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

by

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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 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

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[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.

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 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.
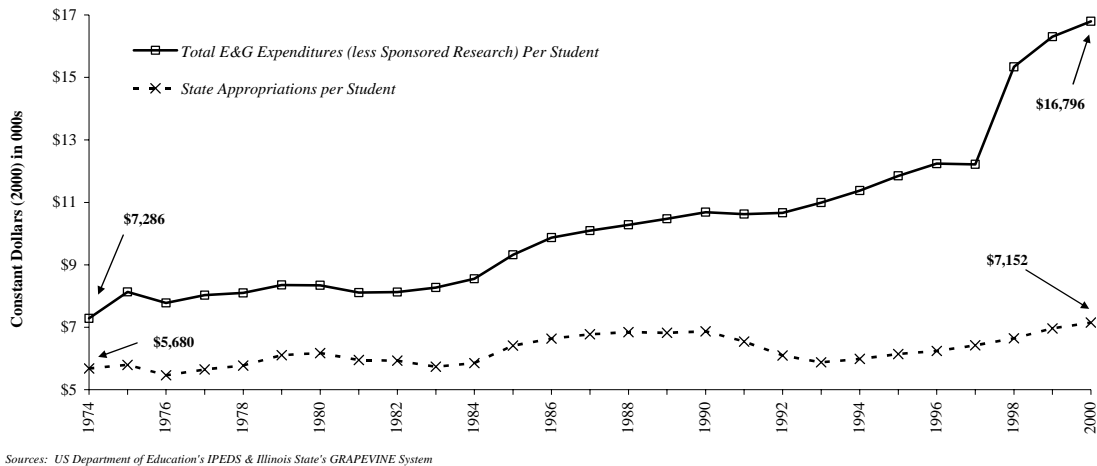

Figure 1
Growth in State Appropriations vs. Current Educational and General Expenditures (net of Sponsored Research) per FTE Student at All Public Universities, 1973-74 – 2000-01AY

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[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%.

[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).

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) 1972 to 2001, the average (across states) share of total state general fund expenditures on education ("EDSHARE") 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 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.
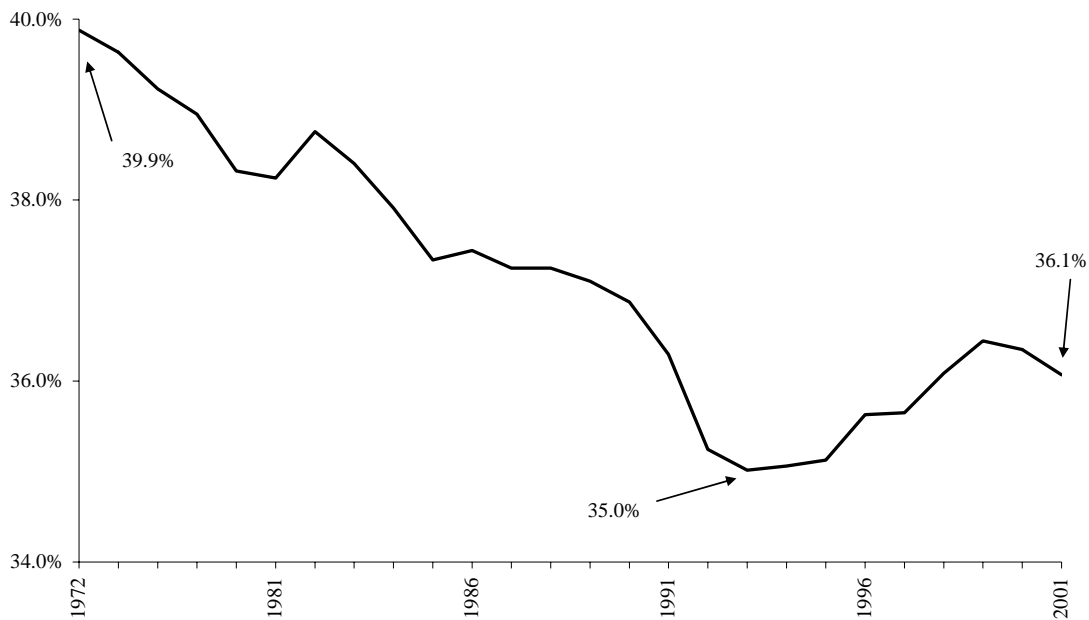
Source: US Census "State Government Finances" Selected Years. See ftp://ftp2.census.gov/pub/outgoing/

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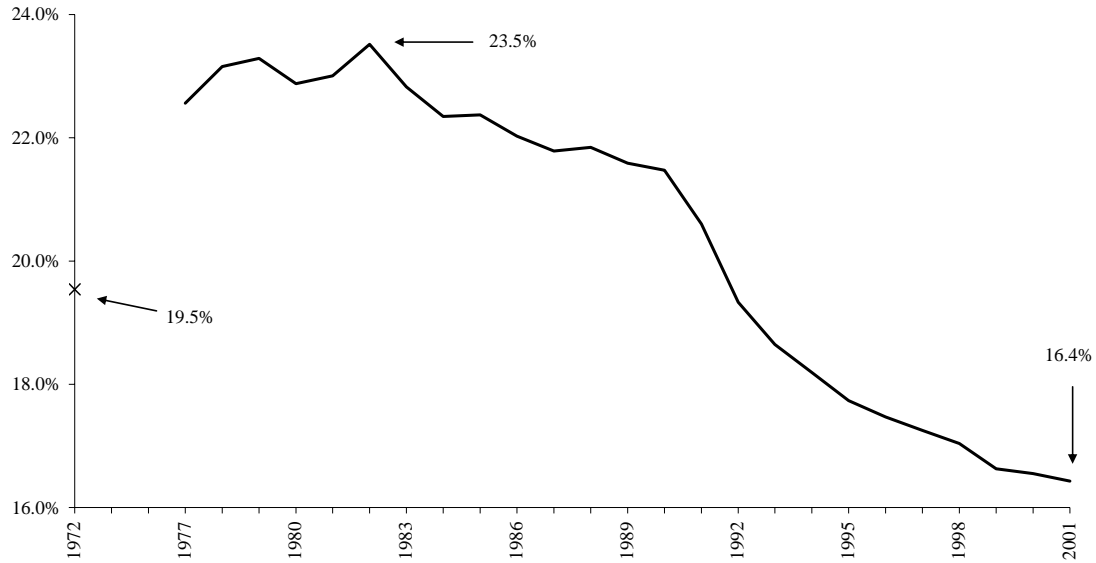
Figure 2
Average Share of State General Expenditures on Education
1971-72 to 2000-2001

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.

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 ("HESHARE") 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.

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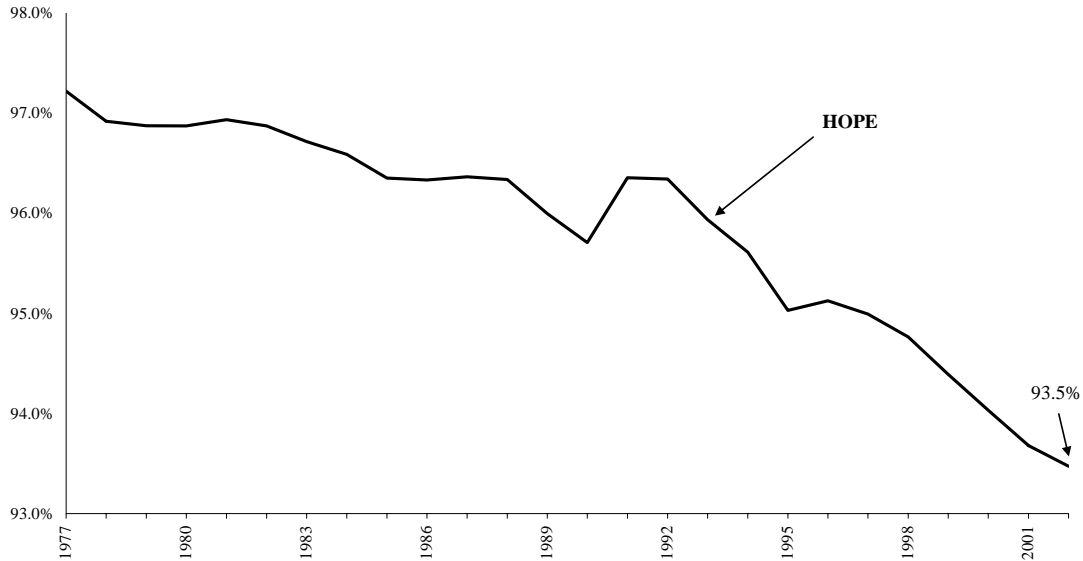
Source:s US Census "State Government Finances" Selected Years and Illinois State's GRAPEVINE.

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).

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 ("INSHARE") 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

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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.

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

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[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.

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

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 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

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[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).

of this sum, consider that it represents fully 50% of the *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]

Data

The analysis in this paper involves a broad panel data set which was assembled from over 30

different sources spanning 1977-2001.[10] 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

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[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. 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 instate tuition
at a public four year institution in 2001!

[10] A complete description of the data can be found in Rizzo (2004).

result in an additional $75 million for higher education nationwide, and as much as a quarter-billion

additional dollars in New York.

Table 1
Summary Statistics for Baseline and Selected Variables and Years

	1977			2001		
	Mean	Min	Max	Mean	Min	Max
Income and Budget Measures:						
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
Demographics:						
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
Enrollment Pressure						
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
Competing Interests & Economic Conditions:						
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
Political Factors:						
# 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
Higher Education Factors:						
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 (share)	Higher Education (share)
National Average	20,867	7,491	1,231
		35.9%	16.4%
Iowa	11,199	4,397	871
		39.3%	19.8%
New York	89,237	23,569	3,353
		26.4%	14.2%
North Carolina	28,860	11,960	2,452
		41.4%	20.5%
Texas	58,183	24,805	4,087
		42.6%	16.5%

Empirical Model & Results

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. 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 then estimated assuming several possible treatments of the random components

and cross-sectional components of the error terms.[11] For each of the three outcome measures I propose

the following model:

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

These three equations can be viewed as approximating political economic equilibrium conditions

from an underlying structural demand and supply model. Empirical estimates should therefore be

carefully interpreted. 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.[12]

The parameters of interest, β_k, answer the question, "holding all other factors constant, what is the

expected change in the budget share within a state if some observable factor increases by one unit?" The

inclusion of state effects (c_i) and year effects (γ_i) 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,

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[11] 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. See Rizzo (2004).

[12] 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.

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. Inclusion of time effects also 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.[13]

Baseline Estimates

I estimate equation 1 via ordinary least squares (OLS) for each of the three outcome measures I am interested in. Table 3 presents OLS regression estimates for the EDSHARE and HESHARE equations while table 4 presents OLS estimates for the 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

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[13] 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.

percentage points.[14] All of the results discussed below are *ceteris paribus*, holding all other factors

constant.[15]

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 1977.[16]

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

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[14] 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.

[15] 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 HESHARES. 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.

[16] 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.

percentage 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).[17]

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

Bold 95% significance, ** *italics = 90%*	*EDSHARE* (I)		*HESHARE* (II)	
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)**	*	*0.22* *(0.13)*	**
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	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 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).

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[17] 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).[18] 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 (1972), 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.[19]

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 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

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[18] 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%.

[19] 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.

higher education by the elderly or a more immediate public benefit perceived to be available through financing university research.[20]

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.[21] 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-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

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[20] 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.

[21] 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.

"whiter." However, the impact of this heterogeneity becomes statistically significant and larger when the non-school age adult population is more homogeneous.[22]

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.[23]

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 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

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[22] 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.

[23] 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.

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.

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).[24] 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 immediately discerned from this result.

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.

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[24] 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.

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

Bold 95% significance, ** *italics = 90%*	Baseline (I)		(II)	
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)	*-0.09* *(0.05)*	**	**-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)	*0.0037* *(0.0022)*	**	*0.0039* *(0.0022)*	**
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)	*0.29* *(0.18)*	**	*0.31* *(0.17)*	**
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

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 x COLRACERATIO x INC.[25] 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 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.

Extensions – Incremental Budgeting

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.[26] Consider the HESHARE

equation as an example. The interpretation is that for any level of budgeted funds for education, the

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[25] 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 x 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 x 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. INCx 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.

[26] 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.)

legislators first make expenditures for the minimum level of services required to be provided by K12 and higher education. Then with the remaining 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. Table 5 presents the parameter estimates (θ) from re-estimating the baseline equations using the Arellano-Bond dynamic panel estimation technique when lagged dependent variables are included in the specification.[27] 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 only in part by an incremental process. Looking to the EDSHARE results 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. As one might expect, it appears that legislatures exercise more discretion the more narrowly defined the budget share is. Fifty-six percent of the HESHARE is determined by the level of HESHARE one period earlier while just over ½ of the INSHARE decision is based on the prior year's allocation.

Table 5
Dynamic Panel Estimation on Baseline Regressions: Instrumental Estimates using Dynamic Panel GMM Estimator

Bold 95% significance, ** *italics = 90%*	EDSHARE (2)		HESHARE (4)		INSHARE (6)	
1-Period Lagged Outcome (LAG)	**0.73** **(0.03)**	*	**0.56** **(0.03)**	*	**0.53** **(0.03)**	*

[27] 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 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. Complete results and discussion can be found in Rizzo (2004). Baseline results are largely unaffected by this specification change.

Extensions – Augmented Specifications[28]

I reestimate each baseline specification by adding groups of variables that capture political and voting characteristics, the sources of state general fund revenues, the composition of gross state product by industry, higher education specific variables and other demographic characteristics. Inclusion of any single group of variables had virtually no impact on the original baseline estimates

Augmented EDSHARE regressions yield few notable results. The only important political variable is that as the state government moves from multiparty control to single party control, the education budget share increases.[29] 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, 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.[30]

Augmented HESHARE regressions indicate that political and higher education specific factors are important. Uniparty governments prefer to fund K12 education, and this result does not depend on the specific party that is in control. The composition of political interests within state legislatures, represented by the number of assembly seats per senate seats, produces an interesting (albeit of small magnitude) 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.[31] States spend larger shares on higher education when larger shares of PhDs are awarded in science and technology fields. Legislatures are also more supportive of higher education when a larger share of

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[28] See Rizzo 2004 for complete results.
[29] This result is invariant to the specific party that is in control (Rizzo 2004).
[30] 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.
[31] 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 1977 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.

students attend two-year colleges, 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.

A dramatic, and concerning, result from these regressions is a negative and significant coefficient estimate on real private giving per student at public research universities within a state. As state funding continues to lag, 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 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.[32] 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, the augmented estimates indicate that political factors are contributing to the decline in institutions' share of higher education budgets. The estimates indicate that as voter participation rates increase, and that as a state moves from a Republican governor to a

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[32] 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.

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Democratic governor, student aid increases in attractiveness relative to institutional appropriations though the magnitude of these effects is small.

Though there is a strong negative relationship between the share of PhDs awarded in the sciences and institutional aid shares, this may simply reflect the impacts of targeted student aid programs many years earlier. As with the HESHARE results, institutional efforts to raise private monies seem to be met with retaliatory action by the states. 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.

Extensions – Subsamples of Data[33]

Table 5 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 (K12 court mandates), non-northeast states, low population density states and states governed by a single political party 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, five broad observations are worth highlighting. First, from estimating each equation separately for the years 1977-1982, 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 1977-1982 resulted in a fall in HESHARES by 0.1 points, today a similar increase results in nearly a half point fall in the HESHARE.[34]

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[33] Complete write-up and additional results in Rizzo 2004.

[34] 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.

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.

Third, there is evidence that changes in competing interests (health and crime spending) and federal transfers 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.

Table 5
Percentage Point Changes in Outcomes by State Institutional Characteristics

Institutional Characteristic		ΔEDSHARE	ΔHESHARE	ΔINSHARE
Autonomy of Higher Eduction 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.
* Lowry 2001
** Holbrook and Van Dunk 1993

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.

Extensions - 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.[35] 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.

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[35] 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."

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.[36] Coefficient estimates on the one-period lagged tuition suggest that when tuition increases by $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.[37] 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.[38] 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.

Conclusion

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.

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[36] 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.

[37] 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.

[38] 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.

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 considerable discretion over the determination of the higher education – K12 funding allocation. 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 nearly one-third 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.

The apparent 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.[39]

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 increases[40]; movement away from full-time 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.[41]

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.[42] 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

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[39] See Rizzo (2004) for detailed analysis of policy implications and recommendations for future research.
[40] 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 and those that would be the first generation to attend college – so the sticker shock is of considerable concern.
[41] As Ehrenberg and Brewer (1996) have shown that there is already a distinct advantage to attending an elite private college.
[42] September 19, 2003 (Volume 50 Issue 4).

reciprocity programs and cross-institutional cooperation.[43] 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 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.

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

REFERENCES

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.

Biggs, Michael L. and Jayasri Dutta. 1999. "The Distributional Effects of Education Expenditures." *National Institute Economic Review*. 68-77.

Borge, Lars-Erik and Jorn Rattso. 1995. "Demographic Shift, Relative Costs and the Allocation of Local Public Consumption in Norway." *Regional Science and Urban Economics 25(6):* 705-26.

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*.

Cardak, Buly A. 1999. "Heterogeneous Preferences, Education Expenditures and Income Distribution." *Economic Record*. 75(228): 63-76.

Case, Anne C., Harvey S. Rosen and James R. Hines, Jr. 1993. "Budget Spillovers and Fiscal Policy Interdependence: Evidence from the States." *Journal of Public Economics 52*(3): 285-307.

Ehrenberg, Ronald G. 2000. *Tuition Rising*. Cambridge, MA: Harvard University Press.

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.

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.

Hight, Joseph E. and Richard Pollock. 1973. "Income Distribution Effects of Higher Education Expenditures in California, Florida and Hawaii." *Journal of Human Resources 8*(3): 318-330.

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.

Holbrook, Thomas M. and Emily Van Dunk. 1993. "Electoral Competition in the American States." *The American Political Science Review*. 87(4): 955-962.

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: 343-357.

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: 213-221.

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.

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.

Niskanen, William A. 1968. "Nonmarket Decision Making: The Peculiar Economics of Bureaucracy." *American Economic Review.* 58(1): 293-305.

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.

Rizzo, Michael J. 2004. "A (Less Than) Zero Sum Game? State Funding for Public Education: How Public Higher Education Institutions Have Lost." Dissertation, Cornell University.

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.

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

Windham, Douglas M. 1972. "Equity Implications of State Tuition Policy and Student Loans: Comment." *Journal of Political Economy 80(*3): S172-S74.

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.