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The Fiscal Adjustment Within Public Higher Education: How 2 Year And 4 Year Public Institutions Achieve Long-Run Budget Equilibrium

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THE FISCAL ADJUSTMENT WITHIN PUBLIC HIGHER EDUCATION:

HOW 2 YEAR AND 4 YEAR PUBLIC INSTITUTIONS ACHIEVE LONG-RUN BUDGET EQUILIBRIUM

by

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This thesis, submitted by Ryan Jockers in partial fulfillment of the requirements for the Degree of MSAE from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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Title The fiscal adjustment within public higher education: How 2 year and 4 year public institutions achieve long-run budget equilibrium

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Ryan Jockers

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ABSTRACT

This paper analyzes the fiscal adjustment of both 2-Year colleges, and 4-Year research institutions and finds very different behavior that has implications for market power and returns to scale within their operations. The 4-Year research institutions have greater stability, show evidence of constant returns to scale, and are able to maintain enrollment levels even when tuition prices increase. Further, they take advantage of the diverse revenue streams available to them due to the nature of their operation. Conversely, the 2-Year colleges have less stability and fewer revenue sources, exhibit behaviors of increasing returns to scale, and are not able to maintain enrollment levels when tuition prices increase which causes an even greater reliance on external governmental revenues.

1. Introduction

Public higher education in the United States historically has enjoyed relative stability through subsidies in the form of state appropriations, which implies less dependence on alternative sources of revenue that are tied more directly to market forces. Tuition and fee revenue is the other major source of revenue for public higher education, and is dependent on multiple factors such as enrollment levels, price, financial aid, and distribution of student types (e.g. Undergraduate vs. Graduate). The more dependent a public institution becomes on tuition and fees exposes that said institution to the changing factors of the market. In contrast, appropriations from state governments are set within their respective funding cycles and historically have not changed once that funding was set into law. However, starting with the recession in the early 2000's, and perpetuated by the Great Recession in 2008, a severe drop in state appropriations (37 states with over 10% reductions between 2008 and 2016), coupled with a rising national enrollment set the stage for a shift in how institutions funded their operation.[1]

The goal of this paper is to understand the fiscal adjustments of the public higher education market, specifically the 2-year and 4-year institutions. As the funding landscape of public higher education changes rapidly, and real instructional costs rise at unprecedented levels, institutions are beginning to seek alternative methods to balance their operations; such as grant programs through the federal government, or private funding through alumni associations.[2] However, there has been no clear answer to how institutions achieve long-run budget equilibrium, especially when one understands the distinct challenges faced by the 2-year market compared to the 4-year market. How do the 2-year and 4-year public higher education institutions fiscally respond to shocks in state appropriation revenue? Are there different fiscal adjustments in the markets? Do 4-year institutions possess greater market power to increase tuition/enrollment than 2-year institutions? Are the 4-year institutions that are focused heavily on research able to adjust using less drastic measures? These questions have been addressed within the literature in various ways, yet the testing has been limited to individual budgetary components without examining the system as a whole. This paper attempts to fill gaps in the literature by applying methodologies that take a system approach, similar to what we see in the analysis of municipal governments.

Literature including the empirical testing of macroeconomic intertemporal budget constraints within various levels of government is fairly established. Overall, the research objectives fall into two broad areas: sustainability of the fiscal process, and adjustments used to carry out that fiscal process. Sustainability has been tested through various works

[1]Center on Budget and Policy Priorities; "State Cuts to Higher Education Threaten Quality and Affordability at Public Colleges"; https://www.cbpp.org/research/state-budget-and-tax/funding-down-tuition-up

[2] Bureau of Labor Statistics; BLS Spotlight on Statistics: Back to College; https://www.bls.gov/spotlight/2010/college/data.htm#cpi

on a national level (Wilcox, 1989; Trehan and Walsh, 1988; Trehan and Walsh, 1991) focusing on deficits and their role in satisfying various budget constraints over time. Buettner and Wildasin (2006) analyze U.S. municipalities from 1973 to 1997 finding that imbalances are mostly offset by future expenditures and additionally are funded by changes in grants, with large cities relying heavily on intergovernmental grants. Municipalities are further examined in both the U.S. and Japan, finding that there is much more dependence on own revenue to restore balance in the U.S. compared to Japan municipalities suggesting more autonomy in the U.S. municipalities (Martin-Rodriguez and Ogawa, 2016). The findings by Potrafke and Reischmann (2015) explore the sustainability of fiscal practices within the U.S. and Germany primarily focusing on fiscal transfers and conclude that intergovernmental transfers in both countries play a significant role in creating sustainable fiscal policies. Sustainability is also found by Ji, Ahn and Chapman (2016) to be heavily contingent on intergovernmental transfers a sub-national level looking at both counties and municipalities. Lastly, Saunoris (2015) looks at state data from 1951 to 2008 finding that states with higher debt levels respond slower to fiscal imbalances and rely more on expanding debt levels.

Considering the work mentioned above involving the public sector at various levels, the higher education market has unique characteristics, and the literature within its purview can provide context for the interpretation of the findings in this paper. A general equilibrium model of the market for higher education is extensively documented by Epple, Romano, Sarpca, and Sieg (2013). The authors include models that address both private and public institutions, alternatives to higher education, and student preferences. First, their research shows that increases in federal aid show modest increases in enrollment, mainly from poorer students. Second, they find that rising tuition for state colleges coupled with flat state subsidies produces decreasing enrollment with the lower income students. The cause for tuition increases is extensively examined in both the supply and demand side of higher education, finding that a majority of the increases can be attributed to demand side shocks, or the Bennett Hypothesis. This hypothesis asserts that the institutions respond to expansions of financial aid by increasing tuition (Gordon and Hedlund, 2016). Inefficient cross-subsidies are examined specifically at the University of Iowa and the University of Michigan, and results show that even though welfare would increase if subsidy and tuition structures matched the actual costs and willingness to pay, universities still choose to favor equity over efficiency (Burer and Fethke, 2016). Lastly, the Federal Reserve Bank of New York has shown that the increase in credit supply (student loans) has a dramatic effect on increasing tuition, with an increase in subsidized loans maximums having the greatest positive effect at 60 cents on the dollar (Lucca, Nadauld & Shen, 2015).

Even though there has been thorough research into traditional government entities, the fiscal dynamics of public higher education by testing of macroeconomic intertemporal budget constraints is not well documented. Within the literature, there has been little attempt to truly understand the institutional response of public higher education to shocks, and answer the questions that arise from such responses. This paper tests the intertemporal budget constraint for the 4-year research university and 2-year college

markets in the United States from 1987-2015, with the 4-year regional institutions being excluded.[3] Utilizing a vector error correction model (VECM) in a similar fashion found in research into municipal governments (Buettner and Wildasin, 2006; Martin-Rodriguez and Ogawa, 2016), this paper focuses on how each public higher education market adjusts to fiscal shocks in the deficit levels and the mechanisms used to achieve long-run budget equilibrium. Selecting the VECM as the framework for analysis, we can better understand the shocks mentioned above, and are able to draw comparisons to the VECM research conducted in the municipal government space. For example, intergovernmental revenue was consistently found to be an important factor for municipal governments, and the results from this paper confirm the significance of that revenue category for public higher education with External Revenue being a significant portion of budgetary response to fiscal shocks.

From the research below, it is evident that the methods these two groups utilize to achieve long-term budget equilibrium are immensely different. The 4-Year research institutions are able to increase tuition prices by $.08 per $1 increase in deficit, resulting in a negligible 0.2% decline in enrollment, further reducing the need of external revenue sources ($.33 per capita increase). Conversely, the 2-Year institutions increase tuition prices by $.11 per $1 increase in deficit, resulting in an average decrease in enrollment of 13%, increasing the need for external revenue ($2.15 per capita increase). The budgetary components are the same, yet the way they are employed shows behavioral difference reflective of the environmental realities they live in. Further, the results imply variations in market power and returns to scale within in their operations.

The paper will be structured as follows: Section 2 will give an introduction to the data, including sources and descriptive statistics. Section 3 establishes the VECM empirical methodology, along with any identification issues. Section 4 provides an in-depth look at the results, and proposes an interpretation that fits the public higher education context. Lastly, Section 5 ends the paper with a conclusion that includes future research topics based on the results.

2. Data

The Integrated Postsecondary Education Data System (IPEDS), which is a larger project of the National Center for Education Statistics (NECS), is a vast database that includes information for all United States higher education institutions. Using IPEDS, financial variables and size/scope variables were extracted for all public U.S. institutions from 1987-2015. One of the challenges was ensuring that the financial variables were as consistent as possible throughout the years, as IPEDS changed reporting standards multiple times within

[3] Due to lower observation levels, and possible mission similarities to both the 4-year research universities and 2-year colleges, the 4-year regional universities were not used in testing.

that time. Nevertheless, due to the documentation provided by IPEDS, the data was cleaned and placed into series appropriately with only a few minor issues.

In order to properly compare financial numbers across time and institutions, an inflation adjuster had to be selected to provide the most accurate reflection of the change in prices for the higher education market. The Consumer Price Index (CPI) would have traditionally been selected; however, there is a more accurate adjuster that is specific to higher education. The Higher Education Price Index (HEPI), developed by the Commonfund Institute, "is an inflation index designed specifically to track the main cost drivers in higher education" (Commonfund, 2017). This allows the financial data extracted from 1987-2015 to be compared with increased specificity and further decrease the risk of index misapplication.

Although multiple financial variables are available, the focus will be on grant revenue, appropriation revenue, tuition/fee revenue, total revenue and total expenditures. As mentioned before, understanding that there are various missions with the public higher education market, it is necessary to separate out each sub-market to provide a more thorough analysis. Four-year research universities are defined as "4-year public" as labeled by IPEDS, and a research expenditure level of $150,000 or more.[4] Two-year colleges are defined as "2-year public" as labeled by IPEDS and have little to no research expenditures. If an observation is missing, the institution reported zero in that category, or the number was captured in another institution as it is common for college systems to report in aggregate.

Table 1: Descriptive Variables 1987-2015

Variable	(1) 2 Year Mean	(2) % of Total Revenue	(3) 4 Year Mean	(4) % of Total Revenue
Undergraduate Enrollment	5,582.50		9956.78	
Graduate Enrollment	29.18		2622.49	
Own Revenue				
Tuition and Fees	$8,308	17.32%	$73,980	18.21%
External Revenue				
Federal Appropriations	$163	0.34%	$5,281	1.30%
State Appropriations	$14,866	30.99%	$108,968	26.82%
Federal Grants	$6,551	13.65%	$51,324	12.63%
State Grants	$2,138	4.46%	$10,235	2.52%
Local-Private Grants	$851	1.77%	$25,141	6.19%
Total Revenue	$47,973		$406,286	
Total Expenses	$45,947		$389,950	
Observations	29522		14790	

In thousands, adjusted for inflation using HEPI (Base year 2015)

[4]The $150,000 criteria was compared to the average HEPI adjusted research expenditures per institution between 1987-2015. NSF HERD Survey Criteria used for $150,000 benchmark: https://www.nsf.gov/statistics/srvyherd/#sd

The 2-year colleges have distinct attributes relating to their enrollment mix and revenue dependence. As seen in Column 1, there are little to no graduate students, which means the primary audience is undergraduate students in their first two years of college. Further, there is a heavy reliance on state appropriations and federal grants for external revenue, and tuition/fees for their own revenue. It is worth noting that the federal grants include the Pell Grant program, which provides college funding for low-income students.[5] Column 3 and 4 provides the descriptive summary for the 4-year research universities. Again, the same dependence on state appropriations, federal grant, and tuition/fees exist, yet there are significantly larger enrollments in both graduate and undergraduate compared to the first two group. Further, the 4-year research group operates on a much larger scale due to both larger enrollments and research expenditures.

Although the characteristics of each group are clear, what is not clear is the fiscal response of each group to shocks in the long term. Using proven methodology (Buettner and Wildasin, 2006; Martin-Rodriguez and Ogawa, 2016), this will require an employment of a correctly specified vector auto regression model in the context of public higher education. The next section presents the methodology and approach to achieving this goal.

3. Methodology

As discussed above, this paper will employ a VECM fitted to the higher education panel data from 1987-2015. This paper focuses on the methods each group uses to achieve long-term budget equilibrium, and therefore will utilize a model that uses appropriate variables considering the higher education context. However, before the benchmark equations are established, a quick discussion of the literature relating to this empirical method and variables used in the model is necessary.

The testing of the intertemporal budget constraints at a macro level within the public sector has ranged from the national level (Trehan and Walsh, 1988) to the municipal level (Buettner and Wildasin, 2006; Martin-Rodriguez and Ogawa, 2016) with the inclusion and exclusion of variables based on availability and necessity. For example, Trehan and Walsh do not focus much on intergovernmental transfers, as that is not a major source of revenue at that level of government. In contrast, the research into municipal governments heavily focuses on intergovernmental transfers as a method to achieve long-run budget equilibrium. The following empirical approach will utilize more properties of the municipal models; however since this is the first application to public higher education, changes have to be made to ensure proper specification In the public higher education context.

Considering the previous literature relating to municipal and national governments, using the higher education budget components, a standard four-dimensional vector is

[5] Federal Pell Grant Program: https://www2.ed.gov/programs/fpg/index.html

established. Further, we can test the stationarity of the deficit D_t,[6] which is total expenses minus total revenues. The stationarity of the deficit in the intertemporal budget constraint has been established in literature, which means the deficit acts as the error correction term and should be included in the system.

$$Y_t = (E_t, T_t, R_t, Z_t)' \quad (1)$$

$$Y_t = (\ E_t - T - R_t - \ Z_t) = \ \ D_t, \quad (2)$$

where R_t is External Revenue, E_t is Total Expenditures, T_t is Tuition and Fees, and Z_t is all Other Internal Revenue sources. External Revenue includes all appropriations and grants and Other Internal Revenue includes categories such as auxiliary, athletics, and alumni foundation gifts.[7]

In order to transform (1) into a VECM regression equation for all four vectors, the following will be estimated:

$$Y''_{i,t} = \gamma\ \Delta D_{i,t-1} + \sum_{j=1}^{p} \Gamma_j Y''_{i,t-j} + u_{i,t}$$

The primary aim of this paper is to estimate γ, the error correction term, which is defined as each budgetary component's reaction to the change in the lagged deficit. $Y''_{i,t}$ represents the vector of the budgetary components themselves: $Y''_{i,t} = \left(E_{i,t,} T_{i,t}, R_{i,t}, Z_{i,t}\right)'$ with the '' operator designating second-order differencing. The regressors are the change in deficit of the previous year $\Delta D_{i,t-1}$, defined as $\Delta D_{i,t-1}$= $\Delta b' Y_{i,t-1}$ with $b = (1, -1, -1, -1)$, and the lagged values of the changes in each of the budgetary components, where *p* indicates the lag length, and, $u_{i,t}$ is the error term. Additionally, in order to understand the impact of enrollment on this system, a second model will be estimated that transforms each budgetary component into per capita terms (per student) and adds the change of logged total enrollment as a fifth vector.[8]

This particular VECM specification was estimated at first order differences levels to ensure stationarity across time, which is important to produce consistent estimates. Further, one cointegrating equation was selected as there was no empirical justification to specify any more than that. Lastly, literature has well established the standard need to use four to six lags when using a limited amount of yearly observations (27 years); however in this model context it is difficult to justify the use of four lags due to the specification of the deficit, error correction term, and the budget behavior within public higher education.

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[6] In this specification, the deficit is differenced, and for both the 4-year research universities and 2-year colleges the p-value of the Augmented Dickey-Fuller unit-root test is .0000, indicating stationarity.

[7] Alumni foundation contributions are considered internal, as most university/college foundations operate as an extension of the school itself.

[8] $\frac{Tuition\ and\ Fees}{Total\ Enrollment} = Average\ Price$

Therefore, two lags was selected for all models to ensure maximum accuracy in the interpretation of the results.

Using this system, the focus is to test how each public higher education sub-market (discussed above) reacts to shocks in their deficit levels over time. The hypotheses are that the 4-year research universities adjust primarily with increased tuition/fee revenue, and the 2-year colleges will adjust with increased external revenue.

4. Estimates and Results

4.1 2-year College

During the analyses of the fiscal dynamics within public higher education, we are attempting to understand certain groups within this market. To begin, we look at how 2-Year and 4-Year research public institutions in higher education respond to deficits or surpluses utilizing a vector error correction approach. The empirical work is well laid out in previous literature (Buettner and Wildasin, 2006; Martin-Rodriguez and Ogawa, 2016); however, it has not been applied to the public higher education market. This provides an opportunity to apply a proven approach to a different part of the public sector.

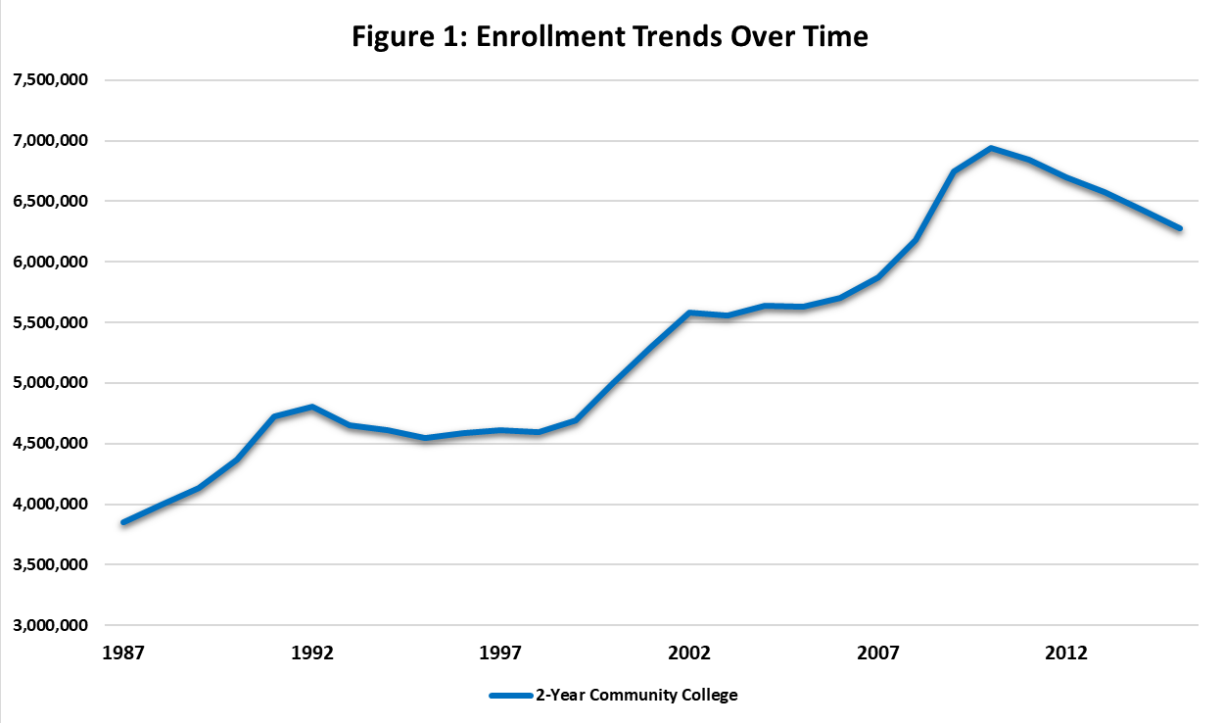

Figure 1: Enrollment Trends Over Time; 2-Year Colleges

Figure 1 provides an overall look at how enrollment has shifted for public 2-year schools over time. More specifically, we can see the peaks and valleys, with notable peaks coming

around 1992, 2002, and 2010. Overall, there has been a steady increase in enrollment, even with the decline starting in 2010, from 3.8 million in 1987 to 6.2 million in 2015. If enrollment has almost doubled within this period, then we would expect revenues and expenses to increase as well considering the infrastructure required to support this type of growth.

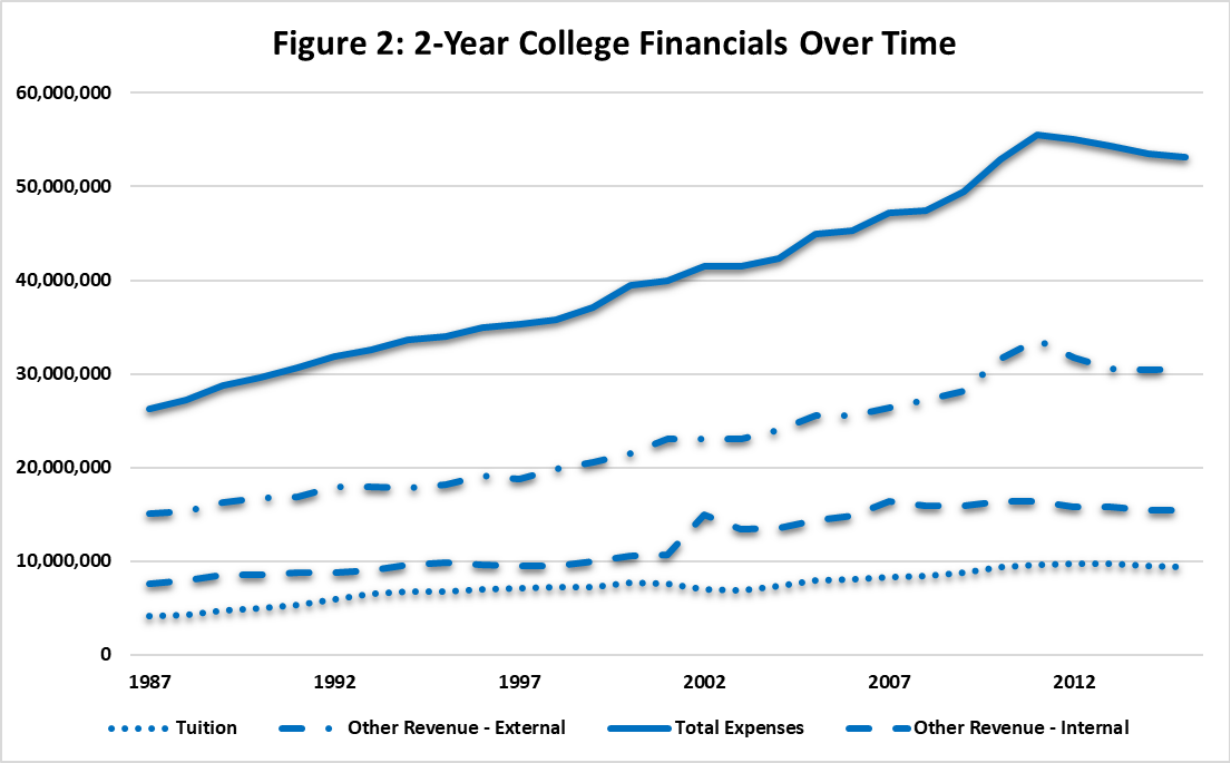

Figure 2: 2-Year College Financials Over Time; Adjusted for inflation using HEPI-2015 dollars, in thousands

Figure 2 provides an analysis over time of these high-level financial groupings, and as expected, revenues and expenses increase over time due to the expansion of enrollment and infrastructure. The Other Revenue - External category (Federal Appropriations, State Appropriations, Federal Grants, State Grants, and Local-Private Grants) make up a majority of the revenues as they come from various levels of government and/or private entities for operational purposes. The 2-year institutions heavily rely on these revenues and will be seeking to increase their share as publically funded institutions. Tuition revenues are the lowest contributors as it is common for community colleges to be relatively inexpensive compared to their 4-year counterparts, yet they will be seeking to find a balance between increasing tuition revenue and remaining affordable. Lastly, The Other Revenue – Internal category (Auxiliary, Athletics, Alumni foundation gifts, and others) are areas the institution is constantly trying to leverage and maximize as they provide opportunities for alternative revenue and involve engagement with the community. However, it is very difficult from this graph to understand how this group responds to changes in their deficit/surplus level. What budget components are pivotal in achieving long run equilibrium? How do different budget

components respond to shocks in the others? In order to answer these questions, we must employ a vector error correction model with the parameter of interest being the error correction term, and the "error" being the lagged deficit. Further, in order to understand better how enrollment affects this process, we look at both differenced levels and differenced per capita measures, with the per capita measure being every budget component divided by total enrollment.

Table 2: 2-Year Institution -Differenced Level- Estimates for the error-correction term

Equation	Error Correction Term	(Std. Err)
Total Expenses	-0.78	(0.75)
Tuition	-0.13	(0.21)
External Revenue	1.70***	(0.73)
Other Own Revenue	-1.23*	(0.70)

Standard errors appear in parentheses. *, **, *** Statistically different from zero at the 10%, 5%, and 1% level.

To begin, in Table 2, we estimate the error correction term while only including the differenced levels of each budgetary component, not accounting for enrollment. With a dollar increase in the lagged change in deficit, we observe $0.78 (-.78) decrease in expenses, a $0.13 (-.13) decrease in tuition revenue, a $1.70 (1.70) increase in external revenue, and a $1.23 (-1.23) decrease in other own revenue. First, we expect to see an overall decrease in expenses in response to a higher deficit, as an institution is forced to balance its budget as a public entity. Second, since tuition revenue is a function of price and enrollment, we need to understand which effect is dominant and how the institution uses those components to achieve a balanced budget. That being said, because of the negative coefficient, we would assume that a decrease in enrollment is dominating any attempt at a price increase to balance the tuition revenue. Third, if the institution is not able to make up revenue from tuition, then as a public entity, it will need to turn to external sources such as appropriations and grants from government or the private sector. With the strong positive coefficient (1.78) and significance at the 1% level, it is clear that this budgetary component is critical to sustain a balanced operation at the community college level. The concept of external revenue or intergovernmental revenue is also to be found highly significant in existing literature relating to municipal and state governments in the United States, and we can conclude that 2-year public colleges are no different in this respect. Lastly, if we suspect that the change in enrollment decreases in response to a positive change in the lagged deficit, then we would expect auxiliary, or other own revenue, to decrease as well since the resources necessary to serve students decreases. With a strong negative coefficient (-1.23), this seems to be the case. However, in order to increase the clarity of our interpretation, we next convert the budgetary components to per capita (student) terms, as the core mission of the public institution is to serve their students.

Table 3: 2-Year Institution -Differenced Per Capita w/ Enrollment- Estimates for the error-correction term		
Equation	Error Correction Term	(Std. Err)
Total Expenses	0.04	(1.11)
Tuition	0.11	(0.29)
External Revenue	2.15***	(0.77)
Other Own Revenue	-1.04	(0.79)
Log Enrollment	-0.13	(0.11)
Standard errors appear in parentheses. *, **, *** Statistically different from zero at the 10%, 5%, and 1% level.		

Important to our understanding of behavioral response to a high deficit is also understanding the response of enrollment. Table 3 now uses per capita terms, and adds enrollment to the model, confirming our previous hypothesis of declining enrollment in response to a higher deficit. All four per-capita budgetary components keep the same sign as in Table 2, yet change in magnitude to some degree, though most importantly, the coefficient for enrollment is negative and provides insight on the effect enrollment has on the budgetary components for community colleges.

Overall, in response to a one-dollar increase in the per student deficit, expenses per student show a $0.04 increase, which implies a focus on higher quality in leaner times. The estimate for price shows a $0.11 increase, and as expected enrollment demand decreases 13%. What becomes clear is that external revenue maintains statistical significance even after the transformation between Table 2 and Table 3, and being consistent with the literature, the 2-year colleges exhibit the behavior of seeking external dollars even on a per capita basis. Further, the magnitude is even larger than in Table 2 (2.15 vs 1.70) and provides increasing confidence that this revenue source is critical for responses to short term shocks. Lastly, other own revenue still decreases and is consistent with our explanation from Table 1.

4.2 4-year Research Universities

Turning our attention to the 4-year research universities, we see a similar trend in enrollment in Figure 3, with an overall increase of roughly 2 million students from 1987 to 2015. Overall, the growth is stable with almost no evidence of cyclicality, which is expected considering the high market power 4-year research institutions hold in public higher education. However, it is important to note that there is a noticeable shift in the growth rate starting in the year 2000.

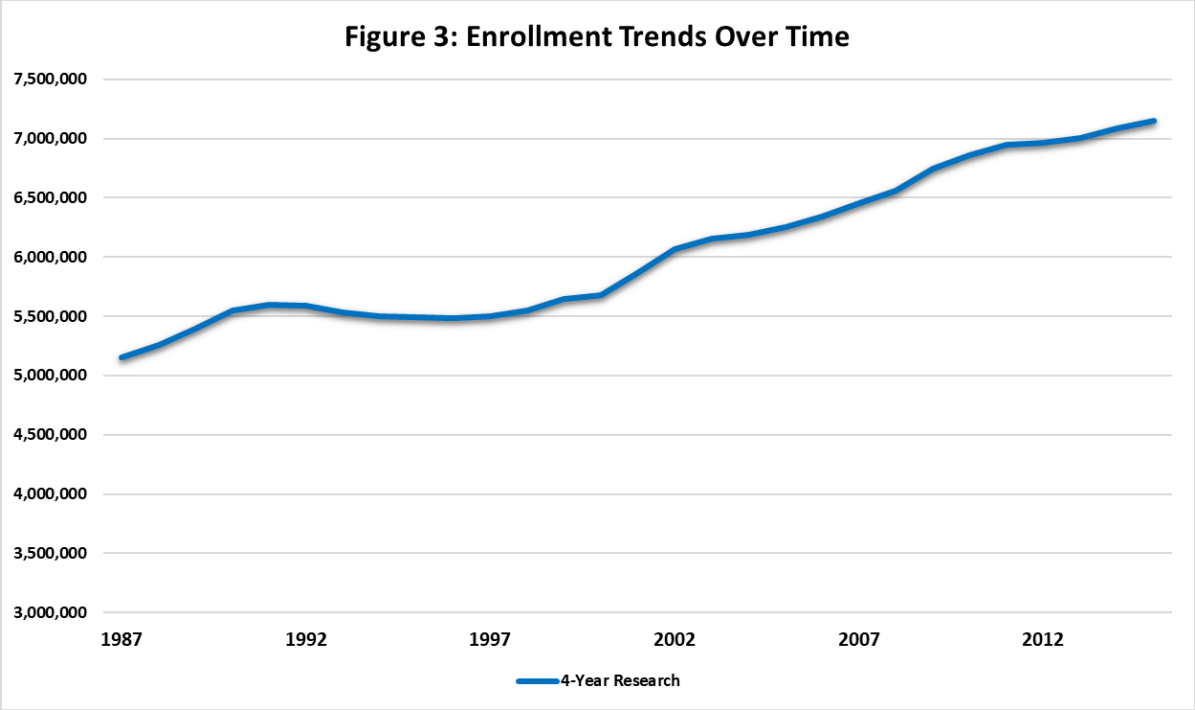

Figure 3: Enrollment Trends Over Time; 4-Year Research Universities

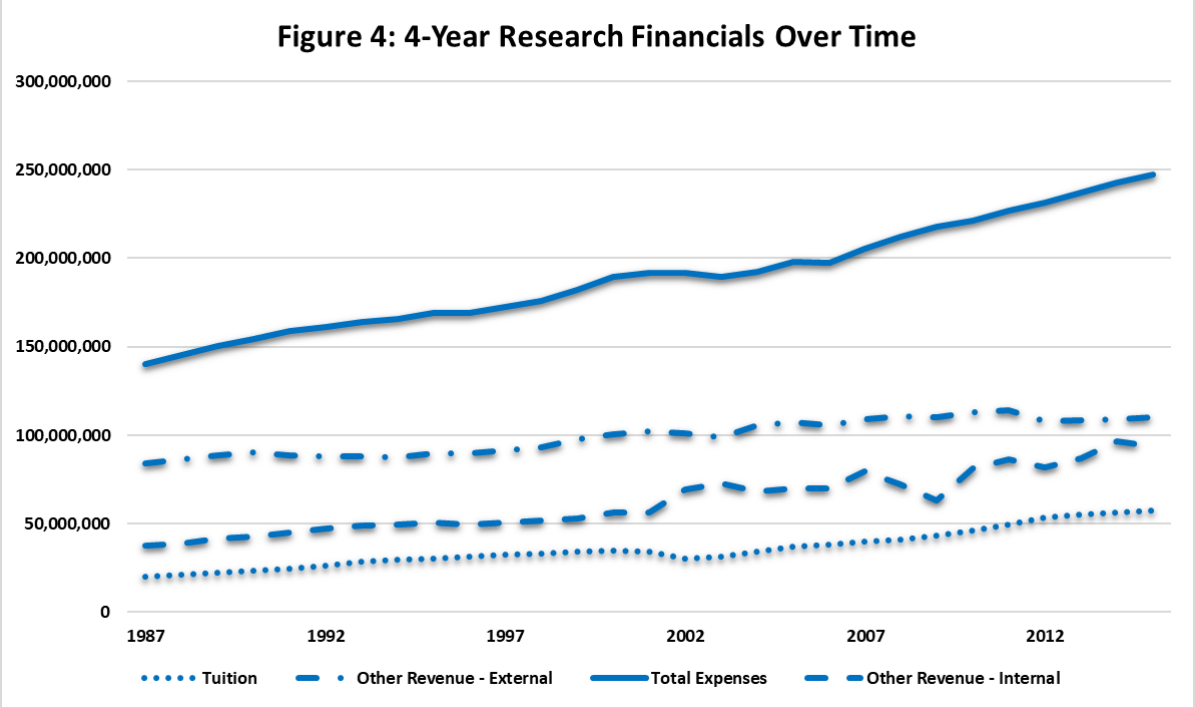

Figure 4: 4-Year Research Financials Over Time; Adjusted for inflation using HEPI-2015 dollars, in thousands

Before we employ the same error correction methodology for the 4-year research institutions, we need to understand how their financials move over time. As expected, Figure 4 shows increasing expenses and revenues as enrollment increases. However, the

external revenue growth is very small in this time compared to the other two revenue streams, which implies that over time these institutions are relying more on tuition, gifts, and other auxiliary revenues to balance their budget and keep up with growth. To understand these dynamics thoroughly, Table 4 presents our first look at the error correction term for 4-year research institutions.

Table 4: 4-Year Research Institution -Differenced Level- Estimates for the error-correction term

Equation	Error Correction Term	(Std. Err)
Total Expenses	-0.03	(0.07)
Tuition	-0.03	(0.04)
External Revenue	0.19***	(0.06)
Other Own Revenue	0.76***	(0.15)

Standard errors appear in parentheses. *, **, *** Statistically different from zero at the 10%, 5%, and 1% level.

As before, we start with the differenced levels of the budgetary components themselves, not taking enrollment into account. Table 4 shows that with a response to a one-dollar increase in the deficit, total expenses decrease by $0.03(-.03). Tuition decreases by $0.03(-.03), external revenue increases by $0.19 (.19), and other own revenue increases by $0.76 (.76). First, the sign for total expenses is expected, as the institutions will reduce overall spending to remain in balance for the future. Second, the sign for tuition is negative, which tells us that the combination of price and enrollment combine to produce a negative effect for tuition. However, due to the small magnitude, the assumption is that there are very small adjustments in price, which would then produce small changes in enrollment. Third, external revenue is positive, and shows the need from outside sources in the form of government appropriations and/or grants. Lastly, the other own revenue has a solid positive response, which confirms what was shown in Figure 4, that the institutions will look to gifts, and other auxiliary revenues in response to deficits and to maintain sustainable growth. Overall, before getting into the per-capita estimates, Table 1 confirms three characteristics about the 4-year research institutions; 1) They have high market power within the public higher education market (Tuition coefficient is negative, yet very small) 2) They have considerable political and economic influence in their state (External revenue coefficient is positive) and 3) They have large operations and alumni funding bases to raise revenues as needed (Other own revenue coefficient is positive, and large).

Table 5: 4-Year Research Institution -Differenced Per Capita w/ Enrollment- Estimates for the error-correction term		
Equation	Error Correction Term	(Std. Err)
Total Expenses	0.01	(0.23)
Tuition	0.08	(0.12)
External Revenue	0.63***	(0.13)
Other Own Revenue	0.33	(0.48)
Log Enrollment	-0.002	(0.00)

Standard errors appear in parentheses. *, **, *** Statistically different from zero at the 10%, 5%, and 1% level.

The two variables of interest in Table 5 are Tuition (price) and Logged Enrollment. Total expenses converges toward zero, although slightly positive, which confirms the theory of keeping quality constant, and the other two revenue variables are still positive. When controlling for enrollment, the 4-year institutions choose to raise their price by $.08 per $1 increase in deficit, which then results in a .2% decrease in enrollment. Although this is a departure from what is observed in Table 4, this is consistent with the hypothesis that there are small changes in both price and enrollment, with the decrease in enrollment dominating to produce an overall decrease in tuition of $.03. Based on literature of intertemporal budget constraint testing in the public sector, we would expect to see external (or intergovernmental) revenue persist in significance and magnitude, which is exactly the case in Table 5. As with the 2-year colleges, the magnitude for external revenue increases and the statistical significance remains the same. However, there is still a noticeable difference in the magnitude of external revenue between the 2-year colleges (2.15 in Table 3) and 4-year research institutions (.63 in Table 5), which I believe strongly points to the market power advantage the 4-year schools have with respect to price setting.

5. Conclusion

Understanding how the public higher education market responds to a deficit allows for the uncovering of mechanisms, which colleges and universities activate, in order to balance their operation and achieve long-run budget equilibrium. With the analysis of the 2-Year colleges and 4-Year research universities it is evident that these two groups are vastly different with respect to their responses to a deficit, and how they utilize the budgetary components available to them. Further, there is also evidence of different behaviors and characteristics with respect to constant returns to scale (with respect to enrollment) and market power.

When looking at the error correction term for per capita expenses and log enrollment, there is a clear difference between the 2-Year and 4-Year research. While the 4-Year shows strong evidence of converging close to zero, the 2-year does not, which points to the 4-Year exhibiting constant returns to scale and the 2-Year showing signs of increasing returns to scale. Further, with the reaction of enrollment to the change in price, the 4-Year research

institutions clearly have a significant advantage in market power and are able to attract the volume and diversity of students from around the country, where the 2-Year colleges are typically restricted to regional students who do not qualify for the larger schools.

Although the approach in this paper utilized well-established methodologies, there is a plethora of research that could be explored to dig deeper into these components and understand further the dynamics of individual institutions over time with a time series panel, or dynamic panel model.

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