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Tuition Revenue Projections and Higher Education Demand for Public Kentucky Universities

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TABLE OF CONTENTS

Executive Summary

Since the 1997 passage of the *Kentucky Postsecondary Education Improvement Act* by the Kentucky State Legislature, the Kentucky Council for Postsecondary Education (CPE) has been an integral part of postsecondary education in the Commonwealth.

Part of CPE's responsibilities include advising the state legislature on the tuition and fee setting process for all public postsecondary institutions in Kentucky. As this responsibility has manifested itself, it is important that the CPE have an accurate, independent tuition revenue forecasting model, as well as gauging the impact of tuition increases on student demand for higher education in Kentucky.

The current CPE tuition revenue-forecasting model uses the following formula (FTE= full time equivalent students):

$$\text{Projected Revenue} = (\text{GradFTE} \times (\text{GradTuit} + \text{GradFees})) + (\text{UndergradFTE} \times (\text{UndergradTuit} + \text{UndergradFees}))$$

The current CPE revenue projection formulas make the following assumptions:
- Tuition increases of 9% per year at research universities, 6% for other four-year institutions, and 5% for the Kentucky Community and Technical College System.

- Fees increase 5% per year at all institutions.

- FTEs increase at rates specified by CPE in accordance with enrollment goals[1].

A technique called backcasting (think forecasting in reverse) was used to analyze the CPE formula by comparing past predicted number to past actual numbers. Results indicate that the CPE tuition revenue forecasting model was 97.4% accurate within the 10 year time period of 1997-2007 for all public post secondary institutions in Kentucky. However, improvements to the model can be made to make it more robust to social or economic changes within the state.

Additionally, data were gathered from the Integrated Postsecondary Educational Database (IPEDS) on the public postsecondary institutions in Kentucky to analyze the effects of tuition increases on student applications and enrollment. Regression results showed that from 2000 to 2006 there was no statistically significant effect of tuition increases on student enrollments or applications for any public university in Kentucky. This finding is consistent with higher education literature(Heller, 1997; Leslie & Brinkman, 1987).

These findings help independently verify the validity of the current CPE tuition revenue forecasting model as well as offer insight into student demand for higher education in the state of Kentucky.

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[1] See Appendix C for CPE FTE projections

Introduction and Background

The Kentucky Council for Postsecondary Education (CPE) is a state coordinating board for

higher education created by a legislative special session in May of 1997 though the passing of

House Bill 1 also known as the *Kentucky Postsecondary Education Improvement Act of 1997*[2].

In accordance with House Bill 1, the CPE has many responsibilities. The CPE website[3] has

outlined a few of its main responsibilities as follows:

- Develops and implements a strategic agenda for the postsecondary and adult education

  system that includes measures of educational attainment, effectiveness, and efficiency.

- Produces and submits a biennial budget request for adequate public funding of

  postsecondary education.

- Monitors and approves tuition rates and admission criteria at public postsecondary

  institutions.

- Defines and approves all academic programs at public institutions.

- Ensures the coordination and connectivity of technology among public institutions.

- Collects and distributes comprehensive data about postsecondary education

  performance.

In June 2008, the Kentucky Council for Postsecondary Education (CPE) requested that the

accuracy of the current CPE tuition forecasting models be checked and that estimates be

developed of the effect of recent tuition increases on student demand for higher education in

Kentucky. Tuition revenue forecasting is critical for government and institutions alike, as

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[2] http://www.lrc.ky.gov/recarch/97ss/HB1.htm
[3] http://cpe.ky.gov/about/cpe/mission.htm

appropriate revenue forecasting informs the annual tuition and fee setting process (Caruthers & Wentworth, 1997). Currently, postsecondary institutions in Kentucky develop their own internal tuition and fee revenue forecasting models, although the exact specification, sophistication, and accuracy of these models are currently unknown.

This paper explores the Council for Postsecondary Educations role as a monitor and approver of tuition rates specifically by assessing the accuracy of the current CPE tuition forecasting model, and by estimating the student response to tuition increases in Kentucky.

Section I: Tuition Revenue Projections for Public Kentucky Universities

Why Revenue Forecasting is Important

It has been a fairly recent advent within the higher education community to introduce private sector staples such as forecasting into continued practice and an integral part of university operations. A "managerial revolution" dating back to roughly the 1960's has been occurring throughout universities nation-wide, although there is considerable debate as to whether or not administrative decision making is an appropriate strategy for the direction of universities. Proponents have argued that this type of analysis will help universities run much more efficiently and effectively, while opponents have argued that the role of the universities should not be dictated by administration, but rather the emphasis should be that it is a place of learning and growth (Rourke and Brooks 1964).

While the debate about the role of a University may continue, there have been some advantages to having revenue forecasting utilized in higher education. Reliable and trusted revenue predictions provide the foundation for fiscal discipline and for the adoption of an executable

budget. There are many different alternative approaches to revenue forecasting, such as, extrapolation or projection, deterministic models, multiple regression equations, econometric equations systems, and microsimulation from taxpayer data files. The importance of finding the appropriate method to produce a satisfactory forecast for the problem at hand is essential to revenue forecasting (Mikesell 2007).

Additionally, there are significant political issues regarding revenue-forecasting including whether it is used as an internal reference or used to inform policy makers. This distinction will shape whether or not results are made public. If fiscal problems are projected they could be construed in a positive or negative light depending upon how active the entity is in solving the problems (Schroeder 2004).

Tuition Revenue Forecasting at the CPE

Currently the CPE uses a "projections and extrapolations" model to estimate tuition revenue forecasts for the state public postsecondary institutions. The CPE has developed its own revenue forecasting model that is based on several relevant projections: anticipated graduate and undergraduate tuition and fees, as well as anticipated enrollment for graduate and undergraduate programs. Graduate and undergraduate tuition and fees are projected separately then added together. The CPE formula for projecting tuition revenues takes the following form: FTE stands for full time equivalent number of students.

$$
\begin{aligned}
\text{Projected Revenue} = (\text{GradFTE} \times (\text{GradTuit} + \text{GradFees})) + \\
(\text{UndergradFTE} \times (\text{UndergradTuit} + \text{UndergradFees}))
\end{aligned}
$$

The current CPE revenue projection formulas make the following assumptions:

- Tuition increases of 9% per year at research universities, 6% for other four-year institutions, and

    5% for the Kentucky Community and Technical College System.

- Fees increase 5% per year at all institutions.

- FTEs increase at rates specified by CPE in accordance with enrollment goals[4].

Methodology and Analysis of the CPE Tuition Revenue Forecasting Model

Some data were provided by CPE, and other information was collected from the Integrated

Postsecondary Educational Database (IPEDS) on actual tuition, fee, and enrollment for public

postsecondary institutions in Kentucky. IPEDS is an extension of the National Center of

Education Statistics and specifically collects post secondary data on tuition, fee, faculty, salaries,

financial aid, and other variables[5]. These data were compared to those projected by the CPE

tuition revenue projection formula for the following public postsecondary institutions in

Kentucky: University of Kentucky, University of Louisville, Murray State University, Morehead

State University, Eastern Kentucky University, Western Kentucky University, Northern

Kentucky University, Kentucky State University, and the Kentucky Community and Technical

College System for 1997 through 2007.

Specifically, to check the accuracy of the CPE tuition revenue forecasting model, I used a

technique called backcasting. Backcasting is simply forecasting in reverse[6]: instead of

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[4] See Appendix C for CPE FTE projections
[5] http://nces.ed.gov/IPEDS/about/
[6] If growth is occurring at 5% per year, backcasting divides by 1.05 rather than multiplying by
1.05

predicting future numbers based on current ones, current numbers are used to predict past

numbers, thereby providing a test of the accuracy of the predictive model since predicted

numbers can be compared to actual historical numbers. Availability of data allowed for

predictions to be made for the years 1997 to 2007, although there were concerns regarding the

accuracy of the 2007 data as there were incongruences between CPE-provided enrollment figures

and those obtained through the IPEDS system[7].

The backcasting procedure showed that, for the years included in the analysis, CPE's tuition

revenue prediction model is quite accurate in predicting aggregated actual institutional tuition

revenues, although slight revisions to the model would produce slightly more accurate

predictions.

Here is a regression of actual revenue on backcasted revenue. Both are stated in millions to

avoid large numbers. The summary statistics and regression results are as follows in Table 1 and

Table 2 on the next page.

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[7] For example, UK had in fact more grad students and fewer undergrads than the CPE data show.
However the numbers are not significantly different from those provided by IPEDS. The main
implication of the deviations is that 2007 data is not matched exactly.

Table 1: Summary Statistics of Backcasted Regression

Variable	Observations	Mean ($)	Standard Deviation	Min.	Max.
Tuition and Fees Backcasted in Millions	99	77.01	51.08	7.85	249.81
Tuition and Fees Actual in Millions	99	69.93	50.5	6.03	242.99

Source: Council for Postsecondary Education and
Integrated Postsecondary Education Database data from 2008;
STATA

Table 2: Regression Equation

Regression Equation	Tuition and Fees = -5.22 + 0.976*Tuition and Fees Backcasted (1.50) (0.016)

*Standard errors in parentheses, R^2 = 97.4%.
Source: STATA

Perfect prediction would imply that tuition and fees would be about 0.0 + 1.0 times the backcasted figure, with sufficiently small standard errors not to reject those values in statistical tests. The coefficient on Tuition and Fees Backcasted is not statistically significantly different from 1.0, which is the value it would have if the prediction was perfect. However the constant is statistically significantly different from 0.0. The R^2 is high, implying a generally accurate prediction, but it could be improved.

The tuition data provided by CPE and IPEDS indicates that, in the last five years, growth in tuition has been increasing more quickly than the growth assumption built into the model (9 percent at research universities, 6 percent at other four-year institutions, and 5 percent for KCTCS). Specifically, by increasing the predicted growth in tuition by an additional 2.5 percent,

the accuracy of tuition revenue forecasts could be increased slightly. So, for instance, the predicted growth rate of tuition for four-year, non-research institutions would increase from 6 percent to 6.15 percent ($.06 \times 1.025$)[8].

Discussion and Conclusion

This analysis suggests that CPE's current tuition revenue forecasting method accurately predicts total system tuition revenue; however, there are several important limitations to this finding that warrant discussion. First, it is important to realize that the results presented here should not be interpreted as arguing that the CPE model is perfect, or even nearly so. The model works well as long as enrollments and tuition price continue to increase at the rates specified by the model— which has occurred in Kentucky, at least over the relevant time period.

However, deviations from the growth rates specified in the model would result in inaccurate tuition revenue predictions. While certainly tuition rates change, institutional control of these rates means that CPE forecasts of future tuition prices can remain fairly accurate. Conversely, there are numerous factors which influence the demand side for higher education that could potentially impact growth in institutional enrollment and could render CPE's assumptions regarding enrollment growth invalid. Ultimately, if CPE is concerned about the validity of these numbers as state economic and demographic conditions change, a more complex model is needed that would produce predictions that are robust to these changes.

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[8] It is important to note that a slightly improved backcast would scale the prediction down by about 2.5%. This implies a slightly improved forecast would scale the prediction up by 2.5%.

An example of a possible improvement is the incorporation of the state macroeconomy. Higher education is countercyclical: a serious recession leads more people to get more education (Berman and Pfleeger 1997). This also implies that tuition and fee increases could be feasible in the present economy as a source of revenue. This topic is pursued in the second part of this paper, but the data do not cover the period of the present recession.

Development of a more complex tuition revenue forecasting model would not only aid CPE by providing additional insight into the revenue generating capacity of Kentucky's public institutions of higher education, but could also serve as an example for other state boards. This project could be completed at minimal cost to CPE as most indicators that would be utilized in the model are publicly available from sources such as the Census Bureau, the Bureau of Labor Statistics, and from other state agencies.

Section II: Effect of Tuition Increases on Higher Education Demand in Kentucky

In 2000, the University of Kentucky had a tuition price of $3,110 a year for in state students, and in 2005 the tuition price was $5,162 a year for in state students[9]. This represents an estimated increase in tuition price for in state students of 66% for the University of Kentucky in the 6-year period. As noted in Table 3, similar results can be found for a majority of the public postsecondary universities in Kentucky

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[9] CPE and IPEDS data from 2008

Table 3: In-State Tuition Price
2000 and 2005
Public Postsecondary Institutions in Kentucky

University/Year	2000 in-state Tuition per year	2005 in-state Tuition per year
EKU	$2,172	$4,200
KSU	$2,100	$3,550
UK	$3,110	$5,162
UL	$3,149	$5,532
NKU	$2,328	$4,968
WKU	$2,150	$5,316
Morehead	$2,510	$4,320
Murray	$2,172	$3,792

Source: IPEDS 2008

Numerous factors contribute to the need for tuition and fee increases, namely inflation, decreases in state funding, and mandates from the *Postsecondary Education Improvement and Reform Act of 1997* stating goals for the postsecondary education system to reach by 2020. Further, there are considerable private benefits for individuals who obtain higher education, particularly higher wages over a long period of work.

However, there is a growing concern over continued tuition increases as exhibited by Eastern Kentucky University President Doug Whitlock's comments in the Lexington-Herald Leader on February 17, 2009

"We feel like we've about run the string on ... big tuition increases," Whitlock told reporters. "If you had a big jump and wound up serving fewer students, that hurts. So it's striking that right balance that doesn't push us over the point of diminishing returns." (Alessi 2009)

Given the private benefits of higher education and the concerns about increased tuition, it is important to estimate the actual response of potential students to tuition increases.

A review of the relevant literature reveals that much work has attempted to uncover the factors that influence demand for higher education, both at institutional and system level (Heller, 1997; Leslie & Brinkman, 1987). These variables can be generally aggregated into three categories: demographic factors, such as age and race; state economic factors, such as unemployment and state per capita income; and factors that influence the price of higher education, such as tuition and fees, and the availability of financial aid from the federal government, states, and institutions.

Methodology

The analysis incorporates a cross sectional time series (panel) regression model with year and fixed effects for institutions. All the variables were logged so that coefficients estimate elasticities of response to the change in the explanatory variables (i.e. represent a 1% change rather than a 1 unit change).

IPEDS enrollment, applicant, tuition, and financial aid data (see Appendix A for data dictionary for specific variables utilized and explanations of these variables) were used to conduct the analysis for the following public postsecondary institutions in Kentucky: University of Kentucky, University of Louisville, Murray State University, Morehead State University, Eastern Kentucky University, Western Kentucky University, Northern Kentucky University, Kentucky State University for the years 2000-2006. Enrollment and applications received were used as dependent variables (applications received allowed for a clearer look at the demand side only). Due to differences acrossinstitutions regarding the tuition & fee structure, tuition and fees were combined into a singlevariable. Additionally, in order to estimate the average amount of

financial aid received by students at a given institution, all financial aid variables were calculated

according to the followingformula:

(Average Aid Amount x Recipients)/ Institutional Full Time Equivalents

The STATA regression outputs can be found in table 4 and table 5 below, the variables are
explained in appendix A[10].

Table 4: STATA regression output for dependent variable "Log_Applications" for all public
universities in Kentucky 2000-2006

Variable	Coefficient	Standard Error	t-stat
log_fedgrant	0.011	0.148	0.07
log_sgrant	-0.158	0.116	-1.37
log_igrant	-0.007	0.087	-0.08
log_loan	0.122	0.087	1.41
log_tuitf~s	-0.506	0.495	-1.02
Time	0.128	0.078	1.63
Constant	12.226	3.897	3.14

Source: IPEDS 2008
* N=41, R2=40.1%

Table 5: STATA regression output for dependent variable "Log_ Full Time Equivalent" for all
public universities in Kentucky 2000-2006

Variable	Coefficient	Standard Error	t-stat
log_fedgrant	0.064	0.033	1.94
log_sgrant	0.010	0.022	0.48
log_igrant	-0.008	0.016	-0.5
log_loan	0.006	0.018	0.34
log_tuitf~s	-0.049	0.110	-0.44
Time	0.023	0.017	1.32
Constant	9.249	0.877	10.54

Source: IPEDS 2008
*N=53, R2=68.5%

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[10] Jacob Fowles, a Ph. D. candidate at the Martin School helped produce and analyze the
regression results.

Results and Analysis

1) Once the upward time trend in demand for higher education is considered, there is nostatistically significant relationship between either tuition price and applications or tuition priceand institutional enrollments. In other words, demand for public higher education in Kentucky isunrelated to tuition price (at least at current and historic tuition levels). This is consistent with the notion that substantial private benefits drive the demand for higher education in general (Heller 1997: Leslie and Brinkman 1987)

2) Applications and enrollments are also unrelated to the average amount of financial aid that students receive (at current and historic aid levels).

3) Findings 1 and 2 are consistent across all institutions included in the study.

4) The estimates suggest that modest tuition price increases would result in little change in enrollments and applications (and the associated concern regarding student quality).

Limitations

1) The crudeness of the model. It includes no student socio-economic characteristics and does notdistinguish between undergrad and graduate students as well as the in-state/out-of-stateenrollment mix. Additionally it does not include information about high school graduation rates or state economic conditions. Certainly, students vary in how they are impacted by tuition price changes. Weare unable to explore this issue due to limitations of IPEDS data. However, the fixed effectsimplicitly control for these variables to the extent to which any unmeasured variables arecorrelated with institutions or the time trend.

2) Limited time frame. The analysis only looks at the most recent six years of data available from IPEDS.

3) Limited nature of data. Overall variability in tuition price is low in the dataset utilized. This makes predicting the impact of tuition price changes outside of the range of the sample unadvisable. However, tuition has been increasing over this period and is unlikely to stop doing so as long as higher education provides a substantial private benefit in increasing income.

Discussion and Conclusion

The cost of higher education in Kentucky is continuing to rise. However, the estimates above suggest that every percent increase in tuition has had no significant effect on enrollments or applications to public universities within the commonwealth from 2000-2006. This implies that for those years there was inelastic demand for higher education for the institutions studied regardless of the tuition price. As such, moderate tuition increases (5% - 7%) should have no negative effects on enrollment[11].

The years covered in the analysis from 2000-2006 represent a period of economic expansion within the U.S. and Kentucky[12]. Since education is countercyclical, demand for education increases when the economy is worse (Berman and Pflegger 1997), it is arguable that in the current recession increased tuition and fees would be a source of revenue for the universities.

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[11] It is important to note that there are significant political factors regarding higher education. For example, even if a 15% increase in tuition rates did not affect demand, it is unlikely like such an increase would be approved.

[12] U.S. Bureau of Labor and Statistics

Section III: Why These Results Matter to the Council for Postsecondary Education

The Council for Postsecondary Education has significant authority in the tuition setting process for public universities in Kentucky. As such it is important for the CPE to have an independent, and accurate tuition revenue-forecasting model when engaging in discussions with universities about tuition increases. The current CPE tuition revenue forecasting model is 97.4% accurate given the available information from the years 1997-2007, which shows that the model is generally accurate, but even within this setting, improvement is possible. The current model is limited by its lack of socioeconomic data, any significant changes within the state could render the estimates not as accurate.

Additionally, the CPE has an interest in keeping college affordable to as many people (specifically Kentuckians) as possible. Affordability can take many different forms, however a good approximation for affordability can be to gauge the student responses (demand) to tuition price increases. Data from IPEDS was used to run a cross sectional time-series regression for the years 2000-2006. The analysis indicated that for these years and the public universities in Kentucky there was no statistically significant relationship between tuition price and changes in student enrollment. Of course, potential students would prefer to pay less; however there are large, long-term benefits to college education, particularly higher wages and access to more technical jobs as these develop in the future. Given this, universities should be compensated for creating these benefits.

These findings help to better inform CPE decision-making and negotiations in the tuition setting

process by giving them reliable information that can be independently verified.

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Appendix A

Data Dictionary of IPEDS Variables used in analysis

Tuition 2-In-state average tuition

IN-STATE TUITION - The tuition charged by institutions to those students who meet the state's or institution's residency requirements.
TUITION - Amount of money charged to students for instructional services. Tuition may be charged per term, per course, or per credit.
UNDERGRADUATE - A student enrolled in a 4- or 5-year bachelor's degree program, an associate's degree program, or a vocational or technical program below the baccalaureate.
FULL-TIME STUDENT Undergraduate - A student enrolled for 12 or more semester credits, or 12 or more quarter credits, or 24 or more contact hours a week each term
ACADEMIC YEAR - The period of time generally extending from September to June; usually equated to 2 semesters or trimesters, 3 quarters, or the period covered by a 4-1-4 plan.

Fee 2- In-state Required fees

IN-STATE FEES - The fees charged by institutions to those students who meet the state's or institution's residency requirements.
REQUIRED FEES - Fixed sum charged to students for items not covered by tuition and required of such a large proportion of all students that the student who does NOT pay the charge is an exception
UNDERGRADUATE - A student enrolled in a 4- or 5-year bachelor's degree program, an associate's degree program, or a vocational or technical program below the baccalaureate.
FULL-TIME STUDENT Undergraduate - A student enrolled for 12 or more semester credits, or 12 or more quarter credits, or 24 or more contact hours a week each term
ACADEMIC YEAR - The period of time generally extending from September to June; usually equated to 2 semesters of trimesters, 3 quarters, or the period covered by a 4-1-4 plan.

FTE- Full-time equivalent enrollment
This variable is derived from the enrollment by race/ethnicity section of the fall enrollment survey. The full-time equivalent of the institution's part-time enrollment is estimated and then added to the full-time enrollment of the institution. This formula has been used to produce the full-time equivalent enrollment that is published annually in the Digest of Education Statistics. The full-time equivalent of part-time enrollment is estimated by multiplying the part-time enrollment by factors that vary by control and level of institution and level of student.

ANYAIDN- Student Financial Aid and Student Counts - Financial Aid

Number of full-time, first-time degree/certificate-seeking undergraduate students who received any financial aid.

Financial aid - Grants, loans, assistantships, scholarships, fellowships, tuition waivers, tuition discounts, veteran's benefits, employer aid (tuition reimbursement) and other monies (other than from relatives/friends) provided to students to meet expenses. This includes Title IV subsidized and unsubsidized loans made directly to students.

FGRNT_N-

Number of full-time, first-time degree/certificate-seeking undergraduate students who received federal grants (grants/educational assistance funds).

Federal grants (grants/educational assistance funds) - Grants provided by federal agencies such as the U.S. Department of Education, including Title IV Pell Grants and Supplemental Educational Opportunity Grants (SEOG). Also includes need-based and merit-based educational assistance funds and training vouchers provided from other federal agencies and/or federally-sponsored educational benefits programs, including the Veteran's Administration, Department of Labor, and other federal agencies.

FGRNT_A

Average amount of federal grants (grants/educational assistance funds) received by full-time, first-time degree/certificate-seeking undergraduate undergraduate students.

Federal grants (grants/educational assistance funds) - Grants provided by federal agencies such as the U.S. Department of Education, including Title IV Pell Grants and Supplemental Educational Opportunity Grants (SEOG). Also includes need-based and merit-based educational assistance funds and training vouchers provided from other federal agencies and/or federally-sponsored educational benefits programs, including the Veteran's Administration, Department of Labor, and other federal agencies.

SGRNT_N

Number of full-time, first-time degree/certificate-seeking undergraduate students who received state/local grants (grants/scholarships/waivers).

State and local government grants - State and local monies awarded to the institution under state and local student aid programs, including the state portion of State Student Incentives Grants (SSIG).

SGRNT_A

Average amount of state/local grants (grants/scholarships/waivers) received by full-time, first-time degree/certificate-seeking undergraduate students.

State and local government grants - State and local monies awarded to the institution under state and local student aid programs, including the state portion of State Student Incentives Grants.

IGRNT_N

Number of full-time, first-time degree/certificate-seeking undergraduate students who received institutional grants (scholarships/fellowships).
Institutional grants - Scholarships and fellowships granted and funded by the institution and/or individual departments within the institution, (i.e., instruction, research, public service) that may contribute indirectly to the enhancement of these programs . Includes scholarships targeted to certain individuals (e.g., based on state of residence, major field of study, athletic team participation) for which the institution designates the recipient.

IGRNT_A

Average amount of institutional grants (scholarships/fellowships) received by full-time, first-time degree/certificate-seeking undergraduate students.

Institutional grants - Scholarships and fellowships granted and funded by the institution and/or individual departments within the institution, (i.e., instruction, research, public service) that may contribute indirectly to the enhancement of these programs . Includes scholarships targeted to certain individuals (e.g., based on state of residence, major field of study, athletic team participation) for which the institution designates the recipient.

LOAN_N

Number of full-time, first-time degree/certificate-seeking undergraduate students who received student loans.

Loans to students - Any monies that must be repaid to the lending institution for which the student is the designated borrower. Includes all Title IV subsidized and unsubsidized loans and all institutionally- and privately-sponsored loans. Does not include PLUS and other loans made directly to parents.

LOAN_A

Average amount of student loans received by full-time, first-time degree/certificate-seeking undergraduate students Loans to students: Any monies that must be repaid to the lending institution for which the student is the designated borrower. Includes all Title IV subsidized and unsubsidized loans andall institutionally- and privately-sponsored loans. Does not include PLUS and other loans made directly to parents

Appendix B

Conclusions Derived from Regression Analysis in Table 4 and Table 5

Panel data models of applications and ftes, Kentucky universities, 2000-2006 except certain years for Kentucky State

Conclusions:
1) Universities have stable and somewhat growing applicant pools and ftes [large fixed effects].
2) Without time trends, price & quantity are positively associated [supply curve]
3) With time trends, price is irrelevant [growing but mainly fixed supply, increasing demand].
4) Increases of 10% in tuition should have no significant ill effects on actual applications and students, complaints notwithstanding.
5) Federal grants appear to support some increase in students, though none in applications, and that is not true of state grants or any other form of financial aid.

Appendix C
CPE Full Time Equivalent Projections

Table 6: CPE Full Time Equivalent Projections

Undergraduate Enrollment (system-level)	2006 fall headcount undergrad enrollment	2020 enrollment targets	Annual Increase Needed to Meet 2020 Target
Eastern Kentucky University	13,623	23,786	4.00%
Kentucky State University	2,341	4,463	4.70%
Morehead State University	7,515	11,994	3.40%
Murray State University	8,607	13,819	3.50%
Northern Kentucky University	12,668	22,520	4.20%
Western Kentucky University	16,067	27,481	3.90%
University of Kentucky	19,328	31,873	3.60%
University of Louisville	15,103	21,221	2.50%
KCTCS*	86,475	115,841	3.80%
Independents	23,426	50,467	5.60%
Total	205,153	323,465	3.30%
2020 Additional over 2006		118,312	

* 3.8% needed to reach 2010 goals, thereafter 1.4% increase is needed to reach 2020 targets

- 3.3% annual statewide increase needed to get 2020 targets

Source: Council for Postsecondary Education 2008