

The Effects of In-State Tuition Freeze at Public, Four-Year Universities on Enrollment

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Abstract

As state legislatures across the country decrease higher education appropriations and increasingly implement guaranteed tuition plans or tuition freezes, universities will seek to recoup that lost revenue, potentially through various enrollment strategies. This study examines how enrollment at public four-year institutions is affected by state-wide tuition freezes.

Background and Context

In the midst of the financial crisis, as well as an increased focus at the state level on overall expenditures, public higher education funding has consistently been viewed as the “balance wheel” in the budgeting process (Hovey 1999). Between the 2001-2002 and 2011-2012 academic years, state higher education appropriations have dropped \$9.5 billion to \$45 billion (Jaquette and Curs 2015). As a result of this nearly 10% decrease in state funding, public institutions have sought to recover some of this lost revenue through increasing both resident and non-resident tuition rates. At the same time as the decreases in state appropriations for higher education, however, several states have passed legislation that limits exactly how public institutions are able to change tuition rates, due to an increased focus and concern on college affordability.

Traditionally, the majority of guaranteed tuition or tuition freeze plans have been implemented at the university level (Hanover Research 2014), but in light of concerns regarding the cost of higher education, states have begun to issue their own plans. The first plan of note, enacted in 2003, was Illinois’ “Truth in Tuition” law, which required public universities to charge resident students the same tuition rate for their first four years of college (Forrest 2015). While tuition may change annually for each class of incoming students, students know the tuition rate they will pay for their first four years of college when they enter their first year. Oklahoma and Texas, in 2007 and 2013, respectively, required public institutions to offer an optional guaranteed tuition plan to incoming first year students, which was priced at roughly 15% higher than the current tuition rates (State Council of Higher Education for Virginia 2015). More recently, in 2012, Wisconsin advanced these ideas one step further – they implemented a state-wide tuition freeze for all resident students at public institutions for the 2013-2014 academic

year. Tuition has been frozen every year since then, and current resident tuition levels remain at 2013-2014 academic year levels (Herzog 2017). It is important to note that these tuition plans only affect tuition levels, not fees, and are only applicable to students meeting the state's qualifications for being a resident.

By implementing these laws, state law makers are presumably seeking to increase college affordability for their residents, encourage more residents to remain in state when pursuing higher education, and to graduate on time (Hanover Research 2014). In Wisconsin, the tuition freeze was partially implemented due to, in the state legislature's opinion, too high of fund balances on a yearly basis, and a tuition freeze was implemented to decrease the funding reserves of public universities (Herzog 2017). However, lawmakers often overlook a universities' ability to increase fees in response to a decrease in tuition revenue, which could increase overall revenue and cost of attendance even in the face of a tuition freeze; the university could also enroll more non-resident students, whose tuition is not frozen. In fact, the literature has shown that universities will increase fees (Delaney, Kearney, and Hemenway 2016) and non-resident tuition and enrollment, without hurting demand (Delaney and Kearney 2016), giving universities several valid options in response to decreased revenue from both the state and in-state tuition. Additionally, Zhang (2007) found that non-resident applicants increase with an increase in non-resident tuition and fees, perhaps because the higher rates are viewed as one measure of prestige; this incentive is another option for public universities to raise non-resident tuition and enrollment rates.

Purpose

The majority of the literature on guaranteed or frozen tuition levels has centered on the cost of attendance, and tends to focus on Illinois (Delaney and Kearney 2016), since their Truth

in Tuition law is the longest enacted guaranteed tuition law and was the most widespread form of a tuition freeze within a state, prior to 2013. Beyond Illinois and its Truth in Tuition law, little research has been conducted on the topic. As Wisconsin is the first state to implement a state-wide resident tuition freeze, there are many effects yet to be studied. This study seeks to initiate that research, and will examine the effects of a state-wide tuition freeze on total enrollment at public, four year institutions.

Theoretical Design

The guiding theoretical framework for this study is resource dependence theory (Pfeffer and Salancik 1978). This theory posits that the behavior of an organization is often influenced by factors external to the organization, and that minimizing the dependence of the organization on the external stakeholder helps reduce the organization's uncertainty (Hillman et al 2009). While this theory originally focused on corporate entities, many researchers have applied it to the field of higher education policy (Delaney and Kearney 2016). This research uses resource dependence theory to evaluate the outcomes of a state-level policy change (public four-year tuition freezes for in-state students) on total enrollment at public four-year universities. Higher education is seeing a decrease in their external resources (state appropriations), and may be tempted to increase their revenues through other means, such as those can manipulate (tuition and fees). Therefore, a secondary theoretical framework for this research is that of revenue diversification (Froelich 1999). However, state legislatures, presumably intending to curtail the overall total tuition and fees of higher education, have begun to restrict that privilege, and thus the revenues of public universities are restricted twice. Through that framework, this paper will examine the effects on enrollment at public four-year institutions when an external entity (the state) restricts their resources through decreasing state appropriations for higher education and tuition freezes.

Research Question

The study seeks to understand the relationship between state-wide tuition freezes and total enrollment at public four-year institutions, guided by the research question: what are the effects of tuition freezes on total enrollment at public, four-year institutions? A fixed effects difference in differences regression analysis using a balanced state-level panel data set from all 50 states from 2007 to 2014 was conducted to examine this effect, with the primary dependent variable of the study being total enrollment at public four-year institutions. The independent variables for this study are as follows: total tuition and fees for public four-year institutions per state; total high school graduates per state; state appropriations for public four-year institutions; the implementation of a tuition freeze policy; and state issued financial aid awards as independent variables in the analysis. Panel data consists of multiple data points at various time intervals on the same unit. The use of panel data, rather than cross-sectional or longitudinal data, allows for a richer data set incorporating many states, and allows for conclusions based on many different units across multiple time periods. According to Zhang (2010), panel data allows for individual heterogeneity to be considered, which suggests a fixed effects model could be appropriate.

The difference in differences regression model is a slight variation of fixed effects regression (Zhang 2010), and assumes both time-invariant group heterogeneity and group-invariant time-effect. This model is commonly used in higher education to measure the effect of a policy intervention that occurs only in select states or institutions, by measuring the relative effect in the group or groups with the newly implemented policy, and comparing it to the other groups in which the policy or treatment was not applied. Additionally, the difference in differences regression model allows for flexibility in determining different comparison and

control groups, and enables researchers to further check the effects of the treatment by running placebo tests. When running a placebo test, researchers essentially apply a fictional “policy” to several years before the implementation of the actual policy to determine whether or not there were other policies or treatments affecting the results prior to the implementation of the policy.

Variables

Because the research question seeks to measure the effects of a policy change (tuition freeze) on enrollment, total enrollment at public four-year institutions per state is the dependent variable. The fixed effects difference in difference regression was conducted using the following independent variables: total tuition and fees for public four-year institutions per state, total high school graduates per state, state appropriations for public four-year institutions, the implementation of a tuition freeze policy, and state issued financial aid awards.

The data for total enrollment at public four-year institutions per state, total tuition and fees per state, and state appropriations for public four-year institutions were all obtained from the Integrated Postsecondary Education Data System (IPEDS) through the National Center for Education Statistics (NCES). For all data obtained through NCES and IPEDS, there were no missing data points for any of the 50 states for any years between 2007 and 2014; this is a balanced panel data set. Total high school graduates per state was also obtained from IPEDS, but was calculated by adding the total private high school graduates with the total public high school graduates, per state. This data was combined into one variable, and data was available for all states for all years between 2007 and 2014 for both public high school and private high school graduates. Data for state issued financial aid awards was obtained through the Delta Cost Project, and there were no missing data points for any of the 50 states between 2007 and 2014. State-

wide tuition freeze data was coded (0=no, 1=yes) based on information gathered from news reports.

The data for each total enrollment at public four-year institutions, total high school graduates per state, total financial aid issued per state, and state appropriations for public four-year institutions was skewed, and thus log transformed to obtain the linear relationship among data that is an underlying assumption of the Ordinary Least Squares (OLS) regression model. Transforming these data address the non-normality of the data, and allows for easier interpretation of the results, compared with using the raw data. The dependent variable tuition freeze was a binary variable, and did not need to be log transformed, while the data for dependent variable total tuition and fees per state was not skewed and not log transformed.

[Table 1]

Method

Prior to determining the effects model to use, descriptive tests were run on all variables, and the resulting tests indicated that all variables, with the exception of the binary tuition freeze and total tuition and fees, must be log transformed. As a result, the log transformed data for those variables was used in all of the following tests.

[Table 2]

This study utilized a fixed effects difference in differences regression model. Theoretically, a fixed effects model takes into account the unobserved state heterogeneity, which would allow for a state by state comparison of data. Unobserved state heterogeneity is unobserved or unmeasurable differences amongst the states, but is unique to each state. Unobserved group heterogeneity can only be considered when using panel data, so the use of panel data across all 50 states from 2007 to 2014 allows omitted variable bias to be addressed.

However, in order to statistically confirm that a fixed effects model is most appropriate, a Hausman test was run, with a p-value of 0.0000. Thus, the null hypothesis of a random effects model was rejected, and a fixed effects model is confirmed.

After confirming that a fixed effects model is most appropriate for the analysis, a battery of tests was run to confirm the underlying assumptions of the OLS regression model. Since the data set being used is panel data, auto(serial)correlation must be tested for. A Wooldridge test for autocorrelation in panel data was run, and the null hypothesis was rejected, with a p-value of 0.0000; the assumption of no autocorrelation is violated. Next, heteroscedasticity was tested for, using a Modified Wald test; the null hypothesis was again rejected with a p-value of 0.0000. The assumption of homoscedasticity is violated. Lastly, to test for cross section correlation, a Pesaran test was run, and the null hypothesis was rejected, with a p-value of 0.0000. As a result, there is no cross-sectional independence. Based on the results of the Wooldridge, Wald, and Pesaran tests, a feasible generalized least squares regression was selected to control for serial correlation, heteroscedasticity, and cross-sectional dependence. Feasible generalized least squares regression models also take fixed effects into consideration. To test for time fixed-effects, *testparm* was used following the generation of year dummy variables. The null hypothesis was rejected ($p=0.0000$), and year dummy variables must remain in the model.

Next, difference in differences regressions were run for three comparison groups using a feasible generalized least squares regression to control for the violated assumptions listed above. The difference in differences approach allowed a contrast of Wisconsin's data to three comparison groups, a nationwide cohort, the Higher Learning Commission states cohort, and bordering states plus Indiana, in order to measure the magnitude of the effect of the tuition freeze on Wisconsin's enrollment. The tuition freeze was implemented in time for the 2013-2014

academic year; the pre-treatment groups consisted of data from the 2007-2012 academic years, and the post-treatment groups included 2013 and 2014 academic year data. The three comparison groups were used for the following reasons. Using a nationwide sample enables a comparison of Wisconsin to all other states, to see if there are any national trends regarding public four-year enrollment. Public universities in the state of Wisconsin are accredited by the Higher Learning Commission, which also provides accreditation for universities in 18 other states (Higher Learning Commission 2017). The Higher Learning Commission is a regional accreditor, and using comparative data for all 19 states enables a relative geographic comparison for Wisconsin, to potentially identify any geographic trends on public four-year enrollment. Lastly, the third comparison group utilized consists of the four states that border Wisconsin, plus Indiana, to observe more focused geographic trends on public four-year enrollment.

[Tables 3 and 4]

Following the difference in differences regressions using 2013, the year in which Wisconsin froze their public four-year in-state tuition state-wide, as the test year, placebo tests, using 2009 as the faux treatment year, were run for all three comparison groups to determine whether or not the effects seen were due to the tuition freeze or to another variable not included in the regression analysis.

Limitations

There are several limitations to this study, regarding the form of the data, the availability of data for use, and the comparison groups selected. Several assumptions of OLS regression, homoscedasticity, autocorrelation, and cross-sectional dependence, were violated. A feasible generalized least squares regression was used to correct for these violations.

The study examined data between 2007 and 2014; not all of the variables listed had data more recent than the 2014-2015 academic year. 2013-2014 was the first academic year that the tuition freeze was in place, and while two years of enrollment data beyond the treatment year is sufficient for difference in differences analyses, the inclusion of more years is preferred. Additionally, even though the panel data set was balanced for the years 2007 through 2014, there were only a total of 400 observations across all states, and more observations increases the likelihood that significant relationships between the data are revealed. The presence of additional variables and expanding the data set to incorporate more years would potentially provide more statistically significant results.

Consequentially, the data for first time undergraduate enrollees based on in-state residence, presumably those most likely to be encouraged to attend a public four-year institution given a resident student tuition freeze, is only mandatory to be reported every other year, and data for the 2014-2015 academic year was the most recent published. As a result, only one data point was available at the time of publication in the period following the implementation of the tuition freeze. The previous data point for resident and non-resident enrollment was for the 2012-2013 academic year, prior to Wisconsin's tuition freeze. Thus, resident and non-resident enrollment data were not included in the regression model, due to a small set of available data. Total enrollment was instead utilized, as data was available for both the 2013-2014 and 2014-2015 academic years, and all years prior.

Lastly, the comparison groups utilized were based on geography and accreditation group; there was no policy environment considerations taken into account when determining these comparison groups. Comparison groups based off similarities in the policy environment perhaps

would have led to different findings. Geographic regions may not have been the most ideal comparison groups to utilize for this research.

Results

For the feasible generalized least squares regression, utilizing data for all 50 states, total high school graduates per state ($\beta=0.972$, $p=0.000$) had a positive, statistically significant relationship to total public four-year institution enrollment. Total state appropriations for higher education ($\beta=-0.075$, $p=0.000$) and total tuition and fees per state ($\beta=-0.00007$, $p=0.000$) had a negative, statistically significant relationship to total public four-year institution enrollment. Total state financial aid issued ($\beta=-0.151$, $p=0.077$) had a negative, but not statistically significant relationship with total public four-year institution enrollment while the binary tuition freeze variable ($\beta=0.002$, $p=0.989$) had a positive, but not statistically significant relationship with total public four-year institution enrollment.

The statistically significant results show that for every 10% increase in total high school graduates per state, there is a corresponding 9.72% increase in total public four-year enrollment per state. Additionally, for every 10% increase in total state appropriations towards higher education, there is a corresponding 0.75% decrease in total public four-year enrollment per state. The data suggests that for every 10% increase in total tuition and fees, there is no real effect on public four-year enrollment (a 0.0007% decrease).

When running the difference in differences regression for this data set, there were a total of 392 control cases (294 prior to the treatment year, 98 after the treatment year), and 8 treated cases (6 prior to the treatment year, 2 following the treatment year). The difference in differences estimator between the treated and control groups was -0.033, but the result was not statistically significant ($p=0.966$). A placebo difference in differences analysis was run to determine whether

or not there were variables or other treatments not considered in the regression analysis that affected public four-year enrollment numbers, with $\beta=-0.039$ and $p=0.954$; this finding was not statistically significant. Based on the results of the placebo test, it cannot be stated with confidence that the implementation of a tuition-freeze affected enrollment within this sample.

Regarding the comparison group containing Higher Learning Commission accreditation states, using feasible generalized least squares regression, only total high school graduates per state ($\beta=0.898$, $p=0.000$) had a positive, statistically significant relationship with total public four-year institution enrollment. Total state appropriations for higher education ($\beta=-0.735$, $p=0.002$) had a negative, statistically significant relationship with total public four-year institution enrollment. In the Higher Learning Commission accreditation states, a 10% increase in total high school graduates corresponds to an 8.98% increase in public four-year enrollment, while a 10% increase in state appropriations for higher education correlates to a 7.35% decrease in public four-year enrollment. Total state financial aid issued ($\beta=-0.237$, $p=0.115$) and total tuition and fees per state ($\beta=-0.00002$, $p=0.313$) had negative, not statistically significant relationships with total public four-year institution enrollment, while the binary tuition freeze variable ($\beta=0.0115$, $p=0.952$) had a positive, not statistically significant relationship with total public four-year institution enrollment.

After running the feasible generalized least squares regression using states in the Higher Learning Commission region, a difference in differences regression was again performed. In this analysis, there were a total of 152 control cases (114 prior to the treatment year, 38 following), and 8 treated cases (6 prior to the treatment year, 2 following the treatment year). The difference in differences estimator ($\beta=-0.028$) was not statistically significant ($p=0.967$). A placebo

difference in differences regression for this cohort was run, and $\beta=-0.036$, with $p=0.952$; this finding was not statistically significant.

Lastly, the feasible generalized least squares regression model utilizing bordering states as the comparison group returned a positive, statistically significant relationship with total public four-year enrollment for only total state appropriations ($\beta=1.655$, $p=0.000$). For these states, a 10% increase in state appropriations for higher education is associated with a 16.5% increase in public four-year enrollment. No variables had a negative, statistically significant relationship with total public four-year enrollment. Only total high school graduates per state ($\beta=0.0334$, $p=0.875$) had a positive, not statistically significant relationship with total public four-year enrollment, while total financial aid issued per state ($\beta=-0.080$, $p=0.013$), tuition freeze ($\beta=-0.168$, $p=0.276$), and total tuition and fees per state ($\beta=-0.00002$, $p=0.517$) had negative, not statistically significant relationships with total public four-year enrollment.

The difference in differences regression with this data set had a total of 48 control variables (36 prior to the treatment year, 12 following the treatment year), and 8 treated variables (6 prior to the treatment year, 2 following the treatment year). The difference in differences estimator was -0.009 , but was not statistically significant ($p=0.990$). For this cohort, a placebo difference in differences regression found no statistically significant results ($\beta=-0.012$, $p=0.984$).

[Tables 5 and 6]

Conclusions

Several conclusions can be drawn from the study, although few regarding the research question. The data shows that increasing total high school graduates within a state is a robust strategy for increasing public four-year enrollment within a state in the Higher Learning Commission cohort. Nationwide data supports the idea that students will continue to enroll at

public four-year universities, despite increases in tuition. While increases in state appropriations for higher education in states bordering Wisconsin relates to increases in total public four-year enrollment, increases in state appropriations for higher education had a negative relationship on total public four-year enrollment per state nationwide, suggesting other mitigating factors affecting enrollment across the country that do not affect Wisconsin and surrounding states to the same degree. Based on these results, additional variables beyond total high school graduates help determine the total public four-year enrollments nationwide and in Higher Learning Commission states, while additional variables beyond state appropriations must be found to determine public four-year enrollment in states bordering Wisconsin. Finding these additional factors would allow for firm conclusions to be drawn from the difference in differences analysis. Because the variables used in the difference in differences analyses here were not statistically significant, we are unable to draw any firm conclusions from that portion of the analysis. Ultimately, no significant findings can be drawn regarding the effectiveness of state-wide public four-year tuition freezes for in-state students on public four-year enrollment.

Implications for Policy

The results of this study highlight that the total four-year enrollment at public universities in states in different regions of the country is affected by different factors, and that policy makers must seek out these regional factors when evaluating any policy proposals. Policy makers also must use caution when evaluating policy targeting enrollment that is generated from states in different regions than their own. Additionally, policy makers must be aware that simply increasing state appropriations is not a panacea for enrollment issues, and that changes in K-12 education policy leading to more high school graduates will have an impact on increasing total public four-year enrollment numbers. State-wide, public four-year university tuition freezes are a

novel contribution to higher education policy, and more states may begin to implement them. Further research must be done when determining the appropriate factors to consider when evaluating the effects of the freeze on in-state enrollment, which in turn will increase the reliability of difference in differences analysis. As the cost of higher education continues to climb, and universities are encouraged to increase revenue through tuition and fee increases resulting from decreased state appropriations, policy makers must seek and support further research on state-wide tuition freezes for in-state students.

Recommendations for Future Research

For future research on the effects of tuition freezes on enrollment at public, four-year institutions, researchers should focus on gathering detailed enrollment data of resident and non-resident enrollments. NCES publishes this data every other year, and it is optional for public institutions to report this data in the between years. The between year data in IPEDS was inaccessible, and future researchers may contact IPEDS to have that data released, since it is not accessible from the data tools they currently offer. Enrollment data broken down as such would provide a more robust understanding of the effects of the tuition freeze on resident student enrollment, and would allow researchers to identify additional research questions regarding who benefits from tuition freezes and strategies that universities are employing to counteract lost revenues due to tuition freezes. This data would provide policy makers with further information on whether their state's residents are enrolling at higher rates after the implementation of the tuition freeze, or whether universities are increasing the number of non-residents they enroll to balance their decreasing revenues at the cost of resident students. Future research on the effects of Wisconsin's tuition freeze must take into account reciprocity agreements that allow certain out of state students to attend Wisconsin public institutions at resident tuition rates (NASFAA n.d.).

Presumably, state policy makers freeze in-state tuition to incentivize state residents to seek higher education and to remain in their state when they do so; further research on the composition of enrollments following a tuition freeze would provide policy relevant research. To identify the presence of any lagged effects on enrollment, the model must be updated to incorporate new data as it is released.

Additionally, this research would have direct policy implications, and could help inform lawmakers proposing new legislation. Future researchers would also want to consider other variables to include in their regression analysis, such as political control of state legislatures, identifying a way to categorize the political climate surrounding higher education in a state, the quality of public four-year higher education in a state, and state revenue. Higher education is increasingly becoming politicized, and bipartisan activity on higher education is becoming increasingly rare. By considering these variables in addition to tuition freezes, researchers could identify factors more significant to enrollment than the variables utilized here. Determining which independent variables are the most salient to the research question is one of the most important steps in policy research, and identifying these variables for research on tuition freeze is a key step for further research.

In a similar vein, future research may want to consider different comparison groups than those utilized in this study for the difference in differences regression portion of the research. While policy makers may be most interested in comparing their state's data to neighboring states, a geographic comparison perhaps is not always the most appropriate comparison group. Basing comparison groups on other measurable characteristics, such as the presence of a specific policy initiative, similar political environments, or other similar features, could yield more robust results. Additional comparison groups could be created based on similar patterns in state

appropriations, high school graduates, higher education enrollment rates, or other relevant categories. Identifying other comparison groups could be affected by the inclusion of other variables in the regression analysis. By creating more robust and detailed comparison groups for the difference in differences analysis, the resulting data could be more applicable and salient for policy makers. Identifying the appropriate covariates for comparison groups is a key research question to be answered for tuition freeze research.

References

- Delaney, J., & Kearney, T. (2016). Alternative student-Based revenue streams for higher education on institutions: A difference-in-Difference analysis using guaranteed tuition policies. *Journal of Higher Education*, 87(5), 731-769.
- Delaney, J., Kearney, T., & Hemenway, B. (2016). Balancing tuition predictability and affordability: The pitfalls of guaranteed tuition plans. *Change: The Magazine of Higher Learning*, 48(2), 59-66.
- Forrest, S. (5.26.15). *Illinois' Guaranteed-tuition law making college less affordable*. Retrieved from news.illinois.edu
- Froelich, K. A. (1999). Diversification of revenue strategies: Evolving resource dependence in nonprofit organizations. *Nonprofit and Voluntary Sector Quarterly*, 28, 246-268.
- Hanover Research. (2014). *Tuition and Financial Aid Incentives for Improving Graduation Rates*. Washington, D.C.
- Higher Learning Commission (2017). *About the Higher Learning Commission*. Chicago, IL. Retrieved from <https://www.hlcommission.org/About-HLC/about-hlc.html>
- Hillman, A, Withers, M., & Collins, B. (2009). Resource dependence theory: A review. *Journal of Management*, 35(6), 1404-1427.
- Herzog, K. (2017, July 6). University of Wisconsin Regents freeze tuition, OK student fee and housing increases. *Milwaukee Journal Sentinel*. Retrieved from <http://www.jsonline.com/story/news/education/2017/07/06/regents-approve-new-budget-gives-less-uw-madison/455165001/>
- Hovey, H. A. 1999. State spending for higher education in the next decade: The battle to sustain current support. San Jose, CA: National Center for Public Policy and Higher Education.
- Integrated Postsecondary Education Data System (IPEDS) (n.d.). IPEDS Data Center [Data file]. Retrieved from <http://nces.ed.gov/ipeds/datacenter/>
- Jaquette, O., & Curs, B. (2015). Creating the out-of-State university: Do public universities increase nonresident freshman enrollment in response to declining state appropriations? *Research in Higher Education: Journal of the Association for Institutional Research*, 56(6), 535-565
- National Association of Student Financial Aid Administrators (NASFAA)(n.d.). State & Regional College Tuition Discounts. Retrieved from https://www.nasfaa.org/State_Regional_Tuition_Exchanges

Pfeffer, J., & Salancik, G. R. 1978. *The external control of organizations: A resource dependence perspective*. New York: Harper & Row

State Council of Higher Education for Virginia. (2015). *Fixed Rate Tuition Plans: A Survey in Response to Senate Bill 806*.

Zhang, L. (2007). Nonresident enrollment demand in public higher education: An analysis at national, state, and institutional levels. *Review of Higher Education*, 31(1), 1-25.

Zhang, L. (2010). The use of panel data models in higher education policy studies. *Higher Education -New York-*, 25, 307-350.

Tables

Table 1

Dependent and Independent Variables, Data Years 2007-2014

Variables	Data Source
<i>Dependent Variable</i>	
Total public four-year institution enrollment by state	IPEDS
<i>Independent Variables</i>	
Total high school graduates per state	IPEDS
Total state appropriations to public four-year institutions per state	IPEDS
Average tuition and fees for public four-year institutions per state	IPEDS
Total state issued financial aid to public four-year institutions	Delta Cost Project
Tuition Freeze	News reports

Table 2
Descriptive Statistics for All Data in Study, Data Years 2007-2014

Variables	Observations	Mean	SD	Range
<i>Dependent Variable</i>				
Total public four-year institution enrollment by state	400	156210	150451	12067 - 752959
<i>Independent Variables</i>				
Total high school graduates per state	400	68238	78220	5541 - 455854
Total state appropriations to public four-year institutions per state (in thousands of dollars)	400	\$1260356	\$1478453	\$30479 - \$9782352
Average tuition and fees for public four-year institutions per state	400	\$7444	\$2366	\$2980 - \$14538
Total state issued financial aid to public four-year Institutions	400	\$8.89e7	\$1.53e8	\$93718 - \$1.20e9
Tuition Freeze	400	-	-	-

Table 3*Difference In Differences Comparison Cohort – Higher Learning Commission (HLC) States*

Accreditation Group	States
Higher Learning Commission	Arkansas, Arizona, Colorado, Iowa, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, North Dakota, Nebraska, Ohio, Oklahoma, New Mexico, South Dakota, West Virginia, Wisconsin, Wyoming

Table 4*Difference in Differences Comparison Cohort – Bordering States*

Bordering States Cohort	States
Border States	Illinois, Indiana, Iowa, Michigan, Minnesota, Wisconsin

Table 5*Effects of State-Wide In-State Tuition Freeze on Public Four-Year Enrollment, Data Years 2007-2014, Nationwide Comparison*

Variables	Coefficients	p-value	SE
Log total high school graduates	0.972	0.000***	0.023
Log total state appropriations	-0.074	0.000***	0.019
Log total state financial aid	-0.015	0.077	0.008
Tuition freeze	0.002	0.989	0.173
Total tuition and fees	-0.00007	0.000***	5.42e-6

*p<0.05, **p<0.01, ***p<0.001

Effects of State-Wide In-State Tuition Freeze on Public Four-Year Enrollment, Data Years 2007-2014, HLC Comparison

Variables	Coefficients	p-value	SE
Log total high school graduates	0.898	0.000***	0.044
Log total state appropriations	-0.074	0.002**	0.023
Log total state financial aid	-0.024	0.115	0.015
Tuition freeze	0.011	0.952	0.190
Total tuition and fees	-0.00002	0.313	0.00002

*p<0.05, **p<0.01, ***p<0.001

Effects of State-Wide In-State Tuition Freeze on Public Four-Year Enrollment, Data Years 2007-2014, Bordering States Comparison

Variables	Coefficients	p-value	SE
Log total high school graduates	0.033	0.875	0.213
Log total state appropriations	1.655	0.000***	0.300
Log total state financial aid	-0.080	0.013*	0.032
Tuition freeze	-0.168	0.276	0.153
Total tuition and fees	-0.00002	0.517	0.00003

*p<0.05, **p<0.01, ***p<0.001

Table 6*Difference in Differences Regression Analysis, Data Years 2007-2014, All Comparison Groups*

Comparison Groups	DID coefficient	p-value	SE
Nationwide data	-0.033	0.966	0.758
Higher Learning Commission Cohort	-0.028	0.967	0.675
Bordering states	-0.009	0.990	0.670

