Cents and Students Appendix

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A Appendix

A.1 Revenue Balance Sheet and Summary Statistics

Figures 1 and 2 display the two trends that are the focus of this paper. Figure 1 shows how universities are beginning to substitute appropriations revenue with tuition revenue over the course of the sample. Beginning in 2000, state appropriations were on average \$30 million larger than tuition revenue. In 2010, however, appropriations and tuition revenue intersect; and by 2015, tuition revenue is around \$20 million larger than state appropriations for the average university. Figure 2 shows the large increase in demand for universities. Applications nearly catch up to university-level enrollment by 2015, and are growing at a faster rate than admissions. This fierce competition for each seat allows universities to substitute to nonresident students to recuperate revenue, while also potentially forcing resident students out.

Figure 1: State Funding and Tuition Revenue

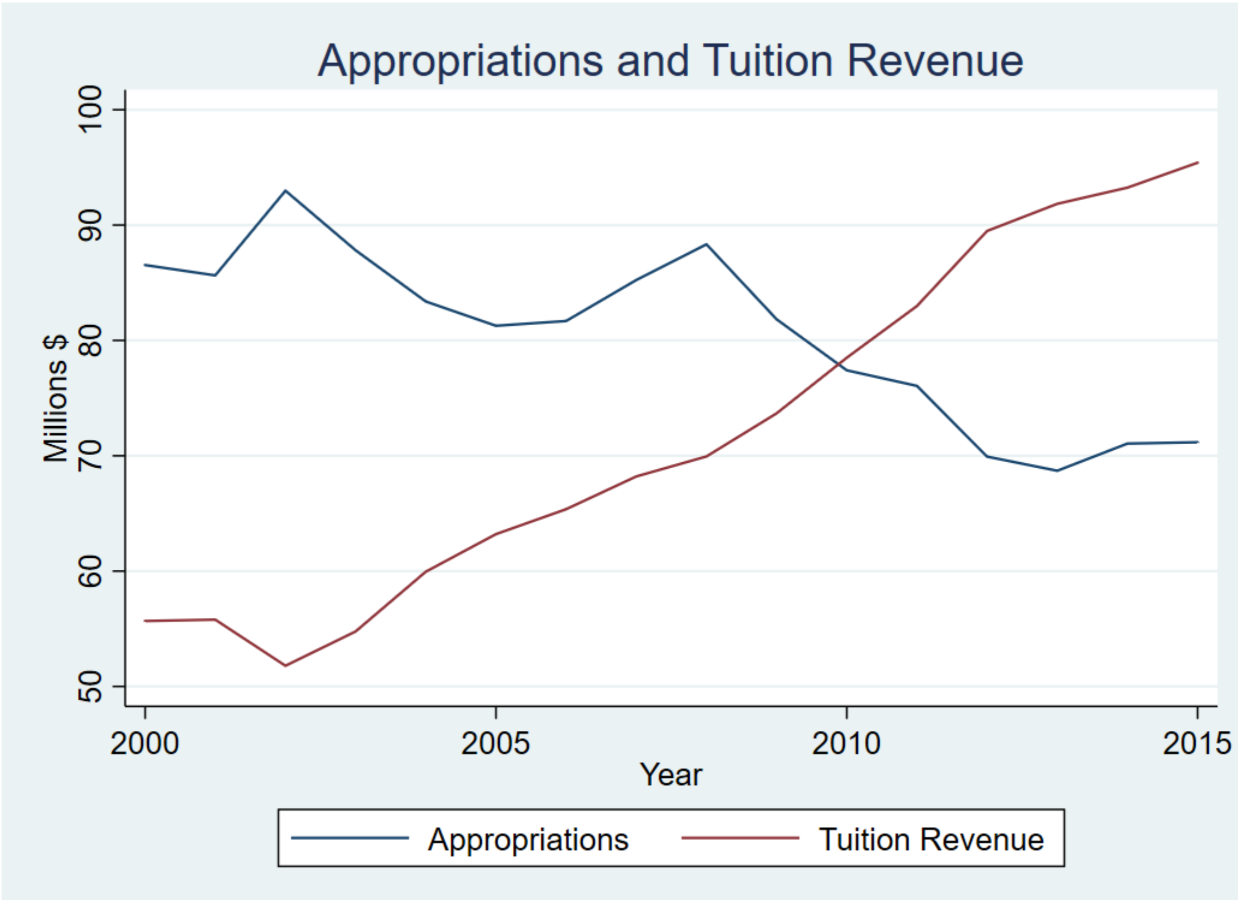
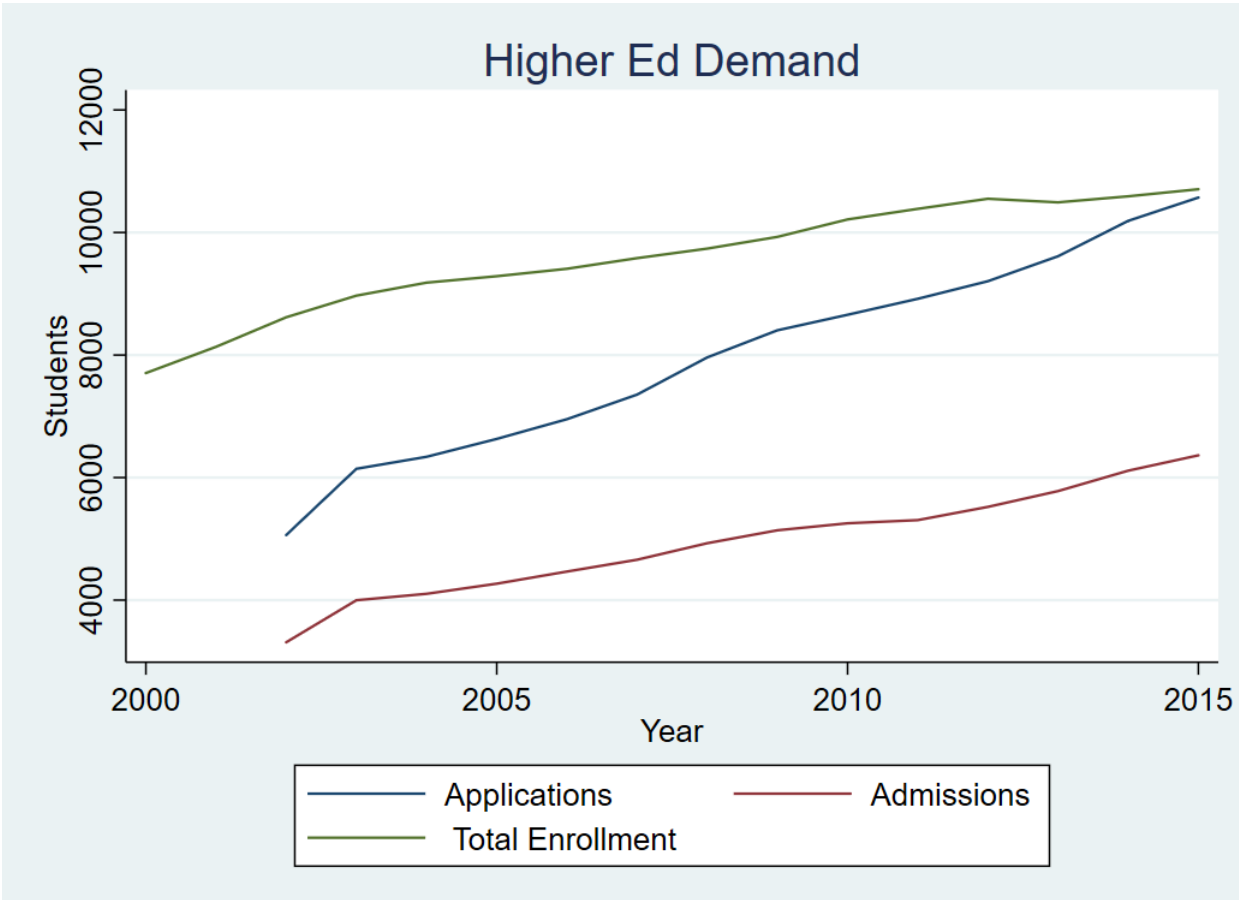


Figure 2: Higher Education Demand



To touch on the extent to which appropriations matter to universities, Table 1 provides a detailed look at revenue by source for the average university. The IPEDS dataset finance survey provides line item information for the two major revenue categories for the university: operating and non-operating revenues. Although a bit of a simplification, it is useful to think of operating revenues as a "variable" revenue that are a function of daily university activity. Non-operating revenues can be viewed as "fixed" in the sense that university day-to-day activity does not influence these measures.[1] What is clear is that state appropriations are a large share of yearly revenue, roughly 32% for the average university. Tuition revenue is the next highest revenue source, comprising about 27% of yearly revenue. There is a sharp drop to the next item, sale of auxiliary services which comes in at 12%.[2]

[1] I will address how state appropriations are somewhat influenced by university behavior in the methodology section below.

[2] Sale of auxiliary services is revenue generated by the university through operating bookstores, athletic events, housing, and selling food and other services on campus.

The justification for focusing solely on tuition revenue as the adjustment margin for universities when confronted with changes to state appropriations is twofold: first, as Table 1 shows, tuition revenue is by far the largest revenue source that universities can manipulate in response to changes in appropriations. Second, the components of tuition revenue are meaningful in evaluating the welfare of students. Increasing tuition for either resident or nonresident students increases their cost of attendance, always a hot-button issue in the world of politics. Increasing the enrollment of those who pay higher tuition—nonresident students—potentially crowds-out resident students, forcing them either to go to lower quality schools, go out-of-state themselves, or in the extreme to not attend college at all. Both of these changes are vital to study to form a complete picture of the ramifications of cutting funding to public universities.

Table 1: Revenue by Source

State Appropriations	0.31	Tuition Revenue	0.28
Sale of Auxiliary Services	0.12	Other Revenue	0.04
Federal Operating Grants	0.09	Federal Non-operating Grants	0.05
State Operating Grants	0.03	State Non-operating Grants	0.01
Gifts	0.02	Investment Income	0.01
Local Operating Grants	0.02	Local Non-operating Grants	0.00
Independent Operations	0.00	Sale of Hospital Services	0.02
Federal Appropriations	0.00	Local Appropriations	0.00

N=7586. All variables are shown as a percent of total revenue. Items with 0.00 shown are less than 1% of revenue.

Table 2: Summary Statistics

	Mean	SD	IQR
State Appropriations (millions $)	85	106	74
Resident Tuition ($)	5319	2584	2827
Nonresident Tuition ($)	14235	5204	5848
Resident 1^{st} Year Enrollment	1492	1250	1513
Nonresident 1^{st} Year Enrollment	338	509	310
Undergraduate Enrollment	10155	8308	10639
Applications	7612	8703	7381
ACT 25^{th} Percentile	19	3	3
ACT 75^{th} Percentile	24	3	3

N=7586. All dollar values are deflated using the Higher Education Price Index (HEPI). Interquartile range (IQR) is the distance between the 75^{th} and 25^{th} percentile observations.

A.2 Robustness Checks

This section will provide robustness checks for the state appropriations instrument. This involves trimming the sample of observations that potentially could be driving the results to see if the coefficients are stable across specifications. The first robustness check drops states that have fewer than 3 schools, and also universities whose share of the total appropriation pool is greater than 50%. The reasoning behind this is to test the validity of the assumption that the "shift" element of the state appropriations instrument, aggregate state funding, is independent of university-level appropriations. In describing the instrument, I mentioned that potential threats to exogeneity are states which have so few schools that each university's individual funding could be strongly correlated with the aggregate pool; and also schools that received such a disproportionately large share of the state pool that their institution-level appropriations could dictate the aggregate funding.

I also provide results using the methodologies of the two papers closest to my own, **?** and **?**. Differences in datasets will not lead to reproduction of results from their papers and I am not intending to do so; but contrasting instrument strength and results across specifications can highlight the strengths and weaknesses of the respective instruments.

Table 3 presents results from the first robustness check: dropping states that have fewer than 3 universities ($N = 258$) and universities that have over 50% of the state-level appropriation pool (an additional 621 university-year observations). To condense results for this check, I present resident/nonresident tuition results as well as the university-level enrollment composition results (originally shown in Table **??**). Columns 1 and 2 present tuition results, columns 3 and 4 enrollment results. The resident and nonresident tuition results after trimming the sample are almost identical to the baseline specifications. The resident tuition elasticity is nearly identical at -0.20, while the nonresident tuition elasticity has increased slightly from -0.10 to -0.12. The only noticeable change from the trimmed sample result relative to Table **??** is that the nonresident enrollment specification has a slightly larger point estimate than in Table **??**. This suggests that states with a larger number of universities and universities with smaller shares of the total state appropriation pool are more likely to increase nonresident enrollment in response to decreased state funding. Ultimately, the results after trimming these potentially problematic states and universities are so similar to baseline results that it appears that the assumption of exogeneity of the aggregate state pool to university activity is valid.

Table 4 presents results from the second robustness check: dropping Colorado from the sample.

Colorado stopped providing state appropriations for universities beginning in 2006, so they are entered as zeros in the IPEDS data from that year forward. Colorado having no appropriations after 2006 with changing tuition and enrollment could change results from the baseline specifications. Table 4 finds that dropping Colorado from the sample does not meaningfully change results from the original results. The resident and nonresident tuition elasticities (columns 1 and 2) are nearly identical to the baseline specification. The university-level resident enrollment results are also robust to the exclusion of Colorado observations. The results from Table 4 show that the inclusion of Colorado in the original sample has no meaningful impact on results.

Table 5 compares results from **?** and **?** to my own specifications. Similar to the results of Tables 3 and 4, the structure of the table has tuition results in the first two columns and enrollment results in columns 3 and 4. The top panel of Table 5 presents my results for reference, the only difference being I have combined the out-of-state and foreign coefficients from Table **??** into a single nonresident regression.

The middle panel of Table 5 shows results using the IV from **?**. Their instrument uses only the shift element from my instrument, $TotStateApprop_{st}$. The benefit of using this instrument is that because no university-level share is assigned, there is no need to test for exogeneity of the share using tests from **?** and **?**. Their instrument is also strongly correlated with university-level state appropriations, with a Kleibergen-Paap F-statistic of 46. However, only the resident tuition regression in column 1 is the expected sign and statistically significant. The nonresident tuition and enrollment regressions (columns 2 and 4, respectively), are not the expected sign and are statistically insignificant. It is difficult to ascertain why these counter-intuitive results are found here. My hypothesis was that instrument strength would suffer due to assigning each university in a state an equal share, however their instrument correlation appears strong. The results with their specification is nonetheless concerning and should be viewed with caution.

The bottom panel of Table 5 uses the IV of **?**. They also use a shift-share instrument, although their specification has been modified for the data of my paper. The data of **?** spans from 1990 to 2013 and they present results as per-capita, so their instrument is $Z_{it} = (\frac{StateApprop_{i,1990}}{TotalRevenue_{i,1990}}) \times (\frac{TotStateApprop_{st}}{StatePopulation_{st}})$. For purposes of comparison, I modify this to be $Z^{*}_{it} = (\frac{StateApprop_{i,2000}}{TotalRevenue_{i,2000}}) \times TotStateApprop_{st}$ to fit with my specifications and data.

After modifying their instrument to fit my data and specifications, the only difference between the **?** IV and mine then is the chosen share: I use a university's share of the aggregate pool in the first year of the sample, while they use a university's fraction of total revenue that comes from state appropriations in that base year. Their chosen share is intuitive in the sense that universities who receive a large share of their yearly revenue from state appropriations are going to be the most effected by sudden cuts, but their share has the problem of overstating appropriations for smaller universities, while understating them for larger universities. Their share assigns the dependence on appropriations for revenue as the share received of the aggregate, meaning a university who received 90% of their revenue from state appropriations is given 90% of the total state pool. The issue with this is that smaller universities who are more dependent on state appropriations for revenue also receive less funding from the state as a function of their size, so assigning them a large share of the total pool overstates their instrumented funding. Larger schools in a state like flagship universities are far less dependent on appropriations as a source of revenue, but receive a much larger fraction of the aggregate due to their size and importance. The **?** IV would assign a university like this a very small amount of the total pool, and thus fundamentally understate the received appropriations of larger, more prestigious universities. This has two consequences: first, the overstatement of small school funding and understatement of large school funding will affect instrument strength. Second, their IV may produce counter-intuitive results because their paper is tailored more to smaller four-year universities and two-year universities, while I focus entirely on four-year universities. Their instrument perhaps captures the available policy levers for these smaller schools who cannot substitute resident for nonresident students; but it will likely fail to account for margins available to larger universities in my sample, and therefore produce results that are either insignificant or the unexpected sign.

Looking at the results of Table 5, these opposite-direction coefficients appear for both nonresident tuition and enrollment. The resident tuition estimate in column 1 is slightly larger than my baseline estimate, but the nonresident tuition coefficient in column 2 is the wrong sign, although it is statistically insignificant. The enrollment results are insignificant across both specifications, implying that universities do not adjust enrollment composition in response to changes to appropriations. This is likely the case for smaller, less-prestigious universities who do not have sufficient demand to substitute higher-paying nonresidents for resident students. As predicted, the strength of the instrument is also weaker than my own (KP F-stat of 17.30), likely due to the fitting issue discussed above. Taken together, the counter-intuitive results of the **?** IV suggest that it is either better suited to predict the behavior of smaller schools, or their chosen share poorly fits the data and therefore produces counter-intuitive results.

To test if correlated inter-state trends impact results—and to confirm the robustness of my own specification—Table 6 adds state-by-year fixed effects to the IV comparisons from Table 5. This necessitates dropping the instrument from ? as their instrument identifies only state-level variation, and therefore would be collinear to the added fixed effects. Adding these state-by-year fixed effects leaves little residual variation, meaning my IV and the modified ? IV only utilize within state-year group variation to identify the causal estimates.[3]

This frames the IV that ? and myself use in the larger shift-share literature. A standard shift-share instrument—see examples like ? and ?—assigns many shares to an entity like a local labor market or industry and uses a national growth rate as an instrument, which it can reasonably be argued is exogenous to local supply and demand determinants. While ? does not assign a share, all three of our papers use many state-level shift-factors. It is more likely for these state-level growth rates to be correlated with local determinants than a national growth rate (checked for in Table 3); but inter-state correlation could potentially confound estimates because it could violate the strict orthogonality assumption of a national growth rate. Adding state-by-year fixed effects controls for this cross-state variation, putting the IV back into the well-established world of the labor-market IV. The hope is that the coefficients are stable moving from Table 5 to 6, meaning that cross-state correlation of aggregate appropriation growth is not meaningfully impacting university-level decision making.

The top panel of Table 6 updates my IV specification with the inclusion of the state-by-year fixed effects. The point estimates do move—the resident tuition coefficient is smaller while the nonresident tuition estimate is larger—but the instrument is still strong with a KP F-statistic of 40.63 and the results are still the expected sign and are a reasonable magnitude. The bottom panel, which presents the updated ? IV, has completely different results from Table 5. Adding the state-by-year fixed effects has changed the ? estimates to be closer to my own—although they are much larger for resident and nonresident tuition, as well as resident enrollment. This coefficient adjustment does not improve the strength of their instrument by much, with the KP F-stat of their IV only increasing to 23.39, roughly half of my own.

This section provided results to test the robustness of my specifications to dropping states with few schools, larger universities within a state, and Colorado. I also addressed differences in my results versus those of closely related papers, showing my instrument provides more robust estimates than prior work. The results presented here confirm that the identification strategy is stable across trimming the sample of potentially confounding observations as well as the inclusion

[3]Which they are able to do due to assigning each university within a state a unique share.

of state-by-year fixed effects which frame the instrument more clearly in the immigration and labor market literature.

Table 3: Robustness Check: Dropping Big Schools

	Tuition		**Enrollment**	
	(1)	(2)	(3)	(4)
	Resident	Nonresident	Resident	Nonresident
$StateApprop_{it}$	-11.54***	-19.76***	9.602**	-8.176***
	(1.797)	(4.058)	(3.736)	(2.477)
N	6692	6692	6692	6692
Coefficient Interpretation	\$1 million $\rightarrow$ \$$\beta$		\$1 million $\rightarrow$ β students	
Elasticity	-0.20	-0.12	0.094	-0.43

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression using the IV. All controls from equation 2 are included. The KP F-stat for the instrument is 60.00 in each column. States that have fewer than 3 schools are dropped as well as any university that has larger than 50% of the aggregate appropriation share.

Table 4: Robustness Check: Dropping Colorado

	Tuition		**Enrollment**	
	(1)	(2)	(3)	(4)
	Resident	Nonresident	Resident	Nonresident
$StateApprop_{it}$	-12.45***	-16.09***	8.497**	-7.404***
	(1.980)	(4.467)	(3.824)	(2.699)
N	7385	7385	7385	7385
Coefficient Interpretation	\$1 million $\rightarrow$ \$$\beta$		\$1 million $\rightarrow$ β students	
Elasticity	-0.20	-0.10	0.088	-0.38

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression using the IV. All controls from equation 2 are included. The KP F-stat for the instrument is 47.98 in each column. Colorado schools are dropped from each regression.

Table 5: Testing **?** and **?**

	Tuition		**Enrollment**	
	(1)	(2)	(3)	(4)
	Resident	Nonresident	Resident	Nonresident
		My Specification		
$StateApprop_{it}$	-12.12***	-16.07***	7.833**	-6.922***
	(1.856)	(4.077)	(3.685)	(2.544)
KP F-stat		53.17		
		?		
$StateApprop_{it}$	-18.76***	22.84	2.720	10.26
	(5.469)	(17.73)	(9.411)	(6.529)
KP F-stat		45.72		
		?		
$StateApprop_{it}$	-16.64***	47.21	-4.034	16.81
	(5.763)	(34.07)	(13.13)	(10.74)
KP F-stat		17.30		
N	7576	7576	7576	7576

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. All controls from equation 1 are included.

Table 6: Adding State-by-Year Fixed Effects

	Tuition		**Enrollment**	
	(1)	(2)	(3)	(4)
	Resident	Nonresident	Resident	Nonresident
		My Specification		
$StateApprop_{it}$	-6.971***	-18.01***	5.042*	-8.568***
	(0.866)	(4.180)	(2.767)	(2.209)
KP F-stat		40.63		
		?		
$StateApprop_{it}$	-16.15***	-38.38***	14.69***	-4.575
	(5.849)	(8.894)	(4.932)	(2.842)
KP F-stat		23.39		
N	7576	7576	7576	7576

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. All controls from equation 1 are included, as well as state-by-year fixed effects.

A.3 Bootstrapping for Coefficient Sensitivity

As an additional test of the sensitivity of the instrumental variables to particular states, Table 7 in the appendix bootstraps progressively larger samples of states to test the sensitivity of the baseline model and which direction bias can potentially be signed. In the table, I present my preferred specifications in bold in the top row. The rows below present average coefficients from 100 repetitions of progressively larger samples of states. The "10 State Coefficient" row in each table randomly chooses ten states as its sample, and runs the associated regression (equation (1) for Table 7) and saves the regression coefficient. This is repeated one hundred times to obtain a distribution of coefficients for the ten state samples, for which I present the mean. This process is repeated taking random samples of twenty, thirty, and forty states. There are associated figures that show kernel densities of the distributions of the coefficients, with vertical red lines to indicate the baseline coefficient.

Table 7, and its associated figures 3-6, display results from the bootstrapped samples for the state appropriations instrument. Columns 1 and 3 of Table 7, which show resident tuition and enrollment, respectively, indicate that the baseline coefficient is larger in absolute value than the bootstrapped estimates. This suggests that the preferred model overstates the extent to which universities increase resident tuition and decrease resident enrollment when state appropriations shrink. However, the tails of the respective coefficient distributions (Figures 3 and 5) skew heavily towards larger estimates than the baseline model suggests.

The nonresident components of Table 7, columns 2 and 4, are larger in absolute value than the preferred model. This would suggest that universities actually increase nonresident tuition and enrollment more than I predict in response to a decrease in state funding. In particular, the nonresident enrollment distributions are leftward-skewed, indicating that some random samples predict very large nonresident enrollment substitutions to decreases in state appropriations.

The results of Table 7 point to the robustness of the state appropriations instrument. Even when drawing relatively small samples of ten states, the point estimate means are close to the baseline model.

Table 7: Bootstrapped Samples for Coefficient Sensitivity

	Tuition		**Enrollment**	
	(1)	(2)	(3)	(4)
	Resident	Nonresident	Resident	Nonresident
Baseline Coefficient	**-12.12**	**-16.07**	**7.83**	**-6.92**
10 State Coefficient	-9.13	-15.96	5.80	-8.50
20 State Coefficient	-10.86	-17.37	7.16	-8.22
30 State Coefficient	-11.25	-16.74	7.47	-8.01
40 State Coefficient	-11.42	-16.99	7.44	-7.85

Row 1 presents results from the baseline specification. The rows below show the average regression coefficient for each bootstrapped sample. Each bootstrap group was run 100 times.

Figure 3: Resident Tuition Distributions

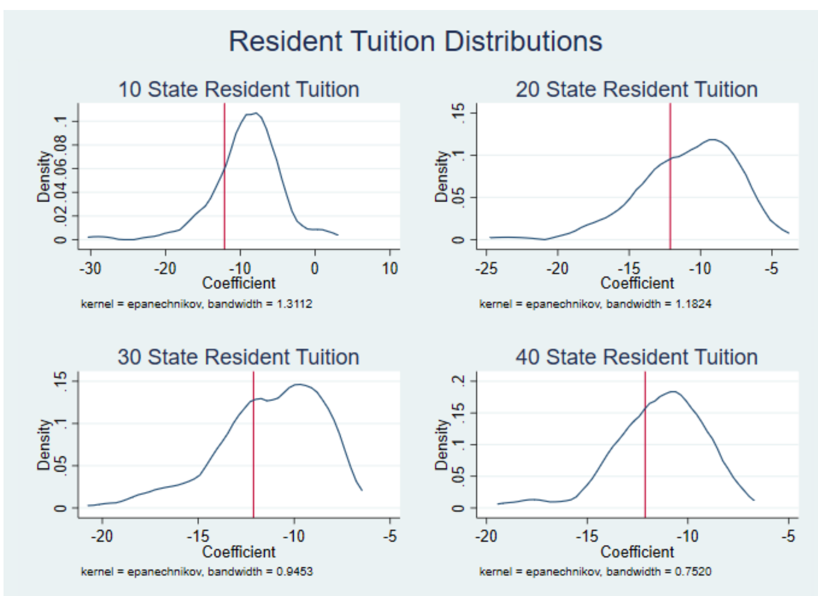


Figure 4: Nonresident Tuition Distributions

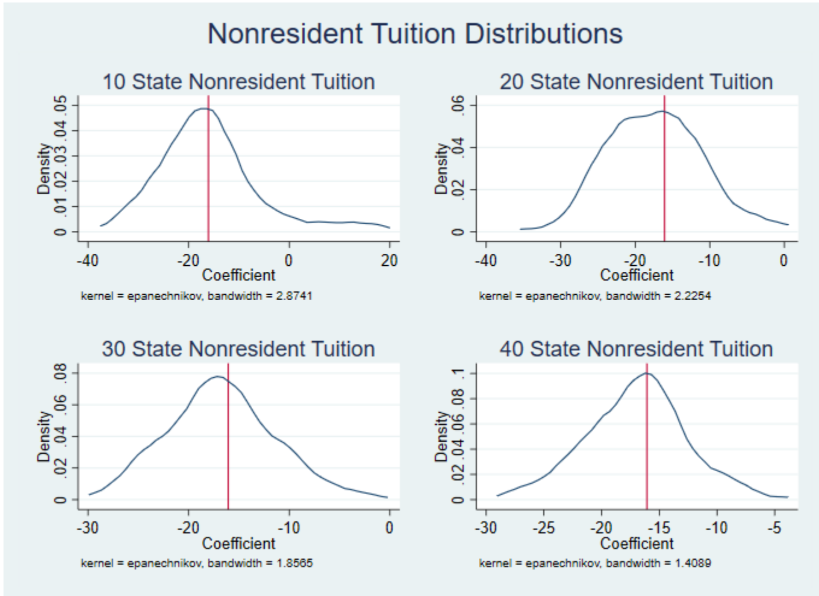


Figure 5: Resident Enrollment Distributions

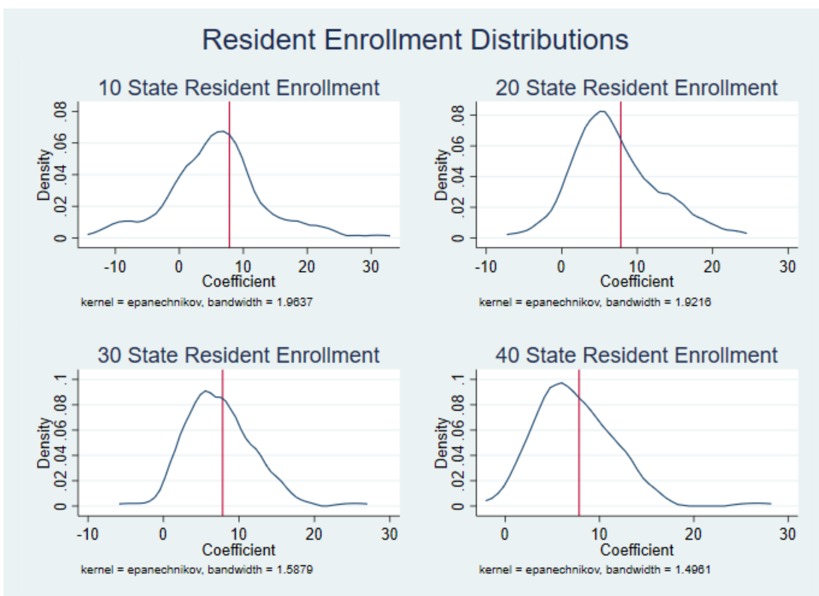
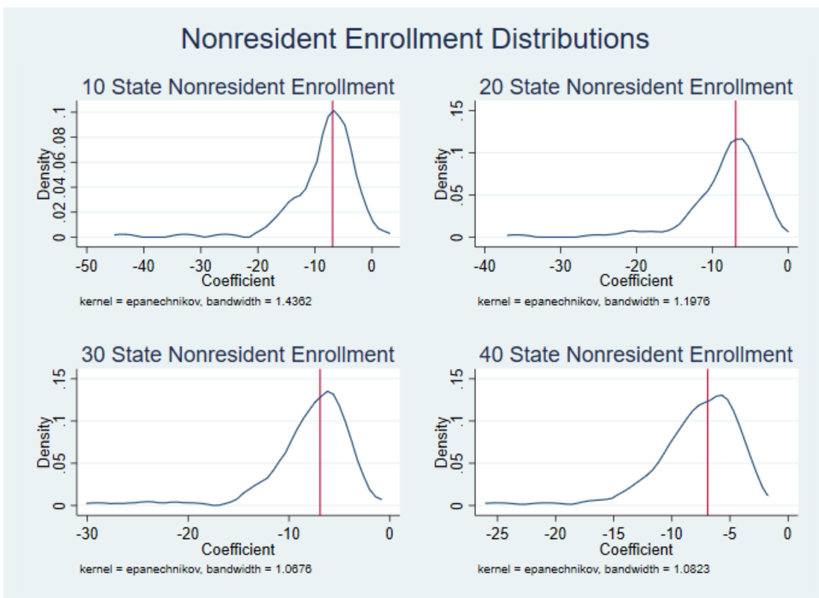


Figure 6: Nonresident Enrollment Distributions



A.4 Sensitivity to Other Budgets Items

Tables 8-17 examine robustness of results to the **?** specification. In describing the model and my chosen controls in section 4.2.1, I discussed the two contrasting model choices for **?** and **?**. The former includes seven university-specific cost measures, as well as other revenue components and tuition in their analysis of state funding on enrollment. The latter work excludes all university-level controls, and chooses only to control for state-level factors. I choose the middle ground by including some university-level controls, but am far more cautious than **?**. Tables 8-17 systematically check correlations between my state appropriations instrument and all revenue and cost measures for the university. I then include measures uncorrelated with my instruments as a first set of specifications, before including all revenue and cost measures.[4]

Tables 8-13 shows results regressing revenue and cost measures on the state appropriations instrument. The particular results will not be mentioned for the sake of brevity, but the chosen uncorrelated (or weakly correlated) controls that appear in Tables 14 and 15 are local operating and non-operating grants, state operating grants, federal and local appropriations, Pell Grants, other revenue, and sales and services. Tables 14 and 15 present results from regressions also including these variables. Results are similar, the only notable exception being the inflation and increased precision of the resident enrollment point estimate. Tables 16 and 17 include all revenue and cost measures for the state appropriations instrument. Again, results are relatively stable even with the inclusion of potentially endogenous measures. The resident tuition coefficient is smaller, and once again the resident enrollment estimate is larger and more precisely estimated. Together, these results show that the appropriations instrument is robust to the inclusion of various revenue and cost measures, although the potential endogeneity of certain variables warrants caution in their inclusion as controls.

[4]Except total revenue and total cost, which would be collinear to the remaining variables.

Table 8: State Appropriations: Other Revenue 1

	Local Grants		State Grants		Federal Grants	
	(1)	(2)	(3)	(4)	(5)	(6)
	Operating	Non-Operating	Operating	Non-Operating	Operating	Non-Operating
$StateApprop_{it}$	-0.0150	-0.00494	-0.0264	0.0616*	-0.0903**	-0.0519*
	(0.0602)	(0.00560)	(0.0277)	(0.0340)	(0.0390)	(0.0298)
N	7123	7123	7123	7123	7158	7158

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from equation 1 are included. Coefficient interpretation is \$1 $\rightarrow$ \$$\beta$.

Table 9: State Appropriations: Other Revenue 2

	(1)	(2)	(3)	(4)	(5)	(6)
	Federal Approp.	Local Approp.	Pell Grants	Gifts	Investment Inc.	Other Rev.
$StateApprop_{it}$	0.00116	-0.00152	-0.0258*	-0.0540**	-0.318***	-0.00572
	(0.00326)	(0.00101)	(0.0141)	(0.0244)	(0.101)	(0.0871)
N	7123	7123	7576	7123	7123	7123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from equation 1 are included. Coefficient interpretation is \$1 $\rightarrow$ \$$\beta$.

Table 10: State Appropriations: Other Revenue 3

	(1)	(2)	(3)	(4)
	Sales & Services	Hospital Services	Independent Operations	Total Revenue
$StateApprop_{it}$	0.134	-0.553***	0.0355*	-0.846**
	(0.135)	(0.197)	(0.0211)	(0.365)
N	7123	7123	7123	7576

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from equation 1 are included. Coefficient interpretation is \$1 $\rightarrow$ \$$\beta$.

Table 11: State Appropriations: Costs 1

	(1) Instruction	(2) Research	(3) Public Service	(4) Academic Support
$StateApprop_{it}$	-0.212**	-0.247***	-0.0109	-0.121***
	(0.0868)	(0.0510)	(0.0546)	(0.0457)
N	7171	7123	7123	7123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from equation 1 are included. Coefficient interpretation is \$1 $\rightarrow$ \$$\beta$.

Table 12: State Appropriations: Costs 2

	(1) Student Services	(2) Institutional Support	(3) Scholarships	(4) Auxiliary Enterprises
$StateApprop_{it}$	-0.0461***	-0.0137	0.0193	-0.162**
	(0.0151)	(0.0226)	(0.0269)	(0.0689)
N	7171	7171	7123	7123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from equation 1 are included. Coefficient interpretation is \$1 $\rightarrow$ \$$\beta$.

Table 13: State Appropriations: Costs 3

	(1)	(2)	(3)	(4)
	Hospital Costs	Independent Costs	Other Costs	Total Costs
$StateApprop_{it}$	-0.537***	0.0315	0.0183	-0.696**
	(0.180)	(0.0242)	(0.0535)	(0.303)
N	7123	7123	7123	7123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from equation 1 are included. Coefficient interpretation is \$1 $\rightarrow$ \$$\beta$.

Table 14: State Appropriations: Robustness with Unrelated Controls

	Resident Tuition		**Nonresident Tuition**	
	(1)	(2)	(3)	(4)
	Baseline	Added Controls	Baseline	Added Controls
$StateApprop_{it}$	-11.01***	-10.13***	-15.56***	-16.48***
	(1.616)	(1.701)	(4.128)	(5.006)
N	7123	7123	7123	7123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from from equation 1 are included. The additional uncorrelated controls are local operating and non-operating grants, state operating grants, federal and local appropriations, Pell grants, other revenue, and sales/services.

Table 15: State Appropriations: Robustness with Unrelated Controls

	Resident Enrollment		**Nonresident Enrollment**	
	(1)	(2)	(3)	(4)
	Baseline	Added Controls	Baseline	Added Controls
$StateApprop_{it}$	7.775**	11.37***	-6.366***	-5.970***
	(3.609)	(3.221)	(2.444)	(2.246)
N	7123	7123	7123	7123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from from equation 1 are included. The additional uncorrelated controls are local operating and non-operating grants, state operating grants, federal and local appropriations, Pell grants, other revenue, and sales/services.

Table 16: State Appropriations: Robustness with All Controls

	Resident Tuition		**Nonresident Tuition**	
	(1)	(2)	(3)	(4)
	Baseline	Added Controls	Baseline	Added Controls
$StateApprop_{it}$	-11.01***	-8.909***	-15.56***	-13.35**
	(1.616)	(1.556)	(4.128)	(5.465)
N	7123	7123	7123	7123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from equation 1 are included. All revenue and cost measures (excluding total revenue and total cost due to multicollinearity) are included.

Table 17: State Appropriations: Robustness with All Controls

	Resident Enrollment		**Nonresident Enrollment**	
	(1)	(2)	(3)	(4)
	Baseline	Added Controls	Baseline	Added Controls
$StateApprop_{it}$	7.775**	10.78***	-6.366***	-5.529***
	(3.609)	(2.739)	(2.444)	(2.025)
N	7123	7123	7123	7123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are in parentheses and clustered at the state level. Each column is a separate regression. All regressions use the state appropriations instrument. All controls from equation 1 are included. All revenue and cost measures (excluding total revenue and total cost due to multicollinearity) are included.