

## Accounting for Trends in State Educational Expenditures

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*Abstract:* Despite public concern and political rhetoric, the American states have actually been investing less in education in recent years. This paper will describe several theoretical perspectives on trends in state educational spending. The **bureaucratic model** would predict steady upward increases as school and university officials try to maximize budgets and personnel, even as the school- and college-age population declines. The **demand model** uses trends in school- and college-age populations to predict trends in educational spending. The **interest-group model** is based on the relative influence of organized interests in a state who favor greater educational spending. The **tax-resistance model** predicts faster rates of increase in states with more federal aid and a larger share of state than local financing of education, because of the unpopularity of local property taxes. The **business-cycle model** is based on the response of state revenues to economic fluctuations. The **Peterson model** of competitive federalism argues that states will invest less in redistributive policies and more in developmental expenditures (including education) as a means to attract business and higher-income taxpayers. The **migration model**, also based on competition within a federal system, predicts that states will invest in human capital if it is likely to remain within the state and produce future payoffs in terms of tax revenue and productivity growth. K-12 and community-college spending thus benefit, but state spending on high education is declining in part because of the high rates of mobility of those with college or postgraduate training. Regression analyses of data for the US as a whole and for four states since 1970 suggest strongest support for both the demand and federal-aid models.

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In his Summer 2000 address to the National Governors' Association meeting in State College, PA, Federal Reserve Board Chairman Alan Greenspan urged the governors to invest more in human capital in their respective states. He argued that such investment was essential to enhancing productivity, and thus economic growth, in the global economy. However, by a number of measures, states are in fact spending LESS, not more, of state resources on education, particularly higher education. Money is of course not the only factor involved in improving both the quality and the quantity of educational outcomes (Hanushek and Benson 1994; Wenglinsky 1998; Lewis and Maruna 1999). But it is difficult to reconcile recent state and federal reductions in educational spending with public and political concerns about school performance and the quality of the future workforce. Since the school- and college-age proportions of the American population have declined since the peak "baby boom" years (Figure 1), is it therefore rational for states and localities to devote fewer resources to education?

This paper will consider several theories that have been advanced to account for recent trends in state spending on K-12 and higher education. I will then test these theories using time-series data from the U. S. as a whole and for four states (California, Illinois, North Carolina, and Pennsylvania) with very different patterns of educational investment. I next examine some recent evidence concerning the relationships among population growth, migration, and spending on education for these four states. In the final section I consider some policy options to encourage more investment in human capital by the states and the federal government.

## **I. Trends in State Spending on Education**

In current (unchained) dollars, educational funding has grown considerably, and these are the figures most often touted in public speeches by elected officials. But the value of the dollar, indexed by the Consumer Price Index, is only about a fifth of what it was in 1970. So the “increases” politicians are wont to proclaim are largely illusory. But their rhetoric about support for education may be a response to growing public concern with education, which was the #1 political issue in the 2000 presidential election campaign (Pomper 2001). Education is a hot topic in many states as well, and figured prominently in recent State of the State addresses (DiLeo and Lech 1999). Symbolic politics and credit-claiming may account for the apparent concern with education by state elected officials, but budgetary data tell a very different tale.

States are in fact spending proportionately LESS, not more, of state resources on elementary and secondary education. Since the 1980s state/local educational spending has increased slightly relative to per capita personal income, from 13 percent in 1984 to over 16 percent as of 1995 (Figure 2). However, total state-local spending has increased faster relative to personal income than has education. As a result, K-12 educational spending has declined as a proportion of state general-expenditure budgets, from over 40 percent in 1970 to 33 percent in 1996 (Winters 1999: 323). Also, the state share of state-local spending on education, which rose dramatically after World War II, has fluctuated since 1970; it peaked at 50 percent in 1987 but declined to 45 percent as of 1994 (U. S. Department of Education 1998). In Pennsylvania, the state share has fallen from close to 50 percent in 1970 to only 34 percent in 2001. As the state share declines, educational spending falls more heavily than ever on local property taxes, exacerbating inequalities in educational funding across school districts as a function of property values (Wenglinsky 1998). And federal spending on K-12 education, although never much

more than 10 percent of the total, has declined as well since the 1980s to a low of 6.6 percent in 1997 (Lewis and Maruna 1999: 451). But at the same time, unfunded federal mandates for programs such as busing, special education, asbestos removal, and access for students with disabilities have increased the financial burden on local schools (Posner 1998).

Declines in public financial support are also evident when we consider trends in state spending on higher education. Since 1990, state appropriations for higher education have risen over 200 percent, but revenues from tuition have risen over 300 percent. Tuition rates at both public and private colleges have risen much faster than inflation, and overall college costs have risen sharply as well ( National Commission on the Cost of Higher Education [NCCHE] 1998; Shaw and Black 2001). But as Figure 3 shows, the state-appropriations share of revenues for public institutions of higher education has declined. Tuition now provides a considerably larger share of total revenue of public institutions of higher education than in 1980, thus shifting the cost of higher education from the society as a whole to students and their families (Ehrenberg 2000). Higher education is increasingly financed by borrowing, and in part because of this trend consumer (and student) debt is now at record levels; the US currently has a negative savings rate (Morgeson 2001; Irwin 2002).

## **II. Theories Concerning Trends in Educational Spending**

Democratic governments are frequently depicted as “Leviathans” exhibiting inexorable tendencies toward growth in both revenues and expenditures. Pressures toward continued growth include population pressures, demands for a higher level of public services as private-sector wealth and income increase, legislative logrolling, and bureaucratic aggrandizement. Parkinson’s Law is the classic example of the latter, since

spending by the British Colonial Office increased even as the British Empire shrank (Parkinson 1957). A **bureaucratic model** of state educational spending would predict steady upward increases as school and university officials try to maximize budgets and personnel, even as the school- and college-age population declines.

But how can we explain the relative *decline* in public expenditures for education? In his 1988 article, Thomas R. Dye reviewed some of the literature on governmental expansionism and offered an alternative demand-based model to account for the decline in state educational spending in the early 1980s. His analysis, based on data for 1970-1983, attributed much of the decline in total state educational spending relative to per capita personal income to a reduction in the school-age population (a consequence of the “baby bust” that had followed the postwar baby boom). Therefore a **demand model** would use trends in school- and college-age populations to predict trends in educational spending. Such an approach meshes well with recent studies emphasizing the importance of demographic trends for public policy (Gimpel 1999; Fosler et al. 1990).

However, children cannot vote, and voting turnout among college students is very low. A variant of the demand model considers the role of organized interests in pressing for spending to meet the needs of affected populations and to increase their own incomes. Jacoby and Schneider (2001) found that interest group activity was one of the best predictors of state policy priorities. Public school teachers are unionized in most states, and constitute a potent political factor in state legislatures and among lobbyists (Thomas and Hrebener 1999). Many Republican elected officials blame increases in teachers’ salaries for driving up the costs of education (1), and are critical of the activities of teachers’ unions (which donate far more to Democrats). And as Radcliff and Saiz (1998) have shown, organized labor is a major predictor of policy liberalism, including spending

for social services, among the states. Therefore, an **organized-interests model** would predict higher levels of educational spending in states with strong teachers' unions and/or high levels of overall union membership.

Other factors that might account for trends in educational spending depend on the methods used to finance public schools. Dye (1988) found that **federal aid to schools** had a significant impact on total spending. Although (as Dye recognized) federal transfers play only a small role in educational funding, they can still offset state spending in other areas and thus free up more monies for education, perhaps substituting for state or local taxes. But in most states, property taxes constitute a major source of school funding. Property taxes are generally highly unpopular with voters, particularly older property owners with fixed incomes who are the people most likely to vote in local elections. In other states, however, the state provides a large share of local school funding, and the states can draw on more broad-based revenue sources (sales and income taxes, lottery revenue) less likely to prompt taxpayer rebellion. Therefore, a **tax-resistance model** would predict that educational spending should vary with the state share of state-local spending on education (2). Since (as noted earlier) the state share has declined in most states since 1970, lower overall spending on K-12 education should result (3).

A **business cycle model** also considers revenues in relation to educational expenditures. During recessions, revenue from state sales and income taxes declines. Since states are required to balance their budgets, either taxes must be increased or spending must be cut (4). Of course some policy areas are shielded from recessionary cutbacks by entitlements, federal mandates, or court orders. But education is less likely than policies such as Medicaid or corrections to be immune from business-cycle

variations in spending. Therefore, educational spending in a state should be a function of the business cycle (as Mazzoni 1993 found for Minnesota). However, local property tax revenue is relatively inelastic; in other words, it does not respond quickly to economic fluctuations. So business-cycle effects (indicated by the state's unemployment rate) should be more pronounced the larger the state share of state-local financing of education, because state broad-based taxes are more income-elastic than are property taxes.

The models discussed thus far all consider educational spending in relation to economic, political, or demographic factors within a state. However, states and communities in a federal system are in constant competition for business, investment, and wealthy taxpayers (Peterson 1985). Peterson argues that states should focus their resources on the “developmental “ spending for the business incentives and public services that would foster economic growth. He classifies education as a developmental expenditure that should attract rather than repel business (5). By contrast, a focus on redistributive spending programs would chase away businesses and wealthier individuals. Nevertheless, trend data on state spending show that the states are in fact spending *more* of their budgets on welfare (driven in part by soaring Medicaid expenditures) and *less* on education and highways since 1970 (Winters 1999: 323). So Peterson's policy typology does not go very far in accounting for recent trends in educational spending.

It is perhaps ironic that so much scholarly and political attention has been devoted to testing whether welfare recipients migrate to states paying higher benefits (Peterson and Rom 1990). In fact, college-trained professionals are the most mobile group in our society (Krieg 1991). But Peterson (1985) fails to note that the well educated can easily seek opportunity elsewhere. State officials are increasingly cognizant of this fact; a

number of states have initiated policies to try to reverse the “brain drain” problem (Danitz 2001) and to address the growing shortage of high-technology workers (OTP 1997). But states may not recover their investment in education if graduates of state colleges and universities take jobs outside the state. In Pennsylvania, a few Republican members of the state legislature have argued that the state should cut back spending for state universities since so many graduates of Pennsylvania schools (particularly teachers) are taking jobs elsewhere.

Therefore, a **migration model** of educational spending predicts declining public investment, particularly in higher education. States with net population outflows should be increasingly wary of such investment, while states experiencing population growth may find it cheaper to import college-trained workers than to educate them at state expense. Fast-growing Nevada is one such example; it ranks very low in spending for higher education. Elementary and secondary education, however, should be less prone to migration effects, since the quality of public schools remains a major factor in both business and residential location decisions. Community college spending should likewise show less of a migration effect than does higher education, since community-college graduates are more likely to remain in the area (Thompson 1986).

### **III. Testing Dynamic Models of State Educational Spending**

Time-series data are needed to evaluate these models of trends in educational spending. The *Census of State Government Finance* provides data on total state (or state-local) spending on education, 1970-1996, and will be used to test the first five models.

However, the migration model requires data on spending by K-12 schools, community colleges, and higher education that are comparable across states and across time, and the data problems here are considerable. Therefore I will use cross-sectional data on changes across time to estimate migration effects.

I begin by extending Dye's analysis into the 1990s in order to test the demand and federal-assistance models. Dye's dependent variable was educational spending as a percent of total personal income, and he used the proportion of the school-age population (ages 5-17) as his indicator of demand. His second predictor was the percent of state-local revenue derived from the federal government. His model also included a control variable: per capita personal income, an indicator of state wealth and major source of state revenue. Dye argued that demand for public services such as education should increase as personal income increases.

I first estimate Dye's model for the U. S. as a whole, using national data on each of these four variables annually from 1970 to 1997 (Table 1). As Dye (1988) recommended, the school-age percent of the population is lagged four years, since it takes time for more schools and teachers to be found to accommodate an increase in school-age children. Per capita personal income and federal aid have one-year lags. The time-series model shown used the Cochrane-Orcutt method to compensate for autocorrelation (model estimated using SPSS). As the regression coefficients show, federal aid is by far the most important predictor of state educational spending for this time period. The proportion of school-aged children is positive as predicted, and significant at the .05 level. Per capita personal income is not significant, supporting Jacoby and Saunders' (2001) conclusion that state policy priorities in 1992 were largely

unrelated to wealth or funding sources. The model shown explains 70 percent of the variance in state educational spending for 1970 to 1997 (6).

The second equation in Table 1 adds unemployment, the average state share of total state-local spending on education, and the percent of the workforce unionized to Dye's original model. The unemployment rate is lagged one year to allow state revenues to reflect the economic slowdown. These additions provide tests for the hypotheses concerning the business cycle, tax resistance, and interest groups, respectively. I also added an interaction term (the product of the unemployment rate and the state spending share) to test whether business-cycle effects are more pronounced if educational spending is based on revenues derived from broad-based income and sales taxes. The expanded model produces a significant improvement in R<sup>2</sup>, from 70 to 96 percent of the variance explained for the U. S. as a whole. Total federal aid to states and the school-age percentage of the population remain significant, but are reduced in value from the first model. Union membership levels show only a slight positive relationship to spending on education. The coefficient for unemployment is significant but positive, not negative as predicted; perhaps states spend more on education to help boost their economies during economic downturns. The interaction term is highly significant, indicating that the higher the average state share of state/local spending, the greater the impact of unemployment on state-local educational spending. The impact of business cycles is thus mediated by the structure of educational finance.

To further test the interest-group, tax resistance, and business-cycle models, I turn to time-series data from four states: California, Illinois, North Carolina, and Pennsylvania. All are sizeable states, and each is from a different region of the country. All are politically competitive and have experienced divided governments in recent years

(Fiorina 1996). They differ considerably in the proportion of the state work force unionized, with an average over the period 1970-1998 ranging from a high of 32 percent in Pennsylvania to a low of 6 percent in North Carolina (7). Further, each has a somewhat different proportion of state vs. local spending on education, with North Carolina having the greatest state role and Pennsylvania the smallest. The state percentage in California increased dramatically after 1978, when Proposition 13 greatly reduced reliance on local property tax revenue. Figure 4 shows the trend in school and college-age populations over time in all four states. The trends are similar, but the states differ in the proportion of school- and college-aged residents; California has the most and Pennsylvania the least.

The first equation in Table 2 shows the results of analysis of the pooled analysis (N=108). This model was estimated using the SAS procedures for pooled time-series cross-sectional regression. For these four states combined, the most important predictors (all highly significant) are personal income, federal aid, and the state share of state/local spending on education. The demand indicator (percent age 5-17) just reaches statistical significance. The coefficient for labor union membership is positive as expected, indicating modest support for the interest-group mode, but the coefficient for unemployment is again negative for these four states as it was for the U. S. as a whole. The interaction term (for unemployment X the state share of state-local educational spending) has the right (negative) sign but is not statistically significant. Overall, this model accounts for 83 percent of the variance.

Table 2 also reports separate time-series regression equations for each state, 1970-1997. The regression results indicate that the proportion of children age 5-17 was an important predictor in Pennsylvania and Illinois, but had little impact in North Carolina and a negative effect in California (perhaps because of the aftermath of

Proposition 13). The coefficient for the workforce unionized was negative in North Carolina, a notoriously weak-union state, and positive in the other three. The interaction terms shows that, contrary to predictions, all four states spend more rather than less on education during recessions (indexed by higher levels of state unemployment). This may indicate either countercyclical spending by the states or the inelasticity of property taxes, but could also point to the need for a more complete modeling of the relationship between the business cycle and state revenues. The impact of federal aid is negative in California, but positive in the three other states; it was close to statistical significance only in Pennsylvania..

The results for individual states must be interpreted cautiously because of the small Ns, but they suggest that different models perform better in different states. The demand model is not symmetric; a decline in the school-age population (as in Pennsylvania and Illinois) does predict lower state expenditures, but an increase in school-age children (as in California and North Carolina) has less impact. The weak impact of unionization in North Carolina suggests that the level of union membership must reach a certain critical mass before it has much political impact on state budgets.

#### **IV. Testing the Migration Model**

The migration model predicts that states experiencing slow population growth and high rates of out-migration would show slower growth in educational spending, especially for higher education. We would thus expect higher rates of educational spending growth in California and North Carolina than in Illinois or Pennsylvania.

However, time-series data on state spending for institutions of higher education is not readily available. The Center for Higher Education at Illinois State University

publishes yearly reports on state spending for public higher education (including community colleges), based on information received from individual states. But the categories reported vary considerably across both states and time; private schools go public, two-year schools become four-year colleges, medical schools may or may not be considered part of state universities. Pennsylvania has its unique category of state-related universities (including the University of Pittsburgh) with mixed private and public boards, and expends a major share of its support for higher education on scholarships for students attending the state's private colleges. The Center for Higher Education does not publish any trend data, and warns against drawing cross-state conclusions about trends. For these four states, I have adjusted the yearly totals for state spending as far as possible to reflect these state idiosyncracies, but the results must be interpreted cautiously.

Predicting demand for college and university education is also problematic. While school attendance by younger children is mandatory, many young people age 18-24 do not pursue further education. Faced with the decline in traditional-aged students, colleges and universities are making strong efforts to attract older adults and to offer lifetime learning and distance-learning opportunities. So the percent of the population age 18-24 is only an estimate of the demand for higher education.

The results, as shown in Table 3, indicate at least partial support for the migration model of trends in state spending since 1980. State spending (in constant 1982 dollars) on public colleges and universities has grown even faster than the college-age population in California and North Carolina. But growth has been somewhat slower in Illinois, and considerably slower in Pennsylvania, where the college-age population has declined most sharply. Also as the migration model predicted, community college spending in each state has grown at a faster rate than spending on higher education. The state share of

community-college revenues has declined since 1980, and the percent of revenue from tuition has risen, but not to the extent experienced by colleges and universities (NCCHE 1998: 308).

Table 3 also includes data on the percent of post-1990 science and technology graduates who earned degrees in a state and remained there (based on National Science Foundation data reported in Gottlieb 2001). California retains a high proportion of its graduates, so has an incentive to invest more in their education; Pennsylvania retains a much lower proportion and thus has more incentive to reduce spending on higher education. North Carolina is losing a slightly higher proportion of graduates than Illinois, but still is spending more on higher education, perhaps because that state still has a growing proportion of college-age young people.

Overall, these four states thus seem to be following Thompson's (1986) advice to focus public resources on more stable elements of the population. Such advice, however, is bad news for four-year colleges and universities. Generating political support for graduate education and research is increasingly difficult in state legislatures in states facing a brain drain of their best educated people. As Donahue (1997) suggested, such behavior may be rational for individual states. But the consequence may well be declining investment in higher education by the U. S. as a whole.

## **Conclusion**

As this paper has shown, investment in human capital by the states (specifically spending on education) has increased slightly since 1970 relative to per capita personal income, but has been declining over the same time period according to a number of indicators. I have put forth several theories to account for these trends. Clearly a

bureaucratic aggrandizement model is not sufficient, since education has lost budget share to other state policy areas (8). School and college-age populations have declined as a proportion of the population since 1970, and this may account for at least some of the decline in state educational spending. A demand-side model also works far better in some states (Pennsylvania and Illinois) than in others (California, North Carolina), suggesting that political and institutional factors mediate between demand and supply. I found only modest support for an interest-groups model (based on state labor union membership), but other measures, specifically of teachers' union membership, should be considered.

Finally, I test whether competitive federalism helps account for declines in state spending, especially in higher education, as a function of migration rates. Although there are serious problems with data comparability over time, preliminary results suggest that this model has some plausibility, since spending has increased relatively more on community colleges than on four-year colleges and universities, whose graduates are most likely to leave. And the decline in support for higher education is most marked in states facing outflows of high-tech graduates.

These results are especially ironic given the increased emphasis in many states on human capital. Many governors have recognized the growing human-capital needs of their states and the problems employers are facing in obtaining highly skilled workers. A few states are even subsidizing in-migration of workers from other countries to meet business needs (Belluck 2001). These data, however, suggest a trend of state disinvestment in human capital in higher education, and I have argued that competitive federalism has been at least partly to blame. Regardless of the national consequences, many states have found it more expedient to import their highly skilled workers than to

produce them themselves, and risk the out-migration of their investment in this highly mobile population.

What is to be done? The National Commission on the Cost of Higher Education (1998) notes that while many stakeholders have contribute to the rising cost of higher education, academic institutions themselves have the major responsibility to control costs and prices. Their report includes numerous examples of successful efforts by colleges and universities to control costs, improve productivity, and increase accountability. However, they also note that universities are NOT businesses; efficiency models based on the private sector may not be appropriate and may in fact harm students and academic programs.

What about options for the public sector? One solution is suggested by recent research (Southern Technology Council, 2001) indicating that student who attend college or university in a state are more likely to remain there after graduation. Lowering out-of-state tuition rates might encourage more students from elsewhere and help to combat the exodus of a state's resident graduates. Citing similar evidence, Virginia recently used its state budget surplus to reduce both in- and out-of-state tuition rates by 20 percent. The STC (2001) study also found that state scholarships for high school students with A or B averages helped to combat brain drain. But any reduction in tuition revenues will require that state funding make up at least some of the difference.

Another solution is for states to make student aid contingent on the recipients' remaining in the state for some period of time. This may be workable for some loan-forgiveness programs, but if salaries and advancement opportunities are rosier elsewhere skilled workers may still prefer to migrate. Governor Tom Ridge initiated a Technology Scholarships program in Pennsylvania in 1999, but it found few takers; engineering and

computer-science students were unwilling to commit to working in the Commonwealth after graduation (a requirement of program) because they thought they would find higher salaries elsewhere (*Pittsburgh Post-Gazette*, March 26, 2001).

A third possible solution is more political: reconsider the growing emphasis on privatizing solutions to problems with publicly-funded education. Both Democratic and Republican office-holders have been highly critical of K-12 schools and universities, overemphasizing corruption, inefficiency, and poor test results, and downplaying the link between education and economic growth (Berliner and Biddle 1996; Hollenbeck 2001). Republican governors and legislators are generally more likely to support privatizing investment in education, whether through voucher programs or shifting the costs of higher education to tuition. This political perspective is often grounded in the viewpoint that those who benefit most directly from quality education should pay for it. But it downplays the benefit to society as a whole from human capital investment, and the public as well as personal costs affecting individuals who cannot afford either private schools or college tuition.

A fourth possible solution, advocated by John Donahue (1997), is to encourage more spending by the federal government on education, especially higher education. But federal monies have never accounted for more than a small portion of university finance, and much of that goes for research. In fact, from 1980 to 1998 the federal government's share of public university revenues actually declined, while income from private grants and endowments rose (data from the National Center for Education Statistics 1998). Federal funding for student loans and grants has been flat since the 1980s, resulting in soaring rates of indebtedness and bankruptcy among recent college graduates (Irvine

2002). The myriad federal regulations now applied to institutions of higher education also raise costs but are seldom offset by additional funding (NCCHE 1998).

But a few modest steps to increase federal support of education have been taken. A projected increase in defense spending for advanced weaponry may benefit some research universities. The federal government now provides expanded tax breaks for savings for college tuition, as part of the 2000 tax reform. And the Education Reform Act passed in December 2001 (with bipartisan support) does provide some modest additional funds for K-12 education. However, its critics point out that unfunded mandates for special education remain unfunded, and that new federal requirements for more frequent testing and state takeover of failing schools will be costly to schools as well (McFeatters 2001). Any dramatic increase in federal financing of education appears unlikely given the growing federal deficit, the recession that began in 2000, and the Bush administration's focus on tax cuts. So states and local governments (and students and their parents) must still rely on their own resources to address issues of educational quality and equity, even as the current recession cuts deeply into their revenues.

### **Footnotes**

1. Salaries are indeed the largest element in school budgets, but teachers' salary increases have barely kept up with inflation, let alone with salaries in other professions (Lewis and Maruna 1999).
2. See Wong 1989 for consideration of reasons for interstate variation in the state share of educational spending. It is highest in the South and Hawaii, and lowest in the Northeast.
3. Several exceptions to this trend should be noted: states such as New Jersey and Texas have had to reform school finance because of court orders; Hawaii has a statewide school

system; and Michigan switched to a value-added tax to reduce the burden of local property taxes.

4. This is similar to the resource model of state spending proposed by Lowery, Konda, and Garand (1983).
5. Bailey et al. (2000) find that competition in a federal system leads to less state spending on higher education and higher tuition rates, suggesting that states view education as more redistributive than developmental.
6. Dye (1988) did not include a time-series analysis for the U. S. as a whole; his U. S. model is based on 1984 data only. He also performed a separate time-series estimate for each of the 50 states, rather than using the pooled data.
7. Since data over time for membership in teachers' unions by state are not available, total union membership will be used as a proxy for labor influence in a state.
8. An incremental model of budgeting works perhaps too well, since the lagged value of state educational spending accounts for over 98 percent of the variance in the next year's spending. For that reason I chose not to include the lagged values in the regressions.

### **Data and Sources**

**Per capita personal income:** *Survey of Current Business* data, cited in *Statistical Abstract of the U.S.*, annual editions.

**Labor union membership:** U. S. Department of Labor data, cited in *Statistical Abstract*, annual editions.

**State spending on education:** Census of State Government Finance data, cited in *Statistical Abstract of the U.S.*, annual editions.

**State share of state/local spending:** U. S. Department of Education, *Statistics of State School Systems*, June 1999, Table 160.

**Federal aid to states:** *Census of State Government Finance*. Federal aid is calculated as a percent of total state expenditures in a given year.

**Spending on higher education:** proportion of the budget of public 4-year colleges and universities from state appropriations. Data from the National Center for Educational Statistics for 1980 and 1991-1996; data for other years from the Center for Higher Education at Illinois State University ([www.coe.ilstu.edu/grapevine](http://www.coe.ilstu.edu/grapevine), historical data)

**Tuition:** percent of revenues for public colleges and universities from tuition. Data from the Center for Higher Education and the U. S. Department of Education, Center for Education Statistics, Financial Statistics of Institutions of Higher Education, Table 331, October 1998.

**Population by state** (amount, loss or gain, age structure): *U. S. Census of Population*

**Unemployment:** U. S. Department of Labor data, cited in *Statistical Abstract of the U.S.*, annual editions.

**Migration of science and technology graduates:** National Science Foundation data cited in Gottlieb, 2001.

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**Table 1. Time-Series Regression of Trends in Total State and Local Spending on Education, 1970-1998**

	Demand Model	Expanded Model
<b>Independent variables:</b>		
School-age population	31.64 (15.50)*	24.65 (11.65)*
Per capita personal income	-.00054 (.0001)	.00008 (.00005)
Federal aid as a percent of state revenue	.707 (.261)**	.53 (.138)*
Unemployment rate		.451 (.118)**
Percent of labor force unionized		.0079 (.007)
State share of spending on education		.038 (.015)*
Interaction: state share X unemployment		-.0009 (.0002)**
Constant	6.57 (2.81)*	-13.52 (7.39)
R2 (adj. R2)	.70 (.64)	.96 (.93)
Durbin-Watson	1.64	1.90
N	28	28

Standard errors in parentheses. \*significant at  $p < .05$  \*\* significant at  $p < .01$

**Table 2. Regression of Trends in State Spending on Education,  
Four States, 1970-1997**

Independent variables:	Regression coefficients (standard error):				
	Four states	CA	IL	NC	PA
School-age population %	2.359 (1.197)*	-6.63 (2.61)*	1.013 (.003)*	.036 (.579)	3.66 (.641)**
Per capita personal income	.000054 (.000)**	.0002 (.000)	.00035 (.000)	.00060 (.000)	.0019 (.000)**
Federal aid as a percent of state revenue	2.294 (.617)**	-.548 (.496)	.112 (.148)	.0037 (.128)	.545 (.273)
Unemployment rate	.0073 (.007)	.0095 (.008)	.00072 (.346)	.0018 (.003)	.0069 (.00)
Percent of labor force unionized	.00028 (.000)	.0012 (.001)	.00085 (.000)	-.0017 (.000)	.00051 (.000)
State share of spending on education	3.009 (.790)**	.650 (.872)	.0713 (.393)	.0044 (.235)	.819 (.814)
Interaction: state share X unemployment rate	-.0064 (.011)	-0.013 (.010)	-0.0028 (.005)	-0.0006 (.004)	-0.103 (.009)
Constant	-5.129 (.668)**	1.766 (1.36)	-.161 (.346)	.0041 (.347)	-1.85 (.679)**
R2 (adj. R2)	.83 (.67)	.94(.91)	.70(.58)	.86(.81)	.82(.75)
F	31.02*	38.95**	5.89*	15.78*	11.72*

N 108 28 28 28 28

\*significant at  $p < .05$  \*\* significant at  $p < .01$

**Table 3.**  
**Trends in State Population and Spending**  
**for Two-Year Colleges and Universities**

	California	Illinois	North Carolina	Pennsylvania
1. Total population growth, 1970-1997	61.3%		6.7%	45.9%
2. Growth in population age 18-24, 1970-1997	24.6		-11.1	2.8
3. Change in state higher education spending 1971-1998 (1982 dollars)	78.2		-2.4	72.6
4. Change in 2-year college spending, 1971-1998 (1982 dollars)	133.2		19.9	98.7
5. Proportion of post-1990 science and technology grads staying in the state	68.3		51.5	49.5

Sources: 1-2 *Census of Population*; 3-4 Center for Education Statistics;  
5 Gottlieb, 2001