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Resident and Nonresident Tuition and Enrollment at Flagship State Universities

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Abstract
[Excerpt] The recent economic downturn in the United States has led to severe current and projected budget deficits in most states. Sharp rises in healthcare costs and increased competition for state funds from other sources has concurrently led to a decrease in the shares of state budgets earmarked for the higher education sector.1 Because universities are able to attract revenue from other sources (e.g. tuition, annual giving and federal student aid) and they are a discretionary component of most state budgets, they are often the first to go under the knife during tough times. The resulting revenue shortages from these budget cuts will most certainly have deleterious effects on college accessibility and on the behavior of these higher educational institutions. Inasmuch as 65% of the 9.2 million students enrolled in four-year institutions in 1999 were enrolled in public institutions and in most states the major public research universities are also the most selective in terms of admissions, it is important to understand institutional responses relating to tuition and enrollment policies, as well as the likely changes in state grant aid policies. How tuition levels, or the availability of grant or loan aid, influence access are empirical questions that we will not address in this chapter. Rather, we will analyze how tuition and enrollment strategies at institutions react to changes in federal and state student need based aid and to state appropriations to public higher education institutions. The former increases student mobility by expanding their choice set, while the latter does not travel with the student.

Keywords
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Comments

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Resident and Nonresident Tuition and Enrollment at Flagship State Universities

by

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I. Introduction

The recent economic downturn in the United States has led to severe current and projected budget deficits in most states. Sharp rises in healthcare costs and increased competition for state funds from other sources has concurrently led to a decrease in the shares of state budgets earmarked for the higher education sector.[1] Because universities are able to attract revenue from other sources (e.g. tuition, annual giving and federal student aid) and they are a discretionary component of most state budgets, they are often the first to go under the knife during tough times. The resulting revenue shortages from these budget cuts will most certainly have deleterious effects on college accessibility and on the behavior of these higher educational institutions. Inasmuch as 65% of the 9.2 million students enrolled in four-year institutions in 1999 were enrolled in public institutions and in most states the major public research universities are also the most selective in terms of admissions, it is important to understand institutional responses relating to tuition and enrollment policies, as well as the likely changes in state grant aid policies.

During the 1979 to 2000 period, the average state appropriation at the flagship public research institutions, as a share of total current fund revenues at the institution, fell from 42% to 31%. Only ten institutions saw increases in the share of their revenues coming from state appropriations over this period, and only three of these saw any increase in the share during the 1988 to 2000 period.

[1] From FY92-FY02, the share of states' discretionary budgets allocated to higher education has fallen 0.8 percentage points from 13.5% to 12.7%. Health care's share has risen from 12.1% to 16.0% during this time. See *National Association of State Budget Officers, State Expenditure Report 2001.*

To make up for this revenue shortfall, public institutions can increase their undergraduate tuition revenues in two ways.[2] First, they may increase the tuition level they charge in-state students, however this is often a politically unpopular move. Second, because all public research institutions charge a higher tuition to out-of-state students than they do to in-state students, they can raise the tuition level they charge out-of-state students and/or adjust the composition of their student body by enrolling more out-of-state students.

Adjusting the share of students that come from out-of-state is at best a short-run solution and for political reasons may be much less easily adjusted than the out-of-state student tuition level. After some point, it may be politically very difficult to further expand the share of out-of-state students, while state officials may not be concerned about charging nonresident students increasingly higher rates of tuition. The political difficulties arise because enrolling more nonresidents may preclude qualified students from one's own state from attending the flagship public university in the state. On the flip side, it would be unwise for a state to totally exclude nonresidents from its universities' corridors because other states might then retaliate against students from the state in question.

The prospects for revenue augmentation from increasing nonresident enrollments are diminished by the presence of tuition reciprocity agreements. These are either bilateral or multi-lateral agreements between schools and / or states allowing nonresident

[2] There are of course other sources of revenue. Total educational and general current fund revenues include undergraduate and graduate student tuition and fees, federal, state and local appropriations, government grants and contracts, private gifts, payouts from endowments, sales and services of educational activities and other sources. Local revenues are typically directed to community colleges while federal monies are focused on direct student support. The endowment levels at most publics are small, so increasing the payout rate is unlikely to have a large impact on annual revenues. Public institutions are actively seeking to increase their fund raising revenues, but many are starting from very low bases.

students to attend a public university at less than the normal out-of-state tuition.[3] These agreements are often program specific, have a regional focus and were created to encourage universities to achieve cost efficiencies in their program offerings.

An institution's ability to employ different tuition and enrollment strategies is dependent upon its degree of autonomy from state interests. Because elected state officials interests diverge from university administrators' and faculty members', we expect institutions in states where there is more legislative oversight in the form of a statewide coordinating board and/or fewer governing boards to find it more difficult to increase tuition and to adjust their enrollment margins.[4]

Some observers have expressed concern that direct student aid (both federal grant aid and state aid), which was designed to improve access, has instead given institutions the freedom to increase tuition. States' financing of higher education is increasingly being provided in the form of grant aid to students rather than in the form of appropriations to institutions. From 1979 to 2000, average (median) direct student aid as a share of total higher educational aid has increased from 3.0% to 5.8% (1.8% to 4.8%). While the real value of the federal Basic Educational Opportunity Grant (Pell Grant) fell by 9% over this time period, access to federal subsidized loans was vastly expanded. In fact, by 1999, 45.4% of students receiving financial aid did so in the form of federal loan aid.

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[3] In some cases, if the flow of students between states taking advantage of tuition reciprocity agreements is not roughly equal, the state that exported more students than it imported makes a payment to the importing state to compensate it for bearing more than its fair share of the costs. These payments go to the state treasury, however, not to the universities themselves.

[4] See Lowry (2001a, 2001b). Lowry also points out that states (schools) where a high percentage of university trustees are appointed by elected officials or directly elected by the voting public also have lower tuition.

How tuition levels, or the availability of grant or loan aid, influence access are empirical questions that we will not address in this chapter. Rather, we will analyze how tuition and enrollment strategies at institutions react to changes in federal and state student need based aid and to state appropriations to public higher education institutions. The former increases student mobility by expanding their choice set, while the latter does not travel with the student.

Institutions may also choose nonresident enrollment policies to satisfy different interests. Since many flagship publics are also high quality institutions, they typically experience an excess demand for seats and can enroll nonresidents to improve academic quality or to enhance the diversity of their student bodies.

Given differing state governance structures, political climates, institutional objectives, and the like, it is not surprising to see the dramatic disparity across states in their use of nonresidents as an enrollment strategy. Figure 1 shows that many of the larger, more populous states such as Ohio, Illinois, Texas, California and New York, do not make great use of this strategy, enrolling less than 10% of their first time freshmen from out-of-state in 1998.[5] [6] However, other states that are smaller, older and/or have a history of private provision of higher education enroll nearly half of their entering classes as nonresidents. Vermont, Delaware, Rhode Island and New Hampshire respectively enrolled 66%, 60%, 48% and 40% of their classes in 1998 in this manner.

[5] The categories were defined using a means clustering analysis described by Everitt (1993). This is an exploratory data technique meant to find natural groups in the data. We chose to employ a partition method that breaks the observations into k-non-overlapping groups. Multiple iterations suggest that the most natural partition was 4 groups. States near the average include Maine and Georgia, enrolling about 20% each.

[6] Public Universities in Texas do not get to keep the extra tuition revenue they receive from enrolling out-of-state students; this revenue flows into the state government coffers. As such they have no financial incentive to enroll out-of-state students.

<<FIGURE 1 ABOUT HERE>>

Table 1 lists the 91 flagship public research institutions whose behavior is analyzed in our study.[7] They are primarily Research I and II institutions and were chosen because they are the most selective and largest public institutions in each state and they enroll the largest shares of nonresidents, or out-of-state students. This chapter is motivated by our desire to understand the causes and consequences of nonresident enrollment. We seek to explain how the share of nonresidents among first-time freshmen varies at a point in time across these institutions and over time at any given institution. We employ panel data from a variety of sources and estimate a system of equations to explain the levels of state need-based grant aid per student, in-state tuition, out-of-state tuition and the share of out-of-state students among first-time freshmen. The longitudinal nature of the data permits us to control for omitted variable bias.

<<TABLE 1 ABOUT HERE>>

In the next section, we briefly survey related literature. Section III presents information on trends in tuition, enrollment and grant aid. In addition to summarizing the data we use to explain these trends, it also discusses the results of a survey we undertook to obtain information on the nature and prevalence of tuition reciprocity agreements. Section IV describes our estimation strategy, presents empirical results and conducts some policy simulations based upon these results. Section V briefly concludes.

II. Selective Literature Review

[7] There are 84 schools from 43 states that were classified as Research I and II in 1994 by the Carnegie Foundation for the Advancement of Teaching. To fully exploit state variation in tuition, enrollment and grant aid policies, we added the flagship public institution from each state that did not have a Research I or II institution. These states were Alaska, Maine, Montana, Nevada, New Hampshire, North Dakota and South Dakota.

The literature on pricing and access in public higher education is replete with papers that analyze issues related to one or more of state grant aid, in-state tuition, out-of-state tuition and nonresident enrollment shares, but none has studied all of these issues simultaneously. Two papers have addressed the determinants of nonresident enrollments. Mixon and Hsing (1994) found, using cross-section data for a sample of public and private academic institutions, that higher nonresident tuition levels were associated with higher nonresident enrollment shares. Their findings lent credence to the notion that universities enroll nonresidents for revenue purposes. Siow (1997) found, after controlling for student body ability, that universities with more successful researchers were more likely to have larger shares of nonresident and foreign students.

Other studies have addressed the determinants of tuition levels for in-state students at public universities. Using cross-section data, Lowry (2001a, 2001b) found that net tuition and fee revenues were higher at public universities that receive less state government funding per student and in states in which public universities have more financial autonomy. Quigley and Rubinfeld (1993) found that states with high private enrollments and many private colleges and universities charged higher tuition levels at their public universities.

Several studies have treated tuition levels at public higher education institutions and state appropriations to these institutions as being simultaneously determined. In the context of a model in which state appropriations were treated as endogenous, Koshal and Koshal (2000) found that lower state appropriations per student, higher median family income and a higher share of students that came from out-of-state were all associated

with higher in-state tuition levels. However, Lowry's (2001a, 2001b) work suggests that state appropriations per student can be treated as exogenous in in-state tuition equations.

Greene (1994) is one of the few studies that addressed out-of-state tuition levels at public universities. Using cross-section data, he found that states with many private colleges, lower tax rates, poor labor markets and with strong in-migration of both population and students, charged higher nonresident tuition. While he observed that higher regional tuition was associated with higher nonresident tuition levels, the association was not statistically significant.

Research relating to federal and state grant aid has addressed how grant aid affects tuition levels and access. Examples include Balderson (1997), Coopers and Lybrand (1997), Haupman and Krop (1998), McPherson and Shapiro (1998), and National Center for Education Statistics (2001). Of concern to many researchers and policymakers is whether academic institutions respond to increases in the Pell Grant program maximum benefit level by increasing their tuition levels. Estimates of the size of this "Bennett Hypothesis" at public institutions range from negligible to a $50 increase in tuition for every $100 increase in aid.[8] Little attention has been given to the determination of federal grant aid levels themselves, let alone to how states determine how much of their resources to devote to financial aid for students.

Most of the prior studies are cross-section analyses, and are subject to the criticism that unobserved institutional or state specific variables may lead to biased coefficient estimates. To avoid this problem, we employ a rich longitudinal institutional level data set that is derived primarily from the Higher Educational General Information System (HEGIS) and its successor the Integrated Postsecondary Education Data System

[8] Named for William Bennett, the Secretary of Education during the Reagan administration.

(IPEDS) in the estimation reported below. The HEGIS and IPEDS data are supplemented with data from numerous other sources.

We report estimates of a system of four simultaneously determined equations for state need-based grant aid, in-state tuition, out-of-state tuition and the share of undergraduate students that are nonresidents. The explanatory variables that are treated as exogenous in our models include federal financial aid parameters, institutional characteristics, state governance characteristics, tuition reciprocity agreement parameters, measures of higher education competition in the state and the institution's enrollment capacity, and other state and regional specific information. Our analyses should be viewed as reduced form in nature due to the difficulty of finding suitable supply and demand restrictions for each equation.

III. Data

Our study uses data on resident and nonresident enrollment and tuition levels for a sample of 91 American public research institutions representing all 50 states. The data come from a variety of sources including HEGIS, IPEDS, the National Association of State Student Grant and Aid Programs (NASSGAP) and annual Current Population Surveys (CPS), as well as other sources. Our econometric analyses use data for eight years during the 1979 to 1998 period.[9]

Table 2 presents data on the shares of full-time first-time freshmen that were nonresidents at sample institutions during the 1979 to 1998 period. Overall, the

[9] Appendix Table 1 details the sources for all of our data. The specific years included in the study were dictated by the years in which information on resident and nonresident enrollments were collected as part of HEGIS or IPEDS. The 1998 academic year was the most recent year for which IPEDS Residence and Migration data was publicly available at the time of this writing.

enrollment share of nonresidents rose from .174 to .191 during the period. However, from 1981 through 1992, when states faced particularly difficult financial times, the average share increased from .166 to .205, an increase of almost .04 and then remained relatively constant as budget situations improved during the remainder of the period.

<<TABLE 2 ABOUT HERE>>

To illustrate the magnitude of a 4 percentage point increase in nonresident enrollment, consider a school with a freshmen enrollment of 3,000 students and a nonresident tuition premium of $6,000. If this school decides to enroll 4% more of its class as nonresidents (120 students), over the course of four years, this would provide the institution with an additional $2.88 million of revenues that could be used to raise faculty salaries, invest in start-up costs for new scientists, hire additional faculty and staff, reduce class sizes and offer more courses.

Schools that exhibited the largest increases in nonresident enrollment shares during the period included Pittsburgh, Massachusetts, Minnesota and Mississippi State, which all more than doubled their shares during the period. In contrast, Illinois-Chicago, Texas Tech, Houston, South Florida and the University of California schools reduced their nonresident enrollment shares by more than half. While the time series variation in nonresident enrollment shares exhibited in this table may not appear very striking, more dramatic cross-section variation exists and can be seen in figure 1.

The well-documented increases in resident and nonresident tuition that occurred during the period are shown in Table 3. In real terms, resident and nonresident tuition levels both more than doubled between 1979 and 1998, with each growing at about 4% per year above the rate of inflation. This table veils the dramatic cross-section variation

that exists in public higher education tuition levels. For instance, in 1998 Vermont charged its residents over $7,000 and Pittsburgh, Temple, Michigan, Penn State, and New Hampshire all charged over $6,000, while all of the Florida universities, Arizona universities, Idaho, Houston, Texas A&M and Nevada-Reno charged near $2,000. The public higher education institutions in California and Texas are among those that increased tuition at the fastest rates, while the Florida and Mississippi schools exhibited the smallest increases during the period.

<<TABLES 3 AND 4 ABOUT HERE>>

Every public research institution charges a higher price to nonresidents, presumably because state taxpayers do not want to subsidize the schooling of non-taxpayers from other states. Moreover, the extent to which nonresidents pay more than residents increased during the period. While both in-state and nonresident tuition levels have experienced roughly equal percentage increases during the period and thus the ratio of nonresident to in-state tuition has remained nearly constant, the real difference in resident and nonresident tuition levels substantially increased during the period because nonresident tuition levels began at a higher base.

Table 3 shows that while in-state tuition increased by an average of less than $2,000 in real terms, nonresident tuition increased by an average of more than $5,000 in real terms. As a result the average premium charged to nonresidents has increased in real terms from $2,700 in 1979 to over $6,500 in 1998 (table 4). This change is significant because as the absolute difference between in-state and nonresident tuition widens, out-of-state enrollments become less desirable from the student-demand side.[10]

[10] These raw data suggest that during the period institutions adjusted their out-of-state tuition levels to generate revenue.

The lowest out-of-state tuition levels and smallest increases occurred largely in the southeastern region. Both the largest out-of-state tuition levels and tuition increases occurred at Michigan, the Virginia schools, North Carolina schools and the California schools. As with the overall level of nonresident tuition, the smallest premia charged to nonresidents and the smallest increases tended to occur at southeastern public institutions. The strong regional patterns that we observe in tuition and enrollment trends suggests the importance of historical competitive and political economic factors.

Turning to trends in state support for public higher education, tables 5 and 6 outline the changes in state need based grant aid to students attending public institutions and state appropriations to public higher education institutions that occurred during the period. Table 5 shows that average state provided need based grant aid per full-time equivalent undergraduate enrolled in public higher education institutions in the state has more than quadrupled in real terms, growing from roughly $67 per student per year to $285 per student per year.[11] One recent study found that 68.5% of first-time, full time students enrolled in public higher educational institutions received financial aid from any source and that 26.9% of these students received state grant aid averaging $1,742 per year. [12] Inasmuch as the average in-state tuition in 1998 was $3,525, state grant aid alone appears to cover over half of the tuition costs for eligible students.

<<TABLE 5 ABOUT HERE>>

Among the most generous states, in terms of state provided grant aid per full-time equivalent student enrolled in public higher education institutions are New York, Illinois

[11] Though the annual percentage increases in real student grant aid (7.5%) outpaced the annual real increases in tuition (4.5%), the real dollar cost to students still rose during the period.

[12] National Center for Education Statistics (2001). In addition, 28.3% of aid recipients receive federal grants averaging $2,262, 30.9% of aid recipients received institutional grants averaging $2,576 per student and 45.4% received loan aid averaging $3,490 per student in 1999.

and Pennsylvania, while the least generous states include Wyoming, Utah, Montana and Mississippi. New Mexico, Virginia, Washington, Maine and Massachusetts are among those states that increased state aid per student the fastest during the period, while Utah, Wyoming, Montana**,** Alabama and Mississippi actually decreased in real terms the amount of need based grant aid they awarded per student enrolled in public institutions during the period. While direct student aid grew rapidly, real state appropriations per full-time equivalent student to public higher education institutions saw very little growth during the period. Table 6 summarizes data on real average state government appropriations per full-time equivalent undergraduate. Nationwide real state appropriations per student did not increase between 1988 and 2000, and only grew by 21% between 1979 and 2000, a 1% per annum annual growth rate. Again, dramatic cross-section variation existed in state funding per student.

<<TABLE 6 ABOUT HERE>>

A few states were able to generously increase support for selected institutions during the period. New Mexico, Maryland, Georgia Tech, Maine and Oklahoma State all enjoyed a doubling of real state support, amounting to increases between $6,000 and $12,000 per student. However, of the 91 schools in our sample, 22 faced decreases in real state appropriations per student between 1979 and 2000. Among the hardest hit were many of the California and Virginia schools, each losing anywhere from 10% to 49% of its state support. These losses represented $1,000 to $12,000 per student cuts in real state appropriations.

In the face of budget pressures and changing political attitudes, states may have an easier time funding direct student aid increases under the guise of promoting access.

Legislators and their constituents may also prefer not to fund institutions directly, because they may worry that the dollars will not go to the intended uses. Raw correlations, however, do not indicate that states that are more generous to students are less generous to institutions (the simple correlation coefficient is 0.14). In fact, it appears that there are states that are generous to higher education on both dimensions and states that are not.

Figure 2 depicts state preferences for direct student aid versus institutional aid in 1996, controlling for per capita tax revenues.[13] Controlling for per capita tax revenues accounts for the fact that states that have more money will be able to spend more on both grants and institutional appropriations. The axes represent US averages. We see that New York, Michigan, Maryland and California exert a great deal of effort to fund both student financial aid and state appropriations to public higher education, while Wyoming, Nebraska, Delaware, Idaho, Utah and Montana fund neither very well. Some states do appear to prefer one form of aid to another. New Jersey, Minnesota, Pennsylvania and Illinois are above average funders of public higher education institutions, while Alaska, Hawaii, North Dakota and Mississippi are above average funders of aid to students.[14] Wealthier and larger states seem to support higher education on both fronts (northeast quadrant of figure) more greatly than the rural and poorer states (southwest quadrant). It is somewhat of a surprise that no clear regional disparities emerge when comparing state preferences for direct student aid versus in-kind institutional aid.

[13] The figure plots normalized residuals from a regression of grant aid on per capita tax revenues in 1996 against residuals from a regression of state appropriations on per capita tax revenues in 1996. These are institutional level regressions and each point on the graph represents enrollment weighted state averages for those states with multiple institutions.

[14] This table shows results for need based aid. Many states are now moving to merit-based aid programs (e.g. GA) and inclusion of this would alter this picture.

<<FIGURE 2 ABOUT HERE>>

During the 1990s, Arkansas, Florida, Georgia, Mississippi and New Mexico each introduced direct student financial aid programs that were based on student performance rather than student need. In some cases these grant aid awards came at the expense of their need-based aid programs. The largest program was Georgia's HOPE scholarship program which awarded $208M of Georgia's total grant aid support of $209M in academic year 1998. Florida and New Mexico's programs each comprised well over 50% of their states' total grant aid funding, while the programs in Mississippi and Arkansas were very small.

Tuition reciprocity agreements are agreements between a school or state and another state or consortium that allow a nonresident student from a neighboring state to attend the public institution at less than the normal out-of-state tuition. The magnitude of the discount may depend on the type of program in which a student is interested, the county in which a student resides, the availability of opportunities in the home state, whether the student is an undergraduate or graduate, whether the student attends part- or full-time and many other factors. While some schools negotiate agreements bilaterally with other states, many now choose to participate in consortium agreements in which a number of states in a geographical region are treated similarly under the agreement.

Tuition reciprocity agreements typically do <u>not</u> require that an institution accept a given number of students, or all students whose "quality" is above a specified level, from out-of-state. They only specify that if the out-of-state students are admitted that the tuition charged to them be below the normal out-of-state student rate. Given that the political process has approved the agreement, at the margin, institutions will only accept

students under a tuition reciprocity agreement if there is excess capacity at the institution for the programs in which the students are applying, or if the accepted students yield more in prestige to the university than accepting more in-state students would yield the institution and if rejecting the marginal in-state students will not cause political problems for the institution.[15]

Under these circumstances, the marginal revenue received by the public university from accepting out-of-state students enrolled under tuition reciprocity agreements is always at least equal to the marginal revenue the institution would have received if it had not enrolled these students. While the marginal revenue the institution receives from a student admitted under a tuition reciprocity agreement may be less than the institution would have received if it could have enrolled more out-of state-students paying its normal out of state tuition, the latter would not always be possible. Moreover, the state as a whole is better off with the tuition reciprocity agreement because of the opportunity that students from it also have to study in other states' public institutions. As we have indicated above, if the balance of students flowing between two states is not equal, often there are additional payments made directly to the coffers of the state that is receiving more students than it is sending.

In the spring of 2001, the Cornell Higher Education Research Institute conducted a "Survey of Tuition Reciprocity Agreements at Public Research and Doctoral Universities". The sample consisted of all 149 public institutions that were classified as Research or Doctoral institutions by the Carnegie Foundation in their 1994 classification

[15] Because of these conditions, sometimes the flagship institutions in a state opt out of the program. So for example, the University of California campuses are not part of the Western Interstate Commission on Higher Education (WICHE) undergraduate exchange consortium, but the California Maritime Academy at California State University is a participant.

scheme. Sixty-one of the 128 universities that responded to the survey said that they participated in a tuition reciprocity program with schools in another state, or as part of a consortium. Table 7 indicates that 39 of the 91 institutions in our sample, a slightly smaller percentage than found in our reciprocity survey sample, participated in such an arrangement.

<<TABLE 7 ABOUT HERE>>

Four consortia are represented among our survey responses: the Academic Common Market, the Midwest Student Exchange Program, the New England Regional Student Program and the Western Interstate Commission for Higher Education. Some institutions in the survey also participate in student exchange programs (e.g. the National Student Exchange, the Consortium of Universities in the Washington Metropolitan Area and the Tuition Exchange, Inc.). Student exchange programs differ from reciprocity agreements in that students participating in them are either visiting another school for a specified time period, or eligibility is limited to a narrowly defined group of students.[16]

While the number of schools participating in these agreements has not changed over our sample period, columns 4 and 5 suggest that students have been increasingly taking advantage of such programs. In addition, the schools that report reciprocal enrollments also enroll a larger share of nonresidents than the average school in our survey. In 1996 for example, an average of 23.9% of enrolled students were nonresidents in the 28 schools reporting reciprocal enrollments while an average of 19.6% of enrolled students were nonresidents in the entire sample.

[16] A brief description of each of the consortia and exchange programs and the institutions participating in each is found at http://www.ilr.cornell.edu/cheri, click on surveys and then click on tuition reciprocity.

Increasing nonresident enrollment shares under these programs does not translate into higher revenues for public higher education institutions given that these students often pay the in-state tuition level.[17] The final column of the table indicates that for these schools, nearly a quarter of their nonresident enrollments are covered under this plan. Returning to our example from earlier, a typical school would then forego about $720,000 in additional tuition revenues due to the presence of these agreements.[18]

IV. Estimation Strategy & Results

A) Model Specification

To achieve a fuller understanding of the causes and consequences of changing tuition and enrollments, we move to a multivariate analysis. We estimate a system of four simultaneously determined equations using panel data, with the institution - year as our unit of analysis, in which the logarithm of state need-based grant aid per student, the logarithm of in-state tuition, the logarithm of out-of-state tuition and the logarithm of the odds-ratio of the share of first time freshmen that are nonresidents are each specified to be functions of each other, a vector of exogenous variables and random uncorrelated (across equations) error terms.[19] Our model should be thought of as being only a "semi-

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[17] Recall from above that sometimes revenues flow from one state to another if the flow of students across the two states does not equalize. However, such revenues accrue to the state, not to the academic institution.

[18] Of course, it is unlikely that anyone would leave cash on the table. The long term cost savings from eliminating program duplication will very likely make up for the revenue losses. States might also gain politically from engaging in these agreements. States that send students likely save money because they do not have to establish and maintain costly programs. States and colleges that receive students can operate programs more efficiently because they gain quality students and if the supply of students is elastic, they might be able to fill spaces that otherwise would have been vacant. Students benefit by not having to pay out-of-state tuition, which may have prevented many of them from earning degrees in the fields they had chosen.

structural," rather than structural model, because the variables found on the right hand side of each equation likely capture both demand and supply factors and represent an equilibrium condition in the underlying structural model.

Appendix table 3 provides the reader a sense of from which side of the market each variable originates. The variables are grouped into six major categories: state demographic and institutional variables, variables reflecting the sources of both institutional and student financial aid (including federal financial aid program variables), variables reflecting institutional enrollment pressures, variables reflecting quality measures and the competitive position of the institutions, and the endogenous variables.[20]

The table shows the variables that are excluded and included in each equation.[21] A blank indicates that the variable is excluded from that equation. For included variables, a "D" indicates that the variable is assumed to influence the outcome through the demand side of the market, an "S" that it is assumed to influence the outcome through the supply side of the market, and a "B" that it is assumed to influence the outcome through both sides of the market. Similarly, a "+" indicates that we expect that the net effect of the variable is to increase the outcome, a "-" that we expect that the net effect of the variable is to decrease the outcome and a "?" that the prediction is ambiguous. Our preferred specification for each of the four equations of interest is described below.

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[19] The first variable, average state need-based aid per student is observed at the state, not institutional level.

[20] These categories are not mutually exclusive. Some variables might be considered to have an impact for multiple reasons. For example, institutions with larger per student endowments have greater financial capabilities ("institutional financial aid"), but larger endowments are also indicative of an institution's high "quality". Further, it is not unreasonable to think that enrollment pressure variables and school quality variables also capture an institution's competitive position to the same extent as well.

[21] There are obvious complications in estimating the system exactly as we have specified it here. The most glaring difficulty is our ability (or lack thereof) to properly identify the system of equations. We discuss the structural system here for expositional purposes and address the empirical relevance in detail in the next section.

The state need-based grant aid equation is assumed to result from the interaction of students' demand for financial aid and the state's willingness to supply it. The in-state tuition equation is assumed to result from the interaction of in-state students' demand for seats at the institution and the institution's willingness to supply such seats. The institution's willingness to supply seats can be thought of as being derived from a utility maximizing model of university behavior in which the objective of the university is to maximize its prestige, which in turn depends upon the average quality of the students that it enrolls, subject to a balanced budget constraint (Ehrenberg and Sherman 1984, Ehrenberg 2000, Garvin 1980, Winston 1999). A public university's behavior may also be constrained by its state government, which may have different objectives than the university does. For example, while the university may want to maximize student quality, the political process may want to keep in-state tuition as low as possible (Groen and White 2001). The out-of-state tuition and the share of nonresident students enrolled at an institution are similarly assumed to result from the interaction of out-of-state students' demand for seats at the institution and the institution's willingness to supply such seats, the latter constrained by the political process in the state.

The grant aid equation includes variables that relate to federal, other state and institutional sources of student financial aid. Federal loan and grant program variables included in the model are the size of the maximum Pell grant (PELL), the percent cap on costs (CAP) and categorical variables that indicate the degree the degree of access that students have to subsidized federal loans (1979, 1992).[22] The presence of state merit aid

[22] The percent cap is a percentage of college costs that students were eligible to receive in Pell grants. The cap was removed in 1992, so that students at low-tuition institutions that were eligible for the maximum Pell grant could use any funds in excess of tuition costs to pay for living and other expenses. In 1981, student access to subsidized loans was dramatically reduced with the repeal of the Middle Income Student

programs (MERIT) both reduces student demand for need based aid and the state's pool of available resources from which it might fund need-based aid programs. Variables that relate to institutional sources of aid are the logarithm of real state appropriations per student (APP), the logarithm of real endowment per student (END) and the logarithm of in-state tuition (TUITI) – each of these variables generates income that the institution can use, in principle, for scholarship aid. State demographic and institutional structure variables that are included in this equation (to capture a state's financial capacity to provide need based student aid) are its real tax revenues per capita (TAX), its unemployment rate (UNEMP), the share of households with incomes below that necessary to be eligible for a Pell (ELIG), and the share of its population that is college-aged (AGE). Also included is the degree of political autonomy of each school, as measured by the number of governing boards in the state (GOV).[23]

To control for the impact of enrollment pressure on grant aid, we include a measure of state seating capacity (SEAT), calculated as the ratio of a state's predicted enrollment in its public higher education institutions to its actual enrollment in these institutions in a year.[24] Additional measures of enrollment pressures that are included are

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Assistance Act (MISAA) after a run-up in usage from its inception in 1978. Access was expanded again in 1992 with the removal of a portion of housing assets in the expected family contribution formula.

[23] Lowry (2001a, 2001a) hypothesized that the greater the number of different independent governing boards in a state, the more decentralized state governance of higher education was and thus the less that political pressure from the state could be used to keep tuition levels down. He found evidence that this relationship held. It is not clear, however, whether state aid per student will be higher or lower in states with more political autonomy for their higher education institutions.

[24] Predicted enrollments are calculated by dividing a state's full-time equivalent public 4 year enrollment in 1970 by the size of the college-age population in the state in 1970 (ages 18-24) and then multiplying this ratio by a weighted cohort size in each year of our study. If both the share of students going to publics and college enrollment rates in a state remained constant over time, then the weight used to calculate predicted enrollments in year t would simply be the size of the college age population in year t. Between 1970-1998, the share of students attending publics was stable (between 75-80%), but enrollment rates increased

the ratio of graduate enrollments to undergraduate enrollments in the state (GRAD), the share of new students in the state enrolled in private colleges (PRIV) and in two-year colleges (TWO) and the logarithm of real average tuition in the region excluding the state in which the institution is located (TUITR).[25] Also included are measures of overall quality in the state, as measured by the weighted average Barron's rating of public (BPUB) and private (BPRIV) institutions in the state.

Our in-state tuition equation is similarly specified. However, real state tax revenues per capita are excluded from this equation because the impact of state resources on tuition is captured by the inclusion of real state appropriations per student (APP). The latter is treated as exogenous in our model.[26] In addition, we include institutional measures of school quality - categorical variables that indicate the Barron's rank of each institution as well as the level of per student grant aid (the dependent variable in the previous equation) – where higher levels would be expected to allow institutions to raise tuition.[27]

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nationwide from 28.8% to 42%. To account for the enrollment rate expansion, we allow the population weight to grow as the enrollment rate grows in each year. We would prefer to have used the ratio of seats available in public colleges to the number of its high school graduates as a capacity measure, but did not do so because of endogeneity concerns. Nonetheless, estimates that exlcuded this variable from the analysis were very similar to those that included it. Since this suggests that the endogeneity of capacity is not driving our results, this variable is included in all of the estimates that follow.

[25] The grant aid per student equation is estimated using state level data. As such all institutional level variables, including real state appropriations per student, are excluded from this equation.

[26] As noted above, Lowry (2001a, 2001a) found that it was permissible to treat state appropriations per student as exogenous in the in-state tuition equation.

[27] For roughly three decades, Barron's Profiles of American Colleges has assigned categorical rankings to 4-year institutions according to a subjective measure of quality. From best to worst, they rank institutions as *most competitive, highly competitive, very competitive, competitive, less competitive and non-competitive.* We created a categorical variable HIGHB for those institutions in the top two categories as well as LOWB for those in the bottom two. The coefficients on these variables are then relative to the omitted middle categories.

More generous student financial aid packages (e.g. federal financial aid programs) make it easier for a school to increase tuition for at least two reasons. First, federal financial aid may reduce barriers to entry for students at the margin of attending college. Second, institutions can increase tuition and for those students not at the grant or loan limits, each dollar of tuition increase will be covered by an additional dollar of aid, up until some maximum. Further, the availability of merit aid will increase the desirability of attending college for all students, putting upward pressure on tuition. Institutional sources of aid have a less obvious impact on tuition. While increased state appropriations per student may allow schools to keep tuition low, this increase in in-kind student aid may result in an increase in demand, forcing tuition upward. Larger endowments per student generate more income for an institution, but more importantly reflect higher institutional quality and permit higher tuition levels. Similarly, higher institutional quality in absolute (as measured by the Barron's ranking) and relative terms (as measured by the ranking of other schools in the state) measures as well as strong enrollment pressure allow institutions to charge high tuition levels.

The logarithm of real out-of-state tuition (TUITO) is specified to be a function of the logarithm of real in-state tuition (TUITI) and most of the variables included in the in-state tuition equation. Again real state tax revenue per capita is excluded from the equation. A notable difference is that we replace the institution's Barron's rankings with measures of the shares of students in the state enrolled at other public (BSPUB) or private (BSPRIV) institutions in the state that are of equal or better Barron's rankings than the institution. These variables capture the institution's monopoly power within the state for students seeking to attend institutions of its quality or higher. Similarly, we include the

share of students in the region enrolled in schools of equal or better quality that are enrolled in private schools (SPRIV); the greater this share is the higher the average tuition will be at institutions perceived as good alternatives to the institution. The logarithm of the share of first time freshmen that are nonresidents (NON) is included to capture the financial benefits to the institution from increasing out-of-state enrollments. Finally, we include the logarithm of the share of undergraduates that are enrolled under reciprocity agreements (RECIP), whose *a priori* impact on nonresident tuition is unclear.

The final equation is the nonresident enrollment share equation. The dependent variable is specified as the logarithm of the odds-ratio of the share of first-time freshmen that are nonresidents to allow the error term to be normally distributed. This equation is specified very similarly to the out-of-state tuition equation, with the logarithm of real out-of-state tuition (TUITO) included as an explanatory variable. We also include the logarithm of the mean SAT scores in the state in which the institution is located (SAT) to see if states with a low supply of high "quality" high school graduates seek to recruit out-of-state students to attract top talent.[28]

Starting with the Georgia HOPE program, which was established in 1993, a number of states have recently adopted merit-based grant aid programs for students who attend college within state. These programs increase the incentive that students from those states have to attend college within state.[29] During our sample period, only Georgia, Arkansas, Florida, New Mexico and Mississippi instituted such programs (between 1994 and 1998), but seven more did so by 2002. Such programs should serve to increase the demand for in-state students to attend public institutions in the state, which

[28] Groen and White (2001) discuss this issue in detail.

[29] Dynarski –this volume

may limit the public institution's ability to expand, or even maintain, its nonresident enrollment share. We include year/state interaction terms for those years in which an institution was in a state that had adopted one of these programs in the nonresident enrollment share equation to test if these programs do in fact reduce nonresident enrollment shares.[30]

We present two types of estimates for each equation. First, to understand why tuition, grant aid and nonresident enrollment vary across states and institutions at a point in time, we present pooled cross-section time-series estimates, using institutional level data for 8 years between 1979 and 1998. Year dichotomous variables are included in these models to control for idiosyncratic time effects.

While the wide variation in the cross-section data makes this approach appealing, it is subject to possible omitted variables bias. For example, institutions located in beautiful areas, other factors held constant, may be able to charge higher tuitions. In this example, omission of "beauty" as an explanatory variable might bias the estimates of other explanatory variables' parameters effects on tuition if these variables are correlated with "beauty." We have attempted to minimize this problem by including a carefully constructed, rich set of explanatory variables in our models.

An alternative way of controlling for omitted variables is to take advantage of the panel nature of the data and employ a fixed effects estimation strategy. The panel data results are useful in understanding how *changes* in explanatory variables affect *changes* in the dependent variables. In addition, the panel data results will be employed to

[30] For example, we include a dummy variable that takes on the value of 1 for Georgia institutions in our sample for 1994, 1996 and 1998, and is zero otherwise.

simulate how changes in key explanatory variables will affect changes in the outcomes of interest to us.

Inasmuch as these four outcomes are determined simultaneously, we would prefer to estimate a jointly determined system of four equations using two-stage least squares (2SLS) to control for the endogeneity of these outcomes.[31] However, the success of this procedure is highly dependent on finding appropriate "instruments" for the endogenous variables in the system.[32] Determining a suitable vector of restrictions has proven to be a challenging endeavor and to avoid debate over the restrictions we have chosen we report below estimates from the reduced form model for our system.

The reduced form is found by solving for the endogenous variables in the system. What one is left with is a system of four outcome equations, with each outcome being a function of purely exogenous variables. Without agreement on acceptable exclusion restrictions, we are unable to recover the underlying structural parameters from estimates of the reduced form model. However, the only real cost of using this procedure is that we are unable to make direct assessments of the impacts that changes in each of the outcomes explicitly has on the other outcomes in the system.

[31] 2SLS estimation is necessary to attempt to correct for the biases that result from the violation of the orthogonality conditions necessary for OLS to be unbiased, though the signs of the potential biases here are ambiguous.

[32] We tried to instrument using the following: In the grant aid equation, we instrument for in-state tuition using the institution's Barron's ranking because the quality of an institution's students likely affects tuition, but not a state's willingness to disperse financial aid to all students in the state. In the in-state tuition equation, we instrument for grant aid with state tax revenues per capita and the weighted ranking of public schools in the state. In the out-of-state tuition equation, we instrument for in-state tuition with state private enrollment share, state two year enrollment share, weighted ranking of private schools in the state, state tax revenues per capita and weighted rank of public schools in the state. Nonresident enrollment shares are instrumented with average SAT scores of high school seniors in the state. In the nonresident enrollment share equation, out-of-state tuition is instrumented with state private enrollment share, state two-year enrollment share, weighted ranking of private schools in the state, state tax revenues per capita and weighted rank of public schools in the state.

We should caution that without a properly specified structural model, one cannot be sure that the estimated associations in our data are causal. However, we believe that our results are of interest and provide a guide to how a public university and prospective students react to state actions and other changes in environmental variables. Those estimates and those we tried using a variety of different sets of instruments proved to be very similar to the estimates of the reduced form system that follows. Appendix tables 4A and 4B present the 2SLS "structural" results for readers that are interested in these findings.[33]

B) Econometric Estimates: Cross – Section Findings

The odd numbered columns of table 8 present the estimated coefficients from the cross-section equations. We have suppressed the standard error reporting to make the tables more readable. Variables that are **bolded** and with an asterisk(*) are significant at the 95% confidence level. Turning first to the average state need-based grant aid per student equation (column (i)), it appears that differences across states in the level of per student grant aid awards are best explained by differences in demographic characteristics, enrollment pressures and overall institutional quality in the states.[34]

<<TABLE 8A ABOUT HERE>>

[33] Though finding suitable exclusion restrictions is a challenging endeavor for this system of equations, the estimates in appendix tables 4 have proven to be robust to a variety of specification changes. The key exclusion restrictions that are necessary to identify the model are real state tax revenue per capita in the in state and out-of-state tuition equations and average SAT scores of high school students in the state in the nonresident enrollment share equation. Many of the other exclusions are made to reduce multicollinearity. We suspect that the insensitivity of the 2SLS estimates and their similarity to reduced form estimates is due to the instruments being either "too weak" or "too strong". By the former, we mean that there is not enough exogenous variation to produce a change in the outcome in question (with a corresponding large asymptotic variance matrix of the 2SLS estimator). By the latter, we mean that the instruments may also be correlated with the underlying model's disturbance term.

[34] All of the results discussed in the paper are *ceteris paribus,* or other variables in the model held constant, findings.

With respect to demographic characteristics, wealthier states, as measured by per capita tax revenues (TAX), award more grant aid per student, but states in which a larger share of the population is of college-aged (AGE) award less aid per student. Further, states in which labor markets are loose award more grant aid per student. However, institutional autonomy (GOV) does not seem to be correlated with state grant aid generosity.

The entire vector of enrollment and state quality variables are strongly related to grant aid awards. Undergraduates in states with less competition for funds with more costly graduate students (GRAD) receive more grant aid. In addition, when private and community college enrollments (PRIV, TWO) are large relative to public four-year college enrollments, grant aid awards are larger – presumably due to the privates subsidizing their own students and the large in-kind subsidy provided by the low-cost (and hence low state appropriations) community colleges.[35] Further, the average (excluding in-state) tuition in the region (TUITR) that the state is located in seems to be positively correlated with the level of grant aid that is awarded. Curiously, states with greater available seating capacity in their public institutions – i.e. their predicted enrollments exceed what they actually enroll in a given year (SEAT) - award less grant aid per student, contrary to our a prior expectation. As expected, states with higher quality public (BPUB) and private (BPRIV) academic institutions, and thus likely higher costs, offer more grant aid.

[35] However, this result may be picking up higher order moments of the state income distribution as the share of two-year students from lower-income families is far greater than that for 4 year students. Therefore, states with comparatively large two-year enrollments may have wider and lower income distributions than others.

Do other sources of student financial aid affect state need-based grant aid awards? One might expect that growing state affinities for non-need based aid programs would crowd out spending on need-based grant aid to students. The preliminary evidence varies by state. While it is not surprising to see that Georgia, Mississippi and Florida have coupled increasing merit based aid generosity with decreasing need based aid support, it is surprising to see that Arkansas and New Mexico have responded by increasing their need based aid generosity, ceteris parabis. However, as hinted at by figure 2, it appears that states prefer one-type of aid to another. It appears that states awarding larger in-kind awards (state appropriation per student to 4-year institutions - APP) award significantly less grant aid per student than states where appropriations are lower.

Moving to the in-state tuition equation (column (iii)), we find that sources of institutional aid and enrollment pressures go a long way in explaining differences across institutions in in-state tuition levels. Schools that receive higher state appropriations per student (APP) charge lower tuition, though the elasticity is far from unity. Taken together, the impacts of having a strong Barron's ranking (HIGHB) and having higher endowment per student (END) suggest that higher quality schools are able to charge more for their product.

Once again, the entire enrollment pressure vector is significant in explaining cross-institution variation in in-state tuition levels. When private competition in a state is important, as measured by the share of first-time freshmen in the state that are enrolled in private academic institutions (PRIV), public universities are able to charge higher tuition, as do institutions in states in which a smaller share of students attend two-year colleges (TWO). A striking result is that the cross-section evidence suggests that in-state

undergraduate students are partially subsidizing the huge costs of graduate education at these research universities. Across institutions, the higher is the ratio of graduate to undergraduate students (GRAD), the higher is the in-state undergraduate tuition. However, this finding might merely reflect that universities with larger shares of their students enrolled as graduate students may be higher quality institutions, which attract better faculty and thus can charge higher tuition levels to its residents. Not surprising, however, is that institutions with more seating capacity (SEAT) tend to charge a lower price for their product and that higher regional tuition (TUITR) allows institutions to charge a higher price.

There is little evidence that differences in student financial aid affect in-state tuition levels and mixed evidence on state demographic and institutional factors. Public universities in states in which the unemployment rate (UNEMP) is high and hence the opportunity cost of enrolling in school is low, charge higher in-state tuition, Unlike Lowry (2001b), we find no evidence that public universities in states with more autonomous governance structures (GOV) charge higher tuition.

<<TABLE 8B ABOUT HERE>>

Column (v) in part B of the table displays the results for the nonresident tuition equation. Contrary to our results for in-state tuition, we do not find that non-resident undergraduates are subsidizing graduate education. Also, given that nonresident enrollments can be viewed to either enhance revenues or school quality, it is not surprising that institutional aid and school quality variables primarily drive the out-of-state tuition results.

Institutions receiving higher state appropriations per student (APP) charge less to nonresidents, though the elasticity is small and institutions with larger endowments per student (END) charge a higher price to nonresidents. Further, schools charge nonresidents more in states in which the average quality of privates (BPRIV) and publics (BPUB) are higher. As alluded to above, these quality measures are closely related to the broader concept of competitive position. In the case of nonresident tuition, regional competition clearly also matters, as schools located in regions in which a large share of students attend private schools (SPRIV) are able to charge more to out-of-state residents. Similarly, when the average tuition in the geographical region is higher (TUITR), schools also charge more to nonresidents.

While demographic characteristics in the state affect nonresident tuition the same way they affect in-state tuition, unlike in the in-state tuition equation, evidence of the impact of merit aid programs (MERIT) on tuition is not mixed. These programs seem to have had a negative effect on nonresident tuition levels – likely deriving from the fact that the increasing prevalence of merit-based aid programs provides an incentive for students to remain in-state who otherwise would have attended more costly out of state or private institutions.

Column (vii) presents the nonresident enrollment share equation. Taken as a whole, the entire vector of variables aside from the sources of student financial aid are strong predictors (across-institutions) of nonresident enrollment share differences. The results seem to indicate that nonresident students are used both for the purposes of generating revenues and to augment institutional quality. Turning to the institutional aid variables, we see that states providing higher state appropriations per student (APP) tend

to enroll fewer nonresidents. While one might expect nonresidents to prefer to attend institutions that receive more state support per student, sometimes state support per student is endogenous in the sense that institutions may receive greater state appropriations per student for each in-state student they enroll. Further, institutions that receive high levels of state support may not need to turn to nonresidents to generate needed revenues. We also find that schools with larger endowments per student (END) attract more nonresidents – further suggesting that this variable be included in the "quality" vector.

Flagship public institutions face political pressure to ensure access to the children of state residents. We do not find however that when seating capacity at all public institutions in a state is low (SEAT), that public institutions enroll smaller fractions of nonresidents. In fact, we find that institutions with a shortage of capacity enroll the largest nonresident enrollment shares.[36] Again, this might be a result of the higher quality institutions being the ones with less excess capacity than lesser institutions. Another enrollment result that is somewhat surprising is that institutions that enroll a larger share of their undergraduates under tuition reciprocity agreements (RECIP) tend to enroll a smaller share of nonresidents than other institutions.

We do find that schools located in states where high school student quality is relatively poor (SAT) enroll a larger share of nonresidents – they need to look elsewhere to find high quality students. Another variable relating to institutional quality is the institution's share of enrollments in a state at schools of equal or higher quality. Other

[36] Due to concerns that the enrollment constraints at the University of California may be heavily influencing our results, we reestimated all of our equations without these schools. These results were very similar (with larger standard errors) to those presented in the text.

variables held constant, institutions whose enrollment is large relative to the total of all public enrollments (BSPUB) or all private enrollments (BSPRIV) at institutions of equal or greater quality in the state have larger shares of nonresident enrollments.[37] It is also not surprising to see that institutions located in states where the average quality of public institutions is high (BPUB) tend to enroll more nonresidents and those in which average private school quality (BPRIV) is high enroll fewer nonresidents. Given the tuition premium paid by nonresidents at public institutions, the cost-per-quality unit of attending private schools in the state may be comparable to that for attending out-of-state publics.

Turning last to the demographic characteristics, the effect of unemployment rates and the proportion of households that are Pell eligible are as expected. Contrary to our expectations, we find that once we control for other factors, schools in states with more governing boards (GOV), hence more autonomous institutions, enroll smaller shares of nonresidents. Further, the institutions located in states with larger college aged population shares (AGE) enroll more nonresidents.

C) Econometric Estimates – Panel Data Results

The even numbered columns of Table 8 present our fixed effects estimates. Because these parameters are estimated from within institution changes over time, they are useful for understanding the potential impacts of policy changes. One might expect that because most of the variation in our data occurs across institutions, fewer statistically significant coefficients would arise, but this is not what we observe. Our discussion

[37] For example, for the public schools, we simply take the ratio of full-time equivalent first time freshmen enrollments in the school under observation and divide it by the total number of full-time equivalent first time freshmen students in public institutions in the state that have at least as high a Barron's ranking as the school under observation.

focuses on results that significantly differ from those found in the cross section and we make some brief comments on those that do not, but which are noteworthy nonetheless.[38]

Turning first to the state need based grant aid equation (column (ii)), we find that changes in sources of student financial aid are the primary determinants of changes in state student need-based grant aid. As students have more access to federal grants (PELL, CAP) and loans (19xx), states respond by awarding more grant aid. Three other results stand out. First, we find that, controlling for other factors, increases in state appropriations per student (APP) lead to states awarding more grant aid – indicating that in-kind aid and direct student aid are perhaps complementary. Second, the impact of enrollment pressures within states is very different than the impact across states. Most notably, we find that as the seating capacity in a state increases (SEAT), states respond by awarding more need-based grant aid per student. Third, we find that state grant aid responds to changes in the income distribution of a state's population. An increase in the share of households whose incomes fall below the maximum level that permits them to be eligible for Pell grants (ELIG), leads to higher levels of state needs based grant aid per student. Note too that changes in institutional quality in the state are not good predictors of grant aid changes. In fact, since quality measures are unlikely to vary within institutions much over time, we do not expect to find statistical significance in many of these variables in any of the equations. As a result, we will ignore these variables in the discussion that follows.

Turning next to the in-state tuition equation (column (iv)), while in the cross-section institutional aid and enrollment factors were largely responsible for explaining

[38] If a so-called "fixed effect" result differs from a cross-sectional estimate, it is likely because the cross-sectional equations did not properly control for time-invariant, institutional (or state) specific information that was also *correlated* with the other explanatory variables in the model.

cross-institutional differences, these results indicate that changes in the availability of student financial aid are also very important, In addition, the impact of enrollment pressures and demographic changes are felt somewhat differently.

We find that increased state appropriations per student (AID) are still associated with lower in-state tuition changes, but neither increases in endowment per student (END) nor changes in the share of students that are graduate students (GRAD) are statistically significantly associated with changes in in-state tuition in the panel. What may be of concern to policy-makers is that it appears that institutions are attempting to capture the additional revenues that have been generated by federal financial aid programs. We find that an increase in the generosity of the Pell grant (PELL) by 10% leads institutions to raise in-state tuition levels by 4.8%. We also find that tuition has also significantly increased as students have had more access students to federal subsidized loans (19xx). The implementation of state merit aid programs has produced mixed results, with tuition rising in the Arkansas institutions and falling in the Florida schools.

Two additional results are of interest. Unlike in the cross-section, as the share of the population that is college-aged (AGE) increases, in-state tuition levels fall but increases in seating capacity result in tuition increases. The latter result is difficult to explain and may reflect reverse causality in the data, despite our best efforts to control for this potential occurrence.

The nonresident tuition equation results in the panel (column (vi)) are very similar to the cross-section results, with the most notable difference being that changes in nonresident tuition are largely explained by changes in state demographic characteristics.

As tax revenues, unemployment rates and the share of households with low incomes increase within a state, we find that nonresident tuition will increase. As the college-aged population increases in its size relative to the remainder of the population, we find that nonresident tuition will decrease. While we saw that institutions responded to federal grant aid increases by increasing in-state tuition, we do not see the same occurring with nonresident tuition. However, it appears that as students have more access to federal subsidized loans, institutions in-turn respond by increasing nonresident tuition. An interesting difference from the cross-section results is that as average SAT scores improve within a state, institutions will have less pressure to pursue nonresident enrollment strategies to improve quality, and we find this manifestation through nonresident tuition increases. Last, just as in the in-state tuition equation, and similarly puzzling, we find that as seating capacity increases at an institution, it responds by increasing nonresident tuition.

Finally, turning to the nonresident enrollment share equation (column (viii)), we see that the fixed effects results are starkly different than the cross-sectional results. No longer do institutional aid factors matter. This may be due to the finding that as state tax revenues increase (and hence the pool of funds available for institutional and student aid), nonresident enrollment shares decrease within an institution.

While sources of student financial aid were not able to explain cross-sectional differences in nonresident enrollments, taken as a whole seem to do a better job of explaining within institution changes. We find that as the cap on costs covered by the Pell grant increases (CAP), more nonresidents would attend an institution, but surprisingly, as access to subsidized loans expands, fewer nonresidents would attend.

The presence of merit aid programs in Florida and Georgia have led institutions in each state to enroll far fewer nonresidents than they had before these programs were instituted.[39]

As a whole, while changes in enrollment pressure are not able to explain changes in nonresident enrollment shares. However we find that nonresident enrollment shares increase as regional tuition levels (TUITR) increase. Last as more of the quality slots in institutions in a region are in private schools (SPRIV), the share of nonresidents at the publics falls. Taken as a whole, these results indicate that nonresident student demand is primarily responsible for explaining within institution changes in nonresident enrollment shares over time.

Before turning to some simple policy simulations in the next section, we address several important issues. First, inasmuch as we are estimating a reduced form system, it is natural to run specifications with and without certain variables that might be problematic (e.g. seating capacity, state appropriations per student, state need based grant aid per student) to see how sensitive our other results are to those variables' inclusion or omission. Our estimates of the system when we exclude/include different permutations of the above three variables proved to be remarkably similar to the results described above. Second, it would be interesting to determine the impact that per student need-based grant aid awards have on tuition and enrollments. Since grant aid is a state-level, rather than an institutional-level variable, one can argue that it is reasonable to treat as exogenous to the institution and include it as an explanatory variable in the other equations. We have done this and the results are reported in appendix tables 5A and 5B.

[39] An unstated goal of each of these programs was to keep high quality residents from attending universities out-of-state. This evidence suggests that this may have indeed occurred.

When per student grant aid is included as an explanatory variable, the estimated effects of the other variables in the model are qualitatively (and in most cases quantitatively) similar to the results presented in Tables 8A and 8B. What is interesting is that we find an impact of state need-based grant aid per student on tuition and enrollment only in the cross-section. That is, institutions located in states that award more need-based student aid are those that charge the highest in-state and nonresident tuition, ceteris parabis, and are also the institutions that enroll the smallest share of nonresidents. However, *changes* in state need-based grant aid do not affect *changes* in in-state and nonresident tuition and nonresident enrollment.

D) Policy Simulations

Table 9 outlines the effects that selected policy changes have on the four outcomes, using the panel data estimates presented in Table 8.[40] The discussion below focuses only on those factors that are likely to vary substantially between years. Inspection of the grant aid results indicates that changes in grant aid are a result of a variety of factors in a state, not solely the result of economic factors. If a state at the average per student grant aid level experienced an increase of $1,000 in per capita tax revenues, that state would only increase per student grant aid by $12 over an average of $307. It appears that there are some spillover effects of increasing institutional and other student sources of financial aid. When the Pell grant max is increased by $100, we see states respond by increasing per student need-based grant aid by $14 and when states

[40] The table reports marginal effects from the presented regressions evaluated at the sample means in the data. When we calculated the marginal effects for individual institutions and then took their means, the impacts were nearly identical.

increase state appropriations per student by $1,000, they also increase support for students by $15.

<<TABLE 9 ABOUT HERE>>

Increases in state support for higher education institutions helps to curb in-state tuition increases but the magnitude of this effect is quite small. For the average institution in our sample, it would take an increase of $1,000 in state appropriations per student to generate an in-state tuition reduction of only $60. The comparable reduction in out-of-state tuition would be larger, about $222. The small estimated elasticities of some of the other variables is misleading. For example, while the elasticity of in-state tuition with respect to the Pell grant is only .48, this translates into institutions raising in-state tuition by $58 every time the Pell grant maximum increases by $100 (while the magnitude of the effect is similar for nonresident tuition, the effect is not statistically significant). This result is particularly alarming when one considers that a majority of students receiving the Pell do not receive the maximum award (and thus will experience a larger price increase than those at the margin) and that the Pell grant program annually exceeds its program allocation from Congress.

Finally, our estimates suggest that most things within institutional or state control would fail to influence the share of nonresidents that public universities enroll. Even the statistical impact of reciprocity agreements is inconsequential. While increases in average tuition rates in the region tend to increase nonresident enrollment shares, clearly individual institutions have little or no control over these rates. About the only tool a state seems to have at its disposal (according to this model) to reduce the dependence on nonresidents is to raise tax revenues. Our estimates suggest that raising per capita tax

revenues by $1,000 will result in the nonresident enrollment share falling by 1.2 percentage points – which would probably not be viewed favorably by state taxpayers.

V. Conclusion

In this chapter, we have analyzed why state need based grant aid per student, in-state and out-of-state tuition levels and nonresident enrollment shares differ across flagship public research universities at a point in time and how each changes over time. There are wide disparities across states in political persuasion, demographic characteristics, income, the availability of private college alternatives, historical factors, university governance and funding priorities that lead to most of the cross-section differences that we observe in these outcomes. Exploiting the panel nature of the data enables us to control for unmeasured institutional heterogeneity, and allows a look within specific institutions to determine which factors are most important in determining changes in these outcomes.

This paper was largely motivated by our interest in understanding why flagship publics make such varying use of nonresident enrollments. As such, the major insight that we draw is that these public institutions do not appear to use nonresident enrollments to supplement or replace revenues (as is the *a priori* belief of many observers), rather it appears that they enroll nonresidents to improve institutional quality, or to serve other interests. This assessment can be reached after considering three major findings in this paper.

First, the flagship institutions appear to use nonresident enrollments to take advantage of cost efficiencies achieved through participation in tuition reciprocity

agreements. Though the empirical evidence we present on the matter is scant, the increased usage of tuition reciprocity programs (as observed in our survey) suggests that institutions realize the revenue limitation in expanding nonresident enrollments. Further, these agreements also reflect the growing regionalization of these state schools. In fact, we find that institutions respond to higher regional tuition by charging high in-state and out-of-state tuition and we see that nonresident students tend to migrate more often when average tuition in their region of residence is higher.

Second, it does appear that institutions attempt to capture additional revenues by cannibalizing the monies provided by federal and state grant aid programs. Consistent with the Bennett Hypothesis, we find substantial evidence that increases in the generosity of the federal Pell grant program, access to subsidized loans and state need-based grant aid awards lead to increases in in-state tuition levels. However, we find no evidence that nonresident tuition is increased as a result of these programs. This observation suggests that institutions look to nonresident enrollments not as a revenue source, but rather as a quality source. In fact, our nonresident tuition results provide more support for this theory by showing that institutions decrease nonresident tuition substantially when the quality of the high school graduates in their own state falls ($200 for every fall in average SAT scores by 10 points). Further, there is little evidence that institutions in states where merit based aid programs were initiated have made attempts to capture these additional monies in the form of higher tuition (with the exception of Arkansas). However, recent research suggests that institutions in other states attempt to capture rents through increases in other fees and charges.[41]

[41] Long (forthcoming).

Third, while differences in state appropriations per student can partially explain cross-sectional differences in the use of nonresident enrollments, it does not appear that public institutions make up for losses in state institutional appropriations by adjusting the proportion of students they enroll from out of state. As expected, we find that institutions respond to state appropriations slowdowns by increasing both in-state and nonresident tuition. The lack of response to changes in state appropriations in the nonresident enrollment share suggests that the top flagships may have already reached an equilibrium with regard to nonresident enrollments.

It should also be recognized that institutional and overall measures of state education quality and competitive position are very strong predictors of cross-sectional differences in tuition and enrollment. Clearly, these factors do not vary rapidly within institutions or states over time, so it is not surprising that we are unable to parse out any statistically significant relationship between these factors and the tuition and enrollment outcomes. This should not be taken to diminish the importance of these factors.

We must caution that the period our data span ends before the recession of the early years of the 21st century, the accompanying growing tightness in state government budgets and thus the decline in the growth, and in some cases the decline in the level, of real state appropriations per student to public higher education institutions. Finding other sources of revenue became increasingly important to public higher education institutions and a number increased their in state tuition levels at double digit rates for the 2002-2003 academic year. Time will tell if they will increasingly turn to out-of state students' tuition revenues to fill the holes in their budgets.

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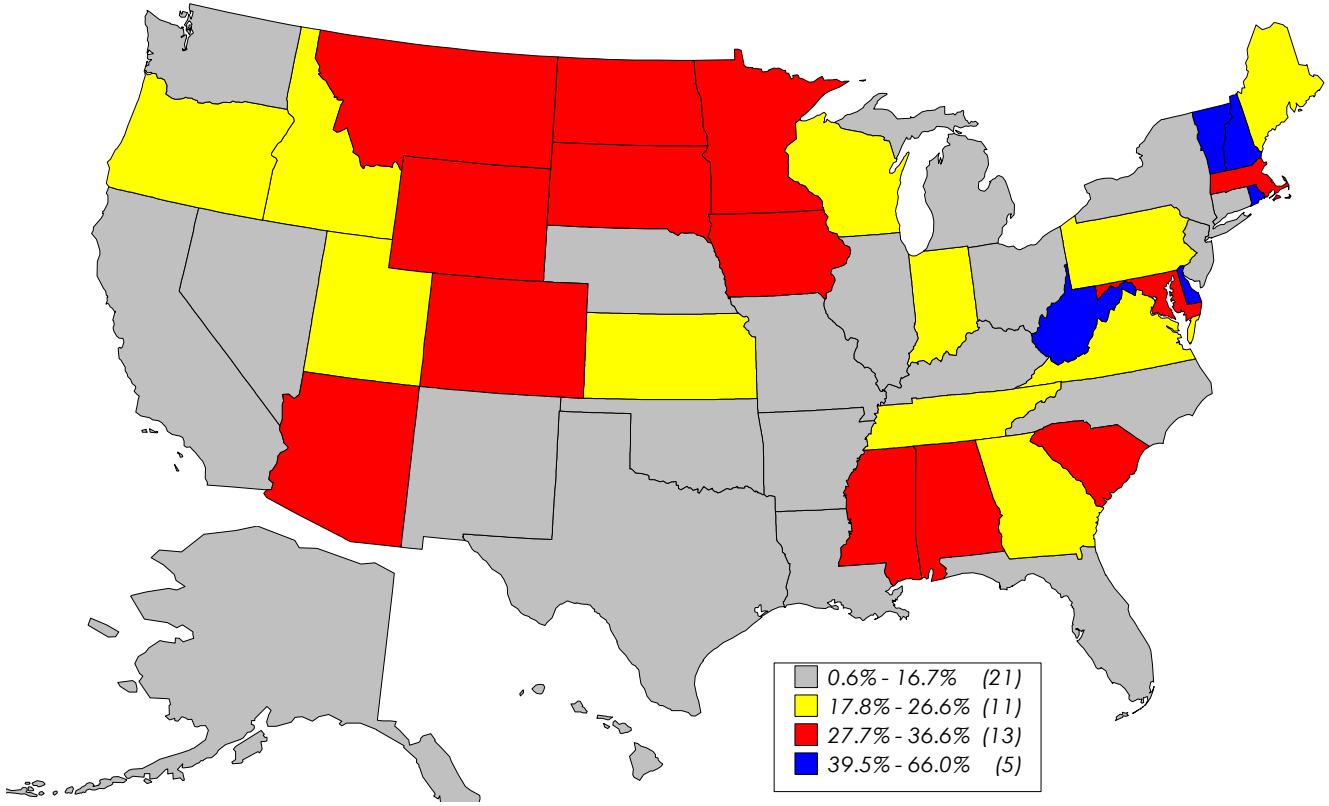
Figure 1
1998 Average Share of First Time Freshmen that are Nonresidents at Research Institutions in the 50 United States
(categories computed through means clustering analysis)



Sources: Integrated Postsecondary Education Data System Residence and Migration Files

Table 1
Flagship Public Research Institutions in the Sample

School	1994 Carnegie Classification	School	1994 Carnegie Classification
Arizona State University (AZ)	RI	University of Hawaii at Manoa (HI)	RI
Auburn University (AL)	RII	University of Houston (TX)	RII
Clemson University (SC)	RII	University of Idaho (ID)	RII
Colorado State University (CO)	RI	University of Illinois at Chicago (IL)	RI
Florida State University (FL)	RI	University of Illinois at Urb.-Champaign (IL)	RI
Georgia Institute of Technology (GA)	RI	University of Iowa (IA)	RI
Indiana University at Bloomington (IN)	RI	University of Kansas (KS)	RI
Iowa State University (IA)	RI	University of Kentucky (KY)	RI
Kansas State University (KS)	RII	University of Louisville (KY)	RII
Kent State University (OH)	RII	University of Maine (ME)	DII
Louisiana State University (LA)	RI	University of Maryland - College Park (MD)	RI
Michigan State University (MI)	RI	University of Massachusetts - Amherst (MA)	RI
Mississippi State University (MS)	RII	University of Michigan (MI)	RI
New Mexico State University (NM)	RI	University of Minnesota - Twin Cities (MN)	RI
North Carolina State University (NC)	RI	University of Mississippi (MS)	RII
Ohio State University (OH)	RI	University of Missouri, Columbia (MO)	RI
Ohio University (OH)	RII	University of Montana (MT)	DII
Oklahoma State University (OK)	RII	University of Nebraska at Lincoln (NE)	RI
Oregon State University (OR)	RI	University of Nevada-Reno (NV)	DII
Pennsylvania State University (PA)	RI	University of New Hampshire (NH)	DII
Purdue University (IN)	RI	University of New Mexico (NM)	RI
Rutgers University - New Brunswick (NJ)	RI	University of North Carolina - Chapel Hill (NC)	RI
Southern Illinois Univ-Carbondale (IL)	RII	University of North Dakota (ND)	DII
SUNY at Albany (NY)	RII	University of Oklahoma, Norman Campus (OK)	RII
SUNY at Buffalo (NY)	RII	University of Oregon (OR)	RII
Temple University (PA)	RI	University of Pittsburgh (PA)	RI
Texas A&M University (TX)	RI	University of Rhode Island (RI)	RII
Texas Tech University (TX)	RII	University of South Carolina at Columbia (SC)	RII
University of Alaska at Fairbanks (AK)	DII	University of South Dakota (SD)	DII
University of Alabama - Birmingham (AL)	RI	University of South Florida (FL)	RII
University of Arizona (AZ)	RI	University of Tennessee at Knoxville (TN)	RI
University of Arkansas (AR)	RII	University of Texas at Austin (TX)	RI
University of California-Berkeley (CA)	RI	University of Utah (UT)	RI
University of California-Davis (CA)	RI	University of Vermont (VT)	RII
University of California-Irvine (CA)	RI	University of Virginia (VA)	RI
University of California-Los Angeles (CA)	RI	University of Washington - Seattle (WA)	RI
University of California-Riverside (CA)	RII	University of Wisconsin-Madison (WI)	RI
University of California-San Diego (CA)	RI	University of Wisconsin-Milwaukee (WI)	RII
University of California-Santa Barbara (CA	RI	University of Wyoming (WY)	RII
University of California-Santa Cruz (CA)	RII	Utah State University (UT)	RI
University of Cincinnati (OH)	RI	Virginia Commonwealth University (VA)	RI
University of Colorado at Boulder (CO)	RI	Virginia Polytechnic Institute (VA)	RI
University of Connecticut (CT)	RI	Washington State University (WA)	RII
University of Delaware (DE)	RII	Wayne State University (MI)	RI
University of Florida (FL)	RI	West Virginia University (WV)	RI
University of Georgia (GA)	RI		

states in ( )
Carnegie Classification descriptions can be found at http://chronicle.com/stats/carnegie

Table 2

Proportion of First-Time Freshmen from Out-of-State (excluding foreign students)

Flagship Public Research and Doctoral Institutions

Year	Unweighted Average	Standard Deviation	Weighted [b] Average	Median	Minimum	Maximum
1979	0.174	0.120	0.168	0.136	0.011	0.550
1981	0.166	0.120	0.161	0.133	0.007	0.543
1984 [a]	0.171	0.128	0.170	0.127	0.010	0.629
1988	0.203	0.136	0.205	0.158	0.012	0.602
1992	0.205	0.157	0.201	0.169	0.001	0.660
1994	0.202	0.152	0.196	0.172	0.005	0.674
1996	0.196	0.145	0.194	0.167	0.005	0.665
1998	0.191	0.139	0.185	0.179	0.006	0.660
% Δ	9.4	15.7	10.3	31.2	-47.8	19.9

[a] *Numbers of out-of-state freshmen imputed for the 8 California schools in 1984*

[b] *Weights are full-time equivalent first time freshmen enrollments*

Source: NCES Higher Education General Information Surveys (HEGIS), Integrated Postsecondary Education Data System (IPEDS) via direct surveys and WebCASPAR

Table 3
In-State and Out-of-State Tuition Levels (1996 dollars)
Flagship Public Research and Doctoral Institutions

	In-State						*Out-of-State*					
Year	Average	% increase	Wtd. Avg.	Median	Minimum	Maximum	Average	% increase	Wtd. Avg.	Median	Minimum	Maximum
1979	1,552		1,582	1,509	676	3,435	4,250		4,246	4,097	2,068	8,182
	(520)	5.2%					(1,273)	4.3%				
1981	1,633		1,667	1,569	638	3,799	4,431		4,460	4,105	1,844	8,402
	(615)	19.0%					(1,401)	17.4%				
1984	1,943		2,006	1,861	557	5,126	5,203		5,334	5,047	1,755	9,799
	(756)	16.6%					(1,614)	20.7%				
1988	2,266		2,320	2,100	1,018	4,840	6,282		6,454	6,059	3,238	13,393
	(859)	25.0%					(1,833)	28.2%				
1992	2,833		2,887	2,656	1,315	6,724	8,055		8,243	7,604	4,139	16,103
	(1,065)	11.0%					(2,551)	8.8%				
1994	3,145		3,174	2,847	1,417	6,919	8,766		8,939	8,169	3,982	17,131
	(1,189)	6.5%					(2,768)	7.9%				
1996	3,348		3,397	3,102	1,568	7,726	9,459		9,689	9,030	5,100	17,916
	(1,185)	5.3%					(2,659)	6.7%				
1998	3,525		3,553	3,302	1,697	7,669	10,094		10,284	9,586	5,512	18,623
	(1,181)						(2,687)					
% Δ	127		125	119	151	123	137		142	134	167	128
CAGR	4.2%		4.1%	4.0%	4.7%	4.1%	4.4%		4.5%	4.3%	5.0%	4.2%

Standard deviations in ( ); weights are full-time equivalent first-time freshmen enrollment

CAGR: "Compound Annual Growth Rate"

Source: NCES Higher Education General Information Surveys (HEGIS), Integrated Postsecondary Education Data System (IPEDS) via WebCASPAR

Table 4
In-State, Out-of-State Tuition Differentials (1996 dollars)
Flagship Public Research and Doctoral Institutions

	(I)	*(II)*	*(III)*	*(IV)*	*(V)*	*(VI)*	*(VII)*
Year	Out-state / In-state ratio	Mean Differential	% Increase in Differential	Weighted Average	Median	Minimum	Maximum
1979	2.74	2,698		2,664	2,537	1,138	5,028
1981	2.71	2,798	3.7%	2,793	2,517	1,077	5,321
1984	2.68	3,260	16.5%	3,328	3,150	1,198	6,526
1988	2.77	4,016	23.2%	4,133	3,878	1,469	8,968
1992	2.84	5,222	30.0%	5,357	4,855	1,878	10,891
1994	2.79	5,620	7.6%	5,765	5,471	1,770	11,439
1996	2.82	6,110	8.7%	6,292	6,060	2,400	12,206
1998	2.86	6,569	7.5%	6,731	6,471	2,537	12,695
% Δ	4.6	143		153	155	123	152
CAGR	0.2%	4.5%		4.7%	4.8%	4.1%	4.7%

Weights are full-time equivalent first time freshmen enrollment

Source: NCES Higher Education General Information Surveys (HEGIS), Integrated Postsecondary Education Data System (IPEDS) via direct surveys and WebCASPAR

Table 5
Need Based Grant Aid to Instate Undergraduate Public Students per FTE Public Undergraduate in the State (1996 dollars)
Flagship Public Research and Doctoral Institutions

Year	Unweighted Average	Standard Deviation	Median	Minimum	Maximum
1979	67.5	78.4	34.9	5.4	415.9
1981	77.2	89.9	45.2	4.5	410.9
1984	93.2	127.0	51.3	11.0	663.4
1988	117.0	134.2	60.9	10.3	594.8
1992	128.6	140.4	89.2	9.0	644.0
1994	139.1	162.4	92.0	10.8	881.1
1996	183.5	196.6	125.8	10.7	949.1
1998	284.7	322.0	180.2	6.8	1585.6
% Δ	321.6	310.8	416.8	25.6	281.2
CAGR	7.5%	7.3%	8.6%	1.1%	6.9%

Source: NASSGAP Annual Reports, HEGIS and IPEDS

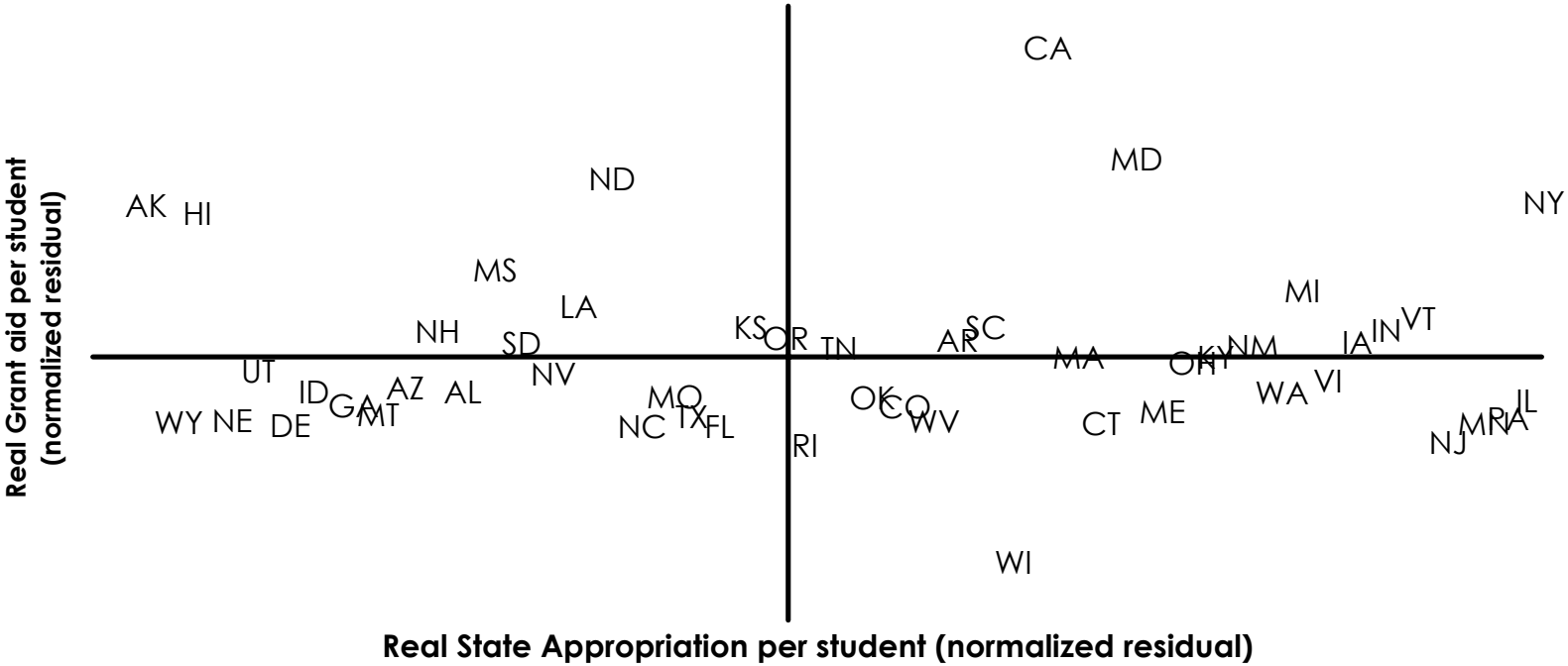
Table 6
State Appropriations per FTE Undergraduate (1996 dollars)
Flagship Public Research and Doctoral Institutions

Year	Unweighted Average	Weighted Average	Standard Deviation	Median	Minimum	Maximum
1979	9,446	8,932	4,355	8,430	3,200	25,297
1981	9,394	8,809	4,757	8,532	3,126	29,429
1984	9,977	9,544	4,495	9,162	3,180	26,045
1988	11,397	10,788	5,203	10,615	3,698	24,741
1992	11,227	10,934	4,769	10,549	3,300	26,736
1994	11,069	10,835	4,522	10,454	3,361	25,372
1996	11,204	10,922	4,429	10,666	3,180	24,421
1998	10,777	10,569	4,030	10,429	3,218	23,306
2000	11,402	11,173	4,364	11,032	3,328	24,073
% Δ	20.7	25.1	0.2	30.9	4.0	-4.8
CAGR	0.9%	1.0%	0.0%	1.2%	0.2%	-0.2%

Source: HEGIS and IPEDS

Figure 2

1996 State Appropriation per Student vs. Need Based Grant Aid per Student*



* Plot of state averages of residuals from regression of state appropriations per student on per capita tax revenues versus residuals from regression of grant aid per student on per capita tax revenues.

Sources: IPEDS, NASSGAP and United States Census State Government Finances (1997).

Table 7
Tuition Reciprocity Agreements

I	*II*	*III*	*IV*	*V*	*VI*	*VII*
Year	# schools reporting reciprocal enrollments	agreements, but don't report enrollment	Mean share of undergrads that are reciprocal	Max share of undergrads that are reciprocal	Mean share of enrollment that are nonresidents*	Mean share nonresidents that are reciprocal
1979	3	36				
1981	4	35				
1984	10	29	3.6%	16.6%	21.5%	16.7%
1988	15	24	3.1%	22.4%	23.8%	13.0%
1992	20	19	7.6%	30.1%	24.2%	31.4%
1994	24	15	6.7%	30.1%	25.4%	26.4%
1996	28	11	5.5%	28.6%	23.9%	23.0%

** for those schools that report reciprocal enrollment*

Source: HEGIS, IPEDS and 2001 Annual Cornell Higher Education Research Institute Survey. For more information about this survey, please see http://www.ilr.cornell.edu/cheri and click on "Surveys".

Table 8 - Part A
State Need Based Grant Aid and Instate Tuition Equations
Reduced Form Regression Results

** significant at 95% level*	*(i)*		*(ii)*		*(iii)*		*(iv)*	
	GRANT AID				IN-STATE TUITION			
Variable	Cross-Section		Panel		Cross-Section		Panel	
State Demographics/Institutional Characteristics								
Log Tax Revenues per Capita (TAX)	**0.57**	*	**0.20**	*	0.07		0.05	
Log unemployment (UNEMP)	**0.34**	*	0.04		**0.20**	*	**0.08**	*
Share of population aged 18-24 (AGE)	**-23.38**	*	**-13.49**	*	0.49		**-9.31**	*
Share of pop. w/ incomes below Max Pell allowable (ELIG)	-0.07		**1.14**	*	**-1.23**	*	0.40	
Log number of governing boards (GOV)	0.01		n/a		0.00		n/a	
Sources of Institutional Aid								
Log state appropriations per student (APP)	**-0.27**	*	**0.53**	*	**-0.24**	*	**-0.18**	*
Log endowment per student (END)	0.02		0.01		**0.02**	*	0.01	
Sources of Student Financial Aid								
Log maximum Pell grant award (PELL)	-10.70		**1.32**	*	-1.89		**0.48**	*
Percent cap on costs (CAP)	-3.50		**0.70**	*	-0.72		**0.34**	*
Post-1979 subsidized loan access (1979)	n/a		**0.57**	*	n/a		**0.15**	*
Post-1992 subsidized loan access (1992)	n/a		**0.73**	*	n/a		**0.38**	*
Arkansas Merit Program (MERIT)	**1.01**	*	**0.77**	*	0.05		**0.24**	*
Florida Merit Program (MERIT)	-0.82		-0.30		**-0.47**	*	**-0.19**	*
Georgia Merit Program (MERIT)	**-1.77**	*	**-1.55**	*	-0.15		-0.10	
Mississippi Merit Program (MERIT)	**-1.90**	*	**-1.01**	*	0.19		-0.09	
New Mexico Merit Program (MERIT)	0.69		**0.73**	*	-0.21		-0.07	
Enrollment Pressure								
Ratio of fte grad to undergrad enrollments (GRAD)	**0.14**	*	-0.09		**0.05**	*	-0.02	
Share of fteftf in state in privates (PRIV)	**1.36**	*	**-1.14**	*	**0.86**	*	**0.53**	*
Share of fteftf in state in 2 years (TWO)	**0.63**	*	**1.32**	*	**-0.35**	*	-0.07	
Seating capacity {predicted enroll/actual enroll} (SEAT)	**-0.87**	*	**0.31**	*	**-0.23**	*	**0.15**	*
Log composite regional tuition, ex-in state (TUITR)	**0.27**	*	-0.08		**0.12**	*	**0.06**	*
School Quality / Competitive Position								
Weak barron's rank (LOWB)	0.04		0.03		0.00		**0.06**	*
Strong barron's rank (HIGHB)	-0.01		-0.01		**0.10**	*	0.06	
Weighted barrons's rank of privates in state (BPRIV)	**0.32**	*	0.02		0.00		**0.04**	*
Weighted barrons's rank of publics in state (BPUB)	**0.30**	*	0.00		**0.05**	*	0.01	
Adjusted R^2	0.595		0.618		0.722		0.866	

Table 8 - Part B
Out-of-State Tuition and Nonresident Enrollment Share Equations
Reduced Form Regression Results

** significant at 95% level*	*(v)*		*(vi)*		*(vii)*		*(viii)*	
	OUT-STATE TUITION				NON-RESIDENT SHARE			
Variable	Cross-Section		Panel		Cross-Section		Panel	
State Demographics/Institutional Characteristics								
Log Tax Revenues per Capita (TAX)	0.00		**0.08**	*	-0.25		**-0.21**	*
Log unemployment (UNEMP)	**0.13**	*	**0.05**	*	**-0.37**	*	**-0.16**	*
Share of population aged 18-24 (AGE)	-1.26		**-4.10**	*	**10.16**	*	3.45	
Share of pop. w/ incomes below Max Pell allowable (ELIG)	**-1.25**	*	**0.59**	*	**1.24**	*	-1.10	
Number of governing boards (GOV)	0.00		n/a		**-0.03**	*	n/a	
Sources of Institutional Aid								
Log state appropriations per student (APP)	**-0.15**	*	**-0.23**	*	**-1.16**	*	0.07	
Log endowment per student (END)	**0.05**	*	**0.01**	*	**0.16**	*	0.04	
Sources of Student Financial Aid								
Log maximum Pell grant award (PELL)	-0.35		0.16		5.11		0.00	
Percent cap on costs (CAP)	-0.43		**-0.17**	*	1.57		**0.08**	*
Post-1979 subsidized loan access (1979)	n/a		**0.05**	*	n/a		**-0.52**	*
Post-1992 subsidized loan access (1992)	n/a		**0.46**	*	n/a		**-0.84**	*
Arkansas Merit Program (MERIT)	**-0.08**	*	**0.17**	*	0.17		-0.44	
Florida Merit Program (MERIT)	-0.27		-0.02		**-1.28**	*	**-1.18**	*
Georgia Merit Program (MERIT)	**-0.11**	*	-0.07		-0.29		**-0.44**	*
Mississippi Merit Program (MERIT)	**-0.27**	*	-0.03		0.48		0.24	
New Mexico Merit Program (MERIT)	-0.02		0.03		0.31		0.18	
Enrollment Pressure								
Ratio of fte grad to undergrad enrollments (GRAD)	-0.01		0.02		-0.04		-0.10	
Share of ftefff in state in privates (PRIV)	**0.20**	*	0.19		0.39		-0.67	
Share of ftefff in state in 2 years (TWO)	-0.09		0.08		**-0.37**	*	0.23	
Seating capacity {predicted enroll/actual enroll} (SEAT)	0.04		**0.16**	*	**-0.26**	*	**-0.28**	*
Log composite regional tuition (TUITR)	**0.15**	*	**0.10**	*	0.08		**0.35**	*
Log share of fte undergrads in reciprocity agreements (RECIP)	0.00		0.00		**-0.09**	*	0.06	
School and Student Quality / Competitive Position								
Weak barron's rank (LOWB)	n/a		n/a		n/a		n/a	
Strong barron's rank (HIGHB)	0.04		0.00		-0.20		0.11	
Weighted barrons's rank of privates in state (BPRIV)	**0.04**	*	**0.05**	*	**-0.31**	*	0.04	
Weighted barrons's rank of publics in state (BPUB)	**0.07**	*	0.03		**0.28**	*	-0.03	
Institution's share of quality public seats in the state (BSPUB)	-0.01		-0.04		**1.29**	*	**0.28**	*
Institution's share of qual. private seats in the state (BSPRIV)	0.00		0.00		**0.01**	*	0.00	
Share of quality seats in region that are private (SPRIV)	**0.37**	*	-0.11		-0.03		**-0.56**	*
Log SAT (SAT)	-0.01		**2.11**	*	**-1.07**	*	-0.15	
Adjusted R^2	0.794		0.904		0.501		0.204	

Table 9
Effect of Selected Policy Changes on Outcomes
Fixed Effects Reduced Form Regression Results
Evaluated at 1998 level of appropriate variable

Selected Policy Change	*Grant Aid*		*Instate Tuition*		*Out-of-State Tuition*		*Nonresident Share**	
Increase state tax revenues per capita by $1,000	**$12**	*	$32		**$158**	*	**-1.16**	*
Increase maximum real Pell Grant award by $100	**$14**	*	**$58**	*	$56		-0.01	
Increase real state appropriations per student by $1,000	**$15**	*	**-$60**	*	**-$222**	*	0.19	
Increase real endowment per student by $1,000	$0		$2		**$7**	*	0.05	
Increase ratio of grad students to first time frosh by 10 pts	-$3		-$5		$20		-0.30	
Increasing seating capacity 10 perc. Pts	**$11**	*	**$63**	*	**$187**	*	**-0.81**	*
Increases in average regional tuition by $1,000	-$3		**$23**	*	**$145**	*	**1.42**	*
Increase share of students enrolled in privates by 1% point	**-$15**	*	**$80**	*	$84		-0.82	
Increase share of students enrolled in two-years by 1% point	**$10**	*	-$6		$20		0.16	
Having higher SAT scores by 10 points in your state					**$201**	*	-0.40	
Increasing the share of std. reciprocal by 10 perc. pts					-$24		0.003	
Average 1998 Value of Dependent Variable	$307		$3,525		$10,094		19.1%	

Items in bold and with (*) are significant at 95% level

** Represents percentage point changes, for example -2.0 would indicate nonresident share falls from x% to (x-2)%*

*** For enrollment equation, numbers indicate percentage point change in share due to being in this category relative to average*

**** Table reports marginal effects evaluated at mean*

Appendix Table 1
Sources and Definitions of Variables

Variable	Definition/Explanation *	Source
1979	Dummy for years subsequent to repeal of Middle Income Student Assistant Act in 1979 which reinstated "needs" test for eligibility for subsidized federal loans	1, 2
1992	Dummy for years subsequent to 1992 when the 5.64% of home equity that was taxable in the expected family contribution (EFC) calculation was removed from taxable assets	1, 2
AGE	Share of population in a state between age 18 & 24	3
AID	Logarithm of need based state grant aid to instate undergraduate students attending institutions in their own state per full-time equivalent four year undergraduate in the state. Includes federal matching LEAP/SSIG monies.	4
APP	Logarithm of state government appropriations in 000's per full-time equivalent undergraduate at the institution	5
BPRIV	Undergraduate enrollment weighted average Barron's ranking of all rated four-year private institutions in the state.	6, 5
BPUB	Undergraduate enrollment weighted average Barron's ranking of all rated four-year public institutions in the state.	6, 5
BSPRIV	Institution's undergraduate enrollment divided by the total undergraduate enrollment of all equally or more highly rated private (Barron's) institutions in the state.	6, 5
BSPUB	Institution's undergraduate enrollment divided by the total undergraduate enrollment of all equally or more highly rated public (Barron's) institutions in the state (including the institution of observation).	6, 5
CAP	Maximum percentage of college costs covered by Pell Grants. Initially 50% of costs, raised to 60% in 1986 and eliminated in 1992.	7
ELIG	Share of state's households with incomes below the maximum allowable to be eligible to received federal grant aid. Maximum income eligibility estimated from EFC	8, 7
END	Logarithm of institutional endowment in 000's per full-time equivalent undergraduate at the institution.	5
GOV	Number of governing boards in the state.	9
GRAD	Ratio of full-time equivalent graduate students to full-time equivalent undergraduate institutions at the institution.	5
HIGHB	Dummy variable equal to one if Barron's ranking is "Highly Competetive" or "Most Competetive."	6
LOWB	Dummy variable equal to one if Barron's ranking is "Not Competetive" or "Less Competetive."	6
_MERIT	Dummy variable equal to one if state had a merit aid program in that year.	4
NON	Logarithm of the share of first-time freshmen that are nonresident, non-foreign students. In nonresident share equation, we use the log-odds ratio. That is the share divided by one minus the share.	5, 10
PELL	Logarithm of the maximum available Pell Grant award.	7
PRIV	Share of ftefttf in state in privates (PRIV)	
RECIP	Logarithm of the share of full-time equivalent undergraduates enrolled under tuition reciprocity programs.	11
SAT	Average SAT score in the state (includes public and private high school students).	12
SEAT	Maximum number of full-time equivalent first-time freshmen enrollment in the state historically at public schools of equal or greater Barron's rank divided by the current number of high school graduates in the state.	5, 12
SPRIV	In the census region, the share of full-time equivalent first time freshmen in schools that are of equal or greater Barron's rank that are enrolled in private schools.	5, 6
TAX	Logarithm of total state tax revenues received per population in the state, excludes federal receipts, in 000's.	13, 3
TUITI	Logarithm of in-state tuition charged.	5
TUITO	Logarithm of out-of-state tuition charged.	5
TUITR (EQUN 1&2)	Logarithm of the enrollment weighted average of public out-of-state (for schools outside my state), public instate (for schools in my state, excluding my school) and private tuition in the census region.	5
TUITR (EQUN 3&4)	Logarithm of the enrollment weighted average of public in-state, public out-of-state and private tuition in the census region, including schools in the state of observation.	5
TWO	Share of public full-time equivalent first-time freshmen enrollment in the state that are in two-year colleges.	5
UNEMP	Logarithm of the state average unemployment rate.	14

* All data in real values using 1996 calendar year GDP implicit price deflator.

Data Sources

1. United States Department of Education web-site
2. Michael Mumper, *Removing College Price Barriers,* SUNY Press, 1996.
3. U.S. Bureau of the Census, Population Estimates Program - Age distribution data on web-site.
4. National Association of State Scholarship and Grant Programs, Annual Survey Reports.
5. Integrated Postsecondary Education Data System Surveys via WebCASPAR. See http://caspar.nsf.gov or www.nces.ed.gov/ipeds.
6. *Barron's Profiles of American Colleges* , 1979-1996.
7. American Councilon Education Center for Policy Analyisis, *2000 Status Report on the Pell Grant Program* .
8. Current Population Surveys, *Estimates of Income of Households by State 1979-1996* .
9. Education Commission of the States.
10. Older resident enrollment data from Higher Education General Information Surveys not available on WebCASPAR was retrieved through original "Fall Residence and Migration Surveys."
11. Cornell Higher Education Research Institute (CHERI) *Survey of Tuition Reciprocity Programs at Public Research and Doctoral Institutions,* Summer 2001. Available on CHERI website at www.ilr.cornell.edu/cheri.
12. U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics* .
13. U.S. Bureau of the Census, Census of Governments via the *Statistical Abstract of the United States.*
14. U.S. Department of Labor, Bureau of Labor Statistics. Employment and Earnings.

Appendix Table 2
Summary Statistics
Average Values of Selected Independent Variables*

Variable	1979	1981	1988	1992	1994	1996	1998
State Demographics / Institutional Characteristics							
Per capita real state tax revenues	2,279	1,865	3,070	2,535	2,669	4,720	5,185
Unemployment rate	5.78	6.91	6.43	6.51	6.36	5.38	4.80
Share of population aged 18-24	13.5%	13.3%	11.1%	10.2%	9.9%	9.6%	9.7%
Share of population with incomes below Pell	63.9%	57.5%	53.5%	49.3%	45.0%	44.9%	49.8%
Sources of Institutional Aid							
Endowment per student	957	1,401	4,466	7,726	9,809	13,977	19,337
Sources of Student Financial Aid							
Pell grant award (real)	3,416	2,663	2,734	2,617	2,392	2,470	2,917
Enrollment Pressure							
# grad students / # first time freshmen	1.20	1.24	1.27	1.59	1.58	1.49	1.10
Share of fteftf in state in privates	30.3%	30.7%	30.0%	31.1%	30.7%	30.2%	23.3%
Share of fteftf in state in two-years	45.7%	47.3%	44.0%	46.0%	44.9%	44.2%	41.9%
Seating capacity (predicted/actual)	1.34	1.31	0.99	0.82	0.82	0.81	0.86
Composite regional tuition	2,932	3,086	5,567	6,090	6,332	6,672	7,059
Composite regional tuition, ex-instate	4,217	4,439	8,005	8,721	9,047	9,541	10,002
School and Student Quality / Competitive Position							
# schools strong Barrons rank	2	3	5	13	11	11	11
# schools weak Barrons rank	17	15	16	13	7	11	11
Weighted rank of privates in state	2.56	2.64	2.90	2.74	2.98	2.98	2.98
Weighted rank of publics in state	2.38	2.39	2.60	2.60	2.66	2.67	2.67
Instn's share of state's quality private seats	251.0%	299.3%	262.0%	267.7%	273.9%	191.6%	191.6%
Instn's share of state's quality public seats	47.9%	47.5%	52.9%	50.8%	51.1%	49.9%	49.9%
Share of quality regional seats - private	37.8%	37.3%	39.4%	40.9%	40.0%	39.5%	39.5%
Average SAT scores of HS grads	936	939	1,042	966	1,043	1,057	1,062

** For those variables not in earlier tables. Also excludes categorical variables.*

Appendix Table 3
Expected Impacts and Exclusion Restrictions in Estimated Equations

	Equation			
Variable	***Grant Aid***	***In-state Tuition***	***Out-State Tuition***	***Non-resident Share***
Endogenous Variables				
Log need based grant aid per public student (AID)		***D +***		
Log in-state tuition (TUITI)	***B +***		***S +***	
Log out-state tuition (TUITO)				***B ?***
Log nonresident enrollment share (NON)			***B ?***	
State Demographics/Institutional Characteristics				
Log state tax revenues per capita (TAX)	**S +**			
Log unemployment (UNEMP)	**D ?**	**D ?**	**B ?**	**B ?**
Share of population aged 18-24 (AGE)	**S -**	**D +**	**D +**	**D +**
Share of population with incomes below Max Pell allowable (ELIG)	**D +**	**D -**	**D -**	**D -**
Log number of governing boards (GOV)	**S ?**	**S +**	**S +**	**S ?**
Sources of Institutional Aid				
Log state appropriations per student (APP)	**B -**	**B ?**	**B ?**	**B ?**
Log endowment per student (END)	**B -**	**B +**	**B +**	**B ?**
Sources of Student Financial Aid				
Log maximum Pell grant award (PELL)	**B -**	**D +**	**D +**	**D +**
Percent cap on costs (CAP)	**D -**	**D +**	**D +**	**D +**
Post-1979 subsidized loan access (1979)	**D +**	**D -**	**D -**	**D -**
Post-1992 subsidized loan access (1992)	**D +**	**D -**	**D -**	**D -**
State merit-based aid programs (MERIT)	**B -**	**B +**	**S +**	**S -**
Enrollment Pressure				
Ratio of fte grad to undergrad enrollments (GRAD)	**D -**	**B ?**	**B ?**	**B ?**
Share of fteftf in state in privates (PRIV)	**B ?**	**S +**		
Share of fteftf in state in 2 years (TWO)	**B ?**	**S -**		
Log seating capacity (SEAT)	**S +**	**D -**	**B ?**	**S +**
Log composite regional tuition (TUITR)	**B -**	**S +**	**D +**	**D +**
Log share of fte undergrads in reciprocity agreements (RECIP)			**B ?**	**B ?**
School and Student Quality / Competitive Position				
Weak barron's rank (LOWB)		**D -**	**D -**	**D -**
Strong barron's rank (HIGHB)		**D +**	**D +**	**D +**
Weighted barrons's rank of privates in state (BPRIV)	**B +**	**D -**		
Weighted barrons's rank of publics in state (BPUB)	**B ?**			
Institution's share of quality public seats in the state (BSPUB)			**B +**	**D +**
Institution's share of qual. private seats in the state (BSPRIV)			**B +**	**D +**
Share of quality seats in region that are private (SPRIV)			**D +**	**D +**
Log SAT (SAT)				**S -**

Appendix Table 4 - Part A
State Need Based Grant Aid and Instate Tuition Equations
"Structural" Estimates - 2SLS Regression Results [(a)]

** significant at 95% level*	*(i)*		*(ii)*		*(iii)*		*(iv)*	
	GRANT AID				IN-STATE TUITION			
Variable	Cross-Section		Panel		Cross-Section		Panel	
Endogenous Variables								
Log need based grant aid per public student (AID)					**0.27**	*	0.18	
Log in-state tuition (TUITI)	**1.59**	*	0.30					
State Demographics/Institutional Characteristics								
Log state tax revenues per capita (TAX)	**0.48**	*	**0.19**	*				
Log unemployment (UNEMP)	0.01		0.02		**0.10**	*	**0.06**	*
Share of population aged 18-24 (AGE)	**-24.49**	*	-10.67		**7.28**	*	**-7.23**	*
Share of pop. w/ incomes below Max Pell allowable (ELIG)	**2.00**	*	1.03		**-1.15**	*	0.14	
Log number of governing boards (GOV)	0.01				0.00			
Sources of Institutional Aid								
Log state appropriations per student (APP)	0.10		**0.59**	*	**-0.25**	*	**-0.32**	*
Log endowment per student (END)	-0.01		0.01		**0.02**	*	0.01	
Sources of Student Financial Aid								
Log maximum Pell grant award (PELL)	-7.95		**1.17**	*	0.45		0.27	
Percent cap on costs (CAP)	-2.40		**0.59**	*	0.06		0.21	
Post-1979 subsidized loan access (1979)	0.64		**0.53**	*	-0.14		0.04	
Post-1992 subsidized loan access (1992)	n/a		**0.61**	*	n/a		**0.23**	
Arkansas Merit Program (MERIT)	**0.93**	*	**0.69**	*	-0.17		0.11	
Florida Merit Program (MERIT)	-0.10		-0.25		-0.26		-0.13	
Georgia Merit Program (MERIT)	**-1.58**	*	**-1.52**	*	**0.38**	*	0.19	
Mississippi Merit Program (MERIT)	**-2.18**	*	**-0.99**	*	**0.69**	*	0.10	
New Mexico Merit Program (MERIT)	1.04		**0.75**	*	**-0.41**	*	-0.19	
Enrollment Pressure								
Ratio of fte grad to undergrad enrollments (GRAD)	0.05		-0.08		0.02		0.01	
Share of ftefft in state in privates (PRIV)	-0.06		**-1.30**	*	**0.51**	*	**0.72**	*
Share of ftefft in state in 2 years (TWO)	**1.20**	*	**1.34**	*	**-0.46**	*	-0.30	
Seating capacity {predicted enroll/actual enroll} (SEAT)	**-0.50**	*	0.26		-0.01		0.10	
Log composite regional tuition, ex-in state (TUITR)	0.08		-0.10		0.02		**0.08**	*
School and Student Quality / Competitive Position								
Weak barron's rank (LOWB)					0.01		0.05	
Strong barron's rank (HIGHB)					**0.10**	*	0.06	
Weighted barrons's rank of privates in state (BPRIV)	**0.31**	*	0.01		**-0.08**	*	**0.04**	*
Weighted barrons's rank of publics in state (BPUB)	**0.20**	*	-0.01					
Adjusted R^2	0.585		0.618		0.647		0.843	

[(a)] The efficiency of a system such as ours can be improved if one accounts for the correlation among the error terms in each equation. 3SLS estimates were largely similar to the 2SLS estimates, but are not reported here due to concern that one or more of the equations in the system are misspecified, which can effect estimates in other equations (Johnston and DiNardo).

Appendix Table 4 - Part B
Out-of-State Tuition and Nonresident Enrollment Share Equations
"Structural" Estimates - 2SLS Regression Results

** significant at 95% level*	*(v)*		*(vi)*		*(vii)*		*(viii)*	
	OUT-STATE TUITION				NON-RESIDENT SHARE			
Variable	Cross-Section		Panel		Cross-Section		Panel	
Endogenous Variables								
Log in-state tuition (TUITI)	**0.49**	*	**0.90**	*				
Log out-state tuition (TUITO)					**-1.49**	*	-0.26	
Log nonresident enrollment share (NON)	-0.03		-0.06					
State Demographics/Institutional Characteristics								
Log unemployment (UNEMP)	0.01		**-0.08**	*	**-0.33**	*	**-0.17**	*
Share of population aged 18-24 (AGE)	-1.25		1.13		3.12		4.57	
Share of population with incomes below Max Pell allowable (FEHC)	**-0.69**	*	0.05		0.59		-0.54	
Log number of governing boards (GOV)	**0.00**	*			**-0.02**	*		
Sources of Institutional Aid								
Log state appropriations per student (APP)	-0.05		0.00		**-1.30**	*	-0.01	
Log endowment per student (END)	**0.04**	*	**0.02**	*	**0.21**	*	0.03	
Sources of Student Financial Aid								
Log maximum Pell grant award (PELL)	-0.09		0.02		-0.12		-0.27	
Percent cap on costs (CAP)	-0.18		-0.02		0.16		-0.02	
Post-1979 subsidized loan access (1979)								
Post-1992 subsidized loan access (1992)								
Arkansas Merit Program (MERIT)	-0.14		-0.07		-0.11		-0.43	
Florida Merit Program (MERIT)	-0.04		0.09		**-1.34**	*	**-1.16**	*
Georgia Merit Program (MERIT)	-0.06		0.05		-0.14		**-0.44**	*
Mississippi Merit Program (MERIT)	**-0.30**	*	0.04		0.06		0.19	
New Mexico Merit Program (MERIT)	0.12		0.04		0.30		0.18	
Enrollment Pressure								
Ratio of fte grad to undergrad enrollments (GRAD)	**-0.04**	*	0.02		-0.08		-0.10	
Seating capacity {predicted enroll/actual enroll} (SEAT)	**0.14**	*	-0.02		-0.11		-0.29	
Log regional composite tuition (TUITR)	**0.11**	*	**0.07**	*	**0.34**	*	**0.37**	*
Log share of fte undergrads in reciprocity agreements (RECIP)					**-0.07**	*	0.05	
School and Student Quality / Competitive Position								
Poor Barrons's rank (LOWB)	**-0.10**	*	0.00		**-0.41**	*	0.02	
Strong Barrons's rank (HIGHB)	**0.07**	*	0.02		-0.08		0.11	
Institution's share of quality public seats in the state (BSPUB)	-0.03		0.04		**1.06**	*	**0.29**	*
Institution's share of qual. private seats in the state (BSPRIV)	0.00		0.00		**0.02**	*	0.00	
Share of quality seats in region that are private (SPRIV)	**0.19**	*	**-0.14**	*	**0.72**	*	**-0.59**	*
Log SAT (SAT)					**-1.21**	*	0.21	
Adjusted R^2	0.865		0.933		0.374		0.203	

Appendix Table 5 - Part A
State Need Based Grant Aid and Instate Tuition Equations
Reduced Form Regression Results Including Grant Aid as Explanatory Variable

** significant at 95% level*	*(i)*		*(ii)*		*(iii)*		*(iv)*	
	GRANT AID*				IN-STATE TUITION			
Variable	Cross-Section		Panel		Cross-Section		Panel	
State Demographics/Institutional Characteristics								
Log Tax Revenues per Capita (TAX)	**0.57**	*	**0.20**	*	0.04		0.04	
Log unemployment (UNEMP)	**0.34**	*	0.04		**0.16**	*	**0.08**	*
Share of population aged 18-24 (AGE)	**-23.38**	*	**-13.49**	*	2.10		**-9.04**	*
Share of pop. w/ incomes below Max Pell allowable (ELIG)	-0.07		**1.14**	*	**-1.17**	*	0.37	
Log number of governing boards (GOV)	0.01		n/a		0.00		n/a	
Sources of Institutional Aid								
Log state appropriations per student (APP)	**-0.27**	*	**0.53**	*	**-0.21**	*	**-0.19**	*
Log endowment per student (END)	0.02		0.01		**0.02**	*	0.01	
Sources of Student Financial Aid								
Log need based grant aid per public student (AID)	n/a		n/a		**0.08**	*	0.02	
Log maximum Pell grant award (PELL)	-10.70		**1.32**	*	-1.18		**0.44**	*
Percent cap on costs (CAP)	-3.50		**0.70**	*	-0.47		**0.32**	*
Post-1979 subsidized loan access (1979)	n/a		**0.57**	*	0.01		**0.13**	*
Post-1992 subsidized loan access (1992)	n/a		**0.73**	*	n/a		**0.36**	*
Arkansas Merit Program (MERIT)	**1.01**	*	**0.77**	*	-0.04		**0.22**	*
Florida Merit Program (MERIT)	-0.82		-0.30		**-0.40**		**-0.18**	*
Georgia Merit Program (MERIT)	**-1.77**	*	**-1.55**	*	0.01		-0.07	
Mississippi Merit Program (MERIT)	**-1.90**	*	**-1.01**	*	**0.35**	*	-0.07	
New Mexico Merit Program (MERIT)	0.69		**0.73**	*	-0.27		-0.09	
Enrollment Pressure								
Ratio of fte grad to undergrad enrollments (GRAD)	**0.14**	*	-0.09		**0.03**	*	-0.01	
Share of fteftf in state in privates (PRIV)	**1.36**	*	**-1.14**	*	**0.76**	*	**0.55**	*
Share of fteftf in state in 2 years (TWO)	**0.63**	*	**1.32**	*	**-0.39**	*	-0.10	
Seating capacity {predicted enroll/actual enroll} (SEAT)	**-0.87**	*	**0.31**	*	**-0.15**	*	**0.15**	*
Log composite regional tuition, ex-in state (TUITR)	**0.27**	*	-0.08		**0.10**	*	**0.06**	*
School Quality / Competitive Position								
Weak barron's rank (LOWB)	0.04		0.03		-0.01		**0.05**	*
Strong barron's rank (HIGHB)	-0.01		-0.01		**0.10**	*	**0.06**	*
Weighted barrons's rank of privates in state (BPRIV)	**0.32**	*	0.02		-0.02		**0.04**	*
Weighted barrons's rank of publics in state (BPUB)	**0.30**	*	0.00		0.03		0.01	
Adjusted R^2	0.595		0.618		0.737		0.866	

Appendix Table 5 - Part B
Out-of-State Tuition and Nonresident Enrollment Share Equations
Reduced Form Regression Results Including Grant Aid as Explanatory Variable

** significant at 95% level*	*(v)*		*(vi)*		*(vii)*		*(viii)*	
	OUT-STATE TUITION				NON-RESIDENT SHARE			
Variable	Cross-Section		Panel		Cross-Section		Panel	
State Demographics/Institutional Characteristics								
Log Tax Revenues per Capita (TAX)	-0.04		**0.08**	*	-0.21		**-0.21**	*
Log unemployment (UNEMP)	**0.11**	*	**0.05**	*	**-0.30**	*	**-0.16**	*
Share of population aged 18-24 (AGE)	-0.06		**-4.06**	*	8.11		4.04	
Share of pop. w/ incomes below Max Pell allowable (ELIG)	**-1.26**	*	**0.58**	*	1.27		-1.13	
Number of governing boards (GOV)	-0.01		n/a		**-0.16**	*	N/A	
Sources of Institutional Aid								
Log state appropriations per student (APP)	**-0.14**	*	**-0.24**	*	**-1.17**	*	0.07	
Log endowment per student (END)	**0.04**	*	**0.01**	*	**0.16**	*	0.03	
Sources of Student Financial Aid								
Log need based grant aid per public student (AID)	**0.06**	*	0.01		**-0.09**	*	0.02	
Log maximum Pell grant award (PELL)	0.22		0.13		4.15		0.03	
Percent cap on costs (CAP)	-0.25		**-0.18**	*	1.25		0.08	
Post-1979 subsidized loan access (1979)	-0.08		0.04		-0.02		**-0.52**	*
Post-1992 subsidized loan access (1992)	n/a		**0.45**	*	n/a		**-0.83**	*
Arkansas Merit Program (MERIT)	-0.12		0.17		0.28		-0.46	
Florida Merit Program (MERIT)	**-0.24**	*	-0.02		**-1.39**	*	**-1.18**	*
Georgia Merit Program (MERIT)	-0.03		-0.05		-0.44		**-0.42**	*
Mississippi Merit Program (MERIT)	-0.18		-0.02		0.23		0.25	
New Mexico Merit Program (MERIT)	-0.06		0.02		0.40		0.15	
Enrollment Pressure								
Ratio of fte grad to undergrad enrollments (GRAD)	-0.01		0.02		-0.02		-0.10	
Share of fteftf in state in privates (PRIV)	0.11		0.20		0.40		-0.62	
Share of fteftf in state in 2 years (TWO)	**-0.13**	*	0.07		-0.38		0.20	
Seating capacity {predicted enroll/actual enroll} (SEAT)	**0.07**	*	**0.16**	*	**-0.35**	*	**-0.29**	*
Log composite regional tuition (TUITR)	**0.14**	*	**0.10**	*	0.10		**0.35**	*
Log share of fte undergrads in reciprocity agreements (RECIP)	-0.01		0.00		**-0.08**	*	0.06	
School and Student Quality / Competitive Position								
Weak barron's rank (LOWB)	n/a		n/a		n/a		n/a	
Strong barron's rank (HIGHB)	0.04		0.00		-0.20		0.11	
Weighted barrons's rank of privates in state (BPRIV)	0.02		**0.05**	*	**-0.26**	*	0.04	
Weighted barrons's rank of publics in state (BPUB)	**0.06**	*	0.03		**0.31**	*	-0.03	
Institution's share of quality public seats in the state (BSPUB)	0.01		-0.04		**1.27**	*	**0.29**	*
Institution's share of qual. private seats in the state (BSPRIV)	0.00		0.00		0.01		0.00	
Share of quality seats in region that are private (SPRIV)	**0.32**	*	-0.11		0.08		**-0.57**	*
Log SAT (SAT)	-0.12		**2.12**	*	-0.86		-0.14	
Adjusted R^2	0.802		0.904		0.508		0.205	