State funding for public higher education: explaining the great retreat

Stone, Joe

University of Oregon

March 2012

State funding for Public Higher Education: Explaining the Great Retreat

Joe A. Stone

W. E. Miner Professor of Economics

University of Oregon

March 2012

ABSTRACT

This study examines reasons for the decline in state funding for public higher education. Prior studies point to Medicaid costs, limitations on tax revenues, income inequality, and Pell grants, but do not estimate their relative importance. Results in this study indicate that income inequality, Pell grants, and K-12 funding are the dominant factors. Pell grants in particular, create powerful incentives for states to substitute Federal dollars for their own. Estimates are identified using 5-year difference-in-differences for 49 states from 1957 to 2007. Regression, instrumental-variables, and Granger-causality estimates yield consistent results.

INTRODUCTION

After a century of growth in state and local expenditures on public higher education, funding has retreated for decades, declining by roughly a third since 1970 as a share of state budgets. the 'great retreat' has been widely shared across states, with only a handful of exceptions, such as New Mexico, Virginia, Washington, Maine, and Massachusetts.

Several explanations have been offered. Two of these, the rising burden of state health care costs singled out by Kane and Orszag (2003) and the growing costs of K-12 schools highlighted by Rizzo (2004), focus on how particular elements of state budgets crowd out funding for higher education. A third explanation, from Archibald and Feldman (2006), focuses not on crowding out, but on restrictions on tax revenues imposed by tax limitation measures enacted in a number of states over the period. Rizzo (2004) points to two other nationwide factors—income inequality and Pell grants. This study's contribution is to disentangle the relative significance of the various factors proposed to explain the great retreat.

EXPLANATIONS

Credible explanations for the near universal retreat from state and local support for higher education must rely on factors widely shared across states, such as the rising costs of health care or pressures to fund k-12 public schools. Tax limitation measures are not a credible explanation for at least two reasons. First, tax limitation measures were passed in only a subset of states. More importantly, state and local tax revenues have *risen* nationally not fallen, as a share of personal income. Factors truly national in scope, such as rising income inequality, Federal Pell grants, costs of K-12 schools, or costs of public health systems are more credible possibilities, and. this study estimates their relative importance.[1]

---

[1] Rizzo (2004) points to other state-specific factors, such as ethnic and age composition of the population.

1. Income inequality

The national trend toward greater income inequality (the 'great divergence') roughly coincides with the great retreat, but are the two related and if so, how? This study's contribution on this issue is to isolate the unique effects of changes in high versus low incomes, rather than simply a change in their ratio, as previously examined by Rizzo (2004). Our conjecture is that the distinction is crucial if the effects of increases in high incomes in reducing demand for public higher education are disproportionately large, as high-income households shift toward more prestigious private or out-of-state public schools and as effects of the views and behavior of the wealthier and presumably more influential, residents of a state are magnified in terms of public perception and policy.

2. Pell grants

Cutting Pell Grants will significantly undermine the portion of Mississippi's higher education freight being paid by federal taxpayers…' ***Picayune Item*** *(*2011)

The Federal Pell Grant program was first approved by Congress in 1965, but was then expanded in generosity relative to college costs until a peak in the late 1970s. Pell grant awards are contingent on income and tuition in a way that creates incentives for states to induce an increase in federal expenditures for students in their state by reducing state expenditures, since a dollar reduction in state expenditures reduces net funding for college students in the state by less than a dollar because Federal funding formulas for student aid offer higher aid for higher tuition and greater need. Rizzo (2004) links these incentives to a shift in state budgets from institutional to direct student aid, but our focus is wider, to estimate the relative importance of Pell grants as a factor in the relative decline in overall higher education funding.

DATA AND EMPIRICAL SPECIFICATION

The data represent 49 states at five-year intervals over the half century from 1957 to 2007. Annual data for state and local public expenditures are available only beginning in 1977. We omit Alaska due to the dominance of the Alaska pipeline and the outlying variances in state fiscal variables relative to other states.

Five-year interval data for public expenditures has the disadvantage of reducing the number of observations relative to the number if annual data were available for the same period, but has the advantage of increased power to identify low-frequency factors relative to higher-frequency factors, and the former are more important than the latter for identifying factors driving the long-term decline in state funding for public higher education.

Data for state and local government fiscal variables are taken from the Census of Governments. Related economic, demographic, and other data for corresponding years are from the Bureau of Labor Statistics (for state population and age composition) or the Department of Commerce (for state real personal income per capita). Data for the Pell grant program are from the National Center for Education Statistics. All data are publicly available.

The relative effects of state healthcare costs, K-12 school funding, income inequality, Pell grants, and other factors are identified using a five-year difference-in-differences specification. Our primary empirical concern is ensuring that estimation adequately controls for variations arising from unobserved heterogeneity and any other important factors, rather than simultaneity bias, so we employ several strategies to control for the influence of unobserved factors. Endogeneity bias is a secondary concern for several reasons: 1) the two key factors of interest, rising income inequality and Pell grants, are primarily national, not regional in origin; 2) 2) any reverse causation from higher education to the non-fiscal independent variables likely

works through longer lags than those identified in the difference-in-differences specification; and 3) complementary tests of Granger causality and instrumental-variables (IV) estimates yield results consistent with the regression estimates, suggesting little or no endogeneity.

Our first strategy to control for unobserved factors is to focus on changes in the funding for public higher education *relative* to funding for the most closely related category of public spending—one likely to be driven by factors similar to those for higher education, such as income, age composition of population, cultural norms, preferences, and other factors influencing public budgets. Funding for public K-12 schools is an obvious choice, so our dependent variable is the difference between the log change in state and local expenditures on higher education and the log change in state and local expenditures on public K-12 schools, with both expressed as a percentage of personal income in the state. This specification is equivalent to restricting the coefficient for K-12 to minus one, so including K-12 as an explanatory variable relaxes that restriction, and we obtain IV estimates to redress the possible bias toward negative one.

To account for the influence of omitted factors, our difference-in-differences specification accounts for state-specific fixed effects using first differenced data, as well as for both state-specific trends and time-varying effects common across states. State-specific fixed effects for estimates based on the first differenced data account for the former, and a quadratic in time controls for the latter. Explicit independent variables include log-change variables for other expenditure factors previously proposed as explanations. That is, for healthcare expenditures (health) and state and local expenditures on K-12 public schools (K-12). This specification permits an estimate of the extent to which rising K-12 expenditures contribute to the relative decline in funding for higher education. However, any measurement error in K-12 expenditure data biases the coefficient on K-12 toward minus one, since K-12 has a coefficient of minus one

by construction as part of the dependent variable. Annual K-12 expenditures are not likely reported with substantial error at the state level. Even so, we also obtain IV estimates and tests of Granger causality to assess robustness. Both yield results consistent with our regression results, revealing little evidence of bias from either endogeneity or measurement error for the coefficient for K-12.

Expressing fiscal variables as log shares of personal income, rather than as budget shares tends to diminish their linear dependence via the government budget constraint. We use the log 90th and 10th percentiles for real personal family income as measures of income inequality, p90 and p10, respectively, because the 90/10 distinction is a common easily understood, measure and because it distinguishes changes in very high and very low incomes. Increases in high incomes likely reduce relative funding for higher education directly through household demand, as richer families shift toward more prestigious private and out-of-state public schools and possibly indirectly as well, through the broader social, economic, and political influence of a state's wealthiest citizens. We also incorporate a set of auxiliary control variables for the age composition of the state population, the log-change of the average real personal income per capita, and the state unemployment rate, though these have no significant role.

A binary variable (Pell) equals one as of 1977, near the peak of the maximum award relative to college tuition, and zero prior to 1977—roughly midway through the half century of data from 1957 to 2007.[2] Our conjecture is that once well established, the Pell program created powerful incentives for state residents to increase federal student-aid expenditures by reducing state subsidies to public colleges and universities.

---

[2]Note that in first-differences, Pell is the time difference in Pell.

As previously noted, we control for state-specific fixed effects by first differencing the data and control for state-specific trends by including state-specific fixed effects in the first-differences specification. Alternative estimates with random state-specific, effects yield equivalent results.

Our identification of the effect of the Pell grant program requires the assumption that underlying trends in the dependent variable unrelated to Pell grants are the same before and after the treatment, i.e. before and after 1977. Fortunately, multiple observations in the pre and post periods for the Pell grant Program identify estimates we can use to assess the sensitivity of the estimated effect for Pell grants to the common trend assumption in two different but complementary, ways. One is to include a polynomial in time (in our case, year and year squared) over the full period before and after full implementation of Pell grants. A second is to account for any difference in trend explicitly by specifying a break in trend after 1977.

RESULTS

1. *Baseline specification*

Column (1) of Table 2 presents ordinary least-squares estimates of our baseline difference-in-differences specification with a linear time trend. State-specific trends and the set of auxiliary control variables are included and noted in all three columns. In both cases, they are jointly insignificant and their individual coefficients are not reported.

The income inequality variables (p90 income and p10 income) are respectively, significantly negative and positive, as expected. The estimated effect of high incomes on the decline in relative funding is much larger, both because the negative coefficient estimated for p90 is larger in absolute value and because recent decades, very high real incomes have increased faster than very low real incomes.

The contribution of rising health care costs to the decline is statistically significant but positive, not negative. The positive estimate suggests the presence unobserved factors associated with increases in both, so we place this estimate into a 'holding cell' for suspect results, pending estimates of alternative specifications. With a coefficient of roughly -0.7 in column (1), K-12 costs also appear to contribute significantly to the relative decline, but K-12 appears on both sides of the regression equation, with a bias toward negative one, so this coefficient estimate joins the coefficient for health in our holding cell for suspect results, pending instrumental-variables estimation. The coefficient for the Pell grant program in column (1) of - 0.23 is large and significantly negative. The linear time trend is also significantly negative but small, indicating an otherwise unexplained annual decline of less than one percent. The overall fit of the equation is strong for first-differenced data, with an R-squared of 0.55, and the Durbin Watson statistic of 2.42 gives little reason for concern regarding specification errors associated with serial correlation, and an estimated ar (1) coefficient is insignificant.

2. *Alternative Specifications*

Column (2) of Table 2 presents estimates extended to include a quadratic polynomial as a test of the sensitivity of the estimated effect of the Pell program to time-varying effects spuriously correlated with the implementation of Pell grants. Neither the linear nor the quadratic coefficient for year is significant, and not surprisingly, the coefficient for Pell in column (2), at -0.21, is only slightly less negative than in column (1) and remains significant. Estimates of other coefficients are also relatively unaffected, though the coefficient for health expenditures is no longer significant, presumably because the time quadratic terms account for unobserved factors responsible for the positive coefficient for health expenditures in column (1).

As an alternative to a time quadratic, Column (3) of Table 2 includes an explicit term (1977 x year) for a possible break in trend after 1977. The linear trend remains significant in column (3), and the estimated coefficient for 1977 x year indicates no significant break in trend. The estimated effect for Pell (-0, 28) also remains significant and is marginally more negative.

3. *Other Robustness tests*

In addition to the alternative specifications of time-varying effects in Table 2. We pursue two additional robustness tests. First, we perform tests of Granger causality for the expenditure, income inequality, and Pell grant variables in Table 2. With either one-period (5-year) lags or two-period (10 year) lags, the tests confirm the significance of the income-inequality variables, K-12 expenditures, and Pell grants and again, reject significance for health expenditures. Given the possibility of negative bias from measurement error or endogeneity for K-12, we also obtain (IV) estimates for K-12 expenditures, with predetermined, two-period lags of the level values of K-12 and the other independent variables as instruments. The resulting IV coefficient for K-12 expenditures (-0.58) is also significantly negative, and only marginally less so than the regression estimate in Table 2. Hence, the estimated contribution of rising K-12 costs to the decline in funding does not appear to be a spurious result of measurement error or endogeneity.[3]

[3] Detailed results for the Granger tests and the instrumental-variables estimates are not presented here, but are available from the author by request.

DISCUSSION

1. *Relative Importance*

Estimates in this study indicate that the costs of K-12 public schools, income inequality, and Federal Pell grants are significant factors driving the relative decline in state funding for public higher education. Other factors raised by prior studies, such as healthcare costs or restrictions on tax revenues imposed by tax limitation measures, are probably important at certain times in particular states, but our analysis does not reveal them as dominant forces. Comparing empirical magnitudes, we find that a one percent increase in K-12 funding is associated with between a half and three-quarter percent decline in relative funding. K-12 funding has roughly doubled since 1970 as a percent of personal income, which implies a decline in relative higher-education funding of about 20-23 percent (-0.58-0.75 x a change in log of 0.3).

Based on the estimated Pell grant coefficient of -0.21 in column (1) of Table 2, the Federal Pell Gant program is also associated with a relative decline in funding of about 23 percent, roughly the same magnitude as for K-12. Hence, K-12 costs and Pell grants appear to account for just over half the roughly 60 percent decline in relative funding.

As for the unexplained remainder of just under 20 percent, our estimates imply a powerful role for income inequality—in particular, increased incomes at the top of the income distribution. The much larger coefficient for high real incomes, (-2.04) versus (1.28) for low incomes implies that even proportionate increases in high and low incomes are associated nearly one for one with declines in relative funding. Compounding the difference in coefficients,, very high (p90) incomes have increased faster than as low (p10) incomes in recent decades, so effects

of increased income inequality more than account for the decline left unexplained by K-12 costs and Pell grants.[4]

2. *Policy Responses*

At the Federal level, one policy response to these patterns might be to revise aid formulas for Pell grant awards to incorporate factors for the ratio of higher education to K-12 expenditures to reduce incentives in the Pell grant program for states to substitute Federal support for their own. Even more directly, the Federal government could stipulate that for residents to be eligible to participate in the Pell grant program, state support to public colleges and universities must exceed some fraction of the per-student funding the state provides K-12 schools. Such requirements (sometimes called 'maintenance of effort' requirements) have long been used in other Federal programs.

Moderating the effects of increased income inequality on funding is likely to be much more complicated and first requires that we identify and understand the mechanisms at work.

[4] Roughly, for example, (-2.04 x 0.1 – 1.28 x .05 ~ .20)

REFERENCES

Archibald, Robert, B and David H. Feldman. (2006) 'Higher Education Spending and the Tax Revolt'. *Journal of Higher Education.* 77. 4: 618-44.

Ehrenberg, Ronald G. (2006) *What's Happening to American Public Higher Education? The Shifting Financial Burden.* Rowman & Littlefield Publishers: Lanham, MD.

Kane, T. J., Orszag, P. R., & Gunter, D. L. (2003). *State fiscal constraints and higher education spending: The role of Medicaid and the business cycle*. Washington, DC: Brookings Institution.

Rizzo, Michael J. (2004) 'A (Less Than) Zero-Sum Game? State Funding for Public Education: How Public Higher Education Institutions Have Lost.' PhD. dissertation. Cornell University Library: Ithaca, NY.

Table 1. Summary Statistics (49 states, 19 57-2007)

	highered*	K-12*	p90faminc	p10faminc	health*
Mean	1.742901	4.400820	96101.57	15963.89	1.369123
Median	1.750851	4.342638	92287.38	15800.40	1.265305
Maximum	3.663851	8.438629	122310.3	17189.12	3.771012
Minimum	0.234768	2.798502	70289.13	13805.12	0.423005
Std. Dev.	0.598116	0.690055	15501.80	974.0611	0.585313
Observations	441	441	441	441	441

*State and local government expenditures as % points of state personal income.
p90 and p10 faminc are real family incomes for the 90th and 10th percentiles, respectively.
See text for sources and description of data and variables.

Table2. Estimates: dlog higher ed - dlog K-12 (49 states, 1957-2007)
(robust standard errors)

	(1)	(2)	(3)
Variables	Baseline	trend trend^2	trend break
Constant	20.42* (3 .94)	596* (688)	20.42* (4.54)
dlog p90income	-2.04* (0.28)	-2.02* (0.34)	-2.04* (0.24)
dlog p10income	1.28* (0.28)	0.49 (0.29)	3.22* (0.32)
dlog health	0.10* (0.05)	0.09 (0.05)	0.09 (0.054)
dlog K-12	-0.75* (0.10)	-0.71* (0.11)	-0.75* (0.09)
dPell	-0.22* (0.04)	-0.21* (0.04)	-0.28* (0.04)
year	-0.58* (0.08)	-59.5 (69.3)	-0.01* (0.000)
(year^2/k)	--	0.02 (0.02)	--
Pell x year/k	--	--	0.08 (0.05)
state trends—included^	yes	yes	yes
other controls—included^	yes	yes	yes
R-squared	0.53	0.53	0.54
s. e. est.	0.14	0.14	0.14
Durbin-Watson	2.44	2.43	2.39
# obs	392	392	392

*significant at .05. ^jointly insignificant
see text for description of data