

November 14, 2004 (draft)

STATE PREFERENCES FOR HIGHER EDUCATION SPENDING:
A PANEL DATA ANALYSIS, 1977-2001

by

Michael J. Rizzo[†]

To be presented at the Federal Reserve Bank of Cleveland's conference on Education and Economic Development, November 18-19, 2004

† Assistant Professor of Economics at Centre College (Danville, KY) and is a Faculty Research Associate at the Cornell Higher Education Research Institute (CHERI)

I am grateful to the Andrew W. Mellon Foundation and the Atlantic Philanthropies (USA) for their support of CHERI. The views expressed herein are those of the author and not necessarily those of the Federal Reserve Bank of Cleveland. All errors are my own.

“In general, however, my impression is that the great danger is not so much institutional extinction, or even that there will be a sudden, dramatic downward shift from one level of quality to another. The greater danger, I believe, is that there will be a slow, unspectacular, but cumulative decline in what it is possible to achieve – and then, as a next step in the process, in what one tries to achieve. Gradual changes of this sort are, in their nature, impossible to measure with any precision, and they may not even be noticeable to quite experienced observers until some considerable time after they have occurred.”

-- William Bowen, President of Princeton University (1977)

Considerable time has passed since Bowen made these ominous comments to the American Economic Association. While there is nothing unusual about university administrators crying out for more funds, a dramatic decline in support for public higher education in the intervening time period suggests that Chicken Little can no longer be ignored.

Few observers would disagree that America’s stellar economic, scientific, political and cultural standing is largely a result of the proliferation of its system of education throughout the states since the nation’s founding. Further, it is not a coincidence that America’s permanent place among the global powers occurred only after public monies from our various legislative entities began spilling into a growing higher education system, changing it from largely a private domain of the elite aristocracy, to a tool for the lower and middle class public to achieve the “American Dream” as well.¹ Despite this and despite the large literature espousing the many benefits of investing in education, public higher education seems to be increasingly falling out of favor with both voters and governments alike.

The goal of this paper is to explain why public higher education *institutions* find themselves in the precarious budget situations they are in today. Among my findings are that changes in observable state characteristics can explain little of the observed fall in higher education budget shares. Generally speaking, public higher education spending has been crowded out by increasing demands for state support of K12 education as a result of court

¹ Goldin and Katz (1999) present an excellent analysis of the shaping of American public higher education during the time that it is commonly believed that America took its place on the world stage, 1890-1940.

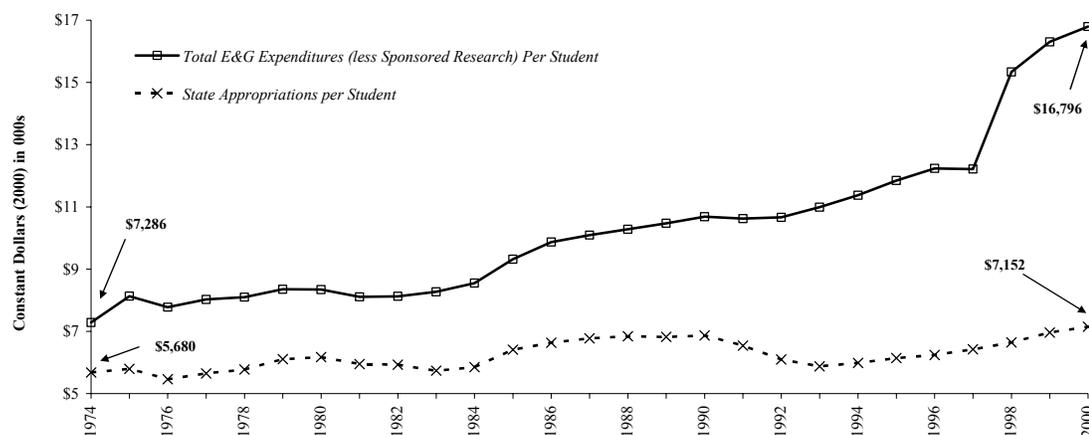
mandated equalization programs, but more importantly because of the great deal of discretion legislatures have over higher education spending. That institutional efforts to raise private money and to increase tuition rates have been met with sharp cuts in budget shares, coupled with projected future enrollment pressures and the political popularity of non-need based aid program expansion, casts a pall on the ability of our public institutions to maintain accessibility and quality much longer into the future.

It should be emphasized that public universities are accustomed to their state funding being at the mercy of economic cycles. In bad budget times, higher education typically bears a disproportionate burden of state funding cuts, with the full expectation that it will be compensated during a recovery. This is not surprising given that higher education is the single largest discretionary item in state budgets. Higher education is also an attractive target for the legislative axe due to its ability to draw revenue from a variety of sources, most prominently tuition – a feature unique to this state budget item. That higher education funding *levels* fluctuate so much is well known and is not the focus of this paper. Rather I emphasize that, in *relative* terms, higher education funding has not fluctuated with the business cycle. Public higher education has faced a continuous precipitous drop in state governmental priority for nearly three decades.

In real terms, the level of state funding for public higher education doubled from \$30 billion in 1974 to nearly \$60 billion in 2000. However, due to the growth in public enrollments, the bottom line in figure 1 shows that per student funding increased in real terms by less than 1% per year (25.9% overall). Real current educational and general expenditures per student (less dollars spent on sponsored research) in public higher education, shown in the top line of figure 1, grew by over 3% per year (130% overall).² As a result, while state

² The sharp increase in reported expenditures may be due to differences in accounting and institutional reporting beginning with the 1997 academic year. Data prior to this year are reported in a different source than later data. However, even if in the unlikely event that actual expenditure levels were flat since 1997; overall growth for the period would have been approximately 70%.

appropriations in 1974 were generous enough to cover 78% of the cost of schooling, in 2000 this support has fallen to just 43%.³ That public universities and colleges are turning to tuition to more than make up for lost state appropriations has raised the ire of taxpayers and politicians alike.



Sources: US Department of Education's IPEDS & Illinois State's GRAPEVINE System

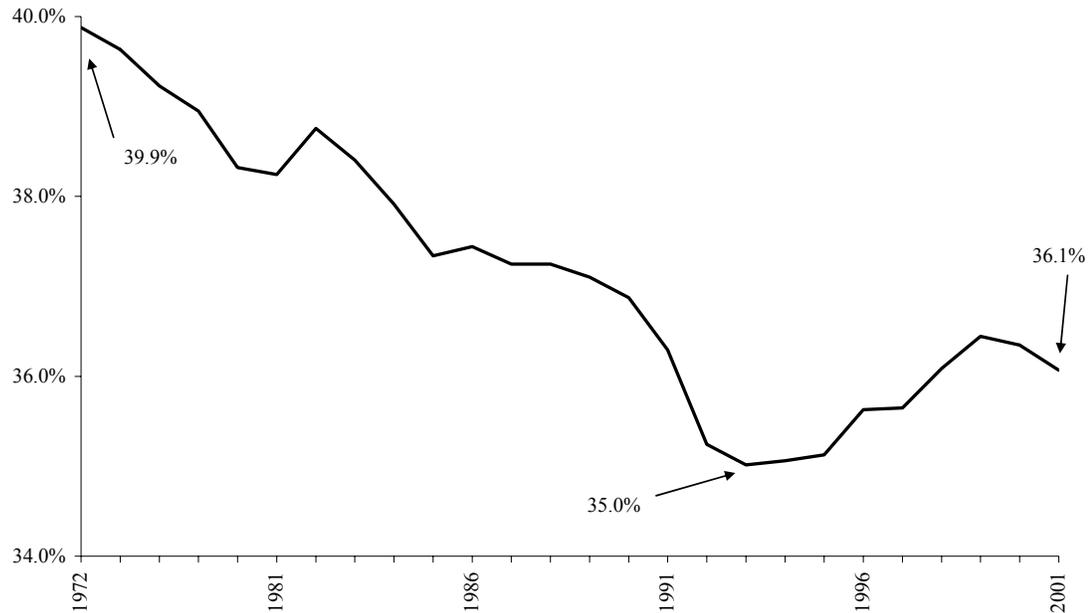
Figure 1
Growth in State Appropriations vs. Current Educational and General Expenditures (net of Sponsored Research) per FTE Student at All Public Universities, 1973-74 – 2000-01AY

What is less well known is that public education has undergone a sea-change in public priorities during this time period. While most laypeople, administrators and even statehouse representatives focus on the dollar values of the state appropriations, very little attention is paid to how higher education fares in relation to other budget items within each state. It is to this *relative* funding that I now turn.

As figure 2 indicates, between the fiscal year (ending) FY1972 to FY2001, the average (across states) share of total state general fund expenditures on education fell from a high of 39.9% in 1972 to a low of 35.0% in 1993, with a slight recovery to 36.1% over the

³ A large body of literature has been devoted to this phenomenon. I will not examine the reasons for expenditure growth in any detail in this paper. While this growth may be a reflection of improvements in quality, it is also likely a result from the increasingly fierce competitive environment institutions are operating in. For a detailed discussion on this matter, see Ehrenberg (2000).

remainder of the decade.⁴ While the decrease has not been monotonic, there is a clear downward trend; the cyclical behavior appears to revolve around this trend and the slight recovery in the late 1990s does not return shares anywhere near their pre-1990s levels.



Source: US Census "State Government Finances" Selected Years. See <ftp://ftp2.census.gov/pub/outgoing/>

Figure 2
Average Share of State General Expenditures on Education
1971-72 to 2000-2001

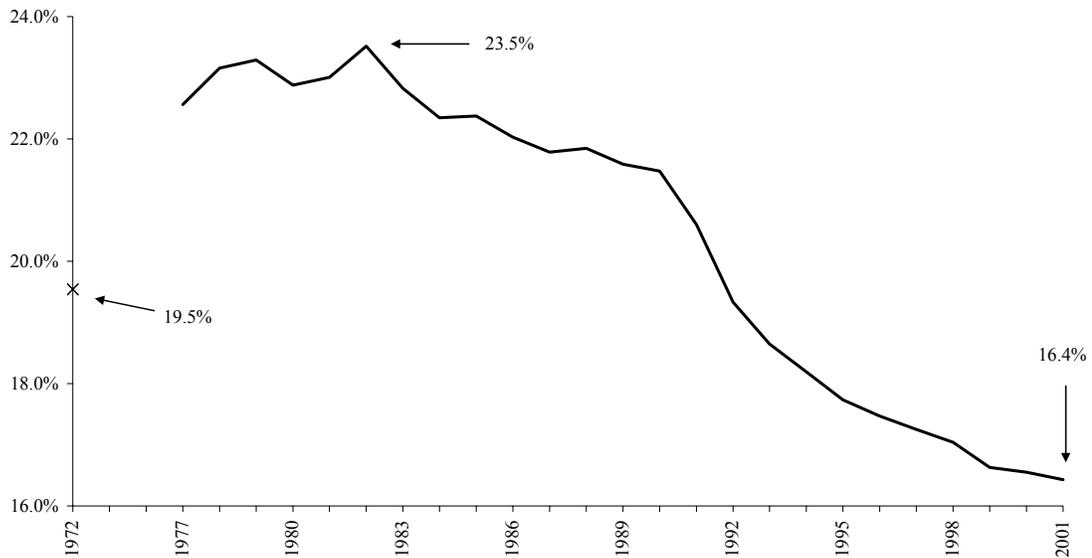
The decline in relative state support for education has occurred throughout the distribution of states – in those that have traditionally devoted a large share of resources to public education (North Carolina’s share has fallen from 51% to 41%) and those that have not (Massachusetts’ share has fallen from 30% to 22%). In fact, only 11 states have seen increases over this period, with an average increase of about 4 percentage points.

⁴ I analyze expenditures made from state general fund budgets because this is the fund where legislatures and governors have the most appropriative discretion. This is the predominant fund for financing a state’s operations. Revenues coming into the general fund derive from a variety of broad based state taxes. The trends that I present below look similar if one were to analyze total state expenditures as well. I will discuss this in more detail later.

There is nothing particularly sacred about education's share of the budget and the many factors thought to be responsible for its decline are well known. Medicaid expenditures have skyrocketed due to large increases in caseloads (it is a means-tested entitlement program), escalating prescription drug costs and lagging support from the federal government. An aging and growing population is putting further stress on health care expenditures and other state services. Corrections expenditures have been growing due to more vigilant prosecution, mandatory sentencing laws and the resulting expansion of prison capacity. Whether education's falling out of favor represent demographic changes alone or a shift of funding priority is unclear and is analyzed in the empirical section of the paper.

Figure 3 describes how the average share of state educational budgets allocated to public higher education has changed in the United States between FY72 to FY01. After a sharp increase in the early 70's, higher education's share has fallen steadily.⁵ Since 1977, the average share of education budgets allocated to higher education across states fell over six percentage points, from 22.6% to 16.4% after peaking at 23.5% in 1982 (a 27% drop). While the most precipitous drops occurred during the recessions of the early 80's and 90's, the lush budget environment in the 1990's was insufficient to halt the bleeding.

⁵ Allow me to begin the discussion of the "fall" with 1977. The rise in the early 70s can be attributed to a number of factors. Chiefly among them are states preparing for the children of the baby boomers attending college and leaving the K12 sector, accommodation of the enrollment surges as a result of the Vietnam War draft deferments and a residual effect of the space and arms race that culminated in the moon landing in 1969.



Source: US Census "State Government Finances" Selected Years and Illinois State's GRAPEVINE.

Figure 3
Average Share of State Education Expenditures on Higher Education
1971-72 to 2000-2001

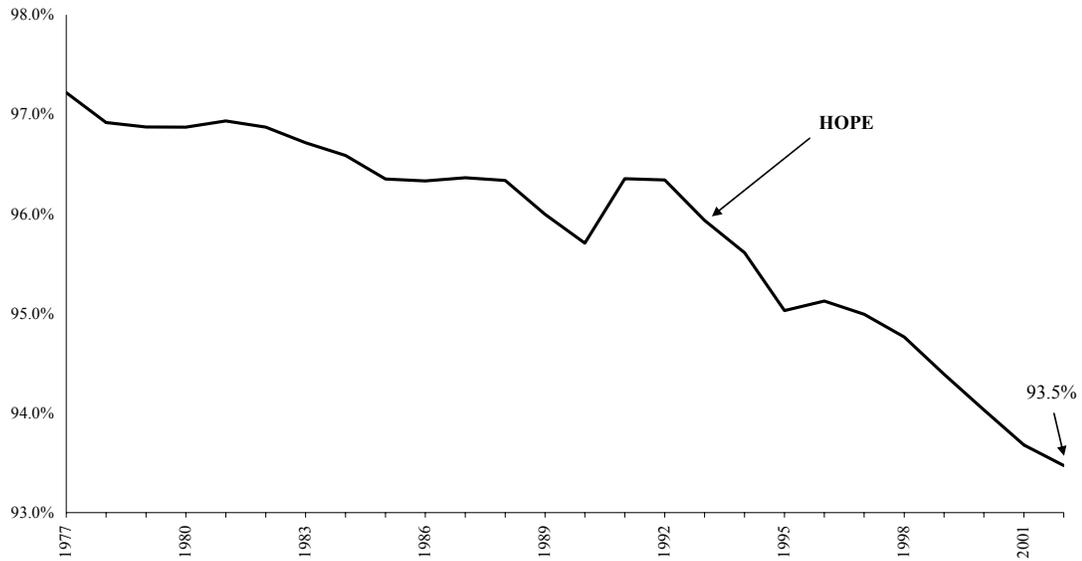
This decline occurred in the vast majority of states. States like Oregon, Wisconsin and California that initially expended well over 25% of their education budget on higher education have all cut their higher education share by over 40% (12 percentage points) while states like Vermont, Massachusetts, New Hampshire and Delaware that initially expended less than 19% of their education budget on higher education, have also cut their shares by over 35% (6 percentage points). Even those states where advances were made (only four states increased their share overall during the period) have seen much of it weathered away by the end of the period. In fact, only one state saw its higher education share increase since 1990 (New Mexico).

The average public education budget size (in 1998 dollars) in FY2001 was \$7.1 billion. Had it been able to maintain its budget share at 1977 levels, public higher education in an "average" state would have received \$439 million more than it actually received in 2001. Considering that average overall full-time equivalent (FTE) enrollment in public two- and

four-year institutions, including all graduate and professional students, was approximately 160,000 students in 2001 (up from 125,000 in 1977), this would have meant an additional \$2,744 per FTE student in support in the average state. To appreciate the magnitude of this loss, recall from figure 1 that average expenditures per student across the U.S. in public higher education in FY2001 was \$16,796. Thus, the decline in higher education's share of state public education budgets represents over 16% of the cost of educating a FTE student. In fact, the monies this loss represents would have been enough to cover 83% of the cost of in-state tuition at a public four year institution in 2001!

A further strain being placed on public higher education institutions is revealed in figure 4. Fueled by the popularity of merit-based aid programs in the 1990s, the share of higher education funding going directly to institutions (as opposed to students) declined over the period, from 97.2% in 1977 to 93.5% in 2002, with most of the decline occurring after the implementation of Georgia's HOPE scholarship program in 1993.⁶ While ultimately student aid dollars make their way back to the institution that an aid recipient attends, this aid travels with the student and cannot be depended upon to support institutional operations.

⁶ By then end of FY2001, 13 states had instituted merit based aid programs similar to Georgia's HOPE program (Krueger 2001). These states are Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Michigan, Mississippi, Nevada, New Mexico, South Carolina and West Virginia. While some states have had small merit programs for over 30 years, which were targeted to specific ethnic groups or students with specific skills, the popularity of broad based programs and their growth did not begin until Georgia's HOPE program exploded on the scene in 1993. The concurrent growth in need-based aid awards may signal that a paradigmatic shift away from broad-based in-kind aid policies is underway.



Source: Illinois State's GRAPEVINE and National Association of State Student Grant and Aid Programs various years.

Figure 4
Average Share of State Higher Education Expenditures to Institutions
1976-77 to 2001-2002

The average public higher education state appropriation (in 1998 dollars) in FY2002 was \$1.3 billion. Had institutions been able to maintain their budget share at the 1977 level, public higher education institutions in an “average” state would have received \$43 million more than they actually received in 2002. Considering that average FTE enrollment in public two- and four-year institutions, including all graduate and professional students, was approximately 160,000 students in 2002, this “loss” represents an additional \$270 per FTE student in support in the average state.⁷ States that were initially less generous to institutions have continued to increase their support for students. For example, New York, Vermont, Illinois and Pennsylvania all decreased their shares to institutions from 83-90% to under 77-85%. On the other hand, there were many states changing their funding strategies and moving aggressively to expand student aid programs from nearly nonexistent in 1977 to rather substantially sized in 2002. Among these states are Georgia, Louisiana, Florida, South

⁷ For comparison purposes, the real value of the maximum Pell grant awarded fell by \$465 over this period.

Carolina, New Mexico and Arkansas – averaging an 11 percentage point drop in the share allocated to institutions over the entire period and 8 percentage points since 1993 alone.

Though the magnitude of the “loss” is far smaller than that represented in figures 2 and 3, this trend should be worrisome nonetheless. Proponents of direct student aid programs champion its cause for two primary reasons: student access and to ensure an accrual of economic benefits within a state. However, recent empirical evidence suggests that the ability of student aid programs to achieve these two goals is very limited. With regard to student access, policymakers have long feared that more generous student aid packages would encourage institutions to capture these additional revenues through higher tuition and other fees, thereby negating the impact of the aid programs. Bridget Long (2003) and Michael Rizzo and Ronald Ehrenberg (2004) provide evidence that supports this view.

With regard to economic development, there is a belief that increasing the generosity of direct student aid awards (and merit programs in particular) would both increase the propensity for students to attend colleges in their home states and increase the propensity for these talented students to remain in-state after graduating.⁸ While a number of studies have found that generous student aid programs result in more talented students remaining in-state to attend college, Jeffrey Groen (2003) finds that although students that attend college within a state are more likely to remain in the state, the magnitude is much too small to justify using economic development as a rationale for merit-based student aid programs.

The combined effect of the trends depicted in figures 2 – 4 indicates that if public higher education institutions had been able to simply maintain their budget shares at 1977 levels, in an average state, institutions would have garnered an additional \$605 million per year. To appreciate the magnitude of this sum, consider that it represents fully 50% of the

⁸ It is believed that areas with a more highly educated workforce have higher wage levels than other areas – and with more highly educated people earning more and therefore paying higher taxes (Moretti, 2003). It is also believed that more highly talented students are most likely to attend colleges outside of the home state and do not return upon graduating (Hoxby, 1997).

total public higher education budget in an average state (\$1.2 billion). Had states been able to retain these dollars, the \$3,781 per full time equivalent student it represents would have been sufficient to cover an additional 23% of institutional expenditures or 114% of in-state undergraduate tuition at an average public four year institution in 2001. These declines have occurred steadily and almost unnoticeably for over 20 years; however institutional responses to this funding withdrawal have enjoyed no such anonymity.⁹

The Empirical Model

In order to explain the budget share outcomes described above I move to a multivariate analysis. I estimate three equations using panel data, with the state-year as my unit of analysis, in which the share of the public general fund budget allocated to education (in state i and year t), the share of the education budget allocated to higher education (in state i and year t) and the share of the higher education budget allocated to institutions (in state i and year t) are specified to be functions of the total available resources at the legislature's disposal, demographic characteristics, enrollment pressures, economic conditions, competing budgetary interests (including private alternatives), political factors, state institutional characteristics and random error terms. These three equations can be viewed as approximating political economic equilibrium conditions from an underlying structural demand and supply model.

$$Outcome_{it} = f(\beta X_{it}) + u_{it} \tag{1}$$

The error terms, u_{it} , are decomposed into a fixed time component, a fixed cross-sectional component and a random component varying over time and across observations. Models are

⁹ It must be emphasized that the national averages presented in figures 2 – 4 above are not driven by any one particular state or group of states. Appendix figure 1 combines the information in these figures to present, for each state, the share of general fund expenditures directly allocated to public higher education institutions from 1977-2001. The steady declines are remarkably similar across all states. Even in states where there had been some recovery during the mid-1990s (California, Louisiana, Florida, Massachusetts), the budget shares never returned anywhere near their initial levels, and began to fall again as the economy turned south in 2001.

then estimated assuming several possible treatments of the random components and cross-sectional components of the error terms.¹⁰

Empirical estimates should therefore be interpreted with caution. For example, it might be difficult to assess whether my results in the EDSHARE equation arise from differences in legislative demand for educational spending, or differences in the technology of supplying educational services to states with different demographic characteristics. It might seem reasonable to exclude the ethnic share of the population from the education production function – which suggests that the demographic effects associated with these variables are likely to result from demand side factors alone. Interpretation of the effect of fluctuations in the school-age population is more difficult, for example, because economies of scale in education could make it possible to deliver the same education to a larger cohort with a less than proportional expansion in education spending.¹¹

Data

The analysis in this paper involves a broad panel data set which was assembled from over 30 different sources.¹² The large number of variables, permutations thereof, and assumptions used in creating them would merit a volume unto itself. Therefore, I will limit this discussion to some general comments about the data set and the outcome variables I am interested in explaining.

¹⁰ Baseline models assume that the random errors are uncorrelated across each equation and uncorrelated over time. Models are then estimating controlling for auto-correlated error terms and / or with the error terms correlated across equations. Additionally, models are also estimated assuming that that error variances are both independent of, and dependent on, the explanatory variables in the model.

¹¹ Since the “amount” of higher education services captured by voters is not observable, but expenditures are, it may be necessary to model the production side of the market for public higher education services. It would be extremely difficult to formulate a model of institutional supply however. State higher education is not likely to be produced efficiently (meaning that individual schools deliver services at minimum cost). Measuring higher education outputs is also notoriously difficult. Quality is an important output, but how can one effectively measure it? If a state focused on measured tangible outputs, universities might focus on minimizing quality and maximizing some tangible output, but this is at odds standard models of prestige maximization. So, what I do above should be viewed as a partial equilibrium analysis.

¹² A complete description of the data can be found at <http://web.centre.edu/rizzo/>.

Table 1 reports summary statistics for six categories of variables used in the analysis. The income and budget measures and the demographic characteristics are derived largely from U.S. Census sources, while the enrollment pressure, competing interests, political, and higher education specific characteristics are derived from less prominent sources. The table presents data for two representative years (1977 and 2001) to highlight how each of the explanatory variables has changed over time. All year references represent fiscal years ending on June 30 of the corresponding year while all dollar values used in the analysis herein represent constant 1998 dollars.

Table 2 displays the level of general fund budget expenditures, education budget expenditures and higher education budget expenditures for four representative states and the national average, and is useful for assessing the magnitude of the impacts of regression estimates presented in the next section. These data indicate that even very small percentage changes in budget shares translate into very large dollar amounts. For instance, a one percentage point increase in the HESHARE in an average state would result in an additional \$75 million for higher education, and as much as a quarter-billion additional dollars in New York.

Table 1
Summary Statistics for Baseline and Selected Variables and Years

| | Mean | 1977 Min | Max | Mean | 2001 Min | Max |
|---|---------|-------------|-----------|---------|-------------|-----------|
| <u>Income and Budget Measures:</u> | | | | | | |
| Median Household Income (1980 earliest) | 33,457 | 24,321 | 51,100 | 40,402 | 28,445 | 52,744 |
| 75-25 Income Ratio (1980 earliest) | 3.1 | 2.7 | 3.7 | 3.3 | 2.8 | 4.0 |
| Per Capita Federal Transfers | 557 | 302 | 1,587 | 992 | 533 | 1,869 |
| <u>Demographics:</u> | | | | | | |
| Median Age | 28.4 | 23.8 | 33.5 | 35.5 | 27.1 | 38.9 |
| Share of Population 5-17 | 25.6 | 22.0 | 29.4 | 20.3 | 17.6 | 25.2 |
| Share of Population 18-24 | 14.4 | 12.3 | 17.5 | 10.5 | 8.5 | 15.7 |
| Share of Population > 65 | 11.4 | 2.7 | 17.9 | 13.4 | 6.2 | 18.7 |
| Percent Nonwhite (1981 earliest) | 16.9 | 1.4 | 67.0 | 20.5 | 3.1 | 75.7 |
| Share 5-17 Population Nonwhite | 20.4 | 0.6 | 70.7 | 25.8 | 4.3 | 83.8 |
| Share 18-24 Population Nonwhite | 20.0 | 2.5 | 63.4 | 25.3 | 4.8 | 75.2 |
| Share >25 Population Nonwhite | 15.7 | 1.2 | 68.9 | 21.2 | 2.2 | 63.0 |
| Share > 65 Population Nonwhite | 11.6 | 0.4 | 72.0 | 11.6 | 1.0 | 77.2 |
| Share Pop 25 and Older w/ HS Degree | 65.5 | 50.0 | 81.5 | 85.4 | 78.2 | 91.7 |
| Share Pop 25 and Older w/ College Degree | 15.3 | 8.3 | 22.7 | 25.2 | 14.8 | 36.2 |
| In-Migration % (All) (1980, 1990, 2000) | 13.0 | 5.6 | 32.1 | 12.0 | 6.4 | 27.5 |
| Out-Migration % (All Ages) | 10.9 | 6.3 | 29.6 | 9.6 | 5.7 | 20.0 |
| In-Migration % (College Age) | 21.1 | 8.4 | 45.3 | 21.5 | 10.3 | 39.3 |
| Out-Migration % (College Age) | 10.8 | 6.2 | 29.8 | 9.5 | 4.8 | 20.7 |
| <u>Enrollment Pressure</u> | | | | | | |
| Share HE Enroll Privates (1999 latest) | 21.0 | 0.0 | 56.7 | 23.9 | 5.0 | 61.5 |
| Share K12 Enroll Privates (1981 earliest) | 9.4 | 1.6 | 19.0 | 9.2 | 2.4 | 16.7 |
| Share HE Enroll 2-Years (1999 latest) | 22.5 | 0.0 | 53.0 | 27.3 | 3.6 | 56.0 |
| Enrollment Rate (1999 latest) | 53.5 | 6.9 | 140.0 | 58.4 | 30.1 | 101.2 |
| FTE HE Enrollment (2000 latest) | 161,464 | 9,082 | 1,074,346 | 214,367 | 16,290 | 1,329,270 |
| K12 Enrollment (2000 latest) | 871,775 | 89,295 | 4,313,926 | 934,034 | 91,757 | 6,050,609 |
| Capacity | 1.23 | 0.80 | 2.08 | 0.82 | 0.33 | 2.14 |
| SAT (1980 earliest) | 945 | 784 | 1,062 | 1,069 | 974 | 1,196 |
| <u>Competing Interests & Economic Conditions:</u> | | | | | | |
| Crime Rate (per 100,000) - (1998 latest) | 4,968 | 2,391 | 8,461 | 4,714 | 2,469 | 7,272 |
| Health (Share >65 x Health CPI) (2000 latest) | 6.0 | 1.4 | 9.5 | 32.7 | 14.9 | 45.8 |
| Unemployment Rate | 7.0 | 3.3 | 10.4 | 3.9 | 2.2 | 6.6 |
| Unemp. Rate Nonwhites (1978 earliest) | 12.3 | 0.0 | 22.2 | 7.3 | 0.0 | 16.7 |
| # States with Court K12 Reform | 2 | | | 24 | | |
| GSP Share Finance, Ins, Real Est, Svc (1978 earliest) | 25.4 | 18.4 | 46.6 | 37.9 | 23.1 | 56.1 |
| Share GF Revs - Corp Income Tax | 6.1 | 0.0 | 13.7 | 4.0 | 1.3 | 12.4 |
| Share GF Revs - Indiv Income Tax | 18.3 | 0.0 | 41.9 | 23.9 | 0.0 | 47.1 |
| Share GF Revs - Lotteries | 0.4 | 0.0 | 3.1 | 1.8 | 0.0 | 8.0 |
| Share GF Revs - Sales Taxes | 35.4 | 4.8 | 62.4 | 29.9 | 1.6 | 66.7 |
| <u>Political Factors:</u> | | | | | | |
| # States with Democrat Governor | 37 | | | 17 | | |
| Assembly Seats per Senate Seats | 3.02 | 1.67 | 16.67 | 2.95 | 1.67 | 16.46 |
| Assembly Seats per 100,000 Population | 5.9 | 0.0 | 47.3 | 4.6 | 0.0 | 32.0 |
| Senate Seats per 100,000 Population | 2.1 | 0.0 | 7.9 | 1.6 | 0.0 | 7.3 |
| Voting Participation Rate | 52.0 | 22.4 | 69.5 | 51.4 | 33.4 | 67.4 |
| <u>Higher Education Factors:</u> | | | | | | |
| Endowment per Student (1996 latest) | 1,562 | 58 | 11,432 | 2,850 | 72 | 21,997 |
| Giving per Student | 526 | 0 | 2,047 | 2,824 | 0 | 7,282 |
| Ph.D degrees / BA degrees | 3.12 | 1.18 | 6.78 | 3.14 | 1.03 | 5.57 |
| Proportion HH w/Inc. Below Pell Max | 64.4 | 43.0 | 76.8 | 56.7 | 42.0 | 71.0 |
| Research Expenditures per Capita | 36 | 8 | 203 | 82 | 29 | 174 |
| Share Ph.D awarded in Science and Eng. | 61.3 | 33.0 | 100.0 | 67.4 | 35.1 | 96.3 |
| Avg Instate Tuition at 4-Years (1999 latest) | 1,637 | 829 | 2,968 | 3,225 | 1,960 | 6,894 |

Note: All dollar values are constant dollars

Table 2
Representative Budget Measures in \$millions for FY2001

| | General Fund | Education <i>(share)</i> | Higher Education <i>(share)</i> |
|-------------------------|--------------|-----------------------------|------------------------------------|
| <i>National Average</i> | 20,867 | 7,491 35.9% | 1,231 16.4% |
| Iowa | 11,199 | 4,397 39.3% | 871 19.8% |
| New York | 89,237 | 23,569 26.4% | 3,353 14.2% |
| North Carolina | 28,860 | 11,960 41.4% | 2,452 20.5% |
| Texas | 58,183 | 24,805 42.6% | 4,087 16.5% |

The choice of the general fund as my unit of analysis was made with great care. A state receives revenues from a variety of sources including federal government appropriations, bond sales, broad based taxes and earmarked programs. Though average general fund expenditures account for slightly less than 50% of total state expenditures, what happens in the state general fund is the best single gauge of the financial position and commitment of a state.¹³ This is because the general fund does not include any special funds restricted by law for specific government activities or functions, nor does it include monies used to fund ongoing capital projects or from other branches of governments. Therefore, the general fund is the portion of state budgets that legislatures and governors have the most appropriative power over in order to fund the ongoing operations of the various state budget items.

¹³ NASBO State Expenditure Report, 2001 p.2.

Though the Census Government Finance data files report separately budgeted expenditures on higher education, the information I use to construct the HESHARE and INSHARE variables is obtained from the Center for the Study of Education Policy at Illinois State University (called Grapevine). Grapevine makes great efforts to capture the most discretionary portion of state higher education budgets. The data do not include appropriations for capital outlays and debt service, no appropriations from monies derived from federal sources, student tuition or fees, auxiliary enterprises and other non-tax sources. For example, all tuition revenues in Texas are collected by the state and redistributed to the schools in the Texas system. These expenditures are included in the Census finance files, but not in the Grapevine data.¹⁴ From this data, I subtract the total amount allocated to private colleges and universities, as reported by the NCES' Integrated Postsecondary Education Data System.

Results

This section presents empirical findings that explain why public education, and public higher education in particular, seems to be a diminishing state priority. For each of the three outcome measures I specify the error term from equation 2.5 to be $(u_{it} = c_i + \gamma_t + \varepsilon_{it})$, and propose the following model:

$$Outcome_{it} = \sum_{k=1}^K B_k X_{itk} + c_i + \gamma_t + \varepsilon_{it}. \quad (2)$$

¹⁴ One might argue that tuition redistribution is up to the discretion of state legislatures as well, but I want to capture the allocation of tax dollars to higher education. Nonetheless, regression estimates that use only census data to compute budget shares are very similar to estimates using the Grapevine data and their presentation is therefore suppressed.

The parameters of interest, β_k , answer the question, “holding all other factors constant, what is the expected change in the HESHARE within a state if some observable factor increases by one unit?”¹⁵

The inclusion of state effects (c_i) and year effects (γ_t) allow me to take full advantage of the panel nature of the data and understand why budget shares *change within a state* over time. Inclusion of state effects controls for unobservable state-specific factors that are constant over time. These factors might include: climate, presence of national parks, high levels of average wages, historical factors, etc. – each presumed to vary across states, but to have a constant impact over time within states. If the state effects were excluded from these regressions, the answer may be misleading if the excluded state effects were correlated with explanatory variables in the model. For example, states with no parkland will have more resources available to devote to higher education. However, if the level of out-migration is negatively correlated with the number of state parks, then the estimated effect of out-migration on the HESHARE would not only pick up the investment decision that states face, but also the impact of a state park system on higher education budgets.

Year effects are included in the models to control for unobserved, time-specific factors that are constant across all states. These factors include: changes in federal laws, federal court decisions, international conflicts and trade patterns, changes in the value of the Pell grant, changes in technology and the education production function, etc. – each presumed to change over time, but to impact all states in the same way.¹⁶ Inclusion of time effects also

¹⁵ The within estimator (often referred to as a “fixed effect” estimator) is a convenient choice to control for state specific omitted variables because it allows for arbitrary correlation between the unobserved state effect and observed explanatory variables that other estimation strategies do not permit (it is very likely in this setting that unobserved fixed factors that affect budget shares also are correlated with observed time varying factors. For instance, the year of statehood is very highly correlated with the percentage of college students enrolled in private schools). Though other strategies may be more efficient (which would be important in such a small data set such as the one I employ), the within estimator is still consistent. The unobservable effects are treated as parameters to be estimated in this model, which is useful to analyze state preferences for particular budget items. Further, the within estimator is useful for making predictions about how states will respond to changing demographic, economic or political conditions within a state.

removes the impacts of systematic changes in the explanatory variables so that the results presented below reflect within-state responses to idiosyncratic shocks alone. For example, when systematic changes in enrollment pressures are controlled for, one might expect to observe smaller changes in budget shares when there are idiosyncratic shocks to enrollment pressure, due to competitive tax pressures, institutional capacity and other factors unique to a given state.¹⁷

Baseline Estimates

I estimate equation 2 via ordinary least squares (OLS) for each of the three outcome measures I am interested in. Table 3 presents OLS regression estimates for the education share (EDSHARE) and higher education share (HESHARE) equations while table 4 presents OLS estimates for the institutional share (INSHARE) equation. The dependent variables are each defined in percentage point terms, so that an estimated coefficient of 2.5, for instance, indicates that an increase in an independent variable of 1 unit results in an increase in the relevant share by 2.5 percentage points.¹⁸ All of the results discussed below are *ceteris paribus*, holding all other factors constant.¹⁹

¹⁶The distinction between the within estimator presented in this section and the between estimators is worthy of more attention, and is largely ignored in the related empirical literature. In most cases, it would be a large coincidence to observe the same difference in budget share outcomes from observation of two different states with a one unit difference in an explanatory variable between them versus observation of a single state that experiences a one unit increase in that same explanatory variable. While it might be true that some variables act like this, there is no theoretical reason why all of them should. For example, if I observe two different states, one with a court-reformed K12 finance system and the other without, I might expect the HESHARE to be larger in the reform state because this state likely had lower state support for K12 education, resulting in the court decision. On the other hand, if I observe a single state before and after the reform decision, I expect the HESHARE to be smaller, because this is implicitly what the court mandates.

¹⁷ For example, impacts of K12 enrollment changes on HESHARE changes would be net of any national trends in K12 enrollments. It is agreed that rising K12 enrollments were a key factor in the growth of state and local spending in the late 50s and 60s as well as in the 90s. Allowing for year effects removes such systematic changes in the size of the school-age population from affecting the results in this analysis.

¹⁸ Models were also estimated using a variety of definitions for most of the independent variables and produced qualitatively similar results. For example, in models where the age distribution is entered continuously, I find that the EDSHARE decreases as the median age of the state increases, *ceteris paribus*. These and other models are available upon request.

The results in column (i) of table 3 suggest that changes in the distribution of income and age composition within a state are responsible for changes in the EDSHARE depicted in figure 2. Each \$1,000 increase in real household income (INC) results in a 1.3 percentage point loss in education's share of the overall budget. This relationship is nonlinear however and reaches a minimum at \$58,000, just beyond the distribution of income observed in 2001 (Maryland = \$53,000). The results also suggest that the increasing inequality of income (INEQU) has resulted in a fall in preferences for public education. Together, these estimates suggest that changes in the distribution of income have accounted for over 100% of the observed changes in the EDSHARE since 1972.²⁰

The changing age composition within a state produced expected changes in the EDSHARE. Changes in the fraction of the population that is school-aged (SCHOOLAGE) were positively correlated with the EDSHARE while an increase in the share of the population that is elderly (ELDERLY) caused a fall in the EDSHARE. Prior research by Poterba (1997), Case et al (1993) and Borge and Rattso (1995) all find a negative correlation between student cohort size and per pupil education funding levels. Though I find a strong positive effect of student-cohort size on budget shares, one cannot infer how expenditures per student will fare. While the point estimate on the elderly share does not appear large, it implies that by the year 2025, when the elderly share is expected to increase by an average of 5 percentage

¹⁹ Though some state level variables do not exhibit great variation year over year, over the entire 30 year period of the sample there is considerable variation. Regression results using 3 year moving averages or 5 year intervals of data are qualitatively similar to the results reported below. Further, a cursory analysis of the outcome data indicates that the largest changes have occurred for the HESHARE. If one were to rank the states according to the budget share measures, one would observe that the rank order correlation on each outcome is not constant over time for the HESHARE, and is much more constant for the EDSHARE and INSHARE. For example, the correlation of state rankings on EDSHARE between 1977 and 2001 is 0.67 while the correlation of state rankings on HESHARE is 0.36 – indicating that changes at the macro-economic level are not solely responsible for changes in the HESHARE, but rather state specific factors are important.

²⁰ Real income increased by approximately \$6,000 over the entire period, the ratio of income of the 75th percentile to the 25th percentile increased by 0.2 points since 1977.

points, that education will lose an additional 2 percentage points in state budgetary priority – representing nearly a half-billion dollars in an “average” state (2001 dollars).²¹

Table 3
OLS Baseline Regressions for Education's Share of General Fund Budgets and Public Higher Education's Share of the Education Budget - Within Estimates

| | <i>EDSHARE</i> | | <i>HESHARE</i> | |
|---|--------------------------------|---|---------------------------------|----|
| | (I) | | (II) | |
| *Bold 95% significance, ** italics = 90% | | | | |
| Median Income in \$1,000 (INC) | -1.27 (0.28) | * | 0.61 (0.23) | * |
| Squared Income (INC2) | 0.011 (0.002) | * | -0.004 (0.002) | * |
| 75-25 Income Ratio (INEQU) | -5.13 (1.81) | * | 4.12 (1.52) | * |
| Share of Population > 65 Years Old (ELDERLY) | -0.41 (0.18) | * | <i>0.22</i> <i>(0.13)</i> | ** |
| Share of Population Aged 5-24 (SCHOOLAGE) | 0.62 (0.12) | * | | |
| Share Pop. 18-24 / Share Pop. 5-17 (COLRATIO) | | | 0.13 (0.04) | * |
| Nonwhite schoolage / Nonwhite non-schoolage (SCHOOLRACERATIO) | 1.42 (1.10) | | | |
| Nonwhite college pop / Nonwhite K12 pop (COLK12RACE) | | | -0.15 (0.14) | |
| (Nonwhite college pop / Nonwhite K12 pop) *Share Adult Population Nonwhite (RACEINTERACT) | | | 0.04 (0.01) | * |
| In-Migration (share population in state today that did not reside here 5 years ago) (INMIG) | 0.02 (0.05) | | -0.02 (0.03) | |
| Out-Migration (share of population in state 5 years ago that does not reside here today) (OUTMIG) | 0.06 (0.06) | | -0.13 (0.06) | * |
| Federal Transfers per Capita (\$1,000) (FEDTRAN) | -0.56 (0.36) | | | |
| Unemployment Rate (UNEMP) | -0.05 (0.06) | | -0.22 (0.05) | * |
| Health Costs (HEALTH) | -0.02 (0.06) | | | |
| Crime Rate (CRIME) | 0.03 (0.12) | | | |
| Court Reform State (COURT) | 1.18 (0.30) | * | -1.19 (0.25) | * |
| Within R ² | 0.319 | | 0.663 | |
| Observations | 1300 | | 1300 | |

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. All also include interactions between income level and distribution and EDSHARE and INSHARE include relative price measures, none of which are statistically relevant and measures controlling for private enrollment pressures. In-migration and out-migration for EDSHARE equation are rates for entire population while for HESHARE and INSHARE are calculated for college aged population alone. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Standard errors in (parentheses).

²¹ <http://www.census.gov/population/projections/nation/summary/np-t3-f.pdf>. This may also partially be picking up the impacts of the increasing Medicaid burden within states, as the elderly make up a large fraction of beneficiaries.

An important finding is that in state-years after a court rules that a state's K12 education finance system is unconstitutional (COURT), the share of the general fund budget allocated to education increases by 1.2 percentage points. This result is consistent with Murray et al's (1998) finding that court reforms in 16 states led to an average increase in per capita K12 spending of 23%.

Turning to the HESHARE results in column (ii), I find that in addition to the factors that affect EDSHARES in column (i), changes in demographic heterogeneity, migration patterns and economic conditions help explain why public higher education has been crowded out by K12 education. While changes in the income distribution have worked in HESHARE's favor, the effects are offset by the losses suffered through education's declining priority in the overall budget process. Increases in household income of \$1,000 (INC) result in increases in HESHARE by 0.6 points throughout the entire range of observed income (the maximum is reached at \$79,000).²² The estimates also suggest that an increase of income inequality within a state (INEQU) results in a larger share of the available education dollars being allocated to higher education. This result, while a positive one for higher education, may not be in the best interests of society at large. Previous research by Hansen and Weisbrod (1969), Windham (1970), UNESCO (2003), suggest that the economic middle and upper class have been able to shift income toward itself in the political process using the higher education finance system, and that in places where inequality is severe, investments in higher education will exacerbate the existing income differentials.²³

Age demographic shifts have also worked in higher education's favor. While states are favorably responsive to changes in the relative size of the college aged cohort to the K12

²² To highlight, an increase in median income in an average state of \$1,000 would result in higher education reaping 17% of the education budget as opposed to 16.4%. However each \$1,000 increase in median income also results in a decline in the EDSHARE to 34.9% from 36.1% in 2001. Therefore, higher education's share of the overall budget remains roughly constant at 5.9%.

²³ However, Lee, Ram and Smith (1999), Cardak (1999), Hight and Pollock (1973) and Biggs and Dutta (1999) present evidence that the system of higher education finance can also be useful to redistribute income toward the economically less advantaged.

aged cohort (COLRATIO), there is also modest evidence that aging populations (ELDERLY) look more favorable on higher education than K12 education. This result may reflect a lower perceived relative tax price for higher education by the elderly or a more immediate public benefit perceived to be available through financing university research.²⁴

Taken together, income distribution and age demographic shifts indicate that higher education's share of the education budget should have gone up by nearly 5 percentage points since 1977. Since the HESHARE fell by approximately 6 points, other factors must account for an 11 percentage point fall.

There are two estimates that will help predict why higher education may face difficulties in the future, but are not able to explain the observed changes in the past – out-migration and unemployment. While the estimated coefficient on the out-migration of the college-aged population (OUTMIG) suggests that increases in out-migration lead states to devote fewer resources to higher education, over this time period the average level of out-migration across states has remained fairly constant.²⁵ Similarly, I find that as the unemployment rate (UNEMP) increases by one percentage point, states respond by cutting the HESHARE by .22 points; however, the average unemployment rate over this time period fell by 2 ½ percentage points.

The estimates in column (ii) suggest a trend that demographic heterogeneity can have a very important effect on education spending. I have included two variables in this equation to capture these impacts. First, I include a variable for the ratio of the college-aged population that is non-white relative to the K12-age population that is non-white (COLK12RACE). To see whether the impact of this heterogeneity varies according to the racial make-up of the non-

²⁴ A majority of elderly wealth is concentrated in home equity, from which property taxes are assessed to finance local schools. Further, since income levels are smaller – they pay less (or no) income taxes and are often granted discounts on state sales taxes which might be used to finance higher education appropriations.

²⁵ Though, wages and other factor prices may fall when out migration increases, so lower higher education expenditures may not necessarily indicate that lower levels of service are being provided in the face of out-migration patterns.

school age population in the state, I also interact it with the share of the population aged 25 and older than is nonwhite (RACEINTERACT). While not statistically significant, an interesting result is that as the college-aged population becomes more nonwhite relative to the K12 population, states devote more resources to the population that is “whiter.” However, the impact of this heterogeneity becomes statistically significant and larger when the non-school age adult population is more homogeneous.²⁶

K12 court reforms have had a large impact on the HESHARE. The estimates suggest that as a state moves to more centralized methods of K12 financing (COURT), the average impact over time has been to decrease the share of the education budget allocated to public higher education by 1.2 points. In an average state in 2001, this represents \$90 million more that public higher education would have been allocated in the absence of the reform program. This result somewhat contradicts the work of Murray et al (1998). While they conclude that the increased expenditures on K12 education did not come at the expense of any other budget item, their study concluded in 1994. Taken together with the EDSHARE result, I find that public higher education spending has been partially crowded out by the increased K12 expenditures resulting from the K12 court reforms.²⁷

The estimated effects of the independent variables on INSHARES in the left hand column (i) of Table 4 can be described briefly. The relationship between demographic changes and the share of higher education budgets appropriated directly to institutions is strong. Increases in the share of the population that is college-aged (COLLAGE) result in

²⁶ In other words (ignoring the fact that I am estimating changes for a moment), higher education funding falls more in states with more heterogeneous racial compositions across different school age cohorts. The more white the non-school age population gets, the more precipitous this fall will be. Only a couple of researchers have looked into this variable. Poterba (1997) finds that different racial mix affects funding for K12 education at the state level while Ladd and Murray (2001) do not find evidence at the local level.

²⁷ The total loss is near \$60 million according to 2001 figures for the average state. In the absence of the reforms, higher education in an average state received 16.4% of the education budget which received 36.1% of the overall budget, or about 5.9% of the overall budget. After the reform, higher education receives only 15.2% of the education budget, which received 37.2% of the overall budget, or about 5.6%. The general fund budget in an average state in 2001 was approximately \$20 billion.

higher INSHARES, so that the subsidy is received by a larger pool of people than would otherwise be the case. However, the size of the college aged cohort fell markedly between 1972 and the early 1990s, resulting in a one point loss in the INSHARE. Aging populations tend to support institutions rather than students as well. The Pell grant variables yield interesting results. As more households become eligible for federal Pell grant awards (PELL), it appears that states respond by reducing the share of aid awarded to institutions, and that this effect is larger when the share of the population that is college-aged (PELLPOP) is larger, though the overall magnitude is minimal. Since more students would be eligible to receive Pell grants (and federal subsidized and unsubsidized loans) when tuition rates are higher, there is a perverse incentive built into the federal financial aid system that encourages states to behave strategically. I am not being pedantic. The Chancellor of the State University of New York, Robert King, was recently quoted saying, “I would suggest that there should be (a tuition increase) ... for students whose family’s incomes is \$50,000 or less, the state’s tuition assistance program picked up the entire \$950 of last year’s hike ... students from most needy families are pretty much insulated from this ... for those families that can afford to pay, eventually, we’re gonna say, you gotta pay a little more.”²⁸

As with the HESHARE, ethnic heterogeneity across age cohorts has an important impact on the INSHARE, with the share going to institutions falling when the college-aged population becomes more nonwhite relative to the adult non-college-aged population (COLRACERATIO).²⁹ Whether this decline is due to an effort to direct merit aid away from nonwhites, or because nonwhites have a larger demand for state need-based aid cannot be

²⁸ *Ithaca Journal*, 12/3/03

²⁹ In results not reported in Table 3.2, it appears as though the effect of the racial heterogeneity is felt most acutely by states that are aging fastest. When an interaction between the share of the population aged 65 with the ethnic heterogeneity variable is included in this model, the first order impact of the ethnic heterogeneity disappears, but I find that the elderly support for institutions falls as the college aged population becomes more nonwhite.

immediately discerned from this result. I return to this important issue in a moment below with a “psuedo-natural experiment” treatment.

Table 4
OLS Regressions for Institutional Share of Public Higher Education Budgets - Within Estimates

| | Baseline (I) | | "Psuedo-Experiment" (II) | |
|---|----------------------------------|----|-----------------------------------|----|
| *Bold 95% significance, ** italics = 90% | | | | |
| Median Income, in \$1,000 (INC) | 0.23 (0.16) | | 0.27 (0.17) | |
| Squared Income (INC2) | -0.001 (0.001) | | -0.002 (0.001) | |
| 75-25 Income Ratio (INEQU) | 1.59 (1.09) | | 1.67 (1.07) | |
| Share of Population > 65 Years Old (ELDERLY) | 0.38 (0.10) | * | 0.38 (0.10) | * |
| Share of Population Aged 18-24 (COLLAGE) | 0.275 (0.116) | * | 0.374 (0.076) | * |
| Nonwhite college / Nonwhite non-college (COLRACERATIO) | -0.009 (0.003) | * | -0.005 (0.007) | |
| In-Migration (share population in state today that did not reside here 5 years ago) (INMIG) | 0.01 (0.02) | | 0.02 (0.02) | |
| Out-Migration (share of population in state 5 years ago that does not reside here today) (OUTMIG) | <i>-0.09</i> <i>(0.05)</i> | ** | -0.11 (0.05) | * |
| Unemployment Rate (UNEMP) | 0.03 (0.04) | | 0.02 (0.04) | |
| Share College Enroll Privates (COLPRV) | 0.019 (0.012) | | 0.033 (0.012) | * |
| Share College Enroll Two-Years (TWOYEAR) | -0.006 (0.012) | | -0.005 (0.012) | |
| Proportion Below Pell (PELL) | -0.06 (0.03) | * | -0.07 (0.03) | * |
| PELL x COLLAGE (PELLPOP) | <i>0.0037</i> <i>(0.0022)</i> | ** | <i>0.0039</i> <i>(0.0022)</i> | ** |
| Regional Nonresident Tuition (\$1,000) (REGTUIT) | -0.21 (0.09) | * | -0.14 (0.09) | |
| PhD Degrees Awarded per BA Degrees Awarded (PHDBA) | -0.15 (0.12) | | -0.14 (0.11) | |
| SAT (100 points) (SAT) | <i>0.29</i> <i>(0.18)</i> | ** | <i>0.31</i> <i>(0.17)</i> | ** |
| Merit Aid State (MERIT) | -2.86 (0.27) | * | -6.89 (3.49) | * |
| MERIT x INC | | | 0.06 (0.09) | |
| MERIT x COLRACERATIO | | | 0.12 (0.03) | * |
| INC x COLRACERATIO | | | -0.0001 (0.0002) | |
| MERIT x INC x COLRACERATIO | | | -0.0029 (0.0009) | * |
| Within R ² | 0.390 | | 0.411 | |
| Observations | 1250 | | 1250 | |

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. All also include interactions between income level and distribution and EDSHARE and INSHARE include relative price measures, none of which are statistically relevant. In-migration and out-migration for EDSHARE equation are rates for entire population while for HESHARE and INSHARE are calculated for college aged population alone. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Standard errors in (parentheses).

Looking to the bottom panel of the table, the estimates suggest that movement to a merit aid program (MERIT) reduces the INSHARE by nearly 3 percentage points. Also, as the nonresident tuition rates at public four year institutions in the geographic region (REGTUIT) increase, states are increasingly turning to student aid rather than institutional appropriations – explaining approximately one percentage point in the INSHARE drop. Again, the reasons for doing so are unclear. It may be the case that higher regional tuitions permit instate publics to charge higher tuitions as well, reducing the pressure on direct state support, or reduce the demand for own residents leaving the state. It may also be the case that higher regional tuition signals an improvement in school quality, and in an effort to compete with these institutions, the state induces its resident students to stay by providing them with larger student aid packages.

Column (ii) presents regression estimates that try to explain the motivation for the increasing popularity of state student merit aid programs. Taking liberty with nomenclature and variable interpretation, I accomplish this by including four additional variables to the specification in column (i): second order interaction terms between the merit aid variable (MERIT) and the median income level (INC); MERIT and the relative nonwhite college age population (COLRACERATIO); INC and COLRACERATIO; and finally, a fully-interacted variable of $MERIT \times COLRACERATIO \times INC$.³⁰ This fully interacted model is akin to a natural experiment approach that answers the question, “Do merit aid states that have heavily nonwhite college populations favor broad based institutional aid or more targeted student

³⁰ For the sake of brevity, I do not present the estimates from intermediate regressions that introduced the second order interactions independently. In each of these regressions, the second-order interactions were each statistically significant and of the expected sign. $MERIT \times COLRACERATIO$ yielded positive and statistically significant results – indicating that states that move to merit aid tend to favor student aid less when the college aged population is increasingly nonwhite – providing support for the notion that the rising importance of merit aid programs has been largely a political scheme to attract middle and upper class white votes and dollars. $MERIT \times INC$ yields statistically significant negative results – which can be interpreted as when income increases in the merit aid states, support for student aid is more dramatic than when income increases in the non-merit aid states. $INC \times COLRACERATIO$ yields a statistically significant negative result – indicating that when income increases in states with relatively more nonwhite college age population, broad based institutional support falls more than when a state is less nonwhite in its college age population.

based aid?” The results are disheartening. While the impacts of the variables in the baseline specification are largely unchanged by the inclusion of the interacted variables, the first-order impact of moving to merit aid programs grows dramatically to nearly 7 percentage points. The variable of interest, MERIT x COLRACERATIO x INC, which can be viewed as a continuous analog to a “difference-in-difference-in-differences” estimator, yields a statistically significant negative result. Considered liberally, this implies that while merit aid states with large nonwhite college aged populations favor institutional support, these states only do so when income is low. When income is high in these states, student aid is preferred – with the somber implication that the increasing popularity of merit aid programs has not been altruistically motivated. Targeted, non-means tested programs seem to be used to redistribute income to middle- and upper-income families and to avoid providing broad-based support to economically disadvantaged members of the populace.

Econometric Estimates – Incremental Budgeting

The results presented in tables 3 and 4 have implicitly assumed that legislators receive utility from every single dollar budgeted for a specific agency. In other words, the baseline specifications allow the entire budget share to be a decision variable. The inability of the explanatory variables in these models to explain all of the declines in the observed budget shares signals that this may not be the case in practice.

It has been suggested that states make funding decisions on an incremental basis, with previous budget levels taken as given when determining current budget allocations.³¹ Consider the HESHARE equation as an example. The interpretation is that for any level of budgeted funds for education, the legislators first make expenditures for the minimum level of services required to be provided by K12 and higher education. Then with the remaining

³¹ It has also been put forth that budgetary decisions may transition away from incremental budgeting in scarce times due to the increased competition for resources when resources are limited. In these cases, other practices may be adopted. (The Profession of Budgeting. *Public Budgeting and Finance* v10, n2 (Summer 1990): 102-06 Standard No: ISSN: 0275-1100.)

budgeted funds, they choose the optimal *increments* to these budget levels, which depends only on the increments to the minimum expenditures, not on the absolute levels.

The empirical implications of this behavior are that rather than estimating an equation for the HESHARE that resembles:

$$HESHARE_{it} = a + \beta X_{it} + c_i + \gamma_t + e_{it} , \quad (3)$$

I would need to estimate an equation that resembles:

$$HESHARE_{it} - \theta HESHARE_{it-1} = a + \beta X_{it} + c_i + \gamma_t + e_{it} \quad (4)$$

If (4) is the correct model, then shifting the lagged dependent variable to the right hand side and estimating within state changes will lead to a correlation between the error term and the lagged dependent variable, even if the error terms themselves are not auto-correlated. This violation of the orthogonality assumption will not only result in biased estimates of θ , but will likely introduce bias in many of the other parameter estimates in the model.

Fortunately, techniques have recently been developed that allow for a satisfactory treatment of this complication.³² The even numbered columns of Table 5 present estimates of the baseline equations using the Arellano-Bond dynamic panel estimation technique. While there is some efficiency loss due to the necessity of using lagged dependent variables as instruments, as long as the error terms are well behaved, the results will be consistent.³³ For completeness, I

³² To be consistent with the estimates in Tables 3 and 4, I want to preserve my “fixed effects assumption” that the unobserved state specific effects are correlated with the observed explanatory variables. Until recently, dynamic panel estimation techniques were unable to accommodate this assumption. They required an explicit specification of the distribution of c_i , and also required that its conditional expectation (on X) to be zero. Instrumental variables generalized methods of moments techniques have recently been developed that take first differences of equation (4) and use lagged differences or lagged levels of the dependent variables as instruments for the endogenous lagged dependent variable. See Greene (pp. 582-584) and Wooldridge (pp. 412 and 493-495) for more detailed discussions.

present the results of uninstrumented models in the odd numbered columns. State budgeting would be strictly incremental if the estimated effects of the lagged dependent variables were each equal to one. If the coefficients equal zero, then it is the case that the entire budget is determined “from scratch” each budget cycle. Therefore, values of θ between 0 and 1 provide for the possibility that expenditures within any budget category can be cut to some extent during that budget cycle.

It is not surprising that the estimates in Table 5 indicate that budget shares are determined in part by an incremental process, and in part by a discretionary process. Looking to the EDSHARE results in column (ii), including the lagged EDSHARE diminishes the importance of the income distribution and court reform variables, while removing the influence of demographic changes on changes in education budget shares. The coefficient on the lagged variable (LAG) indicates that in each period, 73% of the EDSHARE budget is preserved, with the remaining 27% left to legislative discretion.

Including the lagged dependent variables in the HESHARE equation (column iv) has a similar impact on its baseline estimates. Compared to the results in Table 3, column (ii), the impacts of the changing income distribution are removed and the magnitude of the court rulings on budget share changes is smaller. However, the ethnic heterogeneity result is robust to this specification change. As one might expect, it appears that legislatures exercise more discretion over the higher education budget share determination than they do to the process one branch above, with only 56% of the HESHARE determined by the level of HESHARE one period earlier.

³³ One key assumption is that there is no second order auto-correlation in the first differenced idiosyncratic errors. If errors are auto-correlated, even if only first-order, specification (4) is subject to bias as both $HE_{i,t-1}$ and $e_{i,t-1}$ appear on the right hand side of the equation.

Table 5
Dynamic Panel Estimation on Baseline Regressions: Uninstrumented Fixed Effects
Estimates (Odd Columns), Instrumental Estimates using Dynamic Panel GMM
Estimator (Even Columns)

| | EDSHARE | | HESHARE | | INSHARE | |
|---|----------------------------------|-----------------------------------|-----------------------------------|---------------------------------|---------------------------------|------------------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| 1-Period Lagged Outcome (LAG) | 0.81 <i>(0.02)</i> * | 0.73 <i>(0.03)</i> * | 0.62 <i>(0.02)</i> * | 0.56 <i>(0.03)</i> * | 0.75 <i>(0.02)</i> * | 0.53 <i>(0.03)</i> * |
| Median Income in \$1,000 (INC) | -0.39 <i>(0.17)</i> * | -0.45 <i>(0.23)</i> * | 0.31 <i>(0.16)</i> * | 0.17 (0.21) | -0.057 (0.115) | -0.105 (0.134) |
| Squared Income (INC2) | 0.003 <i>(0.001)</i> * | <i>0.003</i> <i>(0.002)</i> ** | -0.003 <i>(0.001)</i> * | 0.000 (0.002) | 0.001 (0.001) | 0.001 (0.001) |
| 75-25 Income Ratio (INEQU) | -1.72 <i>(1.09)</i> | -2.39 <i>(1.45)</i> ** | 1.49 <i>(1.08)</i> | 1.78 <i>(1.36)</i> | 0.09 <i>(0.76)</i> | 0.23 <i>(0.87)</i> |
| Share of Population > 65 Years Old (ELDERLY) | -0.01 <i>(0.12)</i> | 0.12 <i>(0.22)</i> | 0.01 <i>(0.10)</i> | -0.07 <i>(0.21)</i> | 0.095 <i>(0.074)</i> | 0.002 <i>(0.173)</i> |
| Share of Population Aged 5-24 (SCHOOLAGE) | 0.03 <i>(0.08)</i> | -0.09 <i>(0.15)</i> | | | | |
| Share of Population Aged 18-24 (COLLAGE) | | | | | 0.15 <i>(0.06)</i> * | 0.44 <i>(0.08)</i> * |
| Share Pop. 18-24 / Share Pop. 5-17 (COLRATIO) | | | 0.03 <i>(0.03)</i> | 0.04 <i>(0.05)</i> | | |
| Nonwhite school/collage / Nonwhite non-school/collage (SCHOOL/COLRACERATIO) | 0.90 <i>(0.72)</i> | 0.72 <i>(1.09)</i> | | | -0.003 <i>(0.002)</i> | -0.005 <i>(0.003)</i> ** |
| Nonwhite college pop / Nonwhite K12 pop (COLK12RACE) | | | -0.06 <i>(0.10)</i> | -0.19 <i>(0.13)</i> | | |
| (RACEINTERACT) | | | <i>0.015</i> <i>(0.009)</i> ** | 0.04 <i>(0.01)</i> * | | |
| In-Migration (share population in state today that did not reside here 5 years ago) (INMIG) | 0.04 <i>(0.03)</i> | 0.04 <i>(0.04)</i> | -0.05 <i>(0.02)</i> * | -0.03 <i>(0.03)</i> | 0.003 <i>(0.016)</i> | 0.004 <i>(0.016)</i> |
| Out-Migration (share of pop. in state 5 years ago that does not reside here today) (OUTMIG) | 0.03 <i>(0.05)</i> | 0.03 <i>(0.05)</i> | -0.01 <i>(0.05)</i> | -0.03 <i>(0.05)</i> | -0.052 <i>(0.033)</i> | -0.07 <i>(0.03)</i> |
| Federal Transfers per Capita (\$1,000) (FEDTRAN) | -0.33 <i>(0.22)</i> | -0.36 <i>(0.28)</i> | | | | |
| Unemployment Rate (UNEMP) | -0.05 <i>(0.04)</i> | 0.01 <i>(0.06)</i> | -0.13 <i>(0.04)</i> * | -0.15 <i>(0.06)</i> * | -0.032 <i>(0.029)</i> | -0.027 <i>(0.041)</i> |
| Health Costs (HEALTH) | -0.02 <i>(0.04)</i> | 0.00 <i>(0.05)</i> | | | | |
| Crime Rate (CRIME) | -0.13 <i>(0.08)</i> ** | 0.01 <i>(0.10)</i> | | | | |
| Court Reform State (COURT) | 0.44 <i>(0.20)</i> * | 1.04 <i>(0.34)</i> * | -0.56 <i>(0.19)</i> * | -0.92 <i>(0.33)</i> * | | |
| Share College Enroll Two-Years (TWOYEAR) | | | | | 0.001 <i>(0.008)</i> | 0.029 <i>(0.011)</i> * |
| Proportion Below Pell (PELL) | | | | | 0.001 <i>(0.022)</i> | 0.008 <i>(0.025)</i> |
| PELL x COLLAGE (PELLPOP) | | | | | -0.001 <i>(0.002)</i> | -0.001 <i>(0.002)</i> |
| Regional Nonresident Tuition (\$1,000) (REGTUIT) | | | | | -0.082 <i>(0.066)</i> | -0.158 <i>(0.096)</i> ** |
| PhD Degrees Awarded per BA Degrees Awarded (PHDBA) | | | | | -0.086 <i>(0.083)</i> | -0.246 <i>(0.120)</i> * |
| SAT (100 points) (SAT) | | | | | 0.072 <i>(0.137)</i> | 0.215 <i>(0.215)</i> |
| Merit Aid State (MERIT) | | | | | -1.39 <i>(0.19)</i> * | -0.83 <i>(0.29)</i> * |
| Within R2 | 0.733 | | 0.806 | | 0.708 | |
| Observations | 1200 | 1150 | 1200 | 1150 | 1200 | 1150 |

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. All also include interactions between income level and distribution and EDSHARE and HESHARE and INSHARE include relative price measures, none of which are statistically relevant. In-migration and out-migration for EDSHARE equation are rates for entire population while for HESHARE and INSHARE are calculated for college aged population alone. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Standard errors in (parentheses).

Moving to the INSHARE equation in column (vi), it appears that legislatures exercise discretion over about ½ of this budget decision. Inclusion of this lag results in the loss of importance of the elderly demographic on INSHARES, but also causes many of the higher education specific variables to become important. In particular, I find that as the share of college students that attend two-year institutions (TWOYEAR) increases, and as the number of bachelors degrees awarded relative to graduate degrees (PHDBA) increases, states look more favorably upon institutional funding. This may reflect preferences for undergraduate education, or simply represent the fact that two-year colleges are less expensive to operate than four year colleges and that undergraduates are less expensive to educate than graduates.

To summarize, table 5 suggests that legislatures do in fact exercise a great deal of discretion over all three budget shares, with the least amount of discretion taken at the highest branch on the tree.³⁴ Further, treating the process as incremental as opposed to fully discretionary diminishes the impacts of some of the results in tables 3 and 4, but does not have a substantial qualitative impact on the interpretation of those results.

Econometric Estimates – Extensions

This section presents three simple extensions. First, I present results from augmented specifications of the baseline models. Second, I summarize relevant findings from estimation of the baseline models on different sub-samples of the data. Third, since the previous estimates indicate that the falling HESHARE cannot be fully explained by changes in demographic, economic or income characteristics, I explore this issue in a bit more detail by considering the impact of tuition changes.

Augmented Specifications

Tables 6 - 8 present results that are similar to those in tables 3 and 4, but added to each baseline specification are groups of variables that capture political and voting

³⁴ Statistical tests with the null hypothesis that the coefficient on each of the lags is equal to one are easily rejected.

characteristics (column 1), the sources of state general fund revenues (column 2), the composition of gross state product by industry (column 3), higher education specific variables (column 4 of tables 6 and 7) and other demographic characteristics (column 4 of table 8 and column 5 of tables 7 and 8). Since inclusion of any single group of variables had virtually no impact on the original baseline estimates, I have suppressed their presentation.³⁵

The augmented EDSHARE regressions in Table 6 yield few notable results. The only important political variable is that as the state government moves from multiparty control to single party control (UNIPARTY), the education budget share increases.³⁶ States' increasing dependence on individual income taxes (REVINC) bodes well for education, though its impact is small. Each percentage point increase in the share of revenues generated from this source results in an EDSHARE increase of 0.07 points (the average share of revenues generated from individual income taxes increased by 4.6 points from 1977 to 2001). The results in column (3) suggest that the changing industrial composition within a state has had an important impact on education budget shares. Without exception, the results indicate that as the importance of all industry sectors increases relative to that of the sectors aside from Finance, Real Estate, Insurance and Services (GSPFIRE), education budgets expand. However, all of these sectors have seen dramatic *decreases* in their contributions to state economies since 1977. The results indicate that the changing industrial composition has contributed to a 1.6 percentage point drop in the EDSHARE.³⁷

³⁵ I do not present models with all of the explanatory variables included due to the enormous multicollinearity in the data. Further, adding this many variables rapidly diminishes the degrees of freedom available in an already limited model.

³⁶ Estimates not reported indicate that this result is invariant to the specific party that is in control.

³⁷ The share of gross state product generated from FIRE grew by 13 points between 1978 and 2001. The magnitude of the estimate could be retrieved from a regression including only the share of GSP from FIRE, and omitting all other GSP variables. I do not include this variable in the baseline results due to its high correlation with the median income variable and the share of schooling that occurs in the private sector. Therefore, it is difficult to assess what this variable represents.

Table 6
OLS Regressions for Share of State General Fund Budgets Allocated to Education (EDSHARE) - Supplemental Specifications

| *Bold 95% significance | (1) | (2) | (3) | (4) |
|---|------------------------------|-------------------------------|------------------------------|-------------------------------|
| Assembly per Senate Seats (LEGSEAT) | 0.19 (0.16) | | | |
| Voter Turnout (VOTE) | 0.01 (0.01) | | | |
| State Government Uniparty (UNIPARTY) | 0.55 (0.17) | * | | |
| Governor Election Year (GOVELECT) | -0.28 (0.21) | | | |
| Governor Democrat (GOVDEM) | 0.12 (0.17) | | | |
| GF Revenues: Corp. Income Taxes (REVCORP) | | 0.02 (0.06) | | |
| GF Revenues: Fuels (REVFUEL) | | -0.43 (0.08) | * | |
| GF Revenues: Indiv. Income Taxes (REVINC) | | 0.07 (0.03) | * | |
| GF Revenues: Lottery (REVLLOT) | | -0.03 (0.07) | | |
| GF Revenues: Sales (REVSALE) | | 0.04 (0.03) | | |
| Share GSP: Ag., Forest, Fishing, Mining (GSPAG) | | | 0.21 (0.04) | * |
| Share GSP: Const., Manu., Transp., Utilities (GSPCON) | | | 0.26 (0.03) | * |
| Share GSP: Government (GSPGOV) | | | 0.46 (0.07) | * |
| Share GSP: Wholesale and Retail Trade (GSPTRADE) | | | 0.49 (0.11) | * |
| Unemployment Rate - Nonwhites (UNEMPNON) | | | | -0.06 (0.02) |
| Nonwhite Unemp / White Unemp (UNEMPRATIO) | | | | -0.13 (0.13) |
| Share Pop >25 with College degree (EDCOL) | | | | -0.08 (0.05) |
| Share Pop >25 with HS degree (EDHS) | | | | -0.04 (0.03) |
| R ² | 0.332 | 0.330 | 0.351 | n/a |
| Observations | 1300 | 1300 | 1300 | |

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Specifications (4) was not run using all variables in each model, I have compressed them into one category for presentation purposes. All specifications include variables from Table 3.1.

Moving to table 7, the results in column (1) indicate that uniparty governments (UNIPARTY) prefer to fund K12 education, and this result does not depend on the specific party that is in control (not shown). The composition of political interests within state legislatures, represented by the number of assembly seats per senate seats (LEGSEAT), produces an interesting (albeit of small magnitude)

Table 7
OLS Regressions for Share of State Education Budgets Allocated to Public Higher Education (HESHARE) - Supplemental Specifications

| * Bold 95% significance | (1) | (2) | (3) | (4) | (5) |
|--|-------------------------------|---|-----------------|--------------------------------|-------------------------------|
| Assembly per Senate Seats (LEGSEAT) | -0.34 (0.13) | * | | | |
| Voter Turnout (VOTE) | 0.01 (0.01) | | | | |
| State Government Uniparty (UNIPARTY) | -0.37 (0.14) | * <i>this result does not vary by political party</i> | | | |
| Governor Election Year (GOVELECT) | 0.08 (0.17) | | | | |
| Governor Democrat (GOVDEM) | -0.13 (0.14) | | | | |
| GF Revenues: Corp. Income Taxes (REVCORP) | | 0.12 (0.05) | | | |
| GF Revenues: Fuels (REVFUEL) | | 0.07 (0.07) | | | |
| GF Revenues: Indiv. Income Taxes (REVINC) | | 0.03 (0.02) | | | |
| GF Revenues: Lottery (REVLLOT) | | -0.12 (0.06) | | | |
| GF Revenues: Sales (REVSALE) | | 0.02 (0.02) | | | |
| Share GSP: Ag., Forest, Fishing, Mining (GSPAG) | | | 0.00 (0.03) | | |
| Share GSP: Const., Manu., Transp., Utilities (GSPCON) | | | -0.04 (0.03) | | |
| Share GSP: Government (GSPGOV) | | | 0.07 (0.06) | | |
| Share GSP: Wholesale and Retail Trade (GSPTRADE) | | | 0.03 (0.09) | | |
| College Enrollment Rate (ENRATE) | | | | 0.012 (0.006) | * |
| Weighted Average Nonresident Tuition in the Geographic Region in \$1,000 (REGTUIT) | | | | -0.32 (0.13) | * |
| Number of PhD degrees awarded per Bachelors Degrees Awarded (PHDBA) | | | | 0.26 (0.16) | |
| Share of Public Higher Education Enrollments in Two-Year Colleges (TWOYEAR) | | | | 0.03 (0.01) | * |
| Average SAT in 100s (SAT) | | | | -0.24 (0.41) | |
| Research & Development Expend. Per Capita (\$100) (RND) | | | | -1.20 (0.66) | |
| Giving per Student (\$1,000) (GIVE) | | | | -0.36 (0.10) | * |
| Endowment per Student (\$1,000) (ENDOW) | | | | 0.00 (0.05) | |
| Share PhD Awarded in Science and Engin. (PHDSCI) | | | | 3.78 (1.03) | * |
| Merit Aid State (MERIT) | | | | 1.86 (0.38) | * |
| Capacity (CAPAC) | | | | -0.65 (0.42) | |
| Unemployment Rate - Nonwhites (UNEMPNON) | | | | | -0.04 (0.02) |
| Nonwhite Unemp / White Unemp (UNEMPRATIO) | | | | | 0.04 (0.11) |
| Share Pop >25 with College degree (EDCOL) | | | | | 0.45 (3.19) |
| R ² | 0.664 | 0.660 | 0.659 | n/a | n/a |
| Observations | 1300 | 1300 | 1300 | | |

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Specifications (4) and (5) were not run using all variables, I have compressed them into two categories for presentation purposes. All specifications include variables from Table 3.1.

result. The estimate indicates that as local representation becomes more prevalent in statehouses relative to representation of larger geographic areas, higher education does more poorly.³⁸

The estimates in column (4) also merit discussion, though the higher education specific variables may have some degree of endogeneity built into them. Working up from the bottom of this column, there is not strong evidence that HESHARES have been falling in response to increases in seating capacity (CAPAC) in public higher education institutions. The positive coefficient on the share of PhD degrees awarded in science and engineering (PHDSCI) indicates that states look favorably on higher education when it produces highly skilled professionals in emerging science and technology fields. Legislatures are also more supportive of higher education when a larger share of students attend two-year colleges (TWOYEAR), presumably due to the low cost of these colleges and because their accessibility allows for the subsidy to be received by a larger pool of residents. This may also reflect political factors however; as community colleges are more numerous and reside in more political districts than their four year counterparts.

The most dramatic, and concerning, result in table 7 is the negative and significant coefficient estimate on real private giving per student at public research universities within a state (GIVE). As state funding continues to lag behind, public universities have increasingly looked to private donations to supplement their revenue streams. However, some observers have worried that states would view these revenues as replacements for future state appropriations, and allow institutional appropriations to lag in the future. Their fears are well founded. Despite the seemingly small point estimate (each additional \$1,000 per student

³⁸ While one might expect this variable to only vary in the cross-section, only 13 states did not change the number of assembly seats between 1972 and 2001 and only 10 experienced no changes in the number of assemblypersons per senator. Aside from capturing the impacts of self-interested assemblypersons, this variable may also reflect demographic factors, as changes in legislative representation and even in district lines are a function of changing population sizes and ethnic heterogeneity.

raised resulting in a 0.36 point loss in the HESHARE), the magnitude of this crowding out cannot be ignored, especially in the most recent decade. For example, public research universities in Maine have increased their annual private giving per student by \$5,800 since 1990. The coefficient estimate indicates that their HESHARE should have dropped by 2.1 points as a result – which explains nearly all of Maine’s 2.3 point drop over this period. In fact, for each of the five states that have seen their public universities increase per-student giving by over \$3,000, the average fall in HESHARES has been 6.4 points while the five states that have not increased private fundraising efforts since 1990 have seen their shares fall by only 3.9 points.³⁹ This result also casts doubt on the ability of public universities to generate rainy-day funds or to stockpile appropriations in lush times (as their private counterparts can do), due to a fear that future appropriations would be smaller in response.

Turning to the INSHARE results in table 8, the estimates indicate that political factors (column 1) are contributing to the decline in institutions’ share of higher education budgets. The estimates indicate that as a state’s voters become more active (VOTE), and that as a state moves from a Republican governor to a Democratic governor (GOVDEM), student aid increases in attractiveness relative to institutional appropriations though the magnitude of these effects is small.⁴⁰

³⁹ I plan to examine this issue in greater detail in the future. There is an obvious concern about timing and/or endogeneity. With regard to timing, I estimated equations using a 1 period lag of giving and find even stronger results – with the coefficient rising to -0.420 (0.104). I plan to re-estimate this equation with an instrument for giving. See Ehrenberg and C. Smith (2001) for a description of the factors that should be included.

⁴⁰ These results hold when the equation is re-estimated excluding Georgia (Democratic governor Zell Miller was the driving force behind the introduction of the large and politically popular HOPE merit scholarship program in 1993).

Table 8
OLS Regressions for Share of State Public Higher Education Budgets Allocated to Public Institutions (INSHARE) - Supplemental Specifications

| * Bold 95% significance | (1) | (2) | (3) | (4) | (5) |
|---|---------------------------------|-----------------------------------|-----------------|-----------------------------------|-----------------|
| Assembly per Senate Seats (LEGSEAT) | 0.02 (0.10) | | | | |
| Voter Turnout (VOTE) | -0.03 * (0.01) | | | | |
| State Government Uniparty (UNIPARTY) | 0.04 (0.11) | | | | |
| Governor Election Year (GOVELECT) | 0.05 (0.13) | | | | |
| Governor Democrat (GOVDEM) | -0.27 * (0.11) | | | | |
| GF Revenues: Corp. Income Taxes (REVCORP) | | 0.06 (0.04) | | | |
| GF Revenues: Fuels (REVFUEL) | | 0.20 * (0.05) | | | |
| GF Revenues: Indiv. Income Taxes (REVINC) | | -0.035 * (0.018) | | | |
| GF Revenues: Lottery (REVLOT) | | -0.06 (0.05) | | | |
| GF Revenues: Sales (REVSALE) | | 0.01 (0.02) | | | |
| Share GSP: Ag., Forest, Fishing, Mining (GSPAG) | | | 0.01 (0.03) | | |
| Share GSP: Const., Manu., Transp., Utilities (GSPCON) | | | 0.01 (0.02) | | |
| Share GSP: Government (GSPGOV) | | | -0.02 (0.05) | | |
| Share GSP: Wholesale and Retail Trade (GSPTRADE) | | | 0.09 (0.08) | | |
| College Enrollment Rate (ENRATE) | | | | -0.027 * (0.005) | |
| Research & Development Expend. Per Capita (\$100) (RND) | | | | 0.90 (0.52) | |
| Giving per Student (\$1,000) (GIVE) | | | | -0.23 * (0.07) | |
| Endowment per Student (\$1,000) (ENDOW) | | | | -0.03 (0.04) | |
| Share PhD Awarded in Science and Engin. (PHDSCI) | | | | -3.63 * (0.81) | |
| Capacity (CAPAC) | | | | 0.44 (0.32) | |
| Unemployment Rate - Nonwhites (UNEMPNON) | | | | | -0.02 (0.01) |
| Nonwhite Unemp / White Unemp (UNEMPRATIO) | | | | | -0.14 (0.08) |
| Share Pop >25 with College degree (EDCOL) | | | | | -0.03 (0.03) |
| R ² | 0.320 | 0.320 | 0.308 | n/a | n/a |
| Observations | 1250 | 1250 | 1250 | | |

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Specifications (4) and (5) were not run using all variables in each model, I have compressed them into two categories for presentation purposes. All specifications include variables from Table 3.2.

While the estimates of the industrial mix variables (column 3) and other demographic variables (column 5) yield no significant results, the variables representing a state's revenue

sources (column 2) and higher education specific characteristics (column 4) do. The estimates in column 2 suggest that as states rely more on the individual income tax (REVINC), student aid programs grow in popularity. Since so many of the merit based aid programs are funded from lottery revenues, it is somewhat surprising that the share of a state's revenues coming from lottery sources (REVLOT) has no impact on INSHARES, though this may be due in part to its representing a small overall share of state general fund revenues.

Though there is a strong negative relationship between the share of PhDs awarded in the sciences (PHDSCI) and institutional aid shares, this may simply reflect the impacts of targeted student aid programs many years earlier. As with the HESHARE results in Table 7, institutional efforts to raise private monies (GIVE) seem to be met with retaliatory action by the states. The estimates in Table 8 indicate that every \$1,000 increase in real private giving per student results in 0.23 points of the higher education budget leaving institutional coffers and going into the hands of the students.

Without any further discussion, it is worth citing the factors that do not seem to have an impact on any of the observed budget shares. These include: the education level of the population (EDCOL, EDHS), the level of public K12 and higher education enrollments (not shown), higher education seating capacity (CAPAC), the relative unemployment of nonwhites versus whites (UNDIF), relative prices (not shown) and endowment per student (ENDOW).

Econometric Estimates on Sub-Samples of Data

Table 9 depicts how the three budget share measures have changed from 1977-2001 in different sub-samples of the states. Though none of the reported changes within each category are statistically different from one another at the 95% level, several glaring patterns stand out. It appears that non-reform states, non-northeast states, low density states and single party states have cut their EDSHARES the most, while two-year budget cycle states, court reform states, limited governor power states, politically competitive and multiparty states have cut their HESHARES the most. Finally, it appears that students have benefited over institutions

in single-year budget cycle states, in states where governors have substantial appropriative power, in dense states and in states controlled by multiple political parties.

When the baseline models are re-estimated on these different sub-samples of data, a number of interesting patterns emerge. Some of the patterns indicate that the baseline results were driven only by a particular sample of states, and some indicate that the lack of evidence of impacts in baseline regressions were due to confounding effects in different samples.⁴¹ Five broad observations are worth highlighting, a complete summary of the findings is available from the author by request.

First, from estimating each equation separately for the years 1972-1982, 1983-1992 and 1993-2001, it is apparent that changes in economic factors are increasing in importance on EDSHARES and HESHARES over time. The most concerning individual result was that while a one percentage point increase in the unemployment rate between 1972-1982 resulted in a fall in HESHARES by 0.1 points, today a similar increase results in nearly a half point fall in the HESHARE.⁴²

Second, I find evidence that states with funding formulas respond more dramatically to changes in enrollment pressures than do non-formula states, as expected. Further, very few variables are significant in the HESHARE equation estimated on the formula states, indicating that funding formula states may do a better job at insulating higher education from the budget axe than non-formula states.

⁴¹ I only report differences that are statistically different with at least 90% confidence. A complete analysis is available upon request.

⁴² It is also worth noting that the positive impact of SAT on INSHARES in table 4 is due to the positive effect this variable had on institutions in the 1970s. There is a statistically significant, and sizable, negative effect in the most recent decade – indicating that as high school student quality increases, states are increasingly turning to student aid programs, likely in an attempt to keep these students from leaving the state.

Table 9
Percentage Point Changes in Outcomes by State Institutional Characteristics

| Institutional Characteristic | | Δ EDSHARE | Δ HESHARE | Δ INSHARE |
|---|--------------------------|------------------|------------------|------------------|
| Autonomy of Higher Education Institutions | Yes (25 states) | -3.28 | -5.77 | -3.58 |
| | No (25 states) | -3.85 | -6.51 | -3.51 |
| Budget Cycle Length | 2-Years (23 states) | -3.03 | -7.27 | -2.81 |
| | 1-Year (27 states) | -4.01 | -5.17 | -4.17 |
| Court Reform State in 2001 | Yes (24 states) | -2.42 | -7.15 | -3.02 |
| | No (26 states) | -4.91 | -5.22 | -4.03 |
| Funding Formula | Yes (29 states) | -4.23 | -5.71 | -3.78 |
| | No (21 states) | -2.63 | -6.74 | -3.22 |
| Governor Can Reduce Appropriations w/out Approval | Yes (37 states) | -3.66 | -5.60 | -4.26 |
| | No (13 states) | -3.27 | -7.68 | -1.52 |
| New England / Northeast | Yes (9 states) | -2.04 | -5.69 | -4.45 |
| | No (41 states) | -3.89 | -6.24 | -3.35 |
| Political Competition | Competitive (25 states) | -3.29 | -6.77 | -3.44 |
| | Non-compet. (25 states) | -3.84 | -5.51 | -3.65 |
| Population Density | Dense (25 states) | -2.96 | -6.02 | -4.77 |
| | Less Dense (25 states) | -4.17 | -6.26 | -2.32 |
| Uniparty Government | Yes (43% of state-years) | -5.25 | -5.44 | -2.62 |
| | No (57% of state-years) | -2.10 | -6.40 | -3.92 |

Notes: Represent 1977-2001 changes.

No raw changes are statistically different across categories at 95% confidence level.

Uniparty states not constant over time, so changes are for inconsistent sample.

Third, there is evidence that changes in competing interests (HEALTH, CRIME) and federal transfers (FEDTRAN) have a substantial impact on EDSHARES depending on the sub-sample of states one looks within. For example, in states where governors have power to reduce appropriations without legislative approval, and in states that operate on a two-year budget cycle, increases in federal grants per capita result in sizable decreases in the education

budget share. Further, I find evidence that the increasing cost of health care has crowded out education in states that operate on a single-year budget cycle, in states with multi-party governments, in states where governors have significant power, and especially in high density states.

Fourth, the impacts of racial heterogeneity on the HESHARE and INSHARE equations have been increasing over time. With respect to the HESHARE, increasing ethnic heterogeneity across age groups have led to the largest declines in states that exercise more control over its public institutions, in non-formula states and in those where governors have significant power over appropriations cuts. Further, in the INSHARE equation, increasing ethnic heterogeneity has caused institutional shares to fall in states with annual budget reviews, in less densely populated states and in those with a high degree of political competition.

Fifth, though column (ii) of table 3 indicates that an aging state population looks favorably on higher education, it turns out that this result is driven by the impact the aging population had in the 1970s. Regression estimates indicate that in the 1990s, as the share of the population that is over 65 increased by one percentage point, the HESHARE fell by 0.56 points. This effect is statistically different than the effect in the 1970s with more than 99% confidence. Further, the impact (favorable) of aging in the HESHARE and INSHARE equations is driven by states outside of the Northeast. There is also evidence that the impact of an aging population has larger effects when political competition is greatest.

Tuition

Tuition rates at public higher education institutions are determined by the level of state support (Lowry 2001, Rizzo and Ehrenberg 2004), and are often times implicitly set by the legislatures or governors in a state. In just one of many examples, the state of Massachusetts and the University of Massachusetts agreed to keep tuition very low in the

1990s in return for strong support from the state, but are now considering changing this policy.⁴³ In any case, just as federal legislators are loathe to increase the maximum value of the Pell grant due to concerns about the “Bennett Hypothesis”, state legislators may respond to increasing tuition rates by cutting future appropriations, giving rise to a cycle of further tuition increases and budget cuts. Higher tuition rates may also cause future appropriations to be cut simply because they generate distaste for higher education. Since, tuition rates are also likely a function of a long history of state appropriations as well, it would be very difficult to estimate its impact on current budget shares.

The results of several papers uncover mixed evidence on the concurrent relationship between state appropriations and tuition in the cross-section. Lowry (2001) finds no evidence that tuition rates affect state appropriations at the institutional level; Koshal and Koshal (2000) find limited evidence of a relationship in a single year state level analysis; and Strathman (1994) finds that states that charge \$1 more in tuition tend to have lower state appropriations by 93 cents. Though the authors each attempt to control for the endogeneity of tuition, these cross-section results are likely confounded by omitted variables, and cannot be used to conclusively say how within a state funding for higher education is expected to change as tuition rates increase.

I re-estimate the HESHARE regression including a one-period lag of the enrollment weighted average tuition at four-year public institutions in a state as an explanatory variable.⁴⁴ Coefficient estimates on the one-period lagged tuition suggest that when tuition increases by

⁴³ Jeffrey Selingo, *Chronicle of Higher Education*, 2/27/03. Under Governor Romney’s plan, the state’s flagship public campus, the University of Massachusetts at Amherst, would be spun off “to become a premier research university.” Making it independent from the system, the governor said, would allow the institution to increase tuition rates to be more in line with other public flagships so it could “more successfully recruit out-of-state students and compete for top research faculty and grants.”

⁴⁴ Durbin-Wu-Hausman tests indicate that *in changes* the one period lead, the current period level and one period lag are all endogenous in the HESHARE equation. Tests also indicate that the two-period lead and two-period lag are not endogenous. The test is executed by regressing the suspected endogenous variable on all other exogenous variables and computing the residuals from this regression. The test for endogeneity is simply a t-test on the coefficient of this residual when it is included in the original outcome equation along with the suspected endogenous variable.

\$1,000 one year prior to this budget cycle, legislatures respond by cutting the HESHARE by 3.4 points. Though the estimates of the other explanatory variables in the model are unaffected by this change, I also test a specification in which the one-period lag of tuition is instrumented for by lagged values of variables that are expected to have an impact on tuition, but that might not be expected to directly impact HESHARES one year later.⁴⁵ The results are striking and indicate that when lagged tuition increases by \$1,000 within a state, HESHARES are slashed by 6.3 points, with no resulting changes in the other estimated parameters.

Though these results should be viewed with caution, they are very suggestive.⁴⁶ Real average public tuition rates at four-year institutions have grown by approximately \$1,500 since 1972. The coefficient estimate above indicates that HESHARES fell by almost 9.5 percentage points as a result of increasing tuition rates – explaining a majority of the missing 11 percentage point decline from above.

Sensitivity Analysis and Interpretations

That so little of the fall in HESHARES seems to be explained by changes in observable factors suggests that the functional forms of the baseline estimates are misspecified. However, log-log, linear-log and log-linear specifications, among others, do not yield any additional insight into these causes.⁴⁷

There are statistical and pragmatic concerns that will influence the way the results should be interpreted. Since the outcomes of interest in my estimating equations are proportions with restricted values between zero and one, one would suspect that my data are not normally distributed. However, scatter plots of both EDSHARE and HESHARE both

⁴⁵ These variables include combinations of: enrollments, share of enrollments in two-year programs, share of enrollments in graduate programs, regional nonresident tuition rates, average faculty salaries (or a proxy for this), share of enrollments in private higher education, share of PhD awarded in sciences, research dollars per faculty in the state and some specifications with further lags of tuition.

⁴⁶ For instance, some schools will increase tuition in a year in anticipation of *future* appropriations cuts, making it difficult to disentangle the impacts of tuition and state support on each other.

⁴⁷ These estimates are available in the appendix to my paper. Log-log specifications indicate that the income elasticity in the EDSHARE equation is -5 and in the HESHARE equation is $+5$. These results simply suggest that the education budget is less income elastic than the overall general fund budget and that the higher education budget is more elastic than the overall education budget.

within and across states indicate that this is not the case, while the distribution of INSHARE appears to be slightly skewed to the right. Regardless, estimates of regressions that “normalize” the data yield qualitatively identical results to the raw data, so I eschew their presentation here. A second concern is that OLS regression predictions are not restricted to fall between zero and one. Again, this is of little concern in this paper because all of the predicted values from my OLS regression estimates fall within this range, and also because regressions estimated using a logit-transformation of the budget shares produce similar results to the non-transformed regressions.⁴⁸

While the previous concerns were largely cosmetic, the following two are more substantial because they have the potential to affect the parameter estimates in each of the regressions. The first concern results from the long time-series contained in my panel. I have found evidence that the crucial orthogonality assumption required for OLS estimates to be unbiased is violated due to time series correlation in the regression residuals. I computed the residuals from all three baseline regression equations and estimated a variety of regressions of these residuals on their one and two period lags. The results indicate that approximately 2/3 of the variation in today’s residuals can be explained by one-period lagged residuals. When the second lag is added, the same total amount of variation is explained, except with ½ due to the one-period lag and 1/6 due to the two-period lag.⁴⁹ If included explanatory variables are correlated with these lagged residuals, then the parameter estimates in my regressions will be biased. This bias may be exacerbated when lagged dependent variables are added to the model.⁵⁰

⁴⁸ A logit transform of a variable Y is $\ln[Y / (1-Y)]$. Also called the “log-odds” ratio, this transformation results in the regression predictions being constrained between 0 and 1.

⁴⁹ This is true both in states that operate on a single year budget and on a biennial budget, so another factor must be causing this correlation.

⁵⁰ Using methods derived in Baltagi and Wu (1999) I re-estimate the baseline models attempting to control for the autocorrelation in two ways. Both methods do a bit of violence to the reported baseline estimates in that there is a substantial loss of efficiency and the impacts of the elderly, unemployment rate and court reforms disappear in these models.

The second concern is that the prices included in the EDSHARE and HESHARE equation are endogenous. Aside from the obvious fact that the earnings of public employees are a function of the level of state support for that particular budget item, in the case of education, higher earnings are highly correlated with educational quality – which might also be a choice variable for the legislature. To complicate the interpretation of the price variables, in some states it is the case that higher education is heavily subsidized by the federal government in ways which are not at all related to federal taxes, therefore the relationship between the true marginal cost of higher education and the price as seen by voters/legislatures is unstable (Alexander 2001, Bound et al 2001).⁵¹

Nonetheless, regression estimates in equations that attempted to control for the potential endogeneity of the price variables were very similar to those where the prices were dropped, or treated as exogenous. As a result, for expository purposes, the relative price measures were included exogenously in the above baseline regressions.⁵²

The results should be interpreted with caution because included variables may not only capture the demand for education spending, but also differences in technology or other supply factors within states with different demographic and other characteristics. For example, it may seem reasonable to exclude OUTMIG from the higher education production function, and so impacts on HESHARE from changes in migration likely result from demand side factors alone. However, changes in the size of the college-aged cohort are more difficult

⁵¹ A detailed discussion of the treatment of price variables can be found in an appendix to work in progress. To summarize, statistical tests of the price endogeneity in both the EDSHARE and HESHARE equations provided mixed results. The tests amount to including residual values from regressions of the suspected endogenous variables on all of the exogenous variables in the original outcome equations. Simple t-tests on the residual in these augmented regressions indicated that prices are exogenous in the EDSHARE equation and endogenous in the HESHARE equation.

⁵² In the EDSHARE equation, one instrument for the relative price of education instructors to non-education employees was an estimate of the share of education employees that are unionized relative to the share of non-education public sector workers that are unionized. In the HESHARE equation, the instrument was an estimate of the share of public higher education instructors that were unionized to the share of all education instructors that were unionized.

to interpret because economies of scale could make it possible to deliver the same education to larger cohorts with less than proportional increase in spending.

Policymakers should be concerned with the true functional form of legislative utility functions. This understanding is important to know whether certain marginal conditions require influence, or rather an expansion of the budget is necessary to improve the fortunes of public higher education. If the underlying utility function depicted by my utility-tree is *homothetic*, then the cost of reaching higher levels of utility must be proportional to the level of utility – budget shares are independent of utility levels and wealth levels. If this is the case, then simply increasing the size of the education budget will do nothing to alter the increasing substitution of K12 for higher education services. Consumer demand studies typically reject this functional form. In a rough attempt to understand this, I re-estimated the HESHARE and INSHARE equations by including a measure of the total size of the education budget in the HESHARE equation and the size of the higher education budget in the INSHARE equation. The estimates on the budget levels indicate that increasing the size of the education budget will not affect the HESHARE, but increases in the size of the higher education budget, lead to a smaller share of resources going to institutions.⁵³

The results presented above may be hard to interpret literally because there may be cross-variable utility effects associated with higher education spending. For example, spending on public higher education may reduce the incidence of crime and thereby raise the utility of everybody, not just the college aged population when additional dollars are allocated to higher education. Therefore, my estimates may overstate the direct importance of cohort sizes and other variables on budget share changes. This difficulty is related to the fact that it is nearly impossible to control for all factors that affect state legislative decisions. For example, I do not include information on state-wide programs involving property tax limits. Though their impact on budget shares is unclear, their use is increasing across the country, and varies

⁵³ There is spurious negative correlation in these estimates which will be addressed in future work.

by income and demographic conditions – which may explain some of the variation in the estimated coefficients on these variables above. The impact of these property tax exemptions on a variety of outcomes is something I will investigate more deeply in the future.

Finally, the aggregated data used in state-level analyses abstracts from a large degree of within state heterogeneity in the explanatory variables, which likely affects budget outcomes. If this heterogeneity is constant over time, then my within estimation techniques will control for it, however, there is reason to believe that variables such as the homogeneity of households with college aged children have changed over time. Future work should make greater efforts to incorporate this variation.

Conclusion

The race to the bottom in state funding for public higher education has serious implications for academic quality at our public colleges and universities and for the productivity and security of our nation in the future. No institution is immune from the resource squeeze. The University of Michigan is being forced to make tradeoffs just like Wichita State University and Tompkins-Cortland Community College. While the decisions each face are different (e.g. Michigan might decide between increasing the size of its introductory classes or hiring more part-time faculty while Wichita State might decide between keeping faculty salaries constant while accommodating increased enrollments or increasing faculty salaries but turning deserving students away), the causes are the same. In nearly all 50 states, the share of state tax dollars ultimately finding its way to public higher education institutions has fallen by well over 25% in the past 30 years and schools and states are rapidly spiraling toward the private high-tuition equilibrium.

With the higher education act up for reauthorization this year a lot of attention will be paid to the high sticker prices of colleges and universities or the unpleasant outcomes of institutional decisions forced by the aforementioned tradeoffs. What will largely be ignored are the questions of how we got here and who ultimately bears the burden of the withdrawal of

state funding. Like a fish tank that leaks a drop of water per week, it will go largely unnoticed until after several years someone complains that their fish are near death because there's so little room to swim. There's only so many roofs that higher education institutions can delay maintaining – they can't continue to seek temporary financial equilibrium by marginalizing the future. Before I summarize the empirical results of this paper, allow me to answer several questions.

Why Might the Private High-Tuition Equilibrium be Undesirable?

If one were to write down an economic model of higher education finance, the most efficient outcome would be for all universities to charge a price equal to marginal cost *for each student*. Given the ability of most colleges and universities to generate revenues from outside sources, they could then discount tuition prices for those least able to pay. Theoretically this is a great idea, but it has some difficulties in its application.

Under a high-tuition high-aid strategy (HTHAS) there is no guarantee that the aid dollars will go to those students that need it the most. The most transparent reason for this is the difficulty in ascertaining what true ability to pay is. A family of four with a combined income of \$100,000 and renting a home is not necessarily more able to pay for college for one of its children than a family of four with a combined income of \$40,000, but which owns a home worth \$1,500,000. An HTHAS poses a substantial moral hazard problem.

If it is true that there are substantial spillover effects and other positive externalities from individual investments in higher education, under a HTHAS the classic under-provision problem for public goods may well be exacerbated due to an inability for high paying students to internalize all of the benefits.

Dramatic tuition increases that would accompany a HTHAS may disproportionately hurt the middle-class (and likely the median voters) whose family incomes would be too high to receive financial aid, but have not increased fast enough to keep pace with the rate of tuition increases. A recent study by Hill, Winston and Boyd (2004) indicates that at twenty-eight of

the most highly selective (and most costly) private colleges and universities (COFHE schools) low income students actually pay very little to attend these institutions (at one school an average student from the bottom income quintile paid less than \$800 per year to attend). The study also found that while average sticker prices at the COFHE schools are 66% of median U.S. family income, the average student coming from a family with that level of income pays only 23% of her family income to attend. These results do not likely have external validity as the resource base at the COFHE schools dwarfs that of the average public institution.

Movement to a HTHAS may lead to an increase in competition for those students that are able to pay the full sticker price. The larger the share of a student body that pays full price, the more generous institutional financial aid packages can be to those students that cannot afford to pay. Such a strategy would likely decrease the number of low-income students that attend higher quality institutions and will result in even more institutional stratification in quality than that which exists today and at the extreme case an unraveling as envisioned in a pure adverse selection model. The movement away from having a continuum of student financial aid packages and toward a two-peaked discrete distribution might diminish the collegiality within an institution as inevitably the students (and their families) that are paying full cost are receiving the same education as students that are paying substantially less. Finally, the gap between the institutional haves and have-nots may continue to widen as the schools that are able to enroll a wealthier student body would have a larger base from which to draw annual alumni contributions and to build endowments.

A conversion to an entirely need-based aid system may cost states more in the long run than a system of broad appropriations. While institutions of higher education currently have some incentive to keep tuition low (to ensure that they will receive state money the following year), under a HTHAS there would be no such controls as institutions will increase tuition as much as possible to maximize revenues from both students and state-aid. This concern is real. The College Board reports that the institutions that have been increasing

tuition rates the fastest over the last decade are the for-profit private universities. One effect of these increases is to transfer a substantial pool of public money into the private for-profit sector and likely leads to a larger amount of federal money being spent on student aid than otherwise would prevail.

States that move to a HTHAS will necessarily grant a large degree of autonomy to their state institutions. While in many cases this would lead to better institutional outcomes, one area that would be threatened by this move would be the public service mission of state colleges and universities. Extension programs are very expensive to maintain, if for the only reason of the overhead cost of maintaining numerous satellite outposts throughout each state, and would likely be the first target for elimination as universities are granted more autonomy. One might also begin to notice a change in the program offerings of colleges and universities toward more profitable enterprises.

As states continue to allow their public colleges and universities to pursue HTHAS, it would not be surprising to see the public institutions behave more like their private counterparts as far as fundraising is concerned. This might cause concern for two reasons. First, most of the public colleges and universities are starting from such a low base of tuition, private giving and endowment levels relative to their private counterparts that it would take an extremely long time for them to catch up. Second, there are governance and conflict of interest questions that may be more important. For example, the University of Georgia has had to turn to foundation trustees to pay half of the President's salary. A recent dispute involving the athletic program there has caused these trustees to call for his ouster, while the public regents that pay the other half of his salary want him to remain. Additional conflicts may result from a deterioration of the "Chinese Wall" between the sources of research funding and the independence of the research being undertaken. The debate over the sanctity of the privately funded biomedical and agricultural research undertaken at many national public universities has already begun to rage.

Finally if states move to a HTHAS the question remains of whether enough students will be able to receive the benefits of a higher education. If the “average” state spent its entire higher education budget on student aid in 2001, 71,000 students would have received a full tuition scholarship at those relatively low tuition levels. There would be an additional 89,000 students that would be forced to pay the full cost of a public education (about \$17,000 per student per year). One-sixth of the students that attend my institution (Cornell University) receive a Pell grant and nationwide over 50% of all students in higher education receive some form of financial aid. Given the conservative estimates above, 56% of the public school students in the average state would require substantial financial assistance.

Isn't Elementary and Secondary Education More Important?

To make any reasonable assessment here the near impossible task of computing the marginal benefits and costs needs to be done. Even assuming that both the K12 and higher education sectors are in equilibrium, it wouldn't be hard to imagine why the marginal dollars should be distributed to both sectors. K12's synergy with higher education is irrefutable. The production and quality of the next generation of K12 teachers depends vitally on the health of the public higher education sector. Also, in allocating marginal dollars, the spillover effects of larger investments in higher education are likely to be at least as large as those invested in the K12 sector.

Summary of Empirical Results

Though no universally accepted structural (theoretical) model of political economic equilibrium exists, empirical specifications describing preferences for public spending on public education yield valuable insights into why public higher education is facing an alarming fiscal crisis. The empirical evidence in this paper suggests that all of the observed four percentage point fall in education's share of state general fund budgets has been attributable to changes in the income distribution within states. Though measures of

competing interest groups seem to not have crowded out education spending, their effects are confounded by them having differential impacts in different sub-samples of states.

While collectively, observable within state changes are unable to explain the six percentage point drop in the share of the education budget allocated to public higher education since 1977, there is substantial evidence that the discretionary nature of higher education spending and its ability to independently raise revenues have caused its decline. Dynamic panel estimates indicate that states do not practice strictly incremental budgeting, and exercise the most discretion over the determination of the higher education – K12 split than among other budget decisions. Further, estimates on a sample split by three different time periods indicate that the sensitivity of higher education budget shares to declining labor market conditions has increased over time. Attempts by public institutions to respond to lagging state appropriations by increasing tuition or private fundraising efforts have been met with substantial chagrin by state legislatures and calls into question exactly what institutions are expected to do in the face of budget difficulties as they rapidly spiral toward the private equilibrium.

The 3.9 percentage point decline in the share of higher education budgets allocated to public institutions, as opposed to students, can be fully explained by changes in the relative size of the college aged cohort, increases in nonresident tuition rates in the geographic region and by a movement to merit aid programs in 10 states over the past decade. Investigation of the merit aid result reveals that the increasing popularity of non-means tested aid has not been altruistically motivated. I find evidence that these targeted programs are used to redistribute income to well-off families and to avoid providing broad based institutional support that would benefit economically disadvantaged members of the populace. A hypothesis advanced by current president of Murray State University, King Alexander (2001), that federal aid programs provide perverse incentives for higher education funding in that low tax effort states are rewarded with more federal aid than high tax effort states, is supported by these results as

well. I find that as more households in a state become eligible to receive a federal Pell grant that states respond by moving aid away from institutions and toward students. In fact, these perverse incentives may account for some of the unexplained fall in the HESHARE from above. The more support a state provides for its public institutions, and hence the lower the tuition rates are, the less federal aid its students will be eligible to receive. This is consistent with the result in Rizzo and Ehrenberg (2004) that increases in federal Pell grant generosity and state need-based grant aid awards result in increases in in-state tuition levels at flagship public universities.

Several additional results deserve attention. Similar to other studies, I find that court mandated K12 equalization schemes have resulted in substantial increases in K12 spending within states. However, unlike these studies I find that 36% of the total spending increase has come at the expense of public higher education – representing \$280 per full-time public college student in an average sized state. My results also indicate that ethnic heterogeneity across age cohorts results in state funding being allocated to the schooling cohorts that look most similar to the non-school age population in a state.

Figure 5 summarizes the results from both the EDSHARE and HESHARE regressions in a single table by indicating exactly which states look with favor and disfavor on education spending. The raw data used to create this figure are presented both graphically and in tabular form in appendix figures two and three and in appendix table two. The points along the horizontal axis are retrieved by estimating the state effect (the c_i) from equation 3 (for the EDSHARE outcome) and then ranking the states according to the size of the unobserved effect. Broadly speaking this estimated c_i represents a state's fixed preference for funding education relative to other budget items. States with a positive unobserved effect give a

higher priority to educational expenditures than the “average” state.⁵⁴ In this figure, states that exhibit the strongest priority for education funding are assigned a rank in ascending order.

The points along the vertical axis are retrieved by estimating the state effect (the c_i) from equation 3.1 (for the HESHARE outcome) and then ranking the states according to the size of the unobserved effect. Broadly speaking this estimated c_i represents a state’s fixed preference for funding higher education relative to K12 education. States with a positive unobserved effect give a higher priority to higher educational expenditures than the “average” state. In this figure, states that exhibit the strongest priority for higher education funding are assigned a rank in ascending order. These state effects can be considered to represent states’ true tastes for higher education spending because they are computed while controlling for all of the observable factors that are expected to systematically influence budget shares (i.e. the explanatory variables in equation 3).

The 25 states that are located in the two western quadrants (II and III) are those that generally prefer to fund education over other budget items. The 25 states in the eastern quadrants (I and IV) are those that prefer to spend state tax dollars on non-educational items. The 25 states that are located in the two northern quadrants (I and II) are those that prefer to fund K12 education over higher education, while the 25 states in the two southern quadrants (III and IV) prefer to fund higher education over K12 education. Therefore those states that look least favorably upon public higher education are those located in the first quadrant while those states that look most favorably upon higher education are located in the third.

⁵⁴ Not too much should be drawn from the magnitude of the unobserved effects. Their ordinality is of larger interest than their cardinality since the estimation method I use restricts $\sum_{i=1}^{50} c_i = 0$. In other words, the estimated fixed effects represent a state’s deviation from the average state when the average state effect has been normalized to equal zero.

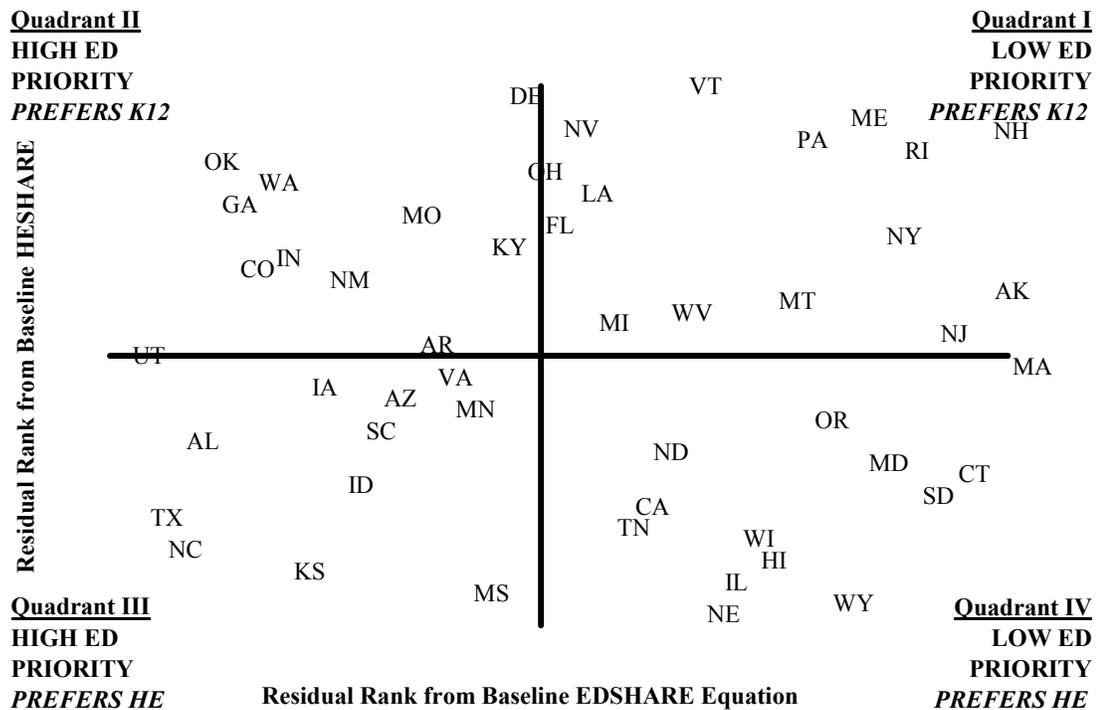


Figure 5
State Preferences for Funding Public Education

What immediately stands out from this figure is that quadrant I is dominated by the states in the Northeastern U.S. With the slight exception of Connecticut every single northeastern state has a relative distaste for all forms of education spending. There is a more random group of states that are strong supporters of public higher education that includes North Carolina, Texas, Kansas, Alabama and Idaho. No clear regional distinctions emerge in the other two quadrants. Delaware, Oklahoma and Washington, while each preferring to spend a large share of their budgets on education, prefer to direct these education dollars to the K12 sector. While Nebraska, Wyoming, Illinois and Hawaii each do not prefer to devote a substantial share of state funds to education, prefer to allocate these scarce dollars to the higher education sector.

A somewhat surprising (to me) finding is that the rank order correlation between the EDSHARE state fixed effects and the HESHARE state fixed effects is 0.02. It does not

appear that a state's (conditional) preference for higher education spending is related to its preference for funding education generally.⁵⁵ The way that I have constructed this figure is that states with a low numerical ranking are those that look more favorably upon an education budget share. Therefore the 0.31 rank order correlation between the HESHARE state fixed effects and the INSHARE state fixed effects indicates that those states that look less favorably on higher education tend to use the limited higher education dollars to fund student aid programs as opposed to funding bloc grants to its public colleges and universities. This correlation may be capturing the fact that those states that do not have an enormous amount of money tied up in public higher education do not want to build costly public infrastructure when the private infrastructure is already there (or when a large share of their college-aged population leaves the state). Hence these states turn to student scholarship programs to provide its residents with access to an affordable education or to entice its residents to remain in the state.

Directions for Future Research

This paper's broad scope has opened the door to a number of interesting research questions. The strong relationship observed between tuition rates and budget shares in section three suggests that a focused dynamic analysis of the tuition – state appropriations relationship would be a fruitful endeavor. Among the strategies I envision pursuing are constructing a test of Granger causality using a vector autoregression (VAR) technique and applying the tools of macroeconomics to understand the tuition – appropriation equilibrium using a dynamic programming approach.

I could very well have estimated a fourth equation in this paper. The share of student aid dollars in the form of need-based aid has shrunk from 92% to 75% in the past decade alone. Since the INSHARE has been increasing substantially over this same period, whether

⁵⁵ The rank order correlation between the fixed effect in the EDSHARE equation and the INSHARE equation is also low, 0.15.

the growth in merit-based aid programs has crowded out need-based aid spending is an empirical question that has yet to be answered.

The large and robust finding that court reforms have led to a partial crowding out of higher education spending naturally leads a researcher to ask what other K12 funding initiatives have an adverse affect on higher education appropriations. Many states have instituted school property-tax relief programs which provide tax relief to certain state residents but these tax savings are reimbursed to the local school districts from the state budget (New York State's STAR program is an example). In fact, in November 2003 the voters in Maine rejected a statewide ballot initiative for a school property tax relief program due to the belief that the state would use funds from higher education to pay for the program.⁵⁶

Examining the impacts of the budget share declines on a number of student and institutional outcomes is a fertile ground for future research (in terms of the specific impact on student outcomes and institutional quality). Eric Bettinger of Case Western Reserve University and Bridget Long of Harvard University are just beginning work analyzing the impact felt by first year students in the Ohio public school system from having taken a class from an adjunct faculty member. They are currently looking at student outcomes while still in college such as the probability of passing future courses in that field of study and the number of additional credit hours taken in that field of study. Ron Ehrenberg and Liang Zhang at the Cornell Higher Education Research Institute are in the process of using institutional level data across the United States to determine the impacts of non-tenure track faculty members have on various institutional outcomes such as graduation rates. Given the appropriate data, an enormously helpful study would be to determine the long-term labor market effects of various institutional quality characteristics on its graduates as well as other impacts of the characteristics on the universities themselves.

⁵⁶ Paul Carrier for www.Mainetoday.com, November 8, 2003.

A study that I am in the beginning stages of will analyze whether fiscal illusion exists in the student matriculation decision. Since public colleges and universities are quickly moving to the private high-tuition high-aid strategy, it would be useful to understand how different students will respond to different financial aid packages. One concern is that a student may react differently to two otherwise similarly valued financial aid scenarios if they are packaged differently. For example, for a net price of \$10,000 a student today may be asked to pay tuition of \$12,000 but receive a \$2,000 merit scholarship award from the state. Would this same student be more or less likely to matriculate at the same institution if the tuition were raised to \$35,000 per year with a corresponding \$25,000 scholarship? Expected utility theory says that she ought to. Prospect theory and my own observations suggest otherwise.

Finally, it would be useful for someone to estimate how rates of return to investments in higher education vary across states and over time within states. In addition, these studies should do their best to do a detailed analysis of the correlation between public higher education investments and economic growth in those states.

Policy Implications

Many of the likely reasons for public higher education's decline are difficult to quantify, but may shed light on policy recommendations and a roadmap for future research. Perception surely represents a challenge for our public institutions. When laypeople think of college, an image of the ivory clad walls and expansive quadrangles of Harvard spring to mind and it is hard for them to disentangle this vision with the reality at many public institutions. For example, a common perception in Texas is that the public system is egregiously wealthy because the Permanent (endowment) Fund is triple the size of the endowment at Rice. Never mind that the payout on this fund supports the operations of seventeen branch campuses and constitute no more than 1/10th of the revenues per student than the Rice endowment generates. Many taxpayers, politicians, and philanthropic organizations have the belief that their dollars

will go further if allocated to more “needy” causes. Further, as the private rate of return to education continues to increase it is incumbent upon the public higher education community to reemphasize the importance of broad based access, their public service mission, that it is a provider of jobs and essential for economic development.⁵⁷

Legislators and taxpayers alike need to be educated about how the system of higher education finance works. Too much attention is paid to sticker prices and to rates of tuition increase and not enough attention to the fact that public university tuition increases are largest when state support is smallest and that only a small fraction of students actually pay the full sticker price to attend an institution of higher education. Further, more attention needs to be paid to actual dollars of tuition changes as opposed to percentage changes. For example, take two hypothetical institutions, Jeffrey College (JC) and Ephraim College (EC) which both depend on their states for funding. Tuition at JC is \$2,000 in 2003-2004 while it is \$20,000 at EC. Due to budget cuts in each of their states, both JC and EC increase tuition in 2004-2005 by \$1,000. The way the news media and many politicians currently interpret this increase, JC would be vilified for increasing tuition by 50% while EC would be lauded for increasing tuition by only 5%!

The “race to the bottom” in state higher education spending suggests we ought to think more seriously about the optimal way to organize the higher education sector throughout the United States. The dramatic differences in costs across all of the states and in different states having varying degrees of preference for higher education suggest that fiscal federalism and higher tier governance may be a better way to finance higher education in order to ensure that all Americans have access to a quality higher education.⁵⁸ As it stands our system of

⁵⁷ The ratio of income of adult male college graduates to high school graduates has increased steadily from 1.25 in 1980 to 1.65 in 2000 with a slight dip in the mid-90s. In future work, I will attempt to recover measures of the rate of return to higher education by state to see how funding priority has changed as these returns have changed.

⁵⁸ The federal government already spends \$70 billion on higher education as compared to \$60 billion by the states.

financing higher education is wrought with inefficiencies which will only increase, not decrease, if we pursue a high-tuition high-aid strategy. The federal student aid programs are an administrative morass for students and their families to wade through. Over 14 million students participate in the Pell grant program, the Special Education Opportunity Grant, Federal Work Study, Perkins Program, Education Tax Credits, Stafford Subsidized Loans, Stafford Unsubsidized Loans, PLUS loans and SLS loans – one can only imagine the administrative cost of these programs and the opportunity costs to families planning for college.⁵⁹

As part of this organizational thinking states should also reconsider how they organize higher education within their own borders. Some may wish to create a streamlined system of community colleges, undergraduate colleges and research universities like in California. Some may wish to devise an integrated K-16 school system. Some may wish to divest themselves of public higher education entirely while others may want to substantially increase the scope of operations. As with most public programs, there is no “one size fits all” solution; the systematic withdrawal of state support for three decades indicates that the current equilibrium is unstable and states and their taxpayers would be well served to change it.

Closing Thoughts

Higher education is increasingly becoming a political issue. Politicians and interest groups are most guilty of committing the cardinal sin in economics – confusing absolute measures with marginal decisions. It is unlikely that the median person (measuring preferences for state spending) in the United States thinks spending more money on K12 education is a bad thing. However, the relevant question is not whether K12 expenditures are good or bad; it is instead how much education spending we want – which can ONLY be answered by looking at the marginal benefits of education spending compared to the marginal costs. While there is no concrete evidence that the net marginal benefits to higher education

⁵⁹ The College Board. *Trends in Student Aid 2003*.

investments are positive, there is also no evidence for the contrary. Interest groups and politicians are increasingly acting as demagogues, appealing to a fervent but small group of supporters that believe more spending on their pet project is the only good thing, completely abstracting from the important economic questions that need to be considered.

Clearly the rise of merit aid programs has been politically motivated, but so too are initiatives to institute performance and accountability standards (which are notoriously difficult to measure and implement). Some of the budget share declines may have occurred in response to the growing use by the flagship public universities of nonresident enrollments. They might also be emblematic of implicit agreements between public universities and legislatures to trade-off less political oversight in exchange for less state funding.

Recent work by Bound, et al (2001) provides additional insight. They find that states may not have an incentive to invest in higher education because the flows of college educated labor produced in a state have little impact on the stock of college graduates that work in a state. If this is the case, then it might make sense for a state to devote its resources to areas where it has a comparative advantage over other states. Finally, it might also be the case that statewide property tax initiatives in many of the states have contributed to the declining higher education share. In work just underway, I am looking at the question of whether the increased state burden for K12 expenditures as a result of local property tax exemptions for particular demographic groups has come at the expense of higher education expenditures.⁶⁰

A continued decline in state support for public institutions will result in innumerable negative consequences for the students that attend, or hope to attend them in the future. Among the consequences are: continued tuition increases⁶¹; movement away from full-time

⁶⁰ This work is primarily focused on more fundamental questions relating to school district expenditures, particularly due to New York State's STAR program.

⁶¹ Although high tuition, high need-based aid strategies are actually quite progressive, the sticker shock created by the high sticker prices, especially at two-year colleges, may scare those away who are at the margin of college attendance. The College Board estimates that the largest public high school class on record will graduate in 2008, and that a majority of these students will come from minority populations

tenure tracked faculty toward part-time faculty and graduate student instructors; increases in student-faculty ratios; an erosion of liberal arts and humanities programs in favor of more practical and professional programs; increases in time to degree and dropout rates; fall in public service expenditures; increased loan burden on students attending college; a limitation of program offerings; and a multitude of additional factors. Further, future budget cutbacks are likely to have a disproportionate negative impact on community colleges, which rely on a larger share of their operating budget from state sources and where a larger share of minority and first time college attendees are enrolled. While these changes may not be dramatic in any single year, over a period of time, the resource gap and faculty quality gap between the publics and privates will be so large as to render a private education and a public education two entirely different products.⁶²

A recent issue of the *Chronicle of Higher Education* asked a variety of higher education experts how they would deal with the tuition crisis facing our institutions, particularly at the publics.⁶³ While laudable, one can't help but feel uneasy with the topic's implicit acceptance that policies of broad state support and low tuition are historical relics. However, there are steps that states and institutions can take to ensure that this doesn't happen. It would be comforting to see comparative rates of return analyses on different state spending items to justify why higher education is falling out of favor, though those are notoriously difficult to calculate. Among the other steps include an increased participation in tuition reciprocity programs and cross-institutional cooperation.⁶⁴ Institutions can attempt to secure multi-year budget appropriations from legislatures in order to stop the destructive pattern of mid-year budget cuts. State tax codes can be revised and our public institutions can do a

and those that would be the first generation to attend college – so the sticker shock is of considerable concern.

⁶² As Ehrenberg and Brewer (1996) have shown that there is already a distinct advantage to attending an elite private college.

⁶³ September 19, 2003 (Volume 50 Issue 4).

⁶⁴ See www.ilr.cornell.edu/CHERI and click on "surveys" for a description of these reciprocity programs.

better job of marketing the “local public good” aspect of their product. While programs like funding formulas may be popular ways to secure financing for institutions, the determination of the formulas themselves are subject to political debate, and may also result in a sub-optimal distribution of student types within institutions due to institutional attempts to take advantage of these formulas.

Funding for education is a (less-than) zero sum game played out in statehouses across the nation. States decide how much to spend on education, then decide how much to allocate to each sector - and for years have acted as if K12 funding is more sacred than higher educational institutional spending. For instance, each state maintains a “rainy day fund” that is supposed to smooth the effects of budget shocks. In 2001, New York met the needs for a 5% K12 budget increase and maintained the current levels of its student aid program (Tuition Assistance Program) out of this fund, but none of it was tapped for SUNY and CUNY institutional needs. In the 2003-2004 fiscal year, 24 of 44 states surveyed by the State Higher Education Executive Officers indicated that they expected to receive decreases in the level of state spending for public higher education and in the 18 states that expected increases, in real per student terms funding is expected to remain flat. Demographic changes and the higher profile of K12 education do not bode well for public higher education’s future as well. A dramatic shift in public and legislative priority is required to ensure that future generations of students have access to public higher education that is of comparable quality to what is available today. An even larger commitment will be required to make this endeavor affordable and to keep our public institutions from falling further behind their private counterparts.

Paul Simon (not the musician, but former United States Senator from Illinois and founder of the Public Policy Institute of Southern Illinois) felt that we as economists and faculty members need to act as custodians of the American Higher Education System. He put it best when he said, “Robert Frost once challenged each of us to become a one-person

revolution... . . . if you are in a position of responsibility in education be willing to do that little extra that ultimately can be meaningful. It may require risking a little, and most of us are risk-averse. But without that small risk, you won't change things... . . . get together with some of your friends and think about little steps that you can take to change things. We don't simply need to lobby state governments for more money, we need to raise the consciousness of the American people, especially those that are down and out, about how important higher education is to our society.

REFERENCES

- Adams, Walter. 1977. "Financing Public Higher Education." *American Economic Review*. 67(1): 86-89.
- Alexander, F. King. 2001. "Disparities in State Tax Effort for Financing Higher Education," presented at Cornell Higher Education Research Institute Higher Education Policy Research Conference: "Financing Higher Education Institutions in the 21st Century", (May 2001).
- Arellano, M. and S. Bond. 1991. "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations." *The Review of Economic Studies*. 58: 277-297.
- Ashenfelter, Orley C. and Ronald G. Ehrenberg. 1975. "The Demand for Labor in the Public Sector." in Daniel S. Hamermesh, ed. *Labor in the Public and Nonprofit Sectors*. Princeton, NJ: Princeton University Press.
- Baltagi, Badi H. and Ping X. Wu. 1999. "Unequally Spaced Panel Data Regressions with AR(1) Disturbances." *Econometric Theory*. 15(6): 814-823.
- Biggs, Michael L. and Jayasri Dutta. 1999. "The Distributional Effects of Education Expenditures." *National Institute Economic Review*. 68-77.
- Borcherding, Thomas E. and Robert T. Deacon. 1972 "The Demand for the Services of Non-Federal Governments." *American Economic Review*. 62(5): 891-901.
- Bound, John, Jeffrey Groen, Gabor Kezdi and Sarah Turner. (forthcoming) "Trade in University Training: Cross-State Variation in the Production and Use of College-Educated Labor." *Journal of Econometrics*.
- Bowen, William. 1977. "Economic Problems Confronting Higher Education: An Institutional Perspective." *American Economic Review*. 67(1): 96-100.
- Cardak, Buly A. 1999. "Heterogeneous Preferences, Education Expenditures and Income Distribution." *Economic Record*. 75(228): 63-76.
- Clotfelter, Charles T. 1976. "Public Spending for Higher Education: An Empirical Test of Two Hypotheses." *Public Finance*. 31(2) 177-195.
- Cohen, L.R. and R.G. Noll. 1998. "Universities, Constituencies, and the Role of the States." In R.G. Noll ed. *Challenges for Research Universities*. Washington, DC: Brookings Institution Press.
- Coughlin, C.C. and O.H. Erikson. "Determinants of State Aid and Voluntary Support of Higher Education." *Economics of Education Review*. 5(2): 179-190.
- Creedy, J. and Francois, P. 1990. "Financing Higher Education and Majority Voting." *Journal of Public Economics*. 43(2): 181-200.

Deaton, Angus and John Muellbauer. 1980. *Economics and Consumer Behavior*. Cambridge: Cambridge University Press.

Directory of Faculty Contracts and Bargaining Agents In Institutions of Higher Education (1977-1996). Richard Hurd and Amy Foerster with Beth Hillman Johnson. Douglas H. White Director The National Center for the Study of Collective Bargaining in Higher Education and the Professions, School of Public Affairs, Baruch College - The City University of New York.

Duflo, Esther. 2001. "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment." *American Economic Review*. 91(4): 795-813.

Dynarski, Susan. Forthcoming 2004. "The Consequences of Merit Aid." in Caroline M. Hoxby ed. *College Choices: The Economics of Which College, When College, and How to Pay For It*. Cambridge: The University of Chicago Press.

Ehrenberg, Ronald G. 2003. "Financing Higher Education Institutions in the 21st Century." Address at the 2003 annual meeting of the American Educational Finance Association.

----- . 2000. *Tuition Rising*. Cambridge, MA: Harvard University Press.

----- . 1973. "The Demand for State and Local Government Employees." *American Economic Review*. 63(3): 366-379.

Ehrenberg, Ronald G. and Dominic Brewer. 1996. "Does It Pay to Attend an Elite Private College? Evidence from the Senior High School Class of 1980." *Research in Labor Economics* 15: 239-271.

Ehrenberg, Ronald G. and Christopher Smith. 2003. "The Sources and Uses of Annual Giving at Selective Private Research Universities and Liberal Arts Colleges." *Economics of Education Review*. 22(3): 223-235.

Fernandez, Raquel and Richard Rogerson. 1998. "Public Education and Income Distribution: A Dynamic Quantitative Evaluation of Education-Finance Reform." *American Economic Review*. 88(4): 813-833.

Fernandez, Raquel and Richard Rogerson. 1995. "On the Political Economy of Education Subsidies." *Review of Economic Studies*. 62(2): 249-262.

Fisher, Ronald C. 1988. *State and Local Public Finance*. Glenview, IL: Scott Foresman

Fortin, Nicole. 2002. "Does College Education Spending Reduce Wage Inequality? Cross-State Evidence from the 1990s." Presented at Annual Meetings of the Society of Labor Economists, Baltimore, MD May 2002.

Goldin, Claudia and Lawrence Katz. 1999. "The Shaping of Higher Education: The Formative Years in the United States, 1890-1940." *The Journal of Economic Perspectives*. 13(1): 37-62.

- Griswold, C.P. and G.M. Marine. 1996. "Political Influences on State Tuition Aid Policy: Higher Tuition/Higher Aid and the Real World." *Research in Higher Education*. 37(2): 244-278.
- Groen, Jeffrey A. and Michelle J. White. 2004. "In-State versus Out-of State Students: The Divergence of Interest between Public Universities and State Governments." *Journal of Public Economics*. 88(9): 1793-1814.
- Groen, Jeffrey A. Forthcoming 2004. "The Effect of College Location on Migration of College-Educated Labor." *Journal of Econometrics*.
- Hansen, W.L. and B. A. Weisbrod. 1969a. *Benefits, Costs, and Finance of Public Higher Education*. Chicago.
- 1969b. "The Distribution of Costs and Direct Benefits of Public Higher Education: The Case of California." *Journal of Human Resources*. 4(2): 176-191.
- Hearn, J.C., C.P. Griswold and G.M. Marine. 1996. "Region resources, and reason: a contextual analysis of state tuition and student aid policies." *Research in Higher Education*. 37(2): 241-243.
- Hill, Catherine, Gordon Winston and Stephanie Boyd. 2004. "Affordability: Family Incomes and Net Prices at Highly Selective Private Colleges and Universities." *Williams Project on the Economics of Higher Education*, Discussion Paper No. 66r.
- Hoenack, Stephen A. and Daniel J. Pierro. 1990. "An Econometric Model of a Public University's Income and Enrollments." *Journal of Economic Behavior and Organization*. 14(3): 403-423.
- Holbrook, Thomas M. and Emily Van Dunk. 1993. "Electoral Competition in the American States." *The American Political Science Review*. 87(4): 955-962.
- Hossler, D., Lund, J., Ramin, J., Westfall, S. and Irish, S. 1997. "State Funding for Higher Education: the Sisyphean Task." *Journal of Higher Education*. 68: 160-190.
- Hoxby, Caroline. February 9, 2000 Testimony to the United States Senate, Committee on Governmental Affairs.
- 1998. "The Effects of Geographic Integration and Increasing Competition in the Market for College Education." Harvard Economics Department Working Paper.
- 1997. "How the Changing Market Structure of U.S. Higher Education Explains College Tuition." National Bureau of Economic Research Working Paper Number 6323.
- Hovey, Harold. 1999. *State Spending for Higher Education in the Next Decade: The Battle to Sustain Current Support*. Prepared by State Policy Research, Inc. for The National Center for Public Policy and Higher Education.
- Koshal, Rajindar K. and Manjulika Koshal. 2000. "State Appropriation and Higher Education Tuition: What Is the Relationship?" *Education Economics*. 8(1): 81-89.

- Krueger, C. 2001. *Merit Scholarships*. Denver, CO: Education Commission of the States.
- Ladd, Helen F. and Sheila E. Murray. 2001. "Intergenerational Conflict Reconsidered: County Demographic Structure and the Demand for Public Education." *Economics of Education Review*. 20(4): 343-357.
- Layzell, Daniel T. & Jan W. Lyddon. 1997. "Budgeting for Higher Education at the State Level: Enigma, Paradox and Ritual." In *ASHE-ERIC Higher Education Report*, No.4, (Washington, DC, ERIC Clearinghouse on Higher Education, The George Washington University).
- Lee, Seong Soo, Rati Ram and Charles W. Smith. 1999. "Distributive Effect of State Subsidy to Undergraduate Education: The Case of Illinois." *Economics of Education Review*. 18(2): 213-221.
- Leslie, Larry, and Ramey, G. 1986. "State Appropriations and Enrollments: Does Enrollment Growth Still Pay?" *Journal of Higher Education*. 57(1): 1-19.
- Long, Bridget Terry. Forthcoming 2004. "How Do Financial Aid Policies Affect Colleges? The Institutional Impact of the Georgia HOPE Scholarship." *Journal of Human Resources*.
- Lowry, Robert C. 2001. "The Effects of State Political Interests and Campus Outputs on Public University Revenues." *Economics of Education Review*. 20(2): 105-119.
- MGT of America. 2001. "Funding Formula and Performance Funding Consulting Services." Discussion Paper: Issues and Models of Performance Indicator Usage and Performance Funding in Higher Education. Austin.
- Moretti, Enrico. Forthcoming 2004. "Estimating the Social Return to Higher Education: Evidence from Longitudinal and Repeated Cross-Sectional Data." *Journal of Econometrics*.
- Murray, Sheila E., William N. Evans and Robert M. Schwab. 1998. "Education-Finance Reform and the Distribution of Education Resources." *American Economic Review*. 88(4) 789-812.
- National Association of State Universities and Land-Grant Colleges (NASULGC) 2001, "Shaping the Future: The Economic Impact of Public Universities," NASULGC Office of Public Affairs.
- Nechyba, Thomas J. 2000. "Mobility, Targeting, and Private-School Vouchers," *American Economic Review*. 90(1): 130-146.
- , 1997a. "Existence of Equilibrium and Stratification in Local and Hierarchical Tiebout Economies with Property Taxes and Voting." *Economic Theory*. 10(2): 277-304.
- , 1997b. "Local Property and State Income Taxes: The Role of Interjurisdictional Competition and Collusion." *Journal of Political Economy*. 105(2): 351-384.

- , 1996. "A Computable General Equilibrium Model of Intergovernmental Aid." *Journal of Public Economics*. 62(3): 363-397.
- Niskanen, William A. 1968. "Nonmarket Decision Making: The Peculiar Economics of Bureaucracy." *American Economic Review*. 58(1): 293-305.
- Painter, Gary and Kwi-Hee Bee. 2001. "The Changing Determinants of State Expenditure in the United States: 1965-1992." *Public Finance and Management*. 9(4): 370-392.
- Peterson, R.G. 1976. "Environmental and Political Determinants of State Higher Education Appropriations Policies." *Journal of Higher Education*. 47(5): 523-545.
- Poterba, James M. and Kim S. Rueben. 1995. "The Effect of Property-Tax Limits on Wages and Employment in the Local Public Sector." *American Economic Review* 85(3): 384-389.
- Poterba, James M. 1997. "Demographic Structure and the Political Economy of Public Education," *Journal of Public Policy and Management* 16: 48-66.
- , 1994. "State Responses to Fiscal Crises: The Effects of Budgetary Institutions and Politics." *Journal of Political Economy*. 102(4): 799-821.
- Reindl, Travis and Dana Brower. 2001. "Financing State Colleges and Universities: What is Happening to the "Public" in Public Higher Education?" Presented at the 2001 Cornell Higher Education Research Institute Conference, *Financing Higher Education Institutions in the 21st Century*, Cornell University, Ithaca, NY, May 22-23, 2001.
- Rizzo, Michael J. and Ronald G. Ehrenberg. Forthcoming 2004. "Resident and Nonresident Tuition and Enrollment at Flagship State Universities." in Caroline M. Hoxby ed. *College Choices: The Economics of Which College, When College, and How to Pay For It*. Cambridge: The University of Chicago Press.
- Rothschild, Michael and Lawrence J. White. 1993. "The University in the Marketplace: Some Insights and Some Puzzles." in Charles T. Clotfelter and Michael Rothschild, eds., *Studies of Supply and Demand in Higher Education*. Chicago: The University of Chicago Press.
- Ruggles, Steven and Matthew Sobek et al. 2003. Integrated Public Use Microdata Series (IPUMS): Version 3.0 Minneapolis: Historical Census Projects, University of Minnesota.
- Sprumont, Yves. 1998. "Equal Factor Equivalence in Economies with Multiple Public Goods." *Social Choice and Welfare*. 15(4): 543-558.
- Strathman, James G. 1994. "Migration, Benefit Spillovers and State Support of Higher Education." *Urban Studies*. 31(6): 913-920.
- Stone, R. 1954. "Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand." *Economic Journal*. 65(259): 511-527.
- Strathman, James. 1994. "Migration, Benefit Spillovers and State Support of Higher Education." *Urban Studies*. 31(6): 913-920.

Strotz, Robert H. 1959. "The Utility Tree – A Correction and Further Appraisal." *Econometrica*. 27(3): 482-488.

Strotz, Robert H. 1957. "The Empirical Implications of a Utility Tree." *Econometrica*. 25(2): 269-280.

Toutkoushian, Robert K. and Paul Hollis. 1998. "Using Panel Data to Examine Legislative Demand for Higher Education." *Education Economics*. 6(2): 141-157.

UNESCO. 2003. "Financing Education - Investments and Returns." Paris: UNESCO Publishing.

Winston, Gordon C. 1999. "Subsidies, Hierarchy and Peers: The Awkward Economics of Higher Education." *Journal of Economic Perspectives*. 13(1): 13-36.

Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross-Section and Panel Data*. Cambridge, Massachusetts: The MIT Press.