Appendix B for sample construction details. *Notes*: Sample limited to students that submitted a FAFSA in both the survey year and the following academic year. Each circle represents the average distance from the Pell Grant eligibility threshold in the following year (e.g., $\widetilde{EFC}_{t+1}$) within a given \$200 $\widetilde{EFC}_t$ bin. All dollar amounts in nominal terms. The black 45 degree line represents the the relationship between current and future EFC if there were no changes over time.

Figure C.4: Pell Grant Generosity and Institutional Aid over Full Support of Running Variable



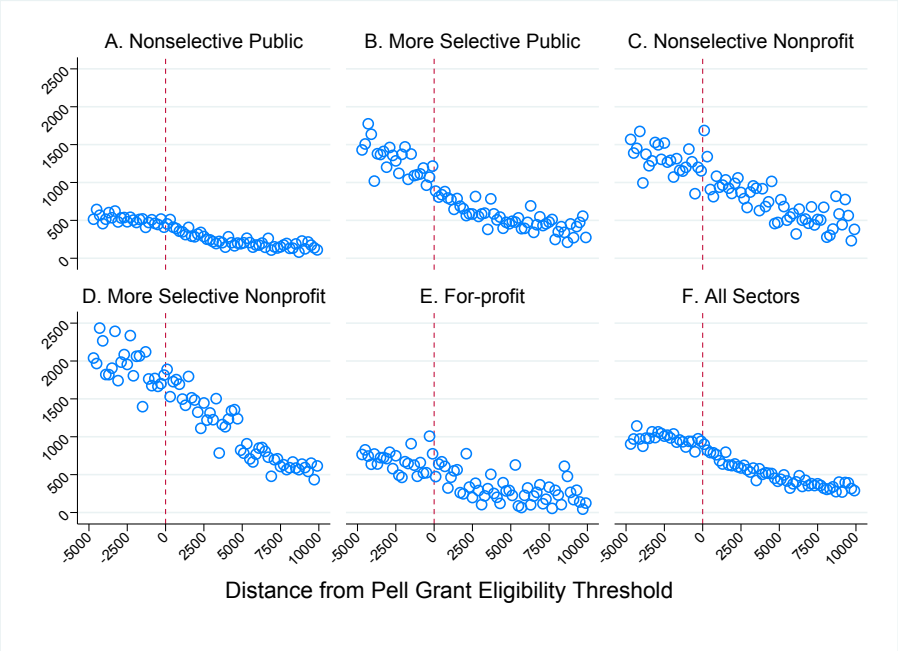
Source: 1996, 2000, 2004, and 2008 NPSAS. See Appendix B for sample construction details. *Notes*: See Figure 5 notes. Students with an expected family contribution more than 30,000 above the Pell Grant eligibility threshold are excluded (approximately 7 percent of observations). All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure C.5: Robustness of First Stage and Reduced Form Estimates to Choice of Bandwidth



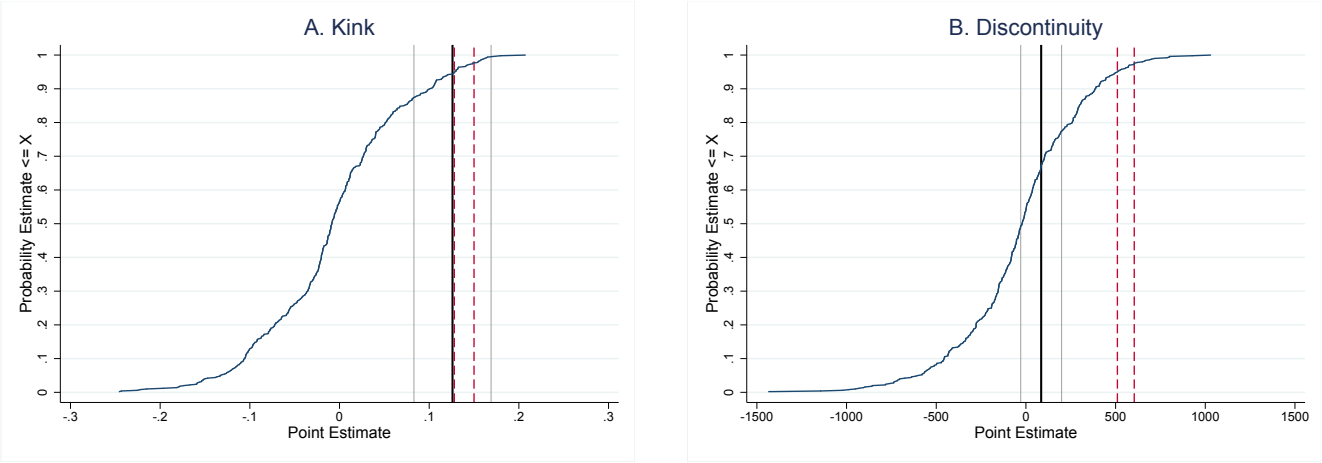
Source: 1996, 2000, 2004, and 2008 NPSAS. *Notes*: See Appendix B for sample construction details. See Figure 7 notes for details. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure C.6: The Distribution of State Grant Aid by EFC and Sector



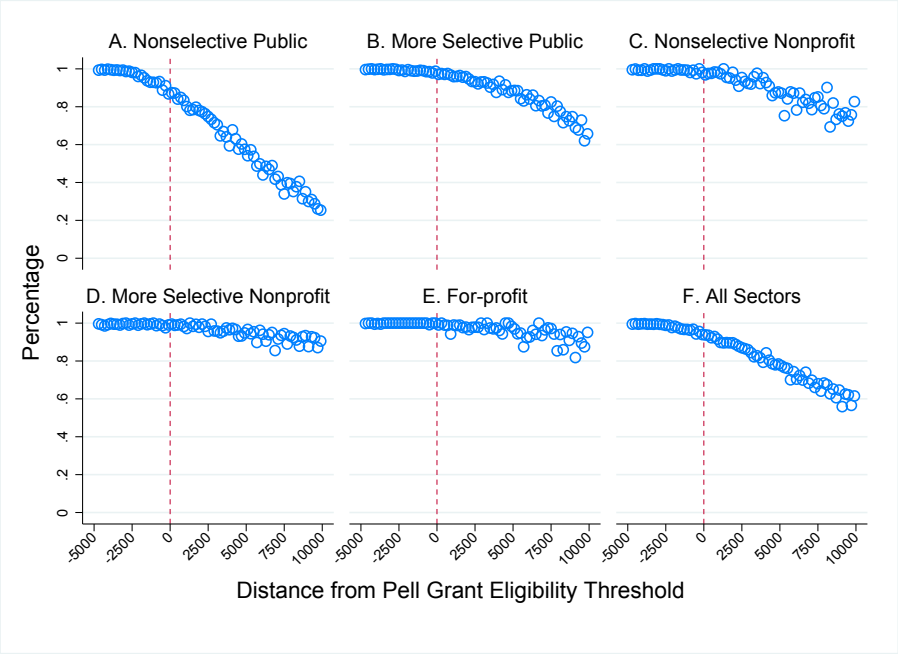
Source: 1996, 2000, 2004, and 2008 NPSAS. *Notes:* See Appendix B for sample construction details. Each circle represents average state grant aid received by students within a given \$200 $\widetilde{EFC}$ bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure C.7: The Distribution Reduced Form Estimates using Placebo Kinks



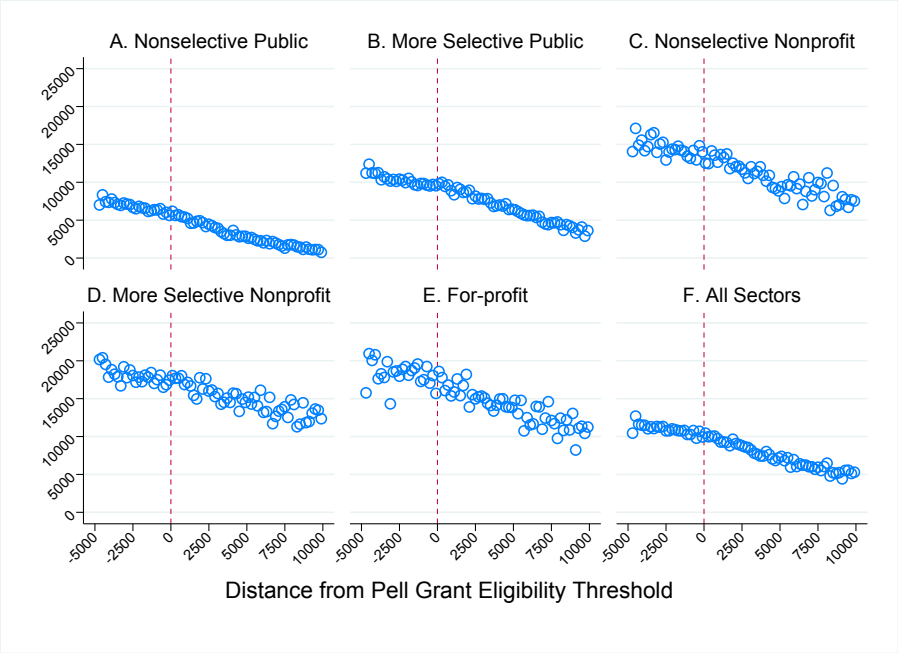
Source: 1996, 2000, 2004, and 2008 NPSAS. *Notes*: See Appendix B for sample construction details. Distribution of estimated kink and discontinuity from 500 regressions of institutional grant aid on $\widetilde{EFC}$ and school by year fixed effects using randomly drawn placebo thresholds. See Section 5.2 for details. Dashed lines correspond to the 95th and 97.5th percentiles of placebo estimates. Solid black line represents point estimate using the actual Pell Grant threshold and thin gray lines represent the corresponding 95 percent confidence interval (from Table 3, Panel B). All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure C.8: Percentage of Students with Unmet Need



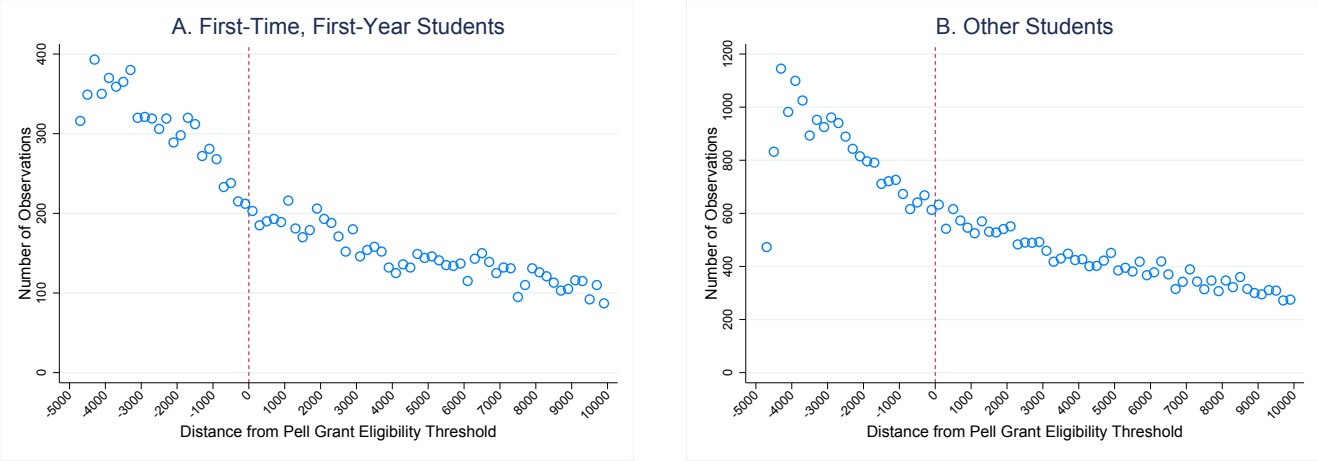
Source: 1996, 2000, 2004, and 2008 NPSAS. *Notes*: See Appendix B for sample construction details. Unmet need equals $max\{COA - EFC - grants, 0\}$, where grants includes state, federal, and institutional grant aid. Cost of attendance (COA) includes tuition and fees, room and board, books and supplies, transportation, and other living expenses. Each circle represents the share of students within a given \$200 $\widetilde{EFC}$ bin that had unmet need. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure C.9: Average Unmet Need



Source: 1996, 2000, 2004, and 2008 NPSAS. *Notes*: See Appendix B for sample construction details. See Figure C.8 notes for description of unmet need. Each circle represents average unmet need for students within a given \$200 $\widetilde{EFC}$ bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure C.10: Number of Observations: Institutional Quality Sample



Source: 2004 and 2008 NPSAS and IPEDS. *Notes*: See Appendix B for sample construction details. \$200 $\widetilde{EFC}$ bins; each circle indicates the number of students in the bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars. Students with EFC = 0 are excluded.

Figure C.11: Measures of Institution Quality: First-Time, First-Year Sample

Source: 2004 and 2008 NPSAS and IPEDS. *Notes*: See Appendix B for sample construction details. \$200 $\widetilde{EFC}$ bins; each circle indicates the average tuition (A), revenue (B), or expenditures (C, D, E) in the specified category per full-time equivalent students (FTEs). All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Table C.1: Characteristics of Schools and Students by Pell Grant Receipt and Sector

A. Public Institutions

	Nonselective		More Selective	
	(1) Pell	(2) No Pell	(3) Pell	(4) No Pell
A. Cost of attendance and financial aid				
Expected family contribution	$719	$3,181	$914	$3,664
Cost of attendance	$11,898	$9,453	$16,919	$14,716
Pell Grant aid	$2,854	$0	$2,957	$0
State grant aid	$719	$227	$1,611	$565
Other federal grant aid	$157	$9	$357	$23
Institutional grant aid	$291	$206	$1,238	$757
Percent receiving institutional aid	0.17	0.11	0.37	0.21
Unmet need	$6,991	$5,667	$9,449	$9,383
Percent with unmet need	0.98	0.84	0.99	0.95
B. Student demographic characteristics				
White	0.49	0.64	0.60	0.76
Male	0.33	0.45	0.43	0.47
Dependent student	0.44	0.46	0.60	0.67
Age	25	25	23	22
In-state	0.96	0.95	0.94	0.92
Adjusted gross income	$17,462	$30,037	$19,548	$35,216
C. Student attendance status				
Full-time	0.69	0.51	0.89	0.81
Months of enrollment	11	10	11	10
Number of students	24,750	21,880	12,190	11,980

Table 1, continued

B. Private Institutions

	Nonselective NP		More Selective NP		For-profit	
	(1) Pell	(2) No Pell	(3) Pell	(4) No Pell	(5) Pell	(6) No Pell
A. Student cost of attendance and financial aid						
Expected family contribution	$733	$3,559	$1,004	$3,843	$602	$3,587
Cost of attendance	$22,292	$20,169	$32,337	$30,484	$23,021	$21,442
Pell Grant aid	$3,006	$0	$2,935	$0	$2,981	$0
State grant aid	$1,571	$756	$2,337	$1,119	$831	$340
Other federal grant aid	$439	$31	$1,024	$52	$218	$16
Institutional grant aid	$2,447	$2,475	$8,684	$7,203	$260	$308
Percent receiving institutional aid	0.46	0.39	0.77	0.63	0.10	0.09
Unmet need	$13,686	$12,704	$15,979	$17,594	$17,899	$16,694
Percent with unmet need	0.99	0.95	0.99	0.97	1.00	0.98
B. Student demographic characteristics						
White	0.48	0.64	0.62	0.77	0.41	0.55
Male	0.33	0.42	0.39	0.41	0.38	0.47
Dependent student	0.46	0.49	0.69	0.74	0.30	0.31
Age	25	25	22	22	26	27
In-state	0.84	0.75	0.76	0.67	0.86	0.80
Adjusted gross income	$18,164	$33,007	$21,695	$38,567	$15,969	$28,941
C. Student attendance status						
Full-time	0.83	0.75	0.92	0.86	0.78	0.74
Months of enrollment	10	10	11	10	10	9
Number of Students	6,070	3,810	6,600	6,000	7,780	3,230

Source: 1996, 2000, 2004, and 2008 NPSAS. *Note*s: See Appendix B for sample construction details. Number of observations rounded to nearest 10. Students with EFCs greater than 4,800 from the Pell Grant eligibility threshold are excluded. See Table 1 notes for additional details and variable definitions. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Table C.2: The Relationship between Pell Grant Eligibility and Predetermined Characteristics

	(1) White	(2) Male	(3) Dependent	(4) SAT score	(5) Age	(6) AGI
A. First-time, first-year students						
Pell Grant eligible	0.017	0.018	0.069	12.4	0.098	-108
	(0.043)	(0.016)	(0.045)	(8.7)	(0.150)	(2203)
× Distance from threshold	0.0004	0.00001	0.0003	0.004	-0.0001	-6.09
	(0.0003)	(0.00001)	(0.0005)	(0.003)	(0.0001)**	(16.7)
Test of joint sig: *p*- value	0.242	0.089	0.241	0.116	0.021	0.932
Polynomial degree	7	1	9	1	1	7
Observations	30,100	30,100	30,100	11,130	30,100	28,500
B. Other students						
Pell Grant eligible	-0.001	-0.021	0.042	10.0	-0.076	445
	(0.012)	(0.037)	(0.035)	(7.7)	(0.312)	(1070)
× Distance from threshold	0.00001	-0.0002	0.0003	0.006	0.0007	5.80
	(0.00001)	(0.0003)	(0.0003)	(0.007)	(0.002)	(4.45)
Test of joint sig: *p*- value	0.685	0.591	0.248	0.293	0.929	0.379
Polynomial degree	2	7	7	2	8	5
Observations	74,200	74,200	74,200	27,810	74,200	69,790

Source: 1996, 2000, 2004, and 2008 NPSAS. *Notes*: See Appendix B for sample construction details. Students with EFCs greater than 4,800 from the Pell Grant eligibility threshold are excluded. Observations missing SAT scores are excluded from Column 4 sample. Observations with missing AGI are excluded from Column 6 sample. Each column within a panel contains estimates from a separate regression. Number of observations rounded to nearest 10. Clustered standard errors (institution by year) in parentheses; ** p<0.01, * p<0.05, + p<0.1. All regressions include institution by year fixed effects and the specified polynomial in $\widetilde{EFC}_{it}$ (allowed to vary by survey year) and $\widetilde{EFC}_{it} \times \mathbf{1}[\widetilde{EFC}_{it} < 0]$. Panel B regressions also include class level fixed effects. Optimal degree of polynomial chosen to minimize the Akaike Information Criterion. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Table C.3: RK and RD Estimates: Heterogeneity by Sector

	(1) IV-RK	(2) IV-RD
Nonselective public		
× Pell Grant Aid	-0.034	0.432
	(0.016)*	(0.521)
More selective public		
× Pell Grant Aid	-0.090	0.811
	(0.163)**	(0.294)**
Nonselective nonprofit		
× Pell Grant Aid	-0.042	0.190
	(0.100)	(1.038)
More selective nonprofit		
× Pell Grant Aid	-0.876	1.345
	(0.163)**	(0.834)
For-profit		
× Pell Grant Aid	-0.098	-0.483
	(0.056)+	(0.403)
Observations	104,300	104,300

Source: 1996, 2000, 2004, and 2008 NPSAS. *Note*s: See Appendix B for sample construction details. Students with EFCs greater than 4,800 from the Pell Grant eligibility threshold are excluded. Each column represents a separate regression. Number of observations rounded to nearest 10. Standard errors clustered at institution by year level in parentheses; ** p<0.01, * p<0.05, + p<0.1. All regressions include school by year fixed effects, a linear term in student expected family contribution ($\widetilde{EFC}_{it}$), allowed to vary by year and sector, interactions between sector and an indicator for Pell Grant eligibility ($\mathbf{1}[\widetilde{EFC}_{it} < 0]$), and the interaction between Pell Grant eligibility and distance from the eligibility threshold ($\widetilde{EFC}_{it}\mathbf{1}[\widetilde{EFC}_{it} < 0]$), also interacted with sector. In column 1, the interaction between $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ and a full set of sector dummies serve as excluded instruments for the interactions between Pell Grant Aid and sector. In column 2, the interaction between $\widetilde{EFC}_{it}\mathbf{1}[\widetilde{EFC}_{it} < 0]$ and a full set of sector dummies serve as excluded instruments for interactions between Pell Grant Aid and sector.

Table C.4: Heterogeneity in the Impact of Pell Grant Aid on Institutional Aid by Year

	1996	2000	2004	2008	Test of equality (p-value)
Public institutions					
Pass-through	-0.111	-0.031	-0.100	-0.098	0.467
	(0.053)*	(0.039)	(0.036)**	(0.028)**	
Willingness to pay	591	198	25	463	0.505
	(315)+	(145)	(637)	(172)**	
Nonselective private institutions					
Pass-through	-0.243	-0.018	-0.061	-0.063	0.705
	(0.151)	(0.144)	(0.126)	(0.098)	
Willingness to pay	183	259	-810	193	0.754
	(394)	(646)	(896)	(326)	
More selective nonprofit institutions					
Pass-through	-1.769	-1.180	-0.535	-0.697	0.195
	(0.608)**	(0.415)**	(0.242)*	(0.256)**	
Willingness to pay	1955	1125	1191	1179	0.903
	(943)*	(784)	(1392)	(638)+	
Observations	15,300	16,080	30,180	42,750	
Test of equality (p-value)					
Pass-through	0.019	0.022	0.193	0.061	
Willingness to pay	0.212	0.508	0.466	0.381	

Source: 1996, 2000, 2004, and 2008 NPSAS. *Note*s: See Appendix B for sample construction details. Students with EFC greater than $4,800 from Pell Grant eligibility threshold are excluded. Number of observations rounded to nearest 10. Standard errors clustered at institution by year level in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Section 6 for definitions and estimation of treatment dimensions. All models include school fixed effects, a linear term in student expected family contribution ($\widetilde{EFC}_{it}$), an indicator for Pell Grant eligibility ($\mathbf{1}[\widetilde{EFC}_{it} < 0]$), and the interaction between Pell Grant eligibility and distance from the eligibility threshold ($\widetilde{EFC}_{it}\mathbf{1}[\widetilde{EFC}_{it} < 0]$). All $\widetilde{EFC}_{it}$ controls are also fully interacted with sector. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Table C.5: Heterogeneity in the Impact of Pell Grant Aid on Institutional Aid by Sector and Demographic Characteristics

	(1) Race			(2) Gender			(3) School location			(4) Past enrollment		
	White	Nonwhite	Test of eq. (p-val.)	Female	Male	Test of eq. (p-val.)	In-state	Out-of-state	Test of eq. (p-val.)	New student	Returning student	Test of eq. (p-val.)
Public Institutions												
Pass-through	-0.077 (0.024)**	-0.080 (0.034)*	0.926	-0.104 (0.023)**	-0.074 (0.030)*	0.414	-0.086 (0.016)**	-0.161 (0.187)	0.688	-0.112 (0.034)**	-0.088 (0.022)**	0.541
WTP	163 (88)+	1034 (454)*	0.057	233 (116)*	445 (153)**	0.239	297 (92)**	954 (776)	0.399	373 (164)*	380 (112)**	0.970
Nonselective Private Institutions												
Pass-through	0.042 (0.086)	-0.207 (0.104)*	0.073	-0.007 (0.088)	-0.137 (0.085)	0.273	-0.086 (0.067)	-0.130 (0.158)	0.800	-0.006 (0.115)	-0.102 (0.070)	0.475
WTP	88 (298)	-146 (386)	0.617	215 (349)	-438 (360)	0.154	41 (285)	-348 (741)	0.616	-61 (428)	-210 (317)	0.775
More Selective Nonprofit Institutions												
Pass-through	-0.939 (0.191)**	-0.953 (0.321)**	0.972	-0.714 (0.223)**	-1.018 (0.237)**	0.343	-0.604 (0.135)**	-1.752 (0.560)**	0.041	-0.756 (0.308)*	-0.784 (0.184)**	0.935
WTP	1385 (377)**	475 (1358)	0.502	775 (540)	1438 (615)*	0.401	280 (469)	3161 (808)**	0.002	1163 (635)+	632 (520)	0.494
Observations	104,300			104,300			104,300			104,300		
Test of equality (p- value):												
Pass-through	<0.001	0.014		0.013	<0.001		<0.001	0.019		0.073	<0.001	
WTP	0.006	0.140		0.614	0.016		0.692	0.005		0.277	0.179	

Source: 1996, 2000, 2004, and 2008 NPSAS. *Notes*: See Appendix B for sample construction details. Students with EFC greater than $4,800 from Pell Grant eligibility threshold are excluded. Number of observations rounded to nearest 10. Standard errors clustered at institution by year level in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Section 6 for definitions and estimation of treatment dimensions. All models include school by year fixed effects, $\widetilde{EFC}_{it}$ allowed to vary by survey year, $\mathbf{1}[\widetilde{EFC}_{it} < 0]$, $\widetilde{EFC}_{it}\mathbf{1}[\widetilde{EFC}_{it} < 0]$, linear and quadratic terms in age, and indicators for gender, race, level, dependency status, and out-of-state student, all fully interacted with the characteristic specified in the column heading. All $\widetilde{EFC}_{it}$ controls are also fully interacted with sector. Sectors are defined in Appendix B; selective and nonselective public institutions are combined as are nonselective private and for-profit institutions. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Table C.6: The Impact of Pell Grant Aid on Institutional Quality

	(1) Tuition/ FTE	(2) Revenue/ FTE	Institutional Expenditures/FTE on: (3) Grants	(4) Instruction	(5) Student Services
A. First-time, first-year students					
Change in slope	0.149	0.058	-0.002	0.025	0.006
	(0.095)	(0.099)	(0.008)	(0.074)	(0.056)
Change in level	461	242	11	221	415
	(287)	(279)	(17)	(170)	(174)*
Dep. var mean | ineligible	$6,627	$11,779	$436	$4,891	$4,234
Observations	18,870	17,590	18,880	18,880	18,840
B. All other students					
Change in slope	-0.043	-0.027	-0.0004	0.023	-0.012
	(0.055)	(0.047)	(0.004)	(0.027)	(0.036)
Change in level	54	24	2	-12	-11
	(124)	(129)	(10)	(96)	(88)
Dep. var mean | ineligible	$6,803	$12,179	$450	$4,925	$4,335
Observations	51,010	47,020	51,020	51,000	50,880

Source: NPSAS students attending institutions in 2004 and 2008 with revenue or expenditure information available in $t-1$ IPEDS data (2003 and 2007, respectively). *Note*s: See Appendix B for sample construction details. Students with EFC greater than $4,800 from Pell Grant eligibility threshold are excluded. Number of observations rounded to nearest 10. Each column within a panel represents a separate regression. Standard errors clustered at the student state of residence by year level in parentheses; ** p<0.01, * p<0.05, + p<0.1. Regressions include student state of residence by year fixed effects, $\widetilde{EFC}_{it}$ allowed to vary by year, $\mathbf{1}[\widetilde{EFC}_{it} < 0]$, $\widetilde{EFC}_{it}\mathbf{1}[\widetilde{EFC}_{it} < 0]$, indicators for gender, race (white versus nonwhite), dependency status, linear and quadratic terms in age, SAT score (sum of math and verbal scores), and an indicator for missing SAT scores. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Table C.7: RK and RD Estimates of the Impact of Pell Grant Aid on Institutional Aid
Institutional Quality Sample

	OLS		IV	
	(1) FS	(2) RF	(3) RK	(4) RD
Change in slope	-0.588	0.094		
	(0.007)**	(0.020)**		
Change in level	172	140		
	(17)**	(66)*		
Pell Grant aid			-0.159	0.818
			(0.034)**	(0.389)*
F-test of excluded instrument			4874	49
Test of equality (p-value)			0.009	
Observations	69,890	69,890	69,890	69,890

Source: NPSAS students attending institutions in 2004 and 2008 with revenue or expenditure information available in $t-1$ IPEDS data (2003 and 2007, respectively). *Notes*: See Appendix B for sample construction details. Students with EFC greater than \$4,800 from Pell Grant eligibility threshold are excluded. See Table 2 notes for additional details.

Appendix D: Discontinuous Density in 2012

In this appendix, I provide evidence of a discontinuous decrease in the number of students at the Pell Grant eligibility threshold in the 2012 NPSAS. Depending on the sector, this discontinuity represents a 18 to 30 percent decrease in the number of students enrolled in college who are barely eligible for Pell Grant aid. I find little evidence of statistically significant positive or negative discontinuities in earlier NPSAS waves. Discontinuities in 2012 are most pronounced in nonselective sectors. To test whether the decrease in the likelihood of college attendance is largest for groups with particular characteristics, I test for within-institution changes in observable predetermined characteristics at the threshold in 2012. Finally, I discuss potential explanations for the apparent reduction in college attendance at the Pell Grant eligibility threshold in 2012.

Figure D.1 displays the number of enrolled students in the 2012 NPSAS within a \$200 $\widetilde{EFC}$ bin. Compared to the approximately 400 students observed just above the Pell Grant eligibility threshold, the 100 student decrease as the threshold is crossed represents a 25 percent decrease in the likelihood of college enrollment.[6] In contrast, there is little evidence of discontinuities in the level or slope of the density of observations in prior NPSAS waves (Figure D.2).

Figures D.3 through D.7 display the number of observations within a given sector by NPSAS wave. There is no graphical evidence of a discontinuous change in the level or slope of the density of students in

[6]The estimated decrease is of a similar magnitude in percentage terms when NPSAS sampling weights are used.

any sector in earlier NPSAS years, although the smaller number of observations in the first two NPSAS waves reduces precision. The 2012 discontinuity is most pronounced in nonselective sectors. For instance, among nonselective public institutions, there is a reduction of 50 observations at the Pell Grant eligibility threshold (an approximately 25 percent decrease).

Similar to Figure 4 in the main text, Table D.8 displays the distribution of predetermined characteristics for 2012 NPSAS students. In most cases, there are not apparent discontinuities or kinks in the relationship between specific characteristics and $\widetilde{EFC}$ at the eligibility threshold. The two exceptions are student age and dependency status (which are related in that in most cases, individuals under the age of 24 are considered dependent students). In Table D.1, I formally test for nonlinearities in the relationship between these characteristics and $\widetilde{EFC}$ at the threshold for Pell Grant eligibility, splitting the sample into new and returning students. The level and slope of the relationship between the probability that a student classified as dependent and $\widetilde{EFC}$ change discontinuously among first-year students while the same is the case for student age among returning students. There are significant changes in the level or slope of this relationship for several other characteristics.

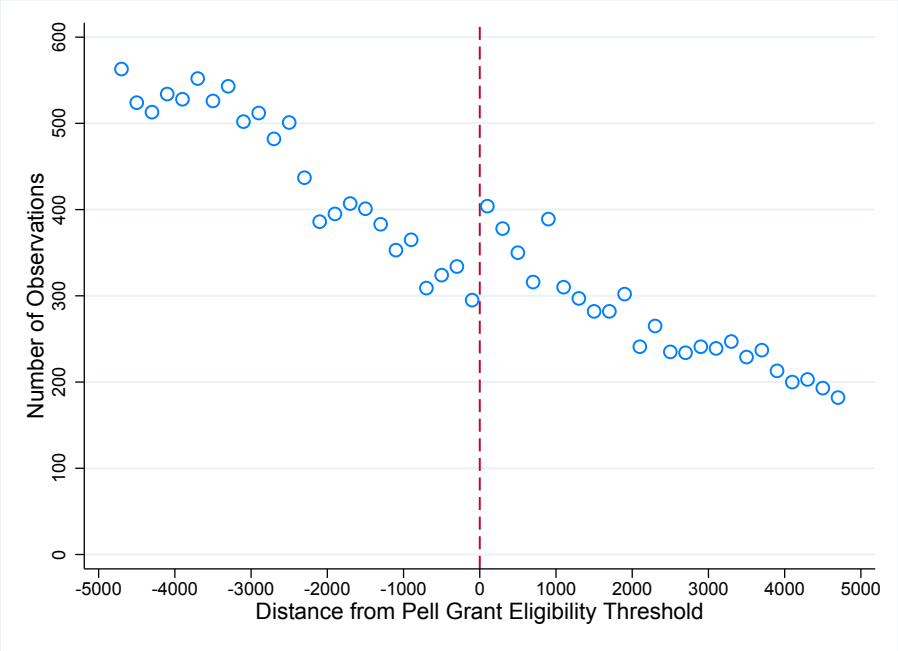
Why is the 2012 NPSAS characterized by a discontinuous decrease in the number of students at the Pell Grant eligibility threshold and discontinuities in student characteristics? One hypothesis is that the Department of Education (ED) might disproportionately select Pell Grant eligible FAFSAs for verification. Students selected for verification must provide documentation of the information on their FAFSA, such as tax returns, W-2 earnings statements, or proof of means-tested benefits receipt.[7] Officially, ED states that around one-third of FAFSAs are selected for verification. According to Cochrane, LaManque and Szabo-Kubitz (2010), Pell-eligible students are substantially more likely to be selected for verification than other FAFSA applicants. Furthermore, ED put new verification rules into effect in 2011 that potentially increased the likelihood of students being selected for verification.[8] If the discontinuous density is in fact due to these changes, it is not clear whether the "missing" students eventually enrolled in college without receiving federal aid, completed the verification process but ended up with a lower or higher EFC, or ultimately did not enroll in college. At least in the case of the 13 California community colleges examined by Cochrane, LaManque and Szabo-Kubitz (2010), most students selected for verification remained eligible for Pell Grants but ultimately did not complete the process and failed to receive this aid.

[7]FAFSA items subject to verification in 2016 include AGI, income tax paid, education credits received, untaxed IRA distributions, untaxed pensions, IRA deductions and payments, tax-exempt interest received, other untaxed income, income earned from work, household size, number of family members in college, Supplemental Nutrition Assistance Program (SNAP) benefit receipt, child support paid, high school completion status, and identity/statement of educational purpose (see https://ifap.ed.gov/fsahandbook/attachments/1516AVG.pdf, Chapter 4 for details).

[8]Prior to this point, schools only had to verify selected FAFSA applicants until 30 percent of the total number of applicants had been verified. The new rules eliminated this cap.

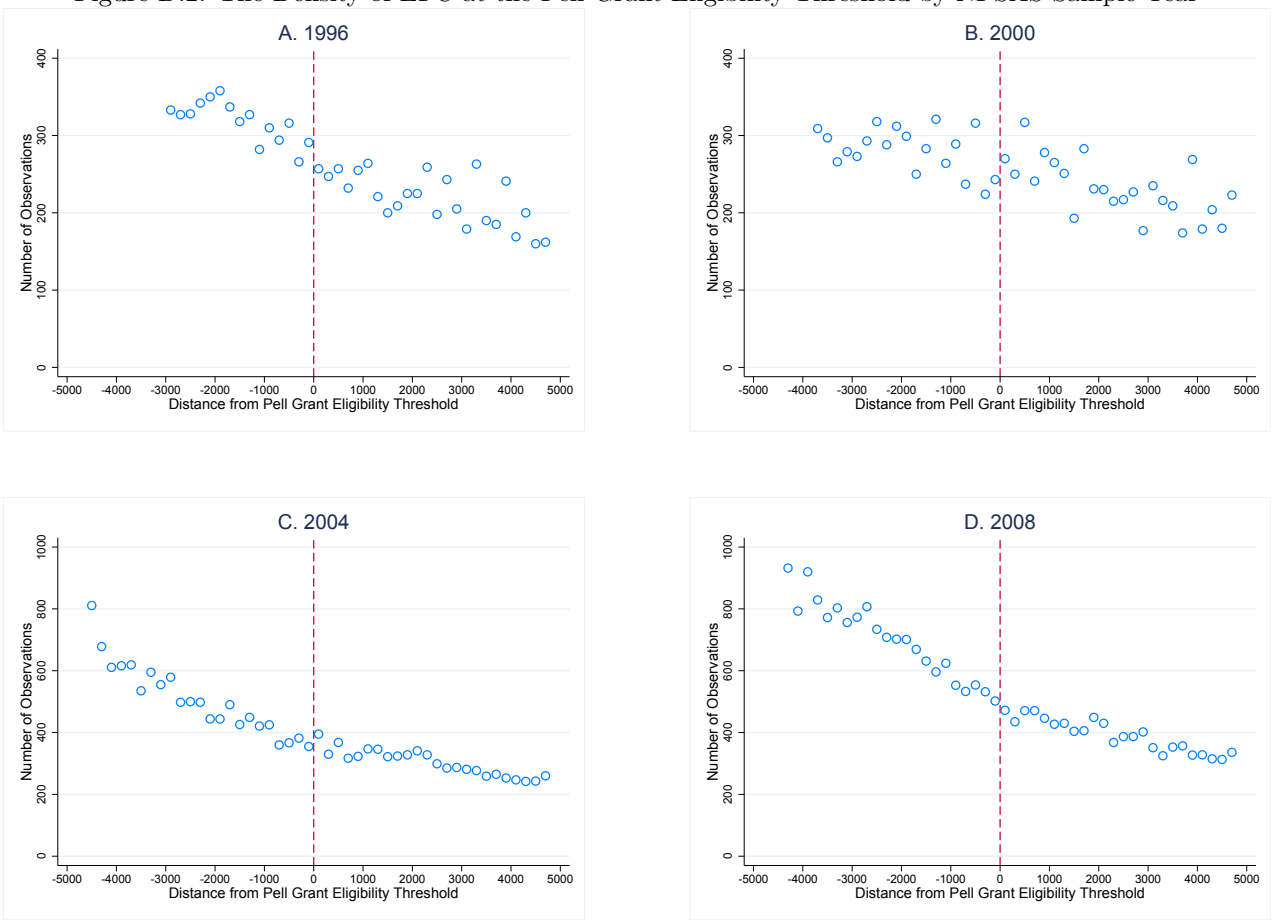
D.1 Figures and Tables

Figure D.1: The Density of EFC at the Pell Grant Eligibility Threshold: 2012 NPSAS



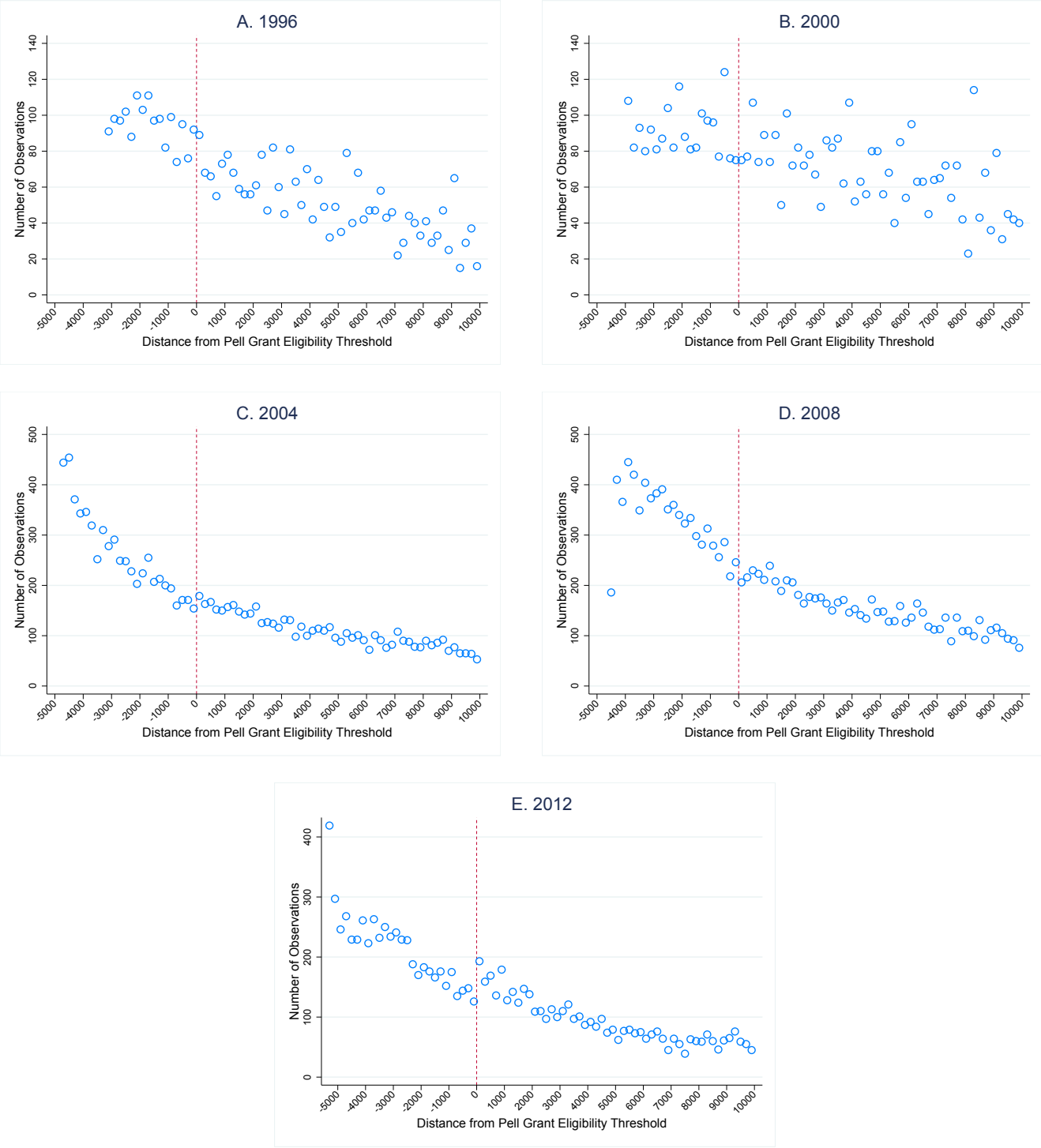
Source: 2012 NPSAS. *Notes*: \$200 $\widetilde{EFC}$ bins; each circle represents the number of students in the bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure D.2: The Density of EFC at the Pell Grant Eligibility Threshold by NPSAS Sample Year



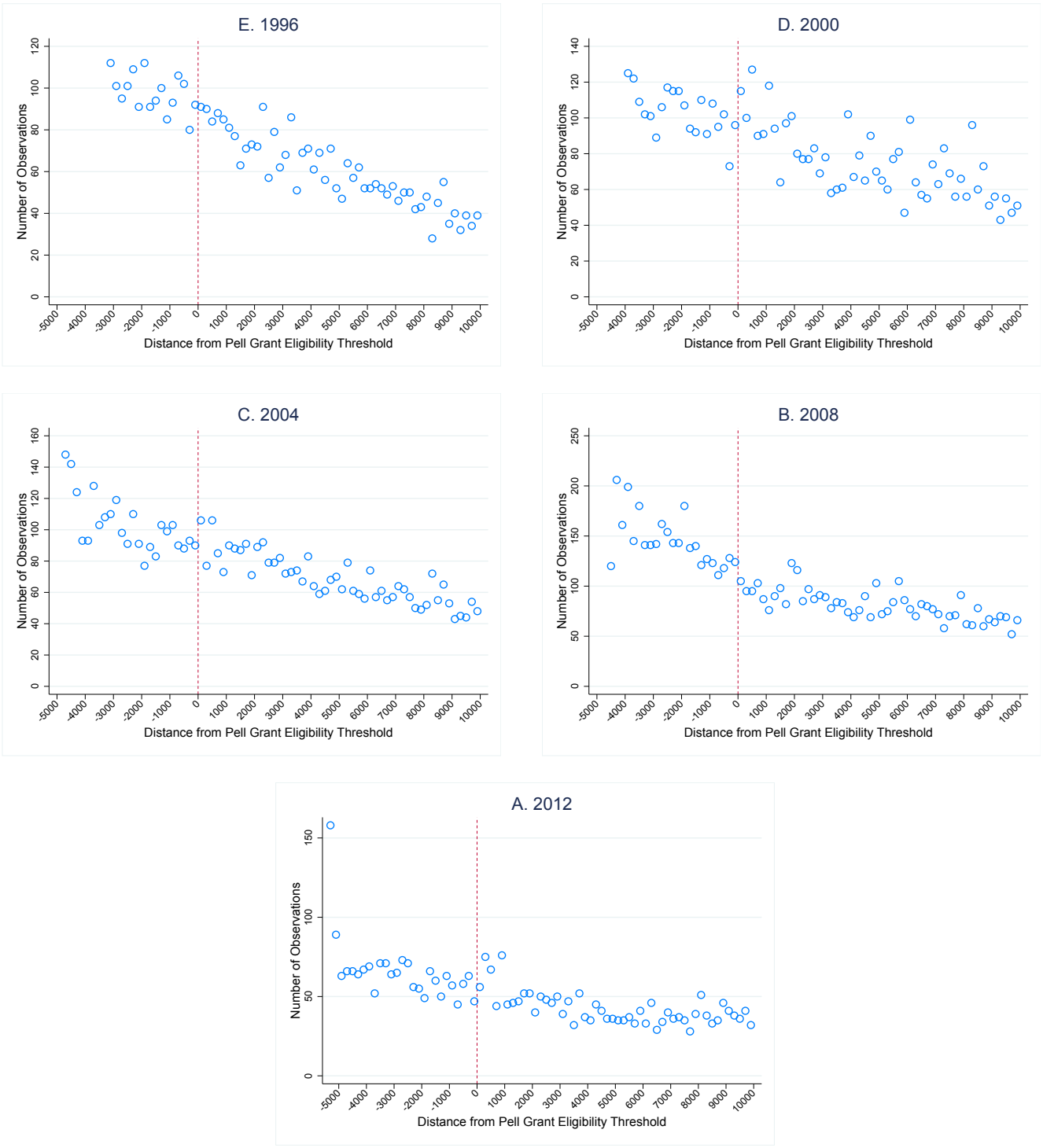
Source: 1996, 2000, 2004, and 2008 NPSAS. *Notes*: See Appendix B for sample construction details. \$200 $\widetilde{EFC}$ bins; each circle indicates the number of students in the bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars. Students with zero EFCs are excluded.

Figure D.3: The Density of EFC at the Pell Grant Eligibility Threshold by NPSAS Sample Year: Nonselective Public Institutions



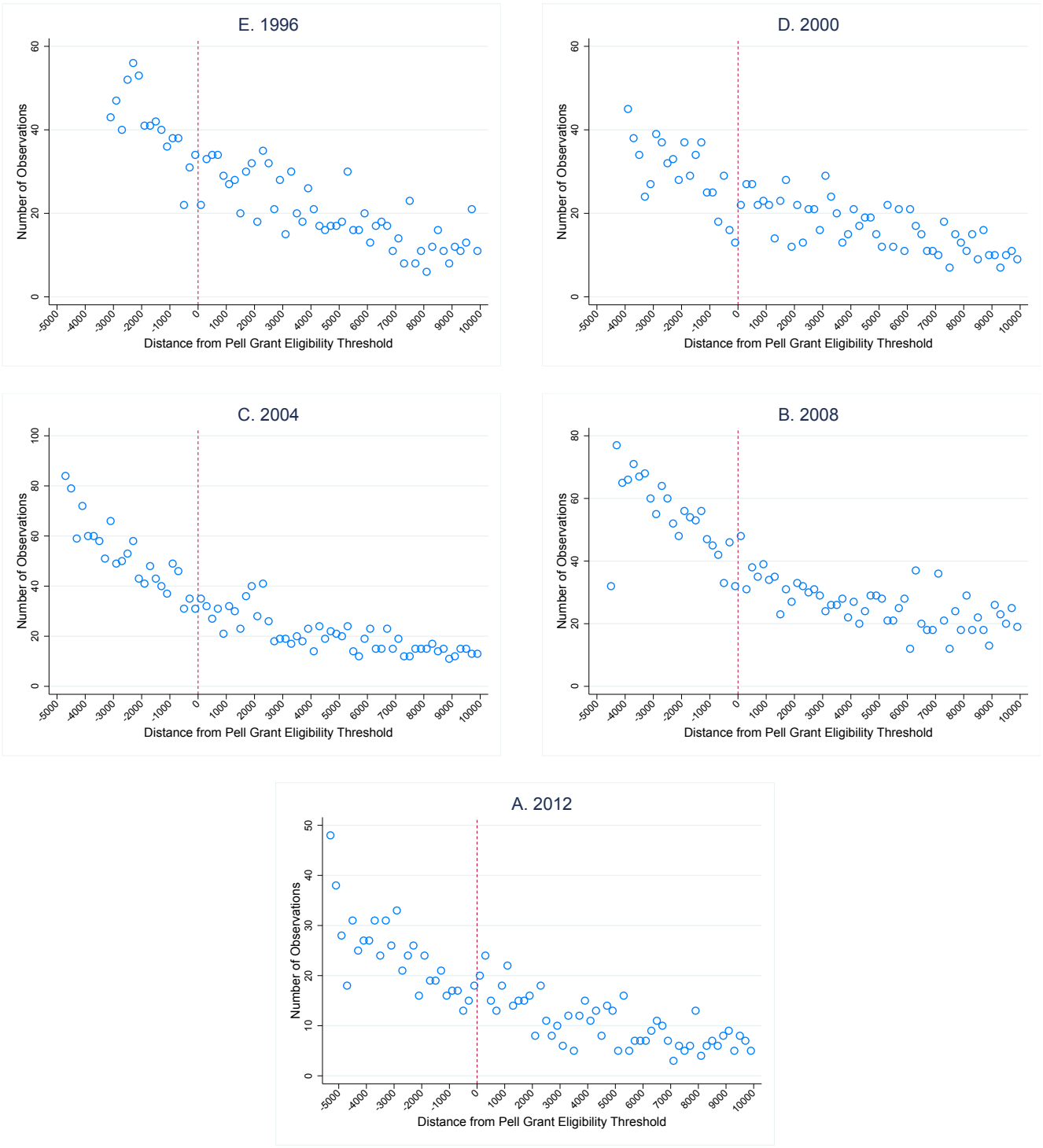
Source: 1996, 2000, 2004, 2008, and 2012 NPSAS. *Notes*: See Appendix B for sample construction details. \$200 $\widetilde{EFC}$ bins; each circle indicates the number of students in the bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars. Students with zero EFCs are excluded.

Figure D.4: The Density of EFC at the Pell Grant Eligibility Threshold by NPSAS Sample Year: More Selective Public Institutions



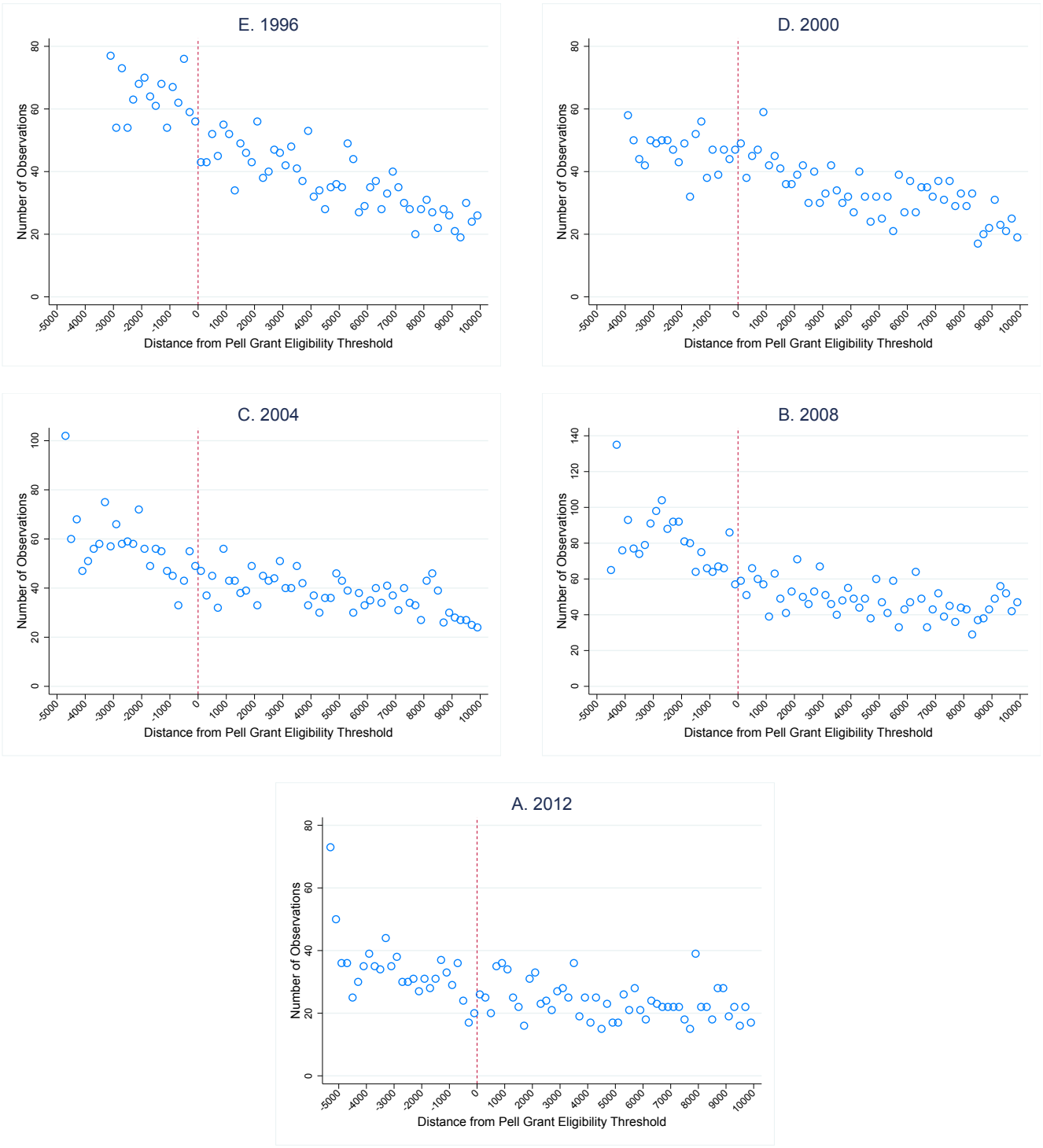
Source: 1996, 2000, 2004, 2008, and 2012 NPSAS. *Notes*: See Appendix B for sample construction details \$200 $\widetilde{EFC}$ bins; each circle indicates the number of students in the bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure D.5: The Density of EFC at the Pell Grant Eligibility Threshold by NPSAS Sample Year: Nonselective Nonprofit Institutions



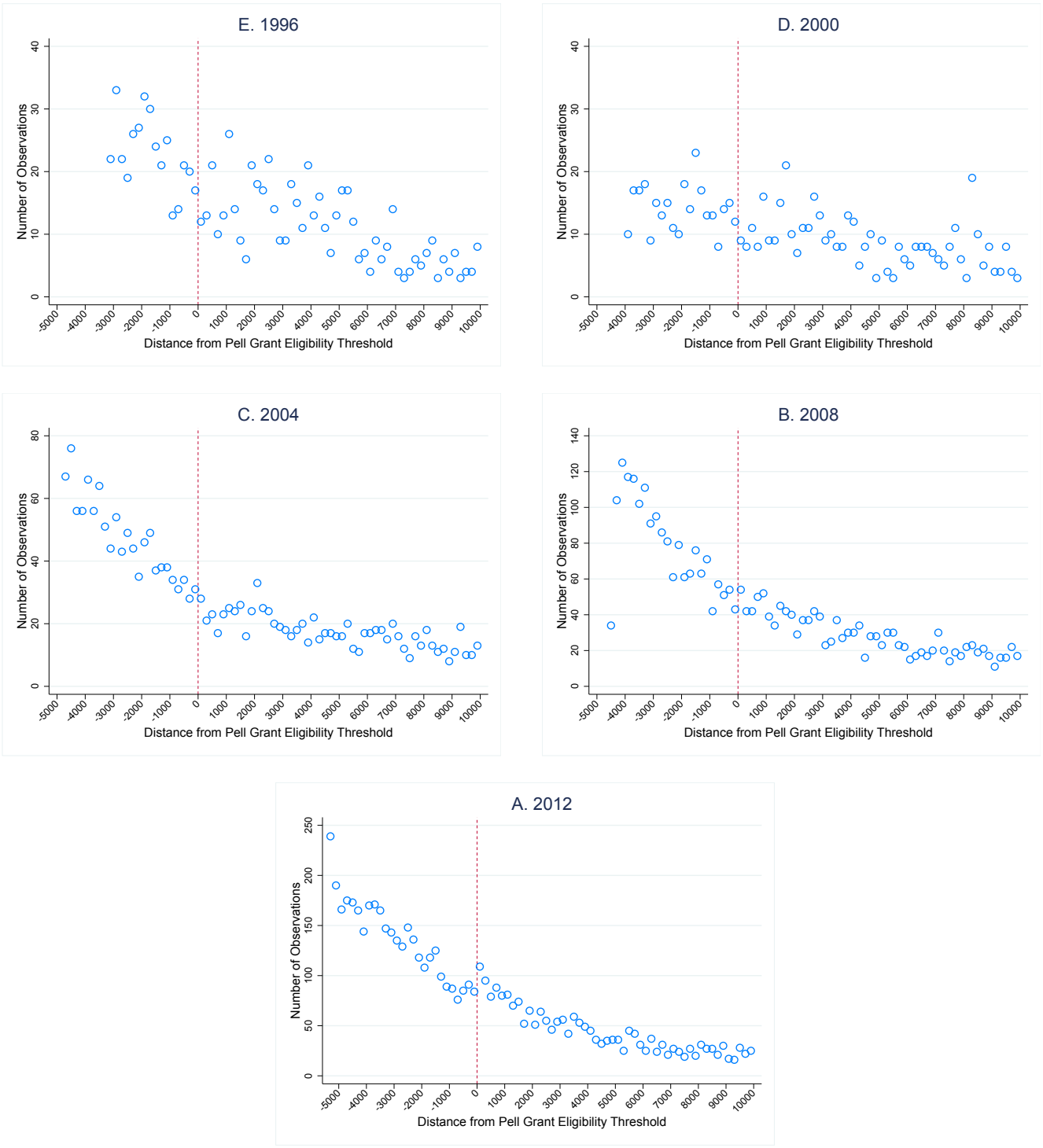
Source: 1996, 2000, 2004, 2008, and 2012 NPSAS. *Notes*: See Appendix B for sample construction details. \$200 $\widetilde{EFC}$ bins; each circle indicates the number of students in the bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure D.6: The Density of EFC at the Pell Grant Eligibility Threshold by NPSAS Sample Year: More Selective Nonprofit Institutions



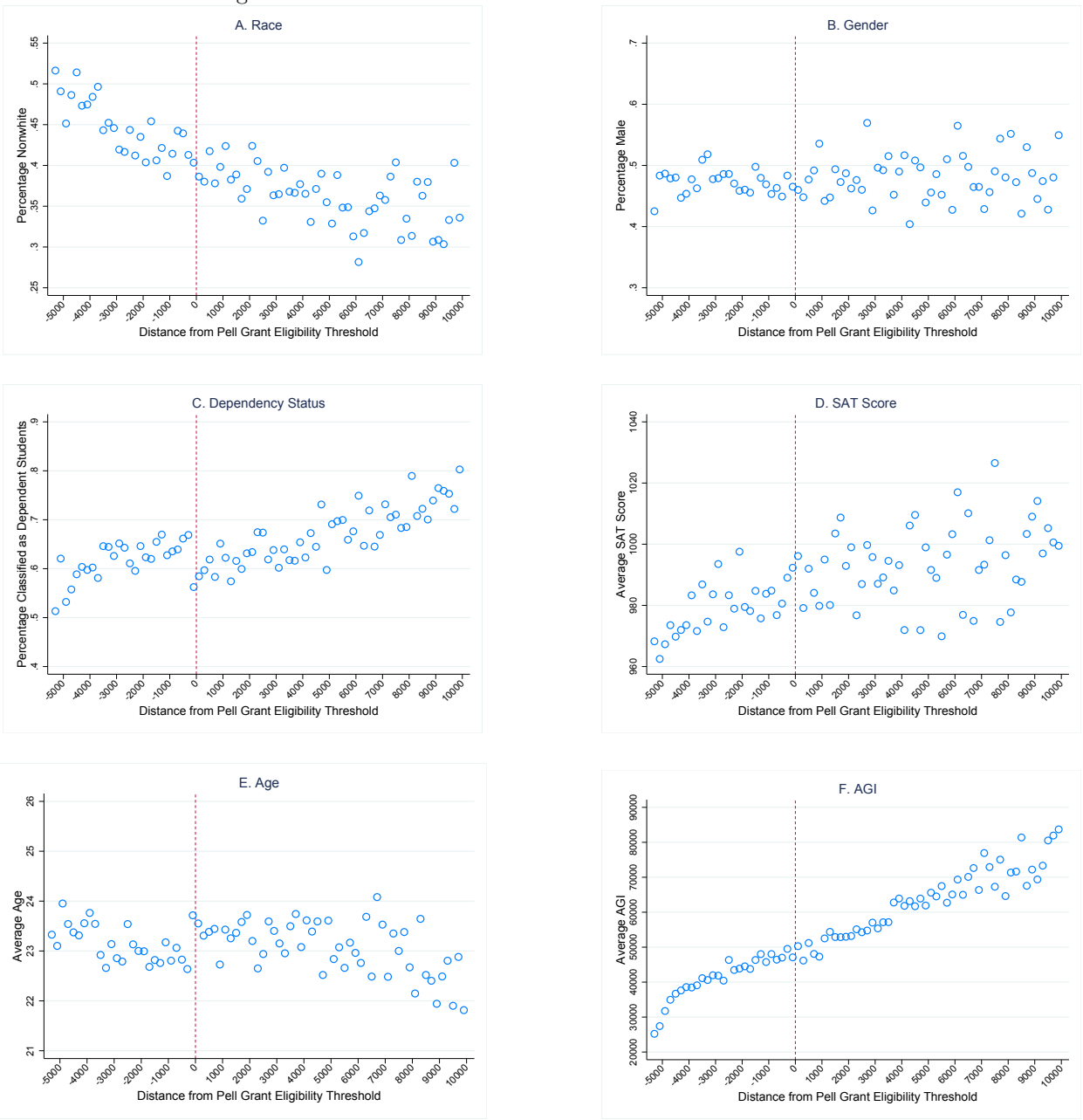
Source: 1996, 2000, 2004, 2008, and 2012 NPSAS. *Notes*: See Appendix B for sample construction details.\$200 $\widetilde{EFC}$ bins; each circle indicates the number of students in the bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure D.7: The Density of EFC at the Pell Grant Eligibility Threshold by NPSAS Sample Year: For-profit Institutions



Source: 1996, 2000, 2004, 2008, and 2012 NPSAS. *Notes*: See Appendix B for sample construction details. \$200 $\widetilde{EFC}$ bins; each circle indicates the number of students in the bin. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Figure D.8: The Distribution of Baseline Characteristics in 2012



Source: 2012 NPSAS. *Notes*: \$200 $\widetilde{EFC}$ bins; each circle represents the mean characteristic for students in the bin (recentered residuals from a regression on school fixed effects). All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

Table D.1: The Relationship between Pell Grant Eligibility and Predetermined Characteristics: 2012

	(1) White	(2) Male	(3) Dependent	(4) SAT score	(5) Age	(6) AGI
A. First-time, first-year students						
Pell Grant eligible	0.003	0.136	-0.124	0.6	-0.032	-9511
	(0.027)	(0.094)	(0.057)*	(8.8)	(0.279)	(4429)*
× Distance from threshold	-0.00005	-0.0003	-0.001	0.004	0.0003	-37.5
	(0.00002)*	(0.0004)	(0.0003)**	(0.003)	(0.0002)	(21.6)+
Test of joint sig: *p*- value	0.129	0.245	<0.001	0.331	0.300	0.051
Polynomial degree	2	7	6	1	2	6
Observations	24,100	24,100	24,100	17,280	24,100	24,100
B. Other students						
Pell Grant eligible	-0.039	0.037	-0.041	0.3	-0.542	-2311
	(0.028)	(0.083)	(0.064)	(17.8)	(0.235)*	(5030)
× Distance from threshold	0.000007	-0.0001	-0.001	0.006	-0.0002	1.1
	(0.00002)	(0.0004)	(0.0004)**	(0.030)	(0.00008)*	(25.0)
Test of joint sig: *p*- value	0.386	0.834	0.010	0.980	0.002	0.877
Polynomial degree	2	7	6	3	1	6
Observations	22,610	22,610	22,610	13,570	22,610	22,610

Source: 2012 NPSAS. *Notes*: Observations missing SAT scores are excluded from Column 4 sample. Observations with missing AGI are excluded from Column 6 sample. Each column within a panel contains estimates from a separate regression. Number of observations rounded to nearest 10. Clustered standard errors (institution) in parentheses; ** p<0.01, * p<0.05, + p<0.1. All regressions include institution fixed effects and the specified polynomial in $\widetilde{EFC}_{it}$ and $\widetilde{EFC}_{it}\mathbf{1}[\widetilde{EFC}_{it} < 0]$. Panel B regressions also include class level fixed effects. Optimal degree of polynomial chosen to minimize the Akaike Information Criterion. Students with EFCs greater than 5,400 from the Pell Grant eligibility threshold are excluded. All dollar amounts adjusted for inflation using the CPI-U and reported in 2013 dollars.

References

Card, David, David Lee, Zhuan Pei, and Andrea Weber. 2012. "Nonlinear Policy Rules and Identification and Estimation of Causal Effects in a Generalized Regression Kink Design." NBER Working Paper 18564.

Cochrane, Debbie Frankle, Andrew LaManque, and Laura Szabo-Kubitz. 2010. "After the FAFSA: How Red Tape can Prevent Eligible Students from Receiving Financial Aid." Oakland CA: The Institute for College Access and Success.

Hahn, Jinyong, Petra Todd, and Wilbert Van der Klauuw. 2001. "Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design." *Econometrica*, 69(1): 201–209.

Hansmann, Henry B. 1980. "The Role of the Nonprofit Enterprise." *Yale Law Review*, 89(5): 835–901.

Lee, David S., and Thomas Lemieux. 2010. "Regression Discontinuity Designs in Economics." *Journal of Economic Literature*, 48(2): 281–355.

Snyder, Thomas D., Cristobal de Brey, and Sally A. Dillow. 2016. "Digest of Education Statistics 2014 (NCES 2016-006)." Washington DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics.

U.S. Department of Education. 2016. "2014-2015 Federal Pell Grant Program End-of-Year Report." Washington DC: U.S. Department of Education, Office of Postsecondary Education.