

Online Appendix for Borrowing Trouble? Human Capital Investment with Opt-In Costs and Implications for the Effectiveness of Grant Aid

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A CUNY and Federal Student Aid Programs

This section provides additional information on the CUNY system and the parameters of federal student aid programs during our sample period.

A.1 CUNY

We distinguish between community colleges and four-year colleges in the CUNY system. Community colleges include Borough of Manhattan Community College (BMCC), Bronx Community College, Hostos Community College, Kingsborough Community College, LaGuardia Community College, and Queensborough Community College. Four-year colleges include Baruch College, Brooklyn College, City College of New York, College of Staten Island, Hunter College, John Jay College of Criminal Justice, Lehman College, Medgar Evers College, New York City College of Technology (NYCCT), Queens College, and York College. However, several of CUNY’s four-year (“senior”) colleges offer both associate and bachelors’ degrees (College of Staten Island, John Jay, Medgar Evers, NYCCT, and York College). All of CUNY’s community colleges only offer associates’ degrees.

CUNY tuition and the range of fees, estimated living expenses, and total cost of attendance faced by full-time, full-year, in-state CUNY students during the years we examine are displayed below in Table A.1.

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Cost of Attendance (COA) equals allowable living expenses include the cost of books and supplies, room and board, transportation expenses, miscellaneous personal expenses, and dependent care, when applicable. Estimated living expenses depend on a students' planned housing. Within institutions, students within the same broad category (e.g., full-time freshmen living off campus) are all classified as having the same COA, even if actual living expenses vary substantially across individuals within a given group.

Table A.1: Annual Expenses, CUNY System Institutions: 2006-07 through 2011-12

	(1) Community colleges	(2) Four-year colleges
Tuition		
2006-07 through 2008-09	\$2,800	\$4,000
2009-10	\$3,150	\$4,600
2010-11	\$3,600	\$5,130
Fees	\$268 - \$355	\$252 - \$477
Books and supplies	\$879 - \$1,146	\$879 - \$1,146
Living expenses		
Off campus	\$5,905 - \$6,568	\$5,905 - \$6,568
With family	\$12,916 - \$16,231	\$12,916 - \$16,231
Total cost of attendance	\$9,852 - \$21,332	\$11,036 - \$22,984

Notes: All dollar amounts in nominal terms.

A.2 Federal Pell Grant Program

Table A.2 displays the minimum and maximum (nominal) Pell Grant awards and Pell Grant eligibility threshold during the years we examine. The relationship between EFC and Pell Grant aid for students eligible for an award that is greater than the minimum and less than the maximum does not vary over the years we examine. As long as a student's COA is greater than her statutory Pell Grant, Pell Grant aid only depends on EFC. For most CUNY students, this constraint is not binding.

Table A.2: Parameters of the Pell Grant Program: 2006-07 through 2010-11

	2006-07	2007-08	2008-09	2009-10	2010-11
Minimum Pell Grant	\$400	\$400	\$890	\$976	\$555
Maximum Pell Grant	\$4,050	\$4,310	\$4,731	\$5,350	\$5,550
Eligibility threshold (EFC)	\$3,850	\$4,110	\$4,041	\$4,617	\$5,273

Notes: All dollar amounts in nominal terms.

Students with a zero EFC receive the maximum Pell Grant award. For the 2006-07 through 2008-09 academic years, dependent students and independent students with children would automatically receive a

\$0 EFC if their family income fell below \$20,000 and their parents either received means tested benefits during the year or were eligible to file a simplified tax return (indicating low assets). In 2010, the income limit was raised to \$30,000.¹

A.3 Federal Direct Loans

Prior to 2010, schools participated in one of two parallel federal lending programs: the William D. Ford Federal Direct Loan Program and the Federal Family Education Loan (FFEL) Program, through which the federal government guaranteed loans originated by private lenders. The 2010 Health Care and Education Reconciliation Act abolished the FFEL program. This reform did not affect CUNY students because CUNY schools were already participating in Direct Loan Program prior to 2010. Students pay an origination fee when taking out federal loan aid, but this fee is continuous in the amount borrowed (approximately 1 percent).

Borrowing limits vary slightly over our sample period. Prior to fall 2007, first-year, dependent students could borrow a maximum of \$2,625 in subsidized federal loans. Prior to fall 2008, dependent students were not eligible to borrow above the subsidized limit and independent students were allowed to borrow an additional \$4,000 in unsubsidized loans. Students who are considered to be in their second year for federal loan eligibility purposes (i.e., those who have accumulated between 30 and 59 credits) with unmet need can borrow up to \$4,500 in subsidized loans (\$3,500 prior to fall 2007), while students in their third year and above (i.e., those who have accumulated at least 60 credits) who have unmet need can borrow up to \$5,500. Regardless of credits accumulated, students in two-year degree programs are never considered to be third year students for federal borrowing purposes. The overall borrowing limits dependent students face are \$6,500 in their second year and \$7,500 as upper years (\$3,500 and \$5,500, respectively, prior to fall 2008), while independent students can borrow up to \$10,500 in their second year and \$12,500 in their third year and beyond (\$7,500 and \$10,500, respectively, prior to fall 2008). Students are limited in the total amount of federal debt they can incur during their undergraduate education. Dependent students can borrow up to \$31,000 overall (\$23,000 subsidized) and independent students can borrow up to \$57,500 (\$23,000 subsidized). See studentaid.ed.gov/types/loans for additional details.

An individual student's subsidized loan eligibility may be less than the amounts described above. According to the Department of Education's Federal Student Aid Handbook, a school cannot package a subsidized loan that exceeds a student's unmet need, which is equal to the cost of attendance minus EFC and other financial assistance (grants and work-study). Unsubsidized loans eligibility is limited to be no more than the

¹See <http://www.ifap.ed.gov/eannouncements/attachments/0708EFCFormulaGuide.pdf> and <http://www.ifap.ed.gov/efcformulaguide/attachments/111408EFCFormulaGuide0910.pdf> for further details.

total cost of attendance minus other financial assistance and subsidized loans (e.g., unsubsidized loans can be used to replace EFC). This latter constraint is rarely binding for students in our sample. Thus, a change in subsidized loan eligibility is almost always met with an equivalent and opposite change in unsubsidized loan eligibility, leaving total loan eligibility unaffected.

As shown in Table A.3, the interest rate on unsubsidized loans was a constant 6.8 percent over the years we examine. Unsubsidized loans start incurring interest immediately, while subsidized loans do not accrue interest as long as the borrower has at least half-time enrollment (6 or more credits attempted in a given semester). The interest rate for subsidized loans after the borrower enters repayment by graduating or dropping below half-time attendance ranged from 6.8 percent in 2007 and 2008 to 4.5 percent in 2011. The federal government also charges borrowers an origination fee. This amount is deducted from the loan prior to disbursement (e.g., in 2011, a student borrowing \$3500 would receive funds equal to \$3465). Origination fees dropped from 3 percent in 2007 to 1 percent in 2011. The last two rows in Table A.3 display the average annual (nominal) interest rate for funds deposited in a taxable money market account and 12-month certificate of deposit (CD) in the first calendar year included in the academic year (e.g., average interest rates for 2006 displayed in the 2006-07 column). Nominal interest rates fell substantially between 2006 and 2010, from 4.5 percent rate on funds deposited in a money market account in 2006 to 0.04 percent in 2010.

Table A.3: Federal Stafford Loan Interest Rates and Origination Fees, Real Interest Rate by Year

	2006-07	2007-08	2008-09	2009-10	2010-11
Interest rate, unsubsidized loans	6.8%	6.8%	6.8%	6.8%	6.8%
Interest rate, subsidized loans	6.8%	6.8%	6.0%	5.6%	4.5%
Origination fee	3.0%	2.5%	2.0%	1.5%	1.0%
Interest rate, taxable money market account	4.5%	4.7%	2.1%	0.2%	0.04%
Interest rate, 12-month CD	3.8%	3.7%	2.4%	1.2%	0.7%

Notes: Interest rates and origination fees for loans originated in specified academic year. Subsidized loan interest rate is zero while students are enrolled (at least half-time) in college; listed interest rate applicable when borrower enters repayment. Annual interest rates on taxable money market account and 12 month CD from Table 1197 in the U.S. Census Bureau, Statistical Abstract of the United States, 2012; available at: <https://www.fdic.gov/regulations/resources/rates/previous.html><https://www.census.gov/compendia/statab/2012/tables/12s1197.pdf>. Annual interest rates represent average monthly annual interest rate for earliest calendar year contained in the academic year (e.g., 2006 under column 2006-07).

Table A.4 provides information on the value of the subsidy students receive when they borrow a subsidized Stafford Loan. The first row represents the funds a student receives at origination if they were to take out a \$3500 subsidized loan. Assuming that students immediately invest these funds in a 12-month, 24-month, or 60-month CD carrying the average annual interest rate at that time, the second through fourth columns display the nominal amount the borrower would receive after cashing out the CD. The last three columns

display the real return to these investments (in the year that the investment is realized). Even if a student were to plan on attending college for five years and invest their initial subsidized loan in a 60-month CD, they were not guaranteed a positive real return to this investment in every year.

Table A.4: Nominal Expected Value of \$3500 Subsidized Stafford Loan Borrowed in First Year

	2006-07	2007-08	2008-09	2009-10	2010-11
At origination	\$3395	\$3413	\$3430	\$3448	\$3465
After 1 year	\$3522	\$3537	\$3511	\$3472	\$3488
After 2 years	\$3654	\$3666	\$3599	\$3524	\$3533
After 5 years	\$4135	\$4130	\$4009	\$3681	\$3803
Inflation-adjusted 1-year return	-\$83	-\$104	\$11	-\$82	-\$117
Inflation-adjusted 2-year return	-\$65	\$56	\$63	-\$131	-\$143
Inflation-adjusted 5-year return	\$221	\$216	\$188	-\$19	\$37

Notes: Annual interest rates on taxable money market account and CDs from Table 1197 in the U.S. Census Bureau, Statistical Abstract of the United States, 2012; available at: <https://www.fdic.gov/regulations/resources/rates/previous.html><https://www.census.gov/compendia/statab/2012/tables/12s1197.pdf>. Annual interest rates represent average monthly annual interest rate for earliest calendar year contained in the academic year (e.g., 2006 under column 2006-07). Second, third, and fourth rows display nominal expected value of loan if invested in CD for specified length. Inflation adjusted return displayed in real dollars at the time that the CD would be redeemed (e.g., the inflation-adjusted return to a \$3500 subsidized loan invested in a 5-year CD in 2010 is displayed in 2015 dollars).

B Additional Figures and Tables

Figure B.1: Sample CUNY Financial Aid Award Letter

The City University of New York - Baruch College
Chris Dempsey, 5555

7/8/1988

Costs in the 2013-14 year

Estimated Cost of Attendance **\$X,XXX / yr**

Tuition and fees	\$ X,XXX	
Housing and meals	X,XXX	
Books and supplies	X,XXX	
Transportation	X,XXX	
Other education costs	X,XXX	

Grants and scholarships to pay for college

Total Grants and Scholarships (Gift Aid; no repayment needed) **\$X,XXX / yr**

Grants from your school	\$ X,XXX	
Federal Pell Grant	X,XXX	
Grants from your state	X,XXX	
Other scholarships you can use	X,XXX	

What will you pay for college

Net Costs **\$X,XXX / yr**
(Cost of attendance minus total grants and scholarships)

Options to pay net costs

Work options

Work-Study (Federal, state, or institutional) \$ X,XXX

Loan Options*

Federal Perkins Loans	\$ X,XXX	
Federal Direct Subsidized Loan	X,XXX	
Federal Direct Unsubsidized Loan	X,XXX	

*Recommended amounts shown here. You may be eligible for a different amount. Contact your financial aid office.

Other options

Family Contribution **\$X,XXX / yr**
(As calculated by the institution using information reported on the FAFSA or to your institution.)

- Payment plan offered by the institution
- Military and/or National Service benefits
- Parent PLUS Loan
- Non-Federal private education loan

Institutional 1st Year Retention Percentage of Full Time Freshman

88.3%

Low

Medium

High

Degrees Awarded 2011-2012: 2,716

Loan Default Rate
Percentage of borrowers entering repayment and defaulting on their loan

3.2%

This Institution

9.8%

National

Median Borrowing
Students at Baruch College typically borrow \$9,309 in Federal loans for their undergraduate study. The Federal loan payment over 10 years for this amount is approximately \$107.13 per month. Your borrowing may be different.

\$

Repaying your loans

To learn about loan repayment choices and work out your Federal Loan monthly payment, go to:
<http://studentaid.ed.gov/repay-loans/understand/plans>

For more information and next steps:

Baruch College
Financial Aid Office
151 E 25th Street, Room 880
New York, NY 10010
Telephone: (646) 312-1360
E-mail: financialaid@baruch.cuny.edu

The above awards are estimated and based upon the data provided on the FAFSA. For federal loan eligibility, consult with the Office of Financial Aid to understand the rights and responsibilities of borrowing. Be sure to respond timely to financial aid requests for missing information. For more details, visit <http://www.cuny.edu/admissions/financial-aid.html>

Figure B.2: Sample CUNY Loan Application Form

Academic Year: 2013-2014

HUNTER
 City University of New York
 695 Park Avenue, New York, NY 10065
 Office of Financial Aid
 Room 241 North
 Tele.: 212-772-4820

Summer 2013
 Fall 2013
 Spring 2014

WILLIAM D. FORD FEDERAL DIRECT STAFFORD LOAN APPLICATION
 (Please **print clearly** in BLACK or BLUE ink)
 Incomplete applications will not be processed

Student's Information:

Last Name: _____ First Name: _____ Middle Initial: _____

SS#: _____ / _____ / _____ Date of Birth: _____ / _____ / _____

Permanent Address: (*P.O. boxes or dorm addresses CANNOT be used as a permanent address)

Street: _____ Apt#: _____

City, State: _____ Zip Code: _____

Mailing Address, if different from permanent address:

Street: _____ Apt#: _____

City, State: _____ Zip Code: _____

Phone #: (_____) _____ Hunter E-mail Address: _____ @hunter.cuny.edu

All loans will be disbursed in two (2) equal payments, Fall 2013 and Spring 2014. If the student is eligible for a Summer 2013 loan and he/she indicates that they would like to be considered for a Summer disbursement, the loan will be disbursed in three (3) payments, instead of two.
 **One (1) semester loans will only be processed for graduating students.

I am registered for at least 6 credits during the Summer 2013 semester. Yes No ****Undergraduates Only:** I would like this loan for Summer 2013 only, because I am anticipating Financial Aid for Fall 2013 & Spring 2014. Yes No

If yes: I would like to be considered for a Summer loan disbursement. Yes No

I am graduating at the end of the following semester: Summer 2013 Fall 2013 Spring 2014
 I am not graduating during the 2013 - 2014 academic year

Total loan amount requested for the 2013-2014 academic year: \$ _____ **.00**

You must round the amount to the nearest whole dollar.

Undergraduates:
 I understand that I will be considered for a SUBSIDIZED loan first. Yes
 If I am not eligible for a subsidized loan, I authorize the Office of Financial Aid to process an UNSUBSIDIZED loan. Yes No

Graduates:
 I understand that Graduate students are no longer eligible for subsidized loans. I authorize the Office of Financial Aid to process an UNSUBSIDIZED loan. Yes

**** UNDERGRADUATE STUDENTS: Will you be pursuing your first Bachelor's degree during the 2013-14 academic year?** Yes No

Borrower's Certification: My signature below certifies that I am aware I must be making Satisfactory Academic Progress in order to receive the Federal Direct Stafford Loan(s) I am applying for. I must complete and sign a Master Promissory Note, if I am required to do so. I also understand that if I have not completed the required steps listed on the front of this application, my loan will not be processed. I understand that it is my responsibility to follow up on the status of my loan application if I do not receive notification. I am also aware that my attendance must be verified by the Office of Financial Aid, before a disbursement is made in accordance with the Financial Aid 'Schedule of Payments'.

Applicant's signature: _____ Date: _____

OFFICE USE ONLY	
UG	G
	SSW
U	F S

Undergraduate Annual Loan Limits and Rates		
Creds Completed	Dependent	Independent
0 - 29.9	\$5,500 (Max. Subsidized= \$3,500)	\$9,500 (Max. Subsidized= \$3,500)
30 - 59.9	\$6,500 (Max. Subsidized= \$4,500)	\$10,500 (Max. Subsidized= \$4,500)
60+	\$7,500 (Max. Subsidized= \$5,500)	\$12,500 (Max. Subsidized= \$5,500)

Graduate Annual Loan Limits and Rates	
\$20,500	

Unsubsidized interest rate: 6.8% fixed (disbursed on or after July 1st, 2013 and prior to July 1st, 2014)
Unsubsidized interest rate: 6.8% fixed (disbursed on or after July 1st, 2006)

****Effective for loan disbursements beginning on or after July 1st, 2012, graduate and professional students are no longer eligible to receive Direct Subsidized Loans. Direct Subsidized Loans disbursed prior to the 2012-2013 academic year are not affected by this change.**

REQUIREMENTS:
 The following 4 criteria are REQUIRED in order for the Office of Financial Aid to process your loan within 15 business days. When your application is reviewed and the 4 criteria have not been completed, your application will not be processed. The Office of Financial Aid will NOT return any incomplete applications. Check with the Office of Financial Aid after 15 business days to follow up on your application status.

- Have a valid 2013-2014 FAFSA Application (www.FAFSA.ED.GOV)
- Must be a matriculated student, registered for at least 6 credits, within your grade level, per semester during the 2013-2014 academic year
- Complete an 'Entrance Counseling' quiz** (www.STUDENTLOANS.GOV)
 * You must attach the confirmation page
- Complete a Master Promissory Note (MPN) ** (www.STUDENTLOANS.GOV)

**Your loan request will be applied to your CUNYfirst account within 15 business days or less.

LOAN ELIGIBILITY DETERMINATION:
 The approved loan amount will be determined by CUNY's Cost of Attendance (COA), minus the Expected Family Contribution (EFC), which is determined by your FAFSA application for 2013-2014. Any financial aid and scholarships you are awarded will be deducted from your COA.

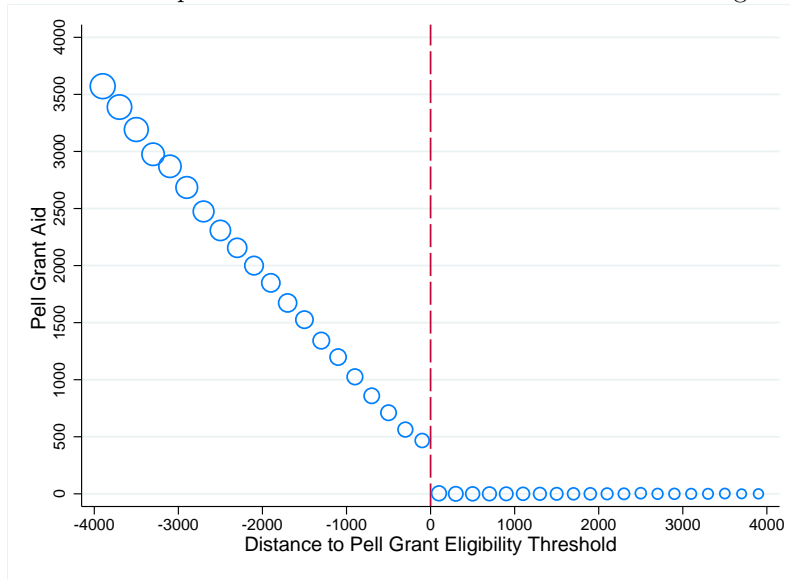
NOTIFICATION:
 Once your loan is processed you should receive an award notification, by mail, from CUNY's University Application Processing Center. If there are any discrepancies on your award notification, you must contact the Office of Financial Aid immediately. Once a disbursement has occurred, you will receive a disclosure statement from the loan servicing agency.

REFUND:
 Check Hunter College's 'Schedule of Payments' for loan disbursement dates. Refunds are mailed by check or you can sign up for Direct Deposit, visit www.hunter.cuny.edu/finaid to print the form. **Direct Deposit is strongly encouraged** because you will get your funds on the same day of disbursement. If your check is mailed, you will get it 3 or 5 days later depending on your local post office. If checks are lost via mail it will take about 4 weeks or longer for you to get a replacement check.

****Note to Transfer Students:** Your 2013-2014 annual loan limit may be affected if you borrowed loans at another institution for Summer 2013 and/or Fall 2013.

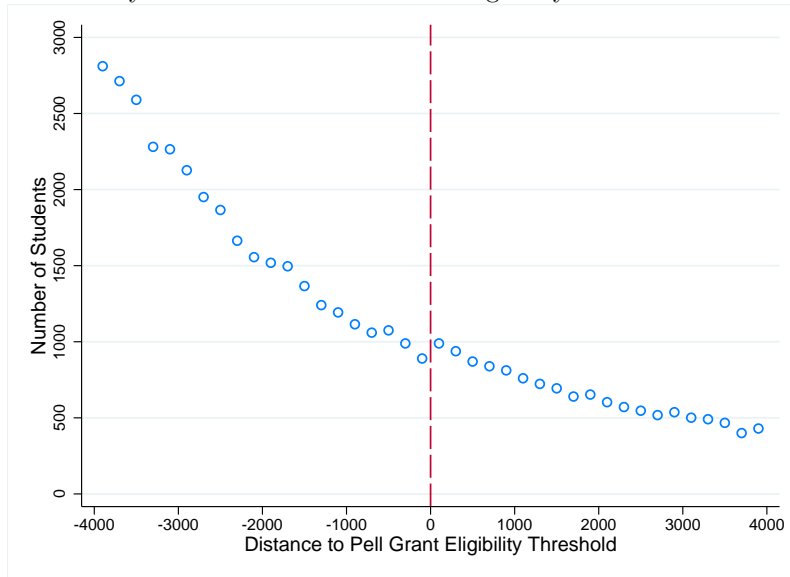
Notes: Available at <http://www.hunter.cuny.edu/onestop/finances/financial-aid/>.

Figure B.3: The Empirical Distribution of Pell Grant Aid: Returning Students



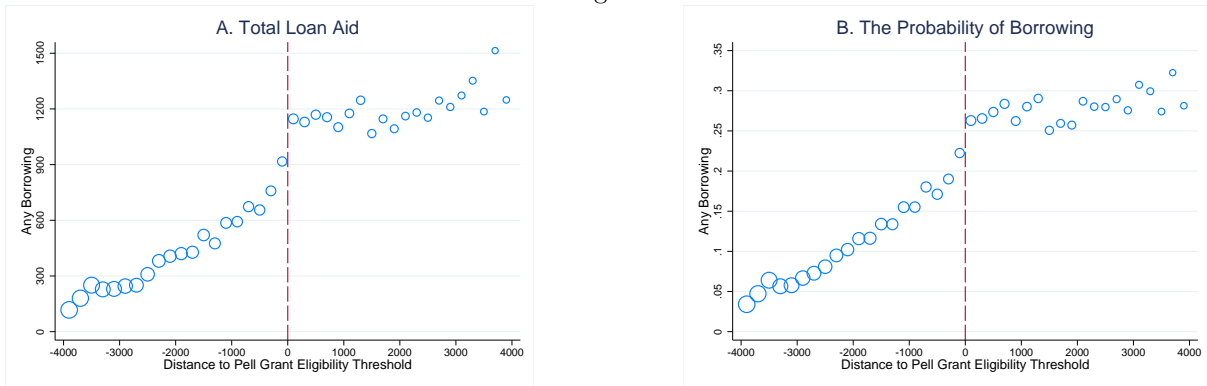
Notes: Second- and third-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. \$200 EFC bins. Each circle represents the average Pell Grant aid received by students in the bin. Larger circles represent a larger underlying sample size. All dollar amounts adjusted to represent constant 2012\$.

Figure B.4: The Density of EFC at the Pell Grant Eligibility Threshold: Returning Students



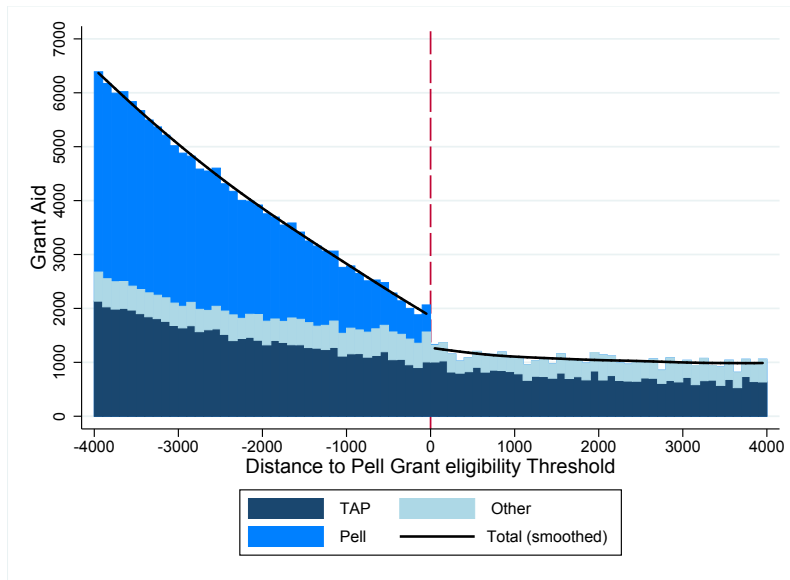
Notes: Second- and third-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. \$200 EFC bins. Each circle represents the total number of students in the bin. All dollar amounts adjusted to represent constant 2012\$.

Figure B.5: The Reduced Form Impact of Pell Grant Eligibility and Generosity on Total Borrowing: Returning Students



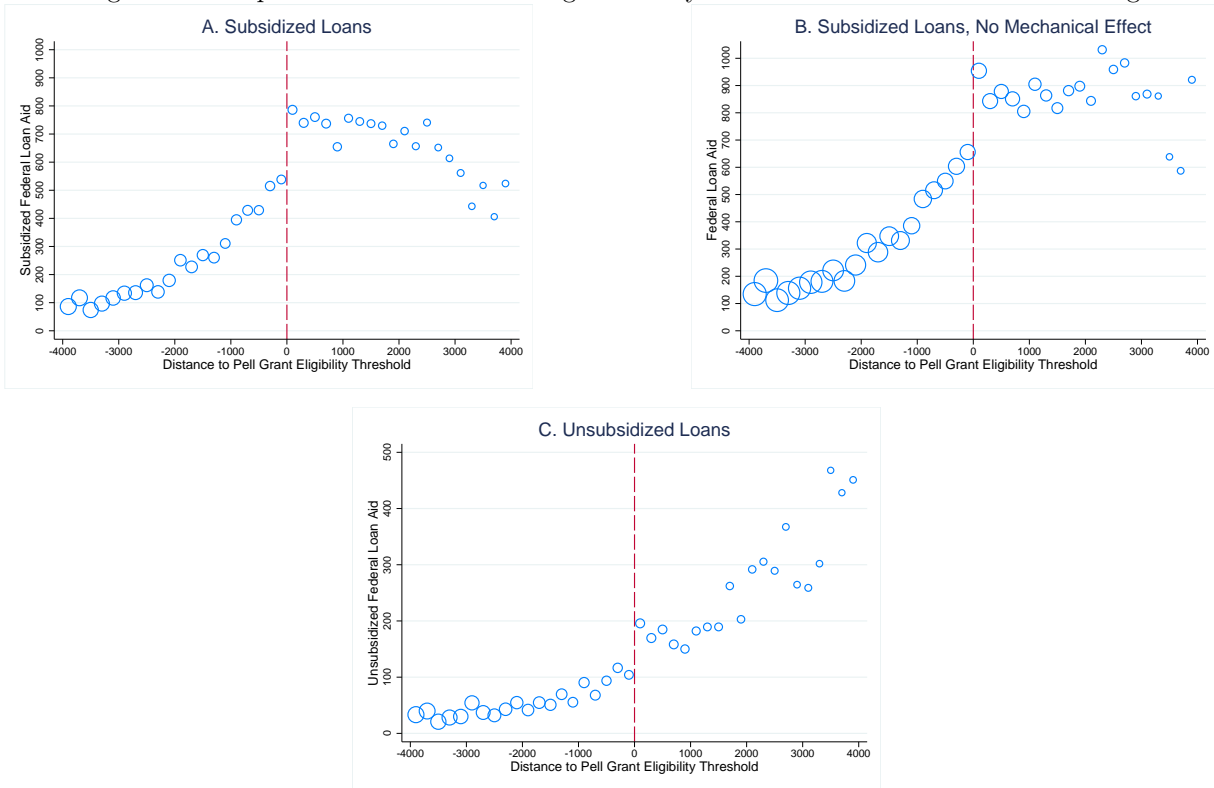
Notes: Second- and third-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. \$200 EFC bins. Each circle represents average loan aid (A) or probability of borrowing for students in the bin. Larger circles represent a larger underlying sample size. All dollar amounts adjusted to represent constant 2012\$.

Figure B.6: The Distribution of Total Grant Aid by Distance from the Pell Grant Eligibility Threshold and Source



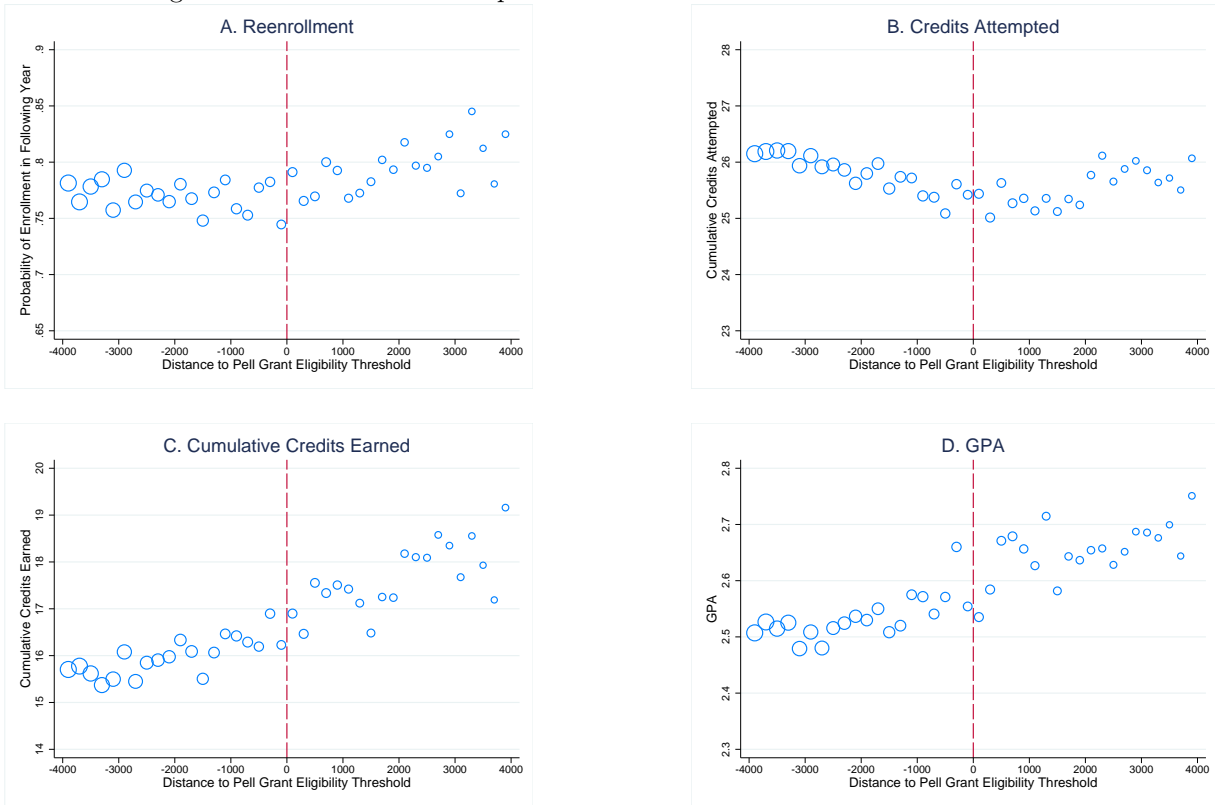
Notes: First-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. \$100 EFC bins. Solid black lines represent smoothed values of total grant aid. All dollar amounts adjusted to represent constant 2012\$.

Figure B.7: Impacts on Overall Borrowing Driven by a Reduction in Subsidized Borrowing



Notes: First-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. \$200 EFC bins. Each circle represents average subsidized (A) or unsubsidized (B) Federal Direct Loan aid received by students in the bin. Larger circles represent a larger underlying sample size. All dollar amounts adjusted to represent constant 2012\$.

Figure B.8: Reduced Form Impacts of Pell Grant Aid on Educational Outcomes



Notes: First-year CUNY undergraduate degree-seeking students; 2007 through 2011 entry cohorts. \$200 EFC bins. Each circle represents the average probability of enrolling in the following year (A), average credits attempted including credit equivalents from remedial courses (B), average credits earned (C), and average GPA (D) among currently enrolled students. Larger circles represent a larger underlying sample size.

Table B.1: Community College Loan Packaging Procedures and Undergraduate Borrowing Rates

	(1) Both	(2) Subsidized	(3) Neither
Number of institutions	324	19	449
Average undergraduate enrollment	14,042	18,483	11,507
Enrollment weighted percent of institutions	0.45	0.03	0.51
Offers BA degree(s)	0.12	0.05	0.07
Pell Grant aid			
Percent	0.40	0.36	0.37
Average receipt	\$3,664	\$3,784	\$3,665
Federal loan aid			
Percent	0.30	0.26	0.16
Average receipt	\$5,338	\$4,231	\$5,110

Notes: Sample includes non-CUNY community colleges participating in federal student loan programs, excluding the 69 community colleges (containing 3 percent of students) for which we were unable to obtain loan packaging practice information (participation status and enrollment from http://projectonstudentdebt.org/files/pub/CC_participation_status_2013-14.pdf). Federal loan and Pell Grant recipient data from the Integrated Postsecondary Education Data System's 2012-13 Student Financial Aid and Net Price file. Information on whether a given community college offers bachelor's degree programs from the IPEDS 2012-13 Institutional Characteristics file. All statistics are enrollment weighted except for average enrollment and the count of institutions in each category.

Table B.2: Comparing CUNY Students with a Nationally Representative Sample of Undergraduates

	<u>Associate's degree-seeking students</u>			<u>Bachelor's degree-seeking students</u>		
	1. NPSAS - packagers	2. NPSAS - nonpackagers	3. CUNY	4. NPSAS - packagers	5. NPSAS - nonpackagers	6. CUNY
<i>A. Cost of attendance and financial aid</i>						
Expected family contribution (EFC)	\$4,396	\$4,374	\$4,205	\$4,712	\$4,566	\$4,751
Total need (= cost of Attendance - EFC)	\$7,494	\$6,777	\$8,442	\$16,156	\$6,925	\$9,585
Total grant aid	\$1,630	\$1,838	\$2,409	\$4,239	\$1,837	\$3,479
Pell Grant aid	\$1,194	\$1,203	\$1,651	\$1,320	\$1,131	\$1,504
Unmet need (= COA - EFC - grants)	\$5,572	\$4,746	\$6,082	\$10,990	\$4,989	\$6,191
Any borrowing?	0.50	0.26	0.14	0.76	0.28	0.18
Borrowing at subsidized DL limit any loan	0.73	0.64	0.68	0.87	0.52	0.82
Borrowing at overall DL limit any loan	0.42	0.28	0.03	0.74	0.29	0.08
Total loan aid	\$2,546	\$1,189	\$546	\$4,844	\$1,315	\$819
Share subsidized	0.63	0.62	0.80	0.58	0.52	0.72
Share private	0.02	0.04	0	0.05	0.13	0
Unmet need after grants and loans	\$3,259	\$3,633	\$5,596	\$4,496	\$3,690	\$5,459
<i>B. Student demographic characteristics</i>						
Female	0.49	0.50	0.51	0.53	0.49	0.56
Dependent student	0.69	0.76	0.89	0.93	0.86	0.98
Age	23	22	19	19	20	18
Race/ethnicity						
Black	0.14	0.14	0.38	0.16	0.11	0.20
Hispanic	0.14	0.23	0.34	0.19	0.27	0.23
White	0.67	0.55	0.18	0.56	0.43	0.36
SAT verbal percentile	32	31	24	45	37	52
SAT math percentile	36	34	22	49	39	54
Parents' highest education						
Less than high school	0.04	0.06	0.05	0.03	0.05	0.03
High school	0.35	0.33	0.40	0.22	0.27	0.35
College	0.58	0.55	0.46	0.72	0.64	0.56
First generation immigrant	0.07	0.07	0.16	0.05	0.12	0.13
Second generation immigrant	0.15	0.21	0.27	0.19	0.28	0.33
Family resources						
Adjusted gross income	\$48,995	\$50,382	\$52,479	\$57,080	\$53,498	\$60,758
Savings	\$3,382	\$3,867	\$3,928	\$5,815	\$3,463	\$9,821

Notes: The sample in Columns 3 and 6 includes to first-year CUNY undergraduate degree seeking students from the 2011 entry cohort who first enrolled in an associate degree program (Column 3) or bachelor's degree program (Column 5). Column 1 and 2 samples limited to first-year undergraduate associate's degree seeking students from the 2012 National Postsecondary Student Aid Study (NPSAS) attending public schools that either package student loans (Column 1) or do not package loans (Column 2). Columns 4 and 5 limited to first-year undergraduate bachelor's degree-seeking students from the 2012 NPSAS attending public schools that either package student loans (Column 4) or do not package loans (Column 5). COA represents the total cost of attendance (equal to tuition and fees, books and supplies, and living expenses). Parental education shares may not sum to 1 due to missing values. First generation immigrants are students who were not born in the United States. Second generation immigrants are students who were born in the United States with at least one foreign-born parent. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.3: The Impact of Pell Grant Aid on Cumulative Financial Aid Received Three Years After Entry

	(1) Cumulative Pell Grant aid	(2) Cumulative loan aid
First year Pell Grant aid	1.189 (0.128)**	-0.574 (0.226)*
Mean	\$4,310	\$1,004
Observations	32,271	32,271

Notes: First-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Each column contains estimates from a separate regression. The dependent variable is cumulative financial aid in the specified category received during a students' first three years (not conditioned on enrollment after first year). Clustered standard errors (institution by year) in parentheses; ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. All regressions also include controls for age, family AGI, and indicators for race (white versus nonwhite), dependency status (dependent versus independent), parents' highest level of education (college, high school, or less than high school), level of attendance (for federal loan eligibility purposes), degree program (AA versus BA), school by year fixed effects, years since entry fixed effects, and a quadratic in student expected family contribution ($\widetilde{EFC}_{it} = EFC_{it} - efc_{0t}$, where efc_{0t} is the threshold for Pell Grant eligibility in year t), allowed to vary on either side of the eligibility threshold. Excluded instruments are $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ and $\widetilde{EFC}_{it} \times \mathbf{1}[\widetilde{EFC}_{it} < 0]$. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold in their first year are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.4: The Relationship between Pell Grant Aid and the Probability of Enrollment:
First-Stage, IV-RD, and IV-RK Estimates

	<u>Enrollment application</u>			
	(1) Pooled	(2) Community colleges	(3) 4-year colleges	(4) <u>Any enrollment any application</u>
<i>A. OLS estimates: impacts on federal grant aid</i>				
Pell Grant eligible	476.51 (23.39)**	407.93 (44.43)**	497.07 (26.78)**	447.54 (31.30)**
× Distance from threshold	-0.649 (0.005)**	-0.658 (0.008)**	-0.647 (0.006)**	-0.628 (0.009)**
Observations	161,841	39,056	122,785	38,971
<i>B. IV-RD estimates: impacts on Pr(Enroll)</i>				
Federal grant aid (\$1k)	-0.003 (0.009)	0.027 (0.015)+	-0.010 (0.010)	0.005 (0.023)
95% CI	[-0.020, 0.014]	[-0.002, 0.056]	[-0.029, 0.009]	[-0.04, 0.05]
Observations	161,841	39,056	122,785	38,971
<i>C. IV-RK estimates: impacts on Pr(Enroll)</i>				
Federal grant aid (\$1k)	0.003 (0.003)	0.009 (0.006)	0.001 (0.003)	0.014 (0.007)*
95% CI	[-0.002, 0.008]	[-0.003, 0.021]	[-0.005, 0.006]	[0.0001, 0.028]
Observations	161,841	39,056	122,785	38,971

Notes: CUNY undergraduate degree seeking applicants; fall 2007 through fall 2010 cohorts. The sample in Columns 1 through 3 includes one observation per prospective student-application (up to 6 per student) while the Column 4 sample includes one observation per student. Each column within a panel contains estimates from a separate regression. The dependent variable in Panel A is total federal grant aid. The dependent variable in Panels B and C is the probability of enrollment conditional on submitting an application. Clustered standard errors (institution by year) in parentheses; ** p<0.01, * p<0.05, + p<0.1. All regressions also include school by year fixed effects and \widetilde{EFC}_{it} . Columns 1 through 3 specifications also include school ranking fixed effects. Excluded instruments are $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ (Panel B) or $\widetilde{EFC}_{it} \times \mathbf{1}[\widetilde{EFC}_{it} < 0]$ (Panel C). Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.5: The Relationship between Pell Grant Eligibility and Predetermined Characteristics

	(1) White	(2) Female	(3) Dependent	(4) Immigrant	(5) Age	(6) AGI	(7) College Ed Parent(s)
<i>A. First-year students</i>							
Pell Grant eligible	-0.002 (0.009)	-0.004 (0.012)	0.002 (0.006)	0.035 (0.031)	-0.012 (0.112)	-1150 (553)*	-0.010 (0.011)
× Distance from threshold	-0.00005 (0.00005)	-0.000001 (0.000005)	0.000007 (0.000002)**	-0.00005 (0.0001)	-0.0001 (0.0001)	-1.06 (0.78)	0.000001 (0.000004)
Test of joint sig: <i>p</i> -value	0.517	0.864	0.014	0.490	0.755	0.019	0.639
Polynomial degree	1	1	1	4	2	2	1
Observations	38,100	38,100	38,100	38,100	38,100	38,100	35,011
<i>B. Returning students</i>							
Pell Grant eligible	-0.004 (0.010)	0.013 (0.010)	-0.009 (0.006)	0.024 (0.017)	0.015 (0.073)	-1561 (658)*	-0.002 (0.028)
× Distance from threshold	-0.000003 (0.000004)	0.00001 (0.000004)	0.000004 (0.000003)	-0.000003 (0.00002)	-0.00005 (0.00003)	-0.78 (1.58)	0.00004 (0.0001)
Test of joint sig: <i>p</i> -value	0.669	0.101	0.202	0.368	0.340	0.048	0.889
Polynomial degree	1	1	1	2	1	3	4
Observations	46,744	46,744	46,744	46,744	46,744	46,744	43,347

Notes: First-, second-, and third-year CUNY undergraduate degree seeking students; 2005 through 2011 entry cohorts. Observations missing information on parental education are excluded from the Column 7 sample. Each column within a panel represents estimates from a separate regression. Clustered standard errors (institution by year) in parentheses; ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. All regressions also include controls for degree program (AA versus BA), school by year fixed effects, years since entry fixed effects, and the specified polynomial in \widetilde{EFC}_{it} (allowed to vary on either side of the eligibility threshold). The degree of polynomial is chosen to minimize the AIC. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.6: The Impact of Pell Grant Aid on Borrowing: Separate IV-RD and IV-RK Estimates

	(1) First-year students	(2) Returning students
Pell Grant aid (RD)	-0.577 (0.138)**	-0.785 (0.171)**
Pell Grant aid (RK)	-0.387 (0.098)**	-0.446 (0.099)**
Test of equality (p -value)	0.169	0.098
Observations	38,100	46,744

Notes: Column 1 sample includes first-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Column 2 sample includes second- and third-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. Each column contains estimates from a separate regression. Clustered standard errors (institution by year) in parentheses; ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. See Table B.3 notes for a list of additional controls. Excluded instruments are $\mathbf{1}[\widehat{EFC}_{it} < 0]$ in IV-RD model or $\widehat{EFC}_{it} \times \mathbf{1}[\widehat{EFC}_{it} < 0]$ in IV-RK model. F-stat from test of significance of excluded instruments in Panel B: 917 (first-year student sample), 854 (returning student sample). F-stat from test of significance of excluded instruments: 199 (first-year student sample, RD model), 1463 (first-year student sample, RK model), 209 (returning student sample, RD model), 1517 (returning student sample, RK model). Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.7: The Impact of Pell Grant Aid on Borrowing Among Would-be Borrowers: RD and RK Estimates

	(1) First-year students	(2) Returning students
<i>A. RD only</i>		
Pell Grant aid	-2.455 (0.472)**	-2.918 (0.516)**
H_0 : crowd-out > -1 , p -value	0.001	< 0.001
Observations	38,100	46,744
<i>B. RK only</i>		
Pell Grant aid	-1.995 (0.421)**	-2.069 (0.388)**
H_0 : crowd-out > -1 , p -value	0.009	0.003
Observations	38,100	46,744

Notes: 2SLS estimates of the impact of an additional dollar of Pell Grant aid on borrowing among would-be borrowers. Column 1 sample includes first-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Column 2 sample includes second- and third-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. Each column within a panel contains estimates from a separate specification. Bootstrapped standard errors (clustered at institution by year); ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.8: The Impact of Pell Grant Aid on Other Sources of Grant Aid

	(1) First-year students	(2) Returning students
<i>A. Impacts on TAP Grant Aid</i>		
Pell Grant Aid	0.051 (0.046)	0.044 (0.048)
Observations	38,100	46,744
<i>B. Impacts on Other Grant Aid</i>		
Pell Grant Aid	0.084 (0.034)*	-0.013 (0.050)
Observations	38,100	46,744

Notes: 2SLS estimates of the impact of Pell Grant aid on other grant aid. Column 1 sample includes first-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Column 2 sample includes second-, and third-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. Each column within a panel contains estimates from a separate regression. Panel A dependent variable is New York State Tuition Assistance Program (TAP) Grant aid. Panel B dependent variable is total grant aid less TAP and Pell Grant aid. Clustered standard errors (institution by year) in parentheses; ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. See Table B.3 notes for a list of additional controls. Excluded instruments are $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ and $\widetilde{EFC}_{it} \times \mathbf{1}[\widetilde{EFC}_{it} < 0]$. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.9: The Impact of Pell Grant Aid on Subsidized and Unsubsidized Borrowing

	<u>Subsidized Loans</u>		<u>Subsidized Loans, no mechanical effect</u>		<u>Unsubsidized Loans</u>	
	(1) First-Year Students	(2) Returning Students	(3) First-Year Students	(4) Returning Students	(5) First-Year Students	(6) Returning Students
<i>A. OLS Estimates</i>						
Pell Grant eligible	-164.56 (42.03)**	-209.01 (45.45)**	-166.36 (55.38)**	-293.29 (70.66)**	-59.90 (22.96)*	-64.98 (21.39)**
× Distance from threshold	0.235 (0.054)**	0.259 (0.054)**	0.268 (0.082)**	0.324 (0.092)**	0.059 (0.032)+	0.076 (0.033)*
Observations	38,100	46,744	23,762	24,191	38,100	46,744
<i>B. 2SLS Estimates</i>						
Pell Grant aid	-0.333 (0.066)**	-0.392 (0.071)**	-0.377 (0.073)**	-0.510 (0.097)**	-0.094 (0.026)**	-0.117 (0.029)**
Crowd-out borrower	-1.725 (0.286)**	-1.840 (0.283)**	-1.632 (0.386)**	-1.954 (0.436)**	-1.621 (0.600)**	-1.539 (0.456)**
H ₀ : crowd-out > -1, <i>p</i> -value	0.006	0.001	0.051	0.014	0.151	0.118
Observations	38,100	46,744	23,762	24,191	38,100	46,744

Notes: The sample in Columns 1 and 3 includes first-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. The sample in Columns 2 and 4 includes second-, and third-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. Each column within a panel contains estimates from a separate regression. Clustered standard errors (institution by year) in parentheses; ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. See Table B.3 notes for a list of additional controls. Excluded instruments in Panel B are $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ and $\widetilde{EFC}_{it} \times \mathbf{1}[\widetilde{EFC}_{it} < 0]$. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.10: The Impact of Pell Grant Aid on Borrowing:
Robustness to Varying Bandwidths and Polynomials

Bandwidth:	\$4,000	\$3,000	\$2,000	\$1,000
Polynomial of order:				
One	-0.134 (0.023)** [0.000]	-0.187 (0.037)** [0.000]	-0.320 (0.057)** [0.038]	-0.665 (0.142)** [0.601]
Two	-0.428 (0.092)** [0.116]	-0.557 (0.109)** [0.867]	-0.706 (0.169)** [0.875]	-0.684 (0.247)** [0.779]
Three	-0.599 (0.148)** [0.442]	-0.814 (0.209)** [0.682]	-0.795 (0.243)** [0.959]	-0.771 (0.327)* [0.778]
Four	-0.910 (0.231)** [0.930]	-0.748 (0.254)** [0.987]	-0.773 (0.294)** [0.992]	-1.110 (0.392)** [0.999]
Optimal Order	2	1	1	2
Observations	38,100	25,613	15,645	7,523

Notes: First-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Each cell represents a separate regression. Standard errors clustered at institution level in parentheses; ** p<0.01, * p<0.05, + p<0.1. All regressions include controls for age, family AGI, and indicators for race (white versus nonwhite), dependency status (dependent versus independent), parents' highest level of education (college, high school, or less than high school), level of attendance (for federal loan eligibility purposes), degree program (AA versus BA), school by year fixed effects, and the specified polynomial in \widehat{EFC}_{it} (allowed to vary on either side of the eligibility threshold). Optimal order of polynomial chosen using Akaike Information Criterion. Square brackets include p-values from test of joint significance of \$200 EFC bin dummies included as additional regressors. Excluded instruments are $\mathbf{1}[\widehat{EFC}_{it} < 0]$ and $\widehat{EFC}_{it} \times \mathbf{1}[\widehat{EFC}_{it} < 0]$. Students with EFC greater than the indicated distance from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.11: The Impact of Pell Grant Aid on Borrowing: Estimates from Local Linear Regressions

	<u>OLS</u>		<u>2SLS</u>		
	(1) FS	(2) RF	(3) RD	(4) RK	(5) RD/RK
<i>A. Imbens-Kalyanaraman Optimal Bandwidth</i>					
Pell Grant eligible	378.10 (26.520)**	-277.63 (52.28)**			
× Distance from threshold	-0.798 (0.014)**	0.223 (0.047)**			
Pell Grant aid			-0.759 (0.142)**	-0.275 (0.058)**	-0.321 (0.058)**
Crowd-out borrower			-3.112 (0.479)**	-1.486 (0.259)**	-1.332 (0.178)**
H ₀ : crowd-out >-1, <i>p</i> -value			<0.001	0.030	0.031
Bandwidth	1,639	2,078	2,078	2,078	2,078
Observations	12,519	16,360	16,360	16,360	16,360
<i>B. Fan-Gijbels Rule of Thumb Bandwidth</i>					
Pell Grant eligible	379.20 (25.52)**	-253.63 (58.60)**			
× Distance from threshold	-0.767 (0.013)**	0.336 (0.091)**			
Pell Grant aid			-0.657 (0.149)**	-0.429 (0.114)**	-0.492 (0.101)**
Crowd-out borrower			-2.704 (0.538)**	-2.223 (0.469)**	-2.025 (0.282)**
H ₀ : crowd-out >-1, <i>p</i> -value			<0.001	0.005	<0.001
Bandwidth	1,774	1,358	1,358	1,358	1,358
Observations	13,726	13,217	13,217	13,217	13,217
<i>C. CCFT CER Optimal Bandwidth</i>					
Pell Grant eligible	458.85 (30.510)**	-308.78 (73.42)**			
× Distance from threshold	-0.400 (0.098)**	0.366 (0.136)**			
Pell Grant aid			-0.772 (0.185)**	-0.418 (0.132)**	-0.619 (0.147)**
Crowd-out borrower			-3.051 (0.561)**	-2.212 (0.593)**	-2.447 (0.403)**
H ₀ : crowd-out >-1, <i>p</i> -value			<0.001	0.021	<0.001
Bandwidth	319	1,012	1,012	1,229	1,012
Observations	2,317	7,621	7,621	9,188	7,621

Notes: Estimates from local linear regressions of Pell Grant aid and loan aid on Pell Grant eligibility and generosity (OLS estimates) and loan aid on Pell Grant aid (2SLS estimates) using a uniform kernel. First-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Each column within a panel represents a separate regression. Standard errors clustered at institution by year level in parentheses; ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. See main text for description of bandwidth selection procedures. We use the `rdwselect` Stata command to estimate the CER-optimal bandwidth separately for RD and RK estimators in Panel C.

Table B.12: OLS Estimates of the Impact of Pell Grant Eligibility and Generosity on Borrowing by Loan Packaging Practices

<i>Packages loans?</i>	<u>(1) Pell Grant aid</u>		<u>(2) Total Loans</u>	
	<i>Y</i>	<i>N</i>	<i>Y</i>	<i>N</i>
Pell Grant eligible	298.92 (38.33)**	128.63 (55.93)*	-152.06 (249.56)	-626.45 (260.11)*
	[0.012]		[0.132]	
× Distance from threshold	-0.761 (0.021)**	-0.711 (0.029)**	0.359 (0.099)**	0.242 (0.106)*
	[0.156]		[0.238]	
Observations	5,410		5,410	

Notes: First-, second-, and third-year NPSAS undergraduate students attending public schools; 2010 through 2012 entry cohorts. Students enrolled in community colleges that we were unable to obtaining packaging information from are excluded. Four-year institutions are all assumed to package loans. Clustered standard errors (institution-level) in parentheses; ** p<0.01, * p<0.05, + p<0.1. All regressions also include controls for family AGI, dependency status (dependent versus independent), years since entry fixed effects, \widetilde{EFC} , degree program (AA versus BA), an interaction between degree program and packaging indicators, and main effects for packaging loans. Excluded instruments are $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ and $\widetilde{EFC}_{it} \times \mathbf{1}[\widetilde{EFC}_{it} < 0]$. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. Sample sizes rounded to the nearest 10 per NCES requirements. All dollar amounts adjusted to represent constant 2012\$.

Table B.13: Heterogeneity in the Impact of Pell Grant Aid on Borrowing by Availability of Online Loan Application

<i>Online loan application?</i>	<u>(1) First-year students</u>		<u>(2) Returning students</u>	
	<i>N</i>	<i>Y</i>	<i>N</i>	<i>Y</i>
Pell Grant aid	-0.417 (0.110)**	-0.452 (0.166)**	-0.416 (0.116)**	-0.684 (0.162)**
Test of eq: <i>p</i> -value	0.859		0.179	
Crowd-out borrower	-1.870 (0.348)**	-1.720 (0.480)**	-1.705 (0.410)**	-2.158 (0.290)**
H ₀ : crowd-out > -1, <i>p</i> -value	0.006	0.067	0.043	<0.001
Test of eq: <i>p</i> -value	0.936		0.804	
Observations	38,100		46,744	

Notes: 2SLS estimates of the impact of an additional dollar of Pell Grant aid on borrowing for all students and for would-be borrowers. Column 1 sample includes first-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Column 2 sample includes second- and third-year CUNY undergraduate degree seeking students; 2005 through 2010 entry cohorts. Each column represents estimates from a separate regression. Clustered standard errors (institution by year) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table B.3 notes for a list of additional controls. All covariates are fully interacted with indicator for whether a student is attending a school that provides an online application for loans. Four of the 17 CUNY institutions provided an online loan application when the cohorts we study were in school. Excluded instruments are $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ and $\widetilde{EFC}_{it} \times \mathbf{1}[\widetilde{EFC}_{it} < 0]$ fully interacted with an indicator for attending a school that offers an online loan application. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.14: Heterogeneity in the Impact of Pell Grant Aid on Borrowing: First-Year Students

<i>Student has characteristic:</i>	<u>(1) White</u>		<u>(2) Immigrant</u>		<u>(3) Dependent Student</u>		<u>(4) College Educated Parent</u>	
	N	Y	N	Y	N	Y	N	Y
<i>A. Dependent Var = Total Loans</i>								
Pell Grant Aid	-0.440 (0.108)**	-0.334 (0.205)	-0.613 (0.141)**	-0.255 (0.115)**	-0.424 (0.436)	-0.433 (0.087)**	-0.457 (0.118)**	-0.458 (0.150)**
Test of eq: <i>p</i> -value	0.662		0.053		0.984		0.998	
Crowd-out borrower	-1.767 (0.331)**	-1.695 (0.811)*	-2.229 (0.348)**	-1.294 (0.487)**	-1.606 (1.531)	-1.858 (0.253)**	-1.970 (0.366)**	-1.877 (0.414)**
H ₀ : crowd-out > -1, <i>p</i> -value	0.010	0.195	<0.001	0.273	0.346	<0.001	0.004	0.017
Test of eq: <i>p</i> -value	0.980		0.628		0.957		0.962	
Observations	38,100		38,100		38,100		35,011	
<i>B. Dependent Var = Credits Earned</i>								
Pell Grant Aid (\$1k)	0.382 (0.494)	0.016 (0.721)	0.044 (0.541)	0.442 (0.553)	3.288 (1.294)*	-0.018 (0.431)	-0.069 (0.717)	0.720 (0.540)
Test of eq: <i>p</i> -value	0.678		0.584		0.018		0.418	
Observations	38,100		38,100		38,100		35,011	

Notes: 2SLS estimates of the impact of an additional dollar of Pell Grant aid on borrowing for all students and borrowing for would-be borrowers (Panel A) or credits earned during academic year (Panel B). First-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Each column within a panel represents estimates from a separate regression. Clustered standard errors (institution by year) in parentheses; ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. See Table B.3 notes for a list of additional controls. All covariates are fully interacted with indicator for whether a student is white (Column 1), a first- or second-generation immigrant (Column 2), a dependent student (Column 3), or has a college educated parent (Column 4). Excluded instruments are $\mathbf{1}[\widehat{EFC}_{it} < 0]$ and $\widehat{EFC}_{it} \times \mathbf{1}[\widehat{EFC}_{it} < 0]$ fully interacted with indicator for having the listed characteristic. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.15: Heterogeneity in the Impacts of Pell Grant Aid by TAP Grant receipt and Minimum Pell Grant: First-Year Students

	<u>1. Any TAP Grant</u>		<u>2. High Minimum Pell</u>	
	N	Y	N	Y
<i>A. Dependent Var = Total Loans</i>				
Pell Grant Aid	-0.775 (0.274)**	-0.352 (0.087)**	-0.470 (0.115)**	-0.419 (0.134)**
Test of eq: p -value	0.138		0.77	
Crowd-out borrower	-3.008 (0.813)**	-1.571 (0.274)**	-2.093 (0.358)**	-1.683 (0.410)**
H ₀ : crowd-out > -1, p -value	0.007	0.018	0.001	0.048
Test of eq: p -value	0.596		0.828	
Observations	38,100		38,100	
<i>B. Dependent Var = Credits Earned</i>				
Pell Grant Aid (\$1k)	-0.766 (0.886)	0.208 (0.428)	0.534 (0.611)	-0.162 (0.498)
Test of eq: p -value	0.279		0.377	
Observations	38,100		38,100	

Notes: 2SLS estimates of the impact of an additional dollar of Pell Grant aid on borrowing for all students and borrowing for would-be borrowers (Panel A) or credits earned during academic year (Panel B). First-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. Each column within a represents a separate regression. Clustered standard errors (institution by year) in parentheses; ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. High minimum Pell years are 2009 and 2010. See Table B.3 notes for a list of additional controls. All covariates are fully interacted with indicator for any TAP Grant received (Column 1) or high minimum Pell Grant (Column 2). Excluded instruments are $\mathbf{1}[\widehat{EFC}_{it} < 0]$ and $\widehat{EFC}_{it} \times \mathbf{1}[\widehat{EFC}_{it} < 0]$ fully interacted with indicators for receiving TAP Grant aid or high minimum Pell year. Students with EFC greater than \$4,000 from Pell Grant eligibility threshold in their first year are excluded. All dollar amounts adjusted to represent constant 2012\$.

Table B.16: Characteristics of Switchers

	E[X]	E[X switcher]	$\beta = \frac{E[X switcher]}{E[X]}$	H ₀ : $\beta=1$ (p- value)
Gender				
Female	0.54	0.66	1.22	0.489
Male	0.46	0.35	0.75	0.500
Race				
Black	0.32	0.46	1.43	0.404
Hispanic	0.29	0.44	1.53	0.340
White	0.25	0.03	0.13	0.168
Other	0.14	0.10	0.73	0.692
Dependency status				
Dependent	0.92	0.98	1.07	0.526
Independent	0.08	0.02	0.23	0.544
Parental education				
Less than high school	0.05	0.10	1.94	0.496
High school	0.39	0.39	0.99	0.986
Some college +	0.49	0.45	0.91	0.789
Missing	0.08	0.06	0.72	0.808
Initial degree program				
AA/AS	0.40	0.34	0.85	0.703
BA/BS	0.60	0.75	1.25	0.384
Foreign born				
Parent	0.51	0.50	0.98	0.962
Student	0.18	0.16	0.91	0.892
SAT scores				
Missing	0.32	0.55	1.72	0.189
Above median math	0.20	0.18	0.91	0.884
Below median math	0.48	0.31	0.65	0.347
Above median verbal	0.19	0.05	0.24	0.268
Below median verbal	0.49	0.45	0.91	0.787

Notes: First-year CUNY undergraduate degree seeking students; 2007 through 2011 entry cohorts. $E[X]$ represents the average characteristic among students near the Pell Grant eligibility threshold, estimated via a regression of that characteristic on a quadratic in \widetilde{EFC} (allowed to vary on either side of the eligibility threshold). $\beta = \frac{E[X|switcher]}{E[X]}$ represents the relative likelihood that an individual with characteristic X is a switcher. We estimate this term by taking the ratio of the coefficient on $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ from a regression of any borrowing $\mathbf{1}[\widetilde{EFC}_{it} < 0]$ and a quadratic in \widetilde{EFC} (allowed to vary on either side of the eligibility threshold) using the full sample to the same coefficient when the sample is limited to students who have characteristic X . $E[X|Switcher] = \beta E[X]$. The fourth column displays the p -value from the test of $\beta = 1$, which is a test of whether the probability that a switcher has characteristic X significantly differs from the probability that a member of the full sample has characteristic X . Students with EFC greater than \$4,000 from Pell Grant eligibility threshold in their first year are excluded. All dollar amounts adjusted to represent constant 2012\$.

C Proofs

In this appendix, we verify the solution and predictions of the conceptual framework in Section 4 and Table 2. Here, we define the more general grant function $g(s|EFC) = g + h(s|EFC)$, in contrast to the treatment of grants in our simplified model presented in the main text that assumes $h(s|EFC) = 0$. We first show that the solution has the form described in the text. Proofs of the predicted effects of an increase in g that are listed in Table 2 follow directly. This appendix concludes with a demonstration that these predictions still hold in the presence of price effects (i.e., $h'(s|EFC) > 0$).

C.1 Solution of Student's Problem

First, the student's problem has either one or two optima. The strict concavity of $u(\cdot)$, concavity of $g(\cdot)$ and $W(\cdot)$, and convexity of $T(\cdot)$, along with piecewise linearity of the cost of borrowing and the regularity condition $W''(s) \leq -R_m(T_d''(s|EFC) - g''(s|EFC))$, imply that the problem is strictly concave in both b and s where differentiable. The proof is trivial except to note that the regularity condition is sufficient because:

$$\begin{aligned} \frac{\partial^2}{\partial s^2} u(c_1) &= \frac{\partial^2}{\partial s^2} u(W(s) - R_{sub}b - \kappa_{sub}(R_m - R_{sub})(b - \bar{b} - \xi(T_d(s|EFC) - g(s|EFC) - EFC - \bar{b}))) \\ &= \frac{\partial}{\partial s} (W'(s) + \kappa_{sub}\xi(R_m - R_{sub})(T_d'(s|EFC) - g'(s|EFC))) u'(c_1) \\ &= (W''(s) + \kappa_{sub}\xi(R_m - R_{sub})(T_d''(s|EFC) - g''(s|EFC))) u'(c_1) \\ &\quad + (W'(s) + \kappa_{sub}\xi(R_m - R_{sub})(T_d'(s|EFC) - g'(s|EFC)))^2 u''(c_1) \end{aligned}$$

and

$$\begin{aligned} W''(s) &\leq -R_m(T_d''(s|EFC) - g''(s|EFC)) \\ \Rightarrow W''(s) + \kappa_{sub}\xi(R_m - R_{sub})(T_d''(s|EFC) - g''(s|EFC)) &\leq 0 \\ \Rightarrow \frac{\partial^2}{\partial s^2} u(c_1) &< 0 \end{aligned}$$

Therefore, the problem is concave except for the discontinuity at $b = 0$. The domain of s is bounded by assumption, which therefore places bounds on b because consumption cannot be negative. Hence, there is at least one solution. The solution will not include b at the lower bound that makes $c_0 = 0$ because

$c_1 > 0 = c_0 \Rightarrow \frac{\partial u(0)}{\partial b} \geq \frac{\partial u(c_1)}{\partial b} \geq \frac{\partial \beta u(c_1)}{\partial b}$, which implies that total utility would be increased by raising b above this level. Similarly, s is bounded from above by non-negativity of c_0 and the fact that b is bounded above by \bar{b} , and the upper bound for s will not be optimal. Any solution for observed students (for whom the lower bound $s = 0$ is revealed to be suboptimal) satisfies the first order condition with respect to s , and either the first order condition with respect to b , $b = 0$, or $b = \bar{b}$.

Second, the solution is unique with probability one. Because the entire problem would be concave if not for the discontinuity, and because the discontinuity reduces utility for values of b greater than zero, any solution with $b < 0$ is unique. It may be, however, that an allocation with $b > 0$ gives the same utility as one with $b = 0$. If two solutions exist for a given level of EFC and ω we denote the positive debt amount chosen in one solution by \underline{b} . Because student resources are continuously distributed, \underline{b} is optimal with probability zero.

Third, the solution takes the monotonically ranked form described in Table 2. The empirical size (possibly zero) of each group will depend on the parameter values and the distribution of resources among students. Here we establish the theoretical existence of each group of students and their ranking by resources.

Consider schooling level \bar{s} satisfying the equation $R_{sub}(T'(\bar{s}|EFC) - g'(\bar{s}|EFC)) = W'(\bar{s})$ and $\omega = u^{-1}(R_{sub}\beta u(W(\bar{s}) + \epsilon)) + T(\bar{s}|EFC) - g(\bar{s}|EFC) - EFC$ for some $\epsilon > 0$. If debt is zero, this allocation gives $u(c_0) = R_{sub}\beta u(W(\bar{s}) + \epsilon) > R_{sub}\beta u(W(\bar{s})) = u(c_1)$. Raising s would increase total utility, but lowering b by an amount that causes the same reduction in c_0 would cause a greater rise in c_1 , implying that a negative value of debt must be optimal. Since $b^* < 0$, $\kappa_0 = \kappa_{sub} = \lambda = 0$, which implies $R_{sub}(T'(s^*|EFC) - g'(s^*|EFC)) = W'(s^*)$. Because this condition contains the derivative of $g(s|EFC)$ and not its level, small changes in the unconditional level of grants, ∂g , only affect borrowing: $\frac{\partial s^*}{\partial g} = 0$, while differentiation of condition (3) gives $\frac{\partial b^*}{\partial g} = -\frac{u''(c_0)}{u''(c_0) + R_{sub}^2 \beta u''(c_1)} \in (-1, 0)$. Note that the optimal allocation responds to ω in the same way that it responds to g : higher values of ω reduce b^* and have no effect on s^* . The conditions hold until ω becomes low enough that $b^* = 0$. We label those with resources high enough to induce negative borrowing (i.e. net saving) Group A.

At $b^* = 0$, $\frac{\partial b^*}{\partial g} = 0$. We label the mass of students with exactly zero debt as Group B. Differentiation gives:

$$\frac{\partial s^*}{\partial g} = \frac{(T'(s^*|EFC) - g'(s^*|EFC))u''(c_0)}{(T''(s^*|EFC) - g''(s^*|EFC))u'(c_0) - (T'(s^*|EFC) - g'(s^*|EFC))^2 u''(c_0) - W''(s^*)u'(c_0) - W'(s^*)^2 u''(c_0)} > 0$$

Denote the optimal schooling choice when $b^* = 0$ as s_0^* (suppressing the arguments of this function to sim-

ply notation). If the fixed cost of borrowing is not too large there will be additional groups with positive debt. Students in Group B obtain utility $u(\omega + EFC - (T(s_0^*|EFC) - g(s_0^*|EFC))) + \beta u(W(s_0^*))$. Students with positive debt obtain utility $u(\omega + EFC - (T(s^*|EFC) - g(s^*|EFC)) - \gamma) + \beta u(W(s) - R_{sub}b - \kappa_{sub}(R_m - R_{sub})(b - \bar{b} - \xi((T_d(s^*|EFC) - g(s^*|EFC)) - EFC - \bar{b})))$. The level of debt for which the two utilities are equivalent is \underline{b} . If $\underline{b} < \bar{b}$ there will be a Group C for which $b \in (\underline{b}, \bar{b})$. As with Group A, $R_{sub}(T'(s^*|EFC) - g'(s^*|EFC)) = W'(s^*)$, $\frac{\partial s^*}{\partial g} = 0$, and $\frac{\partial b^*}{\partial g} = -\frac{u''(c_0)}{u''(c_0) + R_{sub}^2 \beta u''(c_1)} \in (-1, 0)$. Optimal b^* is strictly decreasing with ω except in the region for which small positive amounts of debt are dominated by zero debt as a result of the fixed cost of borrowing.

As resources continue to fall, b^* may rise to the level of b_{sub}^{max} . For Group D, $b^* = b_{sub}^{max} = \bar{b} + \xi((T_d(s^*|EFC) - g(s^*|EFC)) - EFC - \bar{b}) \Rightarrow \frac{\partial b^*}{\partial g} = \xi\left((T'_d(s^*|EFC) - g'(s^*|EFC)) \frac{\partial s^*}{\partial g} - 1\right)$, and because (2) holds, $\frac{\partial s^*}{\partial g} > 0$ as was the case for Group B. The conditions and properties of Groups E and F follow those of Groups A and B, respectively.

C.2 Empirical Predictions

Derivation of the listed implications follows. Denote ω_X as the highest value of ω in each Group X and $F(\omega)$ the cumulative distribution function for ω , conditional on g and EFC . The monotonicity of the policy implies that Group F has mass $F(\omega_F)$, Group E has mass $F(\omega_E) - F(\omega_F)$, Group D has mass $F(\omega_D) - F(\omega_E)$, etc. Because the policy function is discontinuous, implications are shown for a discrete change ϵ in the amount of grant aid received.

1. *If the fixed cost $\gamma > 0$ then $\underline{b} > 0$, and an increase in grant aid may lead to a greater than \$1 for \$1 reduction in loans for borrowers.*

Consider a number $\delta \in (0, \gamma)$ and let $s^*(\gamma - \delta)$ denote optimal schooling when the solution to equation (1) is $b^* = \gamma - \delta$. The choice of $b = 0$ and $s = s^*(\gamma - \delta)$ gives strictly greater utility than $b = \gamma - \delta$ and $s = s^*(\gamma - \delta)$. This implies a strictly dominated range of debt values between zero and some $\underline{b} > \gamma > 0$. Now suppose *all* students have $\omega = \omega_C$ and $b = \underline{b}$. An increase in grant aid from g to $g + \delta/2$ induces these students to stop borrowing. Crowd-out is $\frac{\Delta b}{\Delta g} = \frac{\delta}{\delta/2} = -2 < -1$.

2. *Small changes in the amount of unconditional grant aid only increase the educational attainment of threshold borrowers.*

This implication follows directly from the schooling policy functions.

3. *Grants decrease educational attainment of students whose optimal debt level drops from (weakly) above \underline{b} to a positive amount below \underline{b} .*

Regardless of the choice of b , the choice of s satisfies (2):

$$\begin{aligned} & (T'(s|EFC) - g'(s|EFC)) u'(\omega + EFC + b - (T(s|EFC) - g(s|EFC)) - \gamma \cdot \kappa_0) \\ &= \beta (W'(s) - \xi \kappa_{sub} (R_m - R_{sub}) (T'_d(s|EFC) - g'(s|EFC))) \times \\ & u'(W(s) - R_{sub}b - \kappa_{sub} (R_m - R_{sub}) (b - \bar{b} - \xi ((T_d(s|EFC) - g(s|EFC)) - EFC - \bar{b}))) \end{aligned}$$

Label as \underline{s} the value of s that satisfies this equation when $b = \underline{b}$. As shown above, the choice of $b = 0$ dominates $b \in (0, \underline{b})$. A small increase in grants that induces switching from $b = \underline{b}$ to $b = 0$ increases the value of the left-hand side of the equation (because of the fact that $\underline{b} \geq \gamma$) and decreases the value of the right-hand side. The notation can be simplified slightly because $b = 0 < d_{sub}^{max} \Rightarrow \xi = 0, \kappa_{sub} = 0$. The necessary adjustment to s is downwards because the left-hand side is increasing in s :

$$\begin{aligned} & \frac{\partial}{\partial s} [(T'(s|EFC) - g'(s|EFC)) u'(\omega + EFC - (T(s|EFC) - g(s|EFC))) - \beta (W'(s)) u'(W(s) - R_{sub}b)] \\ &= (T''(s|EFC) - g''(s|EFC)) u'(c_0) - (T'(s|EFC) - g'(s|EFC))^2 u''(c_0) - \beta W''(s) u'(c_1) - \beta W'(s)^2 u''(c_1) \\ & > 0 \end{aligned}$$

While the right-hand side is decreasing in s :

$$\begin{aligned} & \frac{\partial}{\partial s} [\beta (W'(s)) u'(W(s) - R_{sub}b)] \\ &= \beta (W''(s)) u'(W(s) - R_{sub}b) + \beta (W'(s))^2 u''(W(s) - R_{sub}b) \end{aligned}$$

$$< 0$$

C.3 Price Effects

Increases in Pell Grant aid may also have price effects for some students because those who do not attend full-time in both semesters do not receive grant aid. To see whether the empirical predictions will still hold in

the presence of increased price effects we can borrow a common tactic from the optimal taxation literature and write the local linear approximation $l(s^*|EFC)$ to the grant function $g(s^*|EFC)$ as $l(s^*|EFC) = g + p(s - s^*)$. In this function, the slope p describes the grant's incentive to increase schooling effort, and $g'(s^*|EFC) = p$. Price effects alter the second prediction in the preceding subsection but not the first or the third:

1. *If the fixed cost $\gamma > 0$ then $\underline{b} > 0$, and an increase in grant aid may lead to a greater than \$1 for \$1 reduction in loans for borrowers.*

The proof above does not rely on the assumption that $g(s^*|EFC)$ is constant. Instead of increasing g as in the last two lines of the proof, however, consider increasing p .

How does p affect borrowing? When borrowing satisfies the first-order condition (and for simplicity $R = R_{sub}$):

$$0 = (p - T'(s|EFC)) u'(\omega + EFC + g + p(s - s^*) + b - T(s|EFC)) + \beta W'(s^*) u'(W(s) - R_{sub}b)$$

$$\frac{\partial b^*}{\partial p} = - \frac{u'(c_0) + s(p - T'(s|EFC)) u''(c_0)}{(p - T'(s|EFC)) u''(c_0) - R_{sub} \beta u''(c_1)}$$

Suppose we are introducing price effects for the first time, such that $p = 0$ currently. Then $\frac{\partial b^*}{\partial p} < 0$, and as before the additional grant aid pushes optimal debt to a dominated level that induces switching out of borrowing entirely. The rest of the proof is unaltered.

2. *Small changes in the amount of conditional grant aid increase the educational attainment of non-threshold borrowers.*

When a student is not at a borrowing threshold, $(R_{sub} + \kappa_{sub}(R_m - R_{sub}))^{-1} W'(s^*) = T'(s^*|EFC) - g'(s^*|EFC) = T'(s^*|EFC) - p$. As one would expect, the price effect increases schooling (i.e., an increase in p increases s^*). This can be seen using implicit differentiation on the combined first-order conditions for the non-threshold borrowers:

$$\frac{\partial s^*}{\partial p} = - \frac{1}{(R_{sub} + \kappa_{sub}(R_m - R_{sub}))^{-1} W''(s^*) - T''(s^*|EFC)} > 0.$$

3. *Grants decrease educational attainment of students whose optimal debt level drops from (weakly) above \underline{b} to a positive amount below \underline{b} .*

The proof is unaltered.