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The Impact of Tuition Increases on Enrollment in the State of Alabama Public Colleges and Universities

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Abstract

In this paper we estimate the impact of the steep increases in tuition since 2002 on enrollment in public universities in the state of Alabama. We are interested in determining if enrollment in regional universities, which serve a more diverse and non-traditional set of students, is more sensitive to prices than enrollment in more traditional institutions. We estimate different models that control for several relevant variables and find that the elasticity of demand is approximately -0.44 if the University of Alabama and Auburn University are included in the sample while the elasticity is -0.55 if those two institutions are not included.

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I. Introduction

Over the last decade, the proportion of the costs of Alabama Public Colleges and Universities paid by the State of Alabama has decreased by approximately 35% (Mitchell et al 2018). To offset this loss of funding, universities across the state have systematically raised tuition. Average tuition across the state has risen from just over $3500 per year in 2002 to over $9000 in 2014. Figure 1 shows the rise in tuition in Alabama over this period.

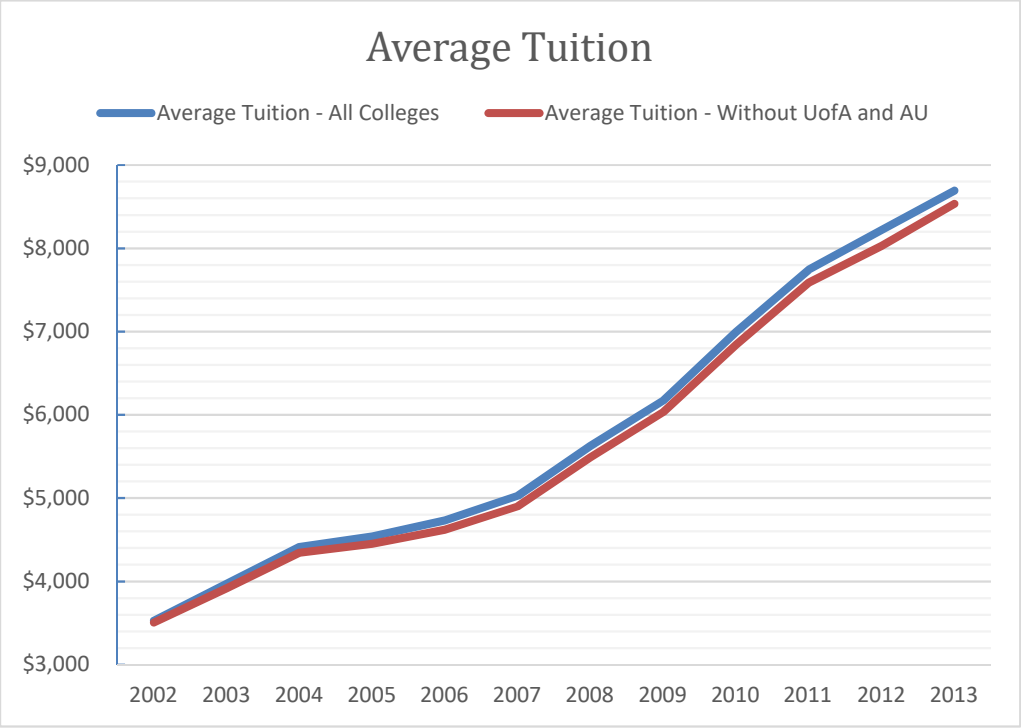

Figure 1 – Average tuition (2002 - 2013) of all public colleges and all colleges except University of Alabama and Auburn University.

Due to this extreme rise in tuition over a relatively short time period, we seek the impact on enrollment in the public colleges and universities in the State of Alabama. In addition, we determine the sensitivity of enrollment to changes in tuition in institutions that cater to a more diverse and non-traditional group of students.

Most tuition rates in Alabama have risen proportionally to each other, because appropriations changes from the state are uniform. Table 1 shows the tuition rates at Alabama's public colleges and universities.

	All Colleges			Without UA and Auburn		
	Average	Median	SD	Average	Median	SD
2002	3,528.4	3,518	359.6	3,504.8	3,445	382.4
2003	3,970.4	3,915	367.3	3,918.7	3,765.5	367.7
2004	4,415.1	4,355	442.7	4,342.7	4,243	427.7
2005	4,539.6	4,466	502.2	4,451	4,398	479.9
2006	4,730.8	4,705.5	563.7	4,621.4	4,576.5	531.1
2007	5,026.5	5,040	576	4,903.1	4,970	524.4
2008	5,627	5,594	669.7	5,489.8	5,585	621.2
2009	6,171.4	6,185	683.8	6,035.7	6,086	641.7
2010	6,994.3	7,136	776.8	6,843.3	6,959	743.2
2011	7,740	7,865	853.9	7,588.5	7,695	828.2
2012	8,215.7	8,275	1,019.7	8,031.2	8,149	982.9
2013	8,693.3	8,770	1,034.1	8,533.7	8,735	1,030.5

Table 1 – Average, median and standard deviation tuition for all public colleges (left) and all public colleges except University of Alabama and Auburn University (Right)

Thus, all public colleges and universities have had their aid from the state reduced proportionally. Consequently, we do not expect to see a substitution effect of prospective students migrating from one public Alabama university to another. Additionally, the number of high school seniors has had little change over the time period researched and has also little if any statistical significance on enrollment.

We hypothesize that non-traditional students (such as students that do not begin full time collegiate study immediately upon graduating high school, those that are older than the traditional age range of 18-22, students that work full time while attending a college or university, and students that have served or currently serve in the armed forces) will be more sensitive to changes in tuition relative to traditional younger and non-working students whose tuition is generally paid by their parents.

II. Literature Review

As fiscal pressures have mounted, colleges and university administrators and their governing boards have been forced to offset declines in non-tuition sources of revenue. Naturally, they face substantial pressure to increase tuition (Hemelt and Marcotte, 2011, p.435-436). Even though it has been widely accepted that universities and colleges face a downward sloping demand curve, it has repeatedly been shown that enrollment is fairly insensitive to increases in tuition. This research has held since the early work of Jackson and Weathersby (1975). This trend continued with Leslie and Brinkman (1987) and Heller (1997). Shin and Milton (2006, p.234) also found that enrollment was not affected by changes in tuition. Denning (2017) found similar results for community colleges, estimating an elasticity of -0.29. Parker and Summers (1993), found that the price elasticity of tuition for private liberal arts college was on the whole approximately -0.33, but was slightly higher for students on financial aid.

While most of these studies were conducted prior to the largest tuition increases, elasticity has remained fairly constant. There is, however, at least some evidence that the elasticities have increased over time. Buss, Parker, and Rivenburg (2004) found that students who did *not* seek financial aid had an elasticity approaching unity. Heller (1996) found that students who were dependent upon financial aid had a significantly more negative elasticity than those who were not.

Due to the recession that started in 2007 and the slow recovery, the impact of employment on enrollment was measured. This variable was found to have one of the largest impacts. When employment declines, enrollment across the State of Alabama public colleges and universities increases. As the economy slowly recovered and employment numbers increased close to pre-recession, a drop in enrollment was observed across the state at most institutions.

III. Model and Methods

The model to be estimated is

$$\ln(enr_{it}) = \beta_0 + \beta_1 \ln(tuition_{it}) + \beta_2 \ln(emp_{jt}) + \beta_3 \ln(wage_{jt}) + \beta_4 \ln(hse_{jt}) + \beta_5 \ln(pcomp_{jt}) + a_t + a_i + \varepsilon_{it}.$$

We are interested in estimating elasticity of demand for college education, thus the log-log specification. We use panel data from 2002 to 2013. The variable enr_{it} is the total enrollment at institution i in year t, $tuition_{it}$ is the in-state tuition at institution

i in year t. For the other variables we mapped each institution to a set of counties that we deemed would have the largest relevance upon enrollment. The appendix shows the correspondence between each public institution and counties. emp_{jt} is the employment level in group j in year t. $wage_{jt}$ is the average wage in group j in year t, hse_{jt} is the number of high school seniors in public schools located in group j in year t. a_t is the time-fixed effect and a_i the institution-fixed effect, these variables are used to control for, respectively, unobservable factors that are fixed across time but variable across institutions (such as the quality of each university) and unobservable factors that are fixed across institution but variable across time (such as the perceived value of higher education in the general population). Table 2 shows the employment, GDP, and wage figures over the course of the sample. GDP is included in the table as an overall indicator, though not included in the model. Data relating to the Universities themselves was obtained from the Alabama Commission on Higher Education (ACHE). Data relating to the other economic variables was obtained from the Bureau of Labor Statistics (BLS), and the Bureau of Economic Analysis (BEA).

	College Enrollment	HS Graduates	Wage	Unemployment	GDP
2002	128,564	44,721	593.9	5.4%	154.6
2003	133,702	41,214	614.1	5.4%	159.1
2004	136,217	36,225	636.1	5.0%	168.1
2005	137,967	37,165	657.9	3.8%	172.8
2006	140,789	37,392	688.6	3.7%	175.3
2007	145,135	36,907	712.8	3.4%	175.3
2008	149,301	37,389	736.4	4.9%	175.0
2009	154,391	41,869	749.7	9.8%	169.1
2010	158,132	42,742	765.7	9.2%	173.0
2011	157,389	44,086	782.9	8.5%	175.2
2012	157,273	43,911	797.9	7.1%	179.1
2013	157,438	44,751	803.4	6.5%	180.7

Table 2 - All state of Alabama figures: Total enrollment in public colleges, high school graduates, average wages, unemployment rate and real GDP.

In this study we are particularly interested in the enrollment sensitivity to increases in tuition in regional universities (those that mainly serve students in a reduced region of the state) relative to the effect in the whole state. As noted above, we hypothesize that non-traditional students – and the institutions that largely cater to them – will show a greater responsiveness to tuition increases. We tested several models

controlling for variables such as the number of high school seniors, employment, cross-price elasticity within the state institutions, and per-capita income.

Log Enrollment	(1)	(2)	(3)	(4)	(5)
Log Tuition	-0.464	-0.728	-0.573	-0.548	-0.549
	(0.16)**	(0.14)**	(0.16)**	(0.16)**	(0.16)**
Log Employment		-1.65	-1.77	-1.78	-1.75
		(0.21)**	(0.22)**	(0.22)**	(0.23)**
Log Wage			-0.634	-0.62	-0.616
			(0.32)	(0.32)	(0.32)
Log High School				0.145	0.136
				(0.15)	(0.15)
Log Price Comp					0.109
					(0.23)
R^2	0.302	0.538	0.55	0.55	0.55
Observations	144	144	144	144	144

* Significant at 5%. ** Significant at 1%

Table 3 – Regression results on the logarithm of enrollment. Not including the University of Alabama and Auburn University.

Log Enrollment	(1)	(2)	(3)	(4)	(5)	(6)
Log Tuition	-0.358	-0.635	-0.46	-0.434	-0.435	-0.366
	(0.16)*	(0.139)**	(0.156)**	(0.158)**	(0.159)**	(0.179)*
Log Employment		-1.684	-1.839	-1.834	-1.83	-1.792
		(0.218)**	(0.224)**	(0.224)**	(0.232)**	(0.234)**
Log Wage			-0.766	-0.75	-0.749	-0.646
			(0.33)*	(0.33)*	(0.332)*	(0.337)
Log High School				0.156	0.154	0.179
				(0.159)	(0.16)	(0.16)
Log Price Comp					0.026	0.043
					(0.24)	(0.16)
Lag Log Tuition						-0.129
						(.125)
R^2	0.318	0.52	0.538	0.541	0.541	0.55
Observations	168	168	168	168	168	167

* Significant at 5%. ** Significant at 1%

Table 4: Regression results on the logarithm of enrollment. Including the University of Alabama and Auburn University

The computations were done including the two largest universities in the state, University of Alabama (Alabama) and Auburn University (Auburn). Due to the uniqueness of these institutions, (national championship football teams, legacy, etc.), Auburn and Alabama are perceived to have stronger "brands," and are generally associated with more traditional university students. The computations were also done excluding these two universities. Our results, presented in Tables 3 and 4, show that the market for higher education remains relatively inelastic. Overall, our result is that the price elasticity of university tuition is approximately -.45, meaning a 1% increase in tuition would result in a .45% reduction in enrollment. Moreover, we observe that non-traditional students tend to have a relatively higher elasticity of demand than traditional students. In fact, we observe that excluding Auburn and the University of Alabama the elasticity increases to approximately -.55. Even with the large increases in tuition, enrollment has remained relatively stable across the state during this time period. Of the variables considered, employment had the largest association with enrollment. When employment declined during the start of the 2007-2008 recession, enrollment saw its largest growth across the state, consistent with earlier findings concerning the countercyclical nature of higher education enrollment.

The other factors considered had little to no significant association with enrollment. These results indicate, therefore, that the macroeconomic climate and tuition rates are the major factors associated with enrollment at Alabama's public colleges and universities. These findings are important to administrators at those colleges and universities, because they illustrate that the revenue effects of the tuition hikes were generally positive at a time of declining state support. Further, as both diminished state funding and increased consumption of higher education are likely to occur during periods of declining employment, the countercyclical nature of the findings is particularly important to administrators for contingency planning relating to future macroeconomic slowdowns.

Additionally, we include a model in which we incorporate lagged variables into our regression model. The results are displayed in Table 4. As shown in Table 4, we found that the lagged term is statistically insignificant. Past values of tuition do not have an effect on current enrolment levels in our sample.

We include below (in Tables 5 and 6) the correlations between cross-county employment and wages. It can be concluded from the tables that there is quite a lot of variability in the level of employment between the counties associated with each university. However, from the second table we see that (not surprisingly) the average wage is highly correlated across counties in our sample. Still, the standard errors of both average employment and average wage are relatively small making both variables statistically significant.

Each variable represents the average employment for the corresponding counties associated with each university.

University code	
A	Alabama A&M University
B	Alabama State University
C	Athens State University
D	Auburn University
E	Auburn University at Montgomery
F	Jacksonville State University
G	Troy State University
H	University of Alabama
I	University of Alabama at Birmingham
J	University of Alabama in Huntsville
K	University of Montevallo
L	University of North Alabama
M	University of South Alabama
N	University of West Alabama

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	1.0000													
B	0.3501	1.0000												
C	0.9588	0.1254	1.0000											
D	0.1924	0.9435	0.0111	1.0000										
E	0.3501	1.0000	0.1254	0.9435	1.0000									
F	-0.1369	0.8147	-0.3729	0.8284	0.8147	1.0000								
G	0.4986	0.7896	0.2839	0.6487	0.7896	0.6998	1.0000							
H	0.1924	0.9435	0.0111	1.0000	0.9435	0.8284	0.6487	1.0000						
I	0.1924	0.9435	0.0111	1.0000	0.9435	0.8284	0.6487	1.0000	1.0000					
J	1.0000	0.3501	0.9588	0.1924	0.3501	-0.1369	0.4986	0.1924	0.1924	1.0000				
K	0.9707	0.4881	0.9186	0.3740	0.4881	-0.0128	0.5291	0.3740	0.3740	0.9707	1.0000			
L	0.8908	0.5774	0.8361	0.4918	0.5774	0.1172	0.6308	0.4918	0.4918	0.8908	0.9302	1.0000		
M	0.4769	0.8553	0.3052	0.8113	0.8553	0.6252	0.7381	0.8113	0.8113	0.4769	0.5567	0.7241	1.0000	
N	-0.8239	0.2116	-0.8884	0.3884	0.2116	0.5979	-0.0786	0.3884	0.3884	-0.8239	-0.6962	-0.5550	0.0036	1.0000

Table 5: Correlation table for average wage

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	1.0000													
B	0.9969	1.0000												
C	0.6704	0.6825	1.0000											
D	0.9958	0.9982	0.6895	1.0000										

E	0.9969	1.0000	0.6825	0.9982	1.0000									
F	0.9639	0.9761	0.6266	0.9698	0.9761	1.0000								
G	0.9982	0.9936	0.6436	0.9940	0.9936	0.9575	1.0000							
H	0.9958	0.9982	0.6895	1.0000	0.9982	0.9698	0.9940	1.0000						
I	0.9958	0.9982	0.6895	1.0000	0.9982	0.9698	0.9940	1.0000	1.0000					
J	1.0000	0.9969	0.6704	0.9958	0.9969	0.9639	0.9982	0.9958	0.9958	1.0000				
K	0.9643	0.9754	0.7094	0.9811	0.9754	0.9587	0.9591	0.9811	0.9811	0.9643	1.0000			
L	0.9825	0.9816	0.5993	0.9858	0.9816	0.9447	0.9860	0.9858	0.9858	0.9825	0.9650	1.0000		
M	0.9955	0.9969	0.6972	0.9972	0.9969	0.9620	0.9934	0.9972	0.9972	0.9955	0.9707	0.9778	1.0000	
N	0.9905	0.9894	0.6685	0.9954	0.9894	0.9524	0.9922	0.9954	0.9954	0.9905	0.9746	0.9904	0.9910	1.0000

Table 6: Correlation table for average employment

We also performed a Granger causality test on our basic model. We used the approach of Dumitrescu and Hurlin (2012) to test the following model

$$\log(enrolment)_{it} = \alpha_i + \sum_k \beta_{ik}\, log(enrolment)_{\,i,t-k} + \sum_k \gamma_{ik}\, \log(tuition)_{i,t-k} + \epsilon_{it}$$

We want to test for significant effects of past values of tuition on present enrolment. The null hypothesis is defined as

$$H_o\colon\ \gamma_{i1} = \cdots = \gamma_{iK} = 0 \qquad \forall i = 1 \ldots N$$

While the alternative hypothesis is that there can be causality for some individuals. Dumitrescu and Hurlin (2012) performs F test on K linear hypothesis to obtain W_i for N individual regressions. Then they compute $\overline{W}$ as the average of all individual Wald statistics. The values of the test statistic for large T (called $\bar{Z}$) and for finite T (called $\tilde{Z}$) are provided below. If the test statistics are larger than the critical value then we reject the null hypothesis.
In our test the value of $\overline{W} = 2.325$, $\bar{Z} = 3.507$ (p-value = 0.0005) and $\tilde{Z} = 1.488$ (p-value = 0.137). Thus since our T is relatively small we do not reject the null hypothesis of no Granger causality between tuition and enrolment.

To conclude we note that the main results of this paper is the somewhat smaller responsiveness to tuition price hikes when taking into account Auburn and Alabama. This discrepancy may arise because those institutions compete for students of greater financial means and higher academic pedigree who might not be that concerned about the cost of attending college. Additionally, students primarily interested in attending Auburn and Alabama are less likely to have employment or other financial obligations, making them less sensitive to increases in tuition costs.

References

Buss, C., Parker, J, Rivenburg, J. (2004). Cost, Quality and Enrollment Demand at Liberal Arts Colleges. *Economics of Education Review, 23(1),* 57-65.

Denning, J. (2017). College on the Cheap: Consequences of Community College Tuition Increases. *American Economic Journal: Economic Policy, 9(2),* pp.155-88.

Dumitrescu, E. and Hurlin, C. (2012). Testing for Granger Non-causality in Heterogeneous Panels. *Economic Modelling*, 29(4):1450-1460

Jackson, G. A., and Weathersby, G. B. (1975). Individual Demand for Higher Education: A Review and Analysis of Recent Empirical Studies. *Journal of Higher Education*, *46*(6), 623–651.

Leslie, L. L., and Brinkman, P. T. (1987). Student Price Response in Higher Education: The Student Demand Studies. *Journal of Higher Education*, *58*(2), 181–201.

Heller, D.E. (1996). *Tuition prices, financial aid, and access to public higher education: A state-level analysis*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY April 8-13, 1996.

Heller, D. E. (1997). Student Price Response in Higher Education: An Update to Leslie and Brinkman. *Journal of Higher Education*, *68*(6), 624–659.

Mitchell, M., Leachman, M., Masterson, K., and Waxman, S (2018).. Unkept Promises: State Cuts to Higher Education Threaten Access and Equity. Center for Budget and Policy Priorities. https://www.cbpp.org/research/state-budget-and-tax/unkept-promises-state-cuts-to-higher-education-threaten-access-and. Accessed on October 28, 2018.

Parker, J, and Summers, J. (1993). Tuition and Enrollment Yield at Selective Liberal Arts Colleges. *Economics of Education Review, 12(4),* 311-24.

Shin, J., and Milton, S. (2006). Rethinking Tuition Effects on Enrollment in Public Four-year Colleges and Universities. *Review of Higher Education*, *29*(2), 213–237.

Hemelt,S., and Marcotte, D. (2011) The Impact of Tuition Increases on Enrollment at Public Colleges and Universities. *Educational Evaluation and Policy Analysis, 33(4),* 435-436.