The Effect of Government Financing on the Behavior of Colleges and Universities

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Abstract - This paper examines the impact of external financial support on the behavior of colleges and universities. We present a simultaneous equations model in which changes over time in tuition and fee charges, institution-specific scholarship aid, and instructional expenditures are expressed as a function of changes over time in levels of federal student aid, federal grants and contracts, state support, and other variables. Variations in external funding are found to have significant effects on institutional behavior, which differ among private four-year, public four-year and public two-year institutions.

The aim of this paper is to improve our understanding of the effects of external government financing on the behavior of colleges and universities, focusing on their tuition and fee charges, institution-specific scholarship aid, and instructional spending. The paper is organized as follows. After a brief discussion of some relevant literature in Section I, we turn in Section II to a description of our data set -- a panel of individual college and university financial data for the period 1978-79 to 1985-86.[1] Section III presents an econometric model of college and university finance and Section IV analyzes the empirical findings that result. Section V concludes.

I. Relation to literature

The research reported here fits into the growing but still quite limited empirical literature on the behavior of governmental and not-for-profit institutions. This important subject has recently started receiving considerable systematic attention from economists, legal theorists and other social scientists.[2] Within higher education, empirical work on institutional behavior has been surprisingly rare. Papers by James (1978) and by Hoenack and Pierro (1986) develop models of the behavioral response of institutional resource allocation to changes in external constraints. The piece by Hoenack and Pierro includes some empirical estimation of the influence of state legislative appropriations on the behavior of a public institution. To our knowledge, no systematic empirical work has been done on the implications of other forms of government spending on institutional behavior. Several studies of student aid do, however, note the potential importance of these issues (Hearn and Wilford (1985) and Finn (1978)).

Empirical studies parallel to this study have been performed for policy areas other than higher education, and they have instructive findings. An interesting example is the work on measuring the effect of state and federal grants on the spending patterns of local school districts.

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1 The academic year 1985-86 is the latest for which national data are available.

2 See the useful collection of articles assembled in Rose-Ackerman (1986).

Not surprisingly, the results indicate that responses depend on the type of subsidy and the manner in which it is distributed (examples include Tsang and Levin (1983) and Craig and Inman (1982)).

Feidstein (1978) examined the effects of federal Title 1 aid on local district spending. The major question was whether local governments spent all of their Title 1 grants on additional educational expenditures (as required under the terms of the program) or whether, instead, some of the federal money was used to replace state and local money or even to provide tax relief. While this question relates to elementary and secondary schooling rather than post-secondary education, the analogous issue in higher education is whether federal funds targeted at low-income groups replace institutional support. Feldstein's regression results indicated that an extra dollar of Title 1 funding augmented total educational spending by 72 cents.[3]

Craig and Inman (1982) examine the effects of different types of federal aid on the educational spending of state and local governments. Their results indicate that different types of aid are in fact allocated differently. A dollar of federal aid that is given to local governments but administered through the state ultimately increases local spending by 87 cents. On the other hand, a dollar of federal aid that goes directly to the local government appears to have a zero or even negative impact on total spending on education, indicating substantial substitutability between federal and local educational expenditures.

The relevant literature is not limited to studies of education. Some of the work on the effects of government subsidies on demand and supply in housing (for example, Barnett and Lowry (1979) and health markets (for example, Sloan, Cromwell, and Mitchell (1978)) is germane. In each case, response functions are estimated which seek to ascertain the effects of different forms of government expenditures.

In sum, while relatively little work has sought to address the response of higher education institutions to changes in external funding, there are a variety of studies that provide a

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3See Craig and Inman (1982), Tsang and Levin (1983) and Gurwitz (1980) for discussion of this work.

methodological basis for our work, and which lead us to believe meaningful empirical estimates can be obtained.

II. The Data

We base our econometric results on a data set reporting financial information on individual colleges and universities. The data set was constructed by merging three federally maintained data sets.[4] One, the Financial Statistics report from the Higher Education General Information Survey (HEGIS), describes the basic financial accounts of all public and private non-profit post-baccalaureate institutions in the United States, as well as a handful of "proprietary" trade schools that are run for profit. The second, the Fiscal-Operations Report and Application to Participate (FISAP) data base, provides more detailed information on student aid spending, revenues and on the aided population at colleges and universities which apply for federal assistance under any of the so-called "campus-based programs" (direct loans, Supplementary Educational Opportunity Grants (SEOG's), and college-work study). The third, the HEGIS Enrollment Survey, reports full- and part-time enrollment for all institutions, allowing us to construct estimates of full-time-equivalent enrollment (FTE). We have these merged data sets for all private non-profit and public colleges and universities for the academic years 1978-79 and 1985-86. The data set has been constructed as a panel, so that only schools with data for both observations years are included. All of our financial variables are calculated on a per FTE student basis, and are expressed as the difference in value between the end and the beginning of the period, adjusted for inflation over the period.

The data sets lack two significant pieces of data, which unfortunately are very hard to supplement from other sources: the amount of borrowing undertaken by students at an institution through the federally guaranteed student loan program, and the amount of grant aid provided to

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4We are grateful to the American Council on Education for preparing the merged data set for our use. Laurent Ross of the ACE was very helpful to us in programming and documenting the merge.

an institution's students through state grant programs. With these two exceptions, coverage of the major items of interest is thorough. Painstaking efforts have been made to clean the data set of reporting and recording errors. In addition, we have dropped all proprietary schools along with all private non-profit two-year colleges from the sample as well as all schools with fewer than two hundred undergraduates. The resulting sample contains a total of 1934 institutions: 896 private four-year colleges and universities, 371 public four-year colleges and universities and 667 public two-year colleges. Each of these categories of institutions is analyzed separately.

Table 1 reports provides descriptive statistics for the variables used in the regression analysis. In addition to reporting the changes over the period, which are used in the regressions, Table 1 also reports the 1978-79 values of the financial variables.

The first three variables represent the dependent variables estimated in the equation system reported below. They are: (1) the change in scholarship aid per FTE student from institutional resources (CHINTSCH); (2) the change in gross tuition and fees per FTE student received by the institution (CHT&F) (the convention followed by academic institutions is to calculate this amount by assuming that every student pays the sticker or list price - hence this variable is gross of financial aid); and (3) the change in instructional expenditures (and expenditures for self-supported research) per FTE student (CHINSTR).[5]

The next four variables in the table measure changes over the period in government revenues provided to higher education institutions. These are, first, the change in federal financial aid grants per FTE student (CHFEDFINAID)[6], second, the change in state and local grants and contracts per FTE student (CHS&LGR&CNT), third, the change in state and local appropriations per FTE student (CHS&LAPP), and, finally, the change in federal grants and

[5]Unfortunately, the data gathered in the federal survey on instructional expenditures do not permit us to break out these two categories of spending separately.

[6]This is the change over the period in the sum of awards to students from the federal Pell grant and SEOG programs. Pell provides awards to qualifying students based on a formula reflecting their family resources and costs of attendance. SEOG funds are supplied to campuses, which have discretion over who among their needy students will receive awards.

contracts (exclusive of student aid grants) per FTE student (CHFGR&CNT).

In addition to these variables, our analysis includes several variables that control for institutional wealth, for the incomes of potential students, and for possible scale effects. These are the change in institutions' endowment per FTE student (CHENDOW), the change in institutions' income from gifts and endowment earnings (CHINCRES), the change in per capita income in the state where the institution is located (CHPERCAP), the level of FTE enrollment in 1978-79 (ENROLL79), and the percentage change in FTE enrollment over the period (%CHENROLL).

III. An Econometric Model of College and University Finance

We conceive of the "university" as an institution whose behavior reflects the pursuit of objectives that are valued by various constituencies associated with it.[7] Assume to begin with that the university simply maximizes some given set of objectives subject to an income constraint. Call the set of objectives (Xi}. Assume that the costs associated with these objectives are additively separable, so that the cost of Xi is Ci(Xi) and the university's budget constraint is,

$$\sum C_i(X_i) \leq I,$$

where I is the university's income.

If the Xi enter a utility function for the university in which each counts positively with diminishing marginal rates of substitution, and if costs rise with higher levels of Xi at a diminishing rate, the university will select optimum levels of activities, X_i^*, with associated cost levels Ci(Xi*).

Suppose the university has an increase in unrestricted income of amount g. Assuming all activities are "normal", each will increase to a new equilibrium level $X_i^{**} > X_i^*$.

[7] "University" here refers to colleges and universities.

What if, instead, the institution receives revenues in amount g that are targeted to be spent on a particular activity, say X,? If this increase in "earmarked" funds does not change the cost or utility functions, the university's response will depend on whether $C_i(X_i^{**})$ is greater or less than g. If the earmarked revenues are less than or equal to the amount that would be spent on X, from a total income of I+g, then the "earmarking" constraint is not binding, and the university will spend the added revenues exactly as if they had come as unrestricted income. If, instead, the earmarked revenues exceed $C_i(X_1^{**})$ then the constraint implied by the earmarking becomes binding. The university will then spend g on X,, and will maximize its utility subject to that constraint and a constraint that its total spending on other activities cannot exceed I. Obviously, this added constraint will result in both more spending on X, and a lower "utility" level for the institution than it would attain from an increase in unrestricted income equal to g.

Thus a simple optimizing model of the university would imply perfect "fungibility" of earmarked dollars up to the point where earmarked funds match the amount the university would spend in the absence of such support, and zero fungibility thereafter.

However, we do not believe that this model adequately captures the reality of university decision making. Introducing some reasonable complications to the model modifies these simple and strong conclusions: there are reasons to expect less than perfect fungibility below the level of an activity that would be chosen in the absence of external finance, and more than zero fungibility above that level.

The first complication arises even within the simple maximizing model. Within relatively broadly defined activities, sources of external support are likely to impose constraints that blur the picture of a sharp dividing line after which external support ceases to replace internal spending. Formally, one could say that each broadly defined activity is composed of a number of more narrowly defined activities (e.g., aiding this student versus aiding that student). At any given level of earmarked external support for the broadly defined activity, some of the narrow activities will have been fully funded externally, while others will not. As the overall level of external

funding increases, the number of narrow activities that can still "absorb" funding will decrease, so that the degree of fungibility will decline more smoothly than the discontinuous result of the simple model.

Second, recognition of political elements in the allocation of resources within a university suggests less than perfect fungibility. The simple model assumes a unified objective function which "the university" is maximizing. In fact, while there may be broad consensus within a university on what objectives are worth pursuing, it is implausible to suppose that such an institution puts stable and agreed weights on these objectives. The availability of external funding is likely to increase the political influence of a constituency that favors a particular objective. This makes it likely that such a group could "capture" more of the benefits of increased external funding than the simple model implies.

A distinct but related point pertains to the incentives the university provides to those who seek and obtain external funding. Unless gains in external funding are shared with those who obtain them, the incentive to seek such funding will be small. Although in principle such rewards could take the form of direct side payments, it seems more plausible that a successful constituency will be rewarded by letting a larger share of the increased funding remain with that area than strict short run optimizing would imply.

Finally, we should note that the simple model assumes that the cost functions facing the university are insensitive to changes in external funding. But this obviously depends on the form that the external funding takes. Suppose, for example, that research funding took the form of "matching grants", with, say, half the marginal cost of a research project being provided externally on condition that the rest is provided internally. Such regulation would reduce the marginal cost of research activities and increase the level of research activity the institution would undertake. Such linkages will clearly increase the responsiveness of activity levels to changes in external funding for them, relative to the simple model sketched above.

For purposes of developing our empirical model, we can identify four major kinds of

objectives that, we hypothesize, most institutions of higher learning share. These are objectives that can readily be linked to institutions' resource allocation decisions. These objectives are:

(1) to maintain or improve the quality of education the institution can offer in the future. This objective implies that, ceteris paribus institutions will prefer a larger endowment, or a higher rate of saving, to a smaller endowment or a lower savings rate.

(2) to expand the applicant pool -- either with the objective of attaining adequate enrollment (for nonselective institutions) or of increasing the institution's capacity to select preferred students. This will normally lead institutions to prefer lower tuition to higher tuition (ceteris paribus and to prefer higher to lower quality of undergraduate instruction.[8]

(3) to recruit a socioeconomically diverse population of students. For most institutions, this will imply a desire to increase the number of disadvantaged and minority students, and this will normally lead the institution, ceteris paribus, to prefer a larger to a smaller rate of spending on student aid.

(4) to improve the institution's prestige and reputation. Thus, institutions will normally prefer larger amounts of spending on research and on instruction to smaller amounts, and will also prefer higher "quality" of service provision more generally.

Our picture then is of a university pursuing such broad goals as these in the context of a variety of constraints. We would expect the weights attached to these goals to be different in different segments of higher education. How will changes in the amount of funds the institution receives for the pursuit of specific purposes -- "earmarked funds" -- affect the way it allocates its resources?

Our discussion above implies that part of any increase in funds "earmarked" for a

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[8]For some private institutions, higher tuition may be seen as an indicator of higher quality, and therefore may make it possible for these institutions to increase their applicant pool by raising tuition. Even for these institutions, however, such constituencies as alumni and trustees are likely to prefer lower tuition to higher.

particular purpose will be "captured" by the university for other purposes. To the extent that this happens, the impact of the increase in funding will be the same as that of an increase in unrestricted income. We would normally expect, however, that spending on the activity for which the funds were designated will increase more than we would predict from an increase in unrestricted income of equal magnitude, and spending on other activities will therefore increase by a smaller amount. The extent of the difference between the effects of an "earmarked" and an unrestricted increase in revenue is an empirical question, the answer to which may differ from one variable to another.

The dependent variables in the three equations in our model are related to the objectives identified in the preceding section. The three equations with our theoretical expectations about signs are displayed in Table 2.

A number of our expected signs follow directly from wealth effects in the theoretical model. Institutions experiencing more rapid increases over the period in state and local appropriations (CHS&LAPP), federal grants and contracts CHFEDGR&CNT or state and local grants and contracts (CHS&LGR&CNT) will gain more in institutional wealth, and, given the objectives described above, are expected to increase institutionally based scholarship aid more rapidly, to raise tuition and fees more slowly and raise instructional expenditures more rapidly than other institutions. Similarly, more rapid growth in endowment (CHENDOW) or more rapid increases in income from gifts and endowment (CHINCRES) should add to the growth in wealth and have the same effects on institutional behavior.[9]

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[9]We postulate that changes in tuition and fees and instructional expenditures are based on changes in the flow of earnings - that is, when the sum of gifts, interest, and dividends declines from one year to the next, institutions respond by increasing the sticker price and lowering instructional expenditures. On the other hand, we assume that changes in the amount of institutional financial aid depend more on changes in the long-run financial situation of an institution as reflected in changes in the stock of wealth rather than changes in year-to-year gifts and earnings. Thus, CHENDOW is included as an independent variable in the CHINTSCH equation while CHINCRES is included as an independent variable in the CHT&F and CHINSTRUCT equations. It should be noted that the high correlation between CHENDOW and CHINCRES implies that they can not both be included as exogenous variables in a particular equation and that these assumptions are basically consistent with ordinary least squares regression results.

More rapid increases in federal financial aid (CHFEDFINAID) also have a positive wealth effect, which explains the expected positive sign for this variable in the equation for changes in instructional expenditures.[10] However, in explaining changes in tuition and in institution-based aid expenditures, changes in federal financial aid have effects additional to the wealth effect. In the case of institution-based aid, this wealth effect may be augmented by the effect of federal aid in making it easier for institutions to attract more lower income students, who may then receive additional institution-based aid.[11] However, these complementary effects may be offset by a tendency for federal aid to substitute for institutional aid spending, tending to counteract the positive effects and leaving the expected sign ambiguous.

The effects of increased federal aid on rates of growth in tuition are similarly ambiguous. Although the wealth effect of more rapid federal aid growth, given the assumed objectives of the institutions, will tend to reduce tuition, some observers have suggested that increased federal aid availability may tend to raise tuitions, as institutions attempt to "capture" more aid through setting a higher sticker price.[12]

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[10] A large positive effect would imply that increases in federal student aid induce institutions to increase their instructional expenditures substantially. This might be viewed as a good thing, if one believes that at the margin society would benefit from more resources being devoted to student instruction. Yet it might be seen as a negative outcome, to the degree that it implies that university expenditures, and hence the *cost* to the nation of higher education, tend to be pushed up by higher student aid.

11 There are actually two forces at work here. First, enrollment demand among lower income students is increased by larger federal student aid awards. (For evidence, see McPherson and Schapiro (1991).) Second, the cost to an institution of recruiting a lower income student (thereby pursuing its objective of promoting diversity) is reduced by the presence of larger amounts of federal student aid.

[12] The argument here is that the level of federal financial aid received by an institution may be a function of its tuition level -- that raising tuition qualifies an institution's students for more federal aid. This might be seen as analogous to medical insurance arrangements which encourage providers to raise their fees. For an influential statement of this argument by the former Secretary of Education, see Bennett (1987). Note that to the extent that this is the case, federal financial aid must be seen as an endogenous variable, while our model assumes it is exogenous. In fact, however, current institutional arrangements imply that there is little responsiveness of federal student aid grant levels to tuition levels, at least in private higher education. The two relevant federal programs are SEOG and Pell. Funding levels in the SEOG program have consistently been below the levels at which the "needs" mechanism for awarding incremental dollars kicks in, and award maxima in Pell have been below the student charges of almost all private and many public institutions; in this case it is the

State per capita income (CHPERCAP) is included in these equations as an indicator of the make-up of the student population of institutions. Institutions from states where income is growing more rapidly are expected to be able to raise tuition more rapidly while sustaining any given level of demand for enrollment and, given objective (1) above, we expect institutions to attempt to gain added revenue in this way. Thus we expect a positive effect of CHPERCAP on CHT&F. Similarly, institutions should be able to attain any given level of diversity in the student population at lower cost in terms of institution-based aid if they are in a state where incomes are rising. Thus we expect the sign on CHPERCAP to be negative in the CHINTSCH equation.

Measures of the level and rate of growth of enrollment (ENROLL79 and %CHENROLL) are included in the equation explaining instructional expenditures in order to capture possible scale or capacity effects. For any given percentage growth in enrollment, the presence of economies of scale would imply that institutions with smaller enrollments at the beginning of the period would experience larger increases in instructional spending than those with larger enrollments; thus the sign on the 1978-79 enrollment level in the CHINSTRUCT equation is expected to be negative.[13] The impact of the percentage growth in enrollment depends on whether institutions have excess capacity; if so, we expect a negative impact of more rapid growth in enrollment on expenditure growth; if not, rising short run marginal costs should lead to a positive effect.

Finally, two endogenous variables, CHT&F and CHINTSCH, enter as explanatory variables in our equations. In explaining changes in instructional expenditures, we assume that more rapid increases in tuition and fees cause instructional expenditures to rise more rapidly through an income effect; a further effect is that institutions with more rapidly growing tuitions

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family's income rather than the institution's tuition that is the binding constraint in determining the award level. Thus, there are some public institutions, but almost no private institutions, at which Pell award levels are responsive to tuition increases.

[13]For a review of the literature on economies of scale in higher education, see Brinkman and Leslie (1986).

may need to increase their instructional expenditures more rapidly to ensure adequate demand. More rapid increases in tuition and fees are also expected to have a positive effect on the growth of institution-based student aid spending, both through an income effect and because more rapid tuition growth will require more rapid increases in spending on student aid to maintain diversity. There is also a reverse causal effect of increases in growth rates of institution-based student aid on rates of growth of tuition. Given the long-run solvency objective of the university, we expect that more rapid growth in institution-based student aid leads to more rapid growth in tuition.

IV. Empirical Results

We have used two stage least squares to estimate the model for three samples of institutions: four-year private colleges and universities; four-year public colleges and universities; and two-year public colleges. The results are presented in Table 3.

As should be obvious from the above discussion, a central concern of ours is the degree to which government funds affect the finances of institutions of higher learning. These funds can be divided into the following categories:

(1) federal financial aid - CHFEDFINAID;

(2) direct state and local government support - CHS&LAPP; and

(3) government grants and contracts - CHFEDGR&CNT and CHS&LGR&CNT.

In terms of category (1) - federal financial aid - we find an effect on the change in institutional scholarships for the private sample and, for public four-year institutions, an effect on the change in tuition and fees. Specifically, an increase in federal financial aid of $1 leads to a 20 cent increase in scholarship expenditures from institutional funds for four-year private colleges and universities (hence, federal financial aid and institutional aid are complements rather than substitutes) and an increase in tuition and fees of 50 cents for their public counterparts.[14] We

[14]The F-value for the tuition and fees equation for four-year publics is insignificant. However, when the equation is re-run dropping all right-hand side variables other than CHFEDFINAID and CHINTSCH, the F-value equals 3.38, which is statistically significant at the .05 level. The coefficient

find no effects of changes in federal financial aid on changes in instructional expenditures for any of the samples, on changes in institutional scholarships for either four-year or two-year publics, or on changes in tuition and fees for either four-year privates or two-year publics. The finding that there is no statistically significant relationship between changes in federal financial aid and changes in the "sticker" price at private four-year institutions goes against the "Bennett hypothesis" that higher federal aid induces these institutions to raise tuition.

Unlike federal financial aid, changes in direct state and local educational appropriations lead to changes in instructional expenditures in all three samples. An increase in direct state and local expenditures of $1 leads to increases in instructional expenditures of $1.39, 30 cents, and 38 cents at four-year privates, four-year publics, and two-year publics, respectively. While the first coefficient is unexpectedly high, the general finding that state and local appropriations support instructional expenditures is not surprising. At private four-year institutions, changes in state and local appropriations also translate into increase in scholarship aid: a $1 increase in these appropriations leads to a 22 cent increase in institutional scholarships. A $1 increase in state and local appropriations also reduces the increase in tuition and fees at four-year privates by 86 cents. The effect on tuition and fees at two-year publics is unexpectedly positive but quite close to zero: a $1 increase in state and local appropriations leads to an increase in tuition and fees of less than 3 cents.[15]

Turning to the third category of government expenditure variables, government grants and contracts, we find significant effects of changes in federal grants and contracts on changes in institutional scholarships, tuition and fees, and instruction. A $1 increase in federal grants and

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of CHFEDFINAID is .377, significant at the .05 level.

"Putting aside scale effects, all five of the unexpected signs in our regressions were in the public sector regressions -- two in the tuition and fee equation for two-year publics, one in the institutional scholarship equation for two-year publics, and two in the instruction equation for four-year publics -- where behavior is not always based on institutional discretion (particularly in the case of setting tuition and fees). For the privates, where institutional sovereignty is the governing mechanism, all 15 of the significant variables with predicted signs based on our theoretical model had the expected sign.

contracts leads to increases in institutional scholarships of 11 cents, 4 cents, and 8 cents, and to increases in instructional expenditures of 22 cents, 13 cents, and 31 cents at four-year privates, four-year publics, and two-year publics. It leads to a decline in tuition and fees of 22 cents at four-year privates and 10 cents at two-year publics. This suggests that federal grant and contract awards have substantial fungibility, with a sizable portion of each dollar in grants going to reduce revenues or increase other spending. A $1 increase in state and local grants and contracts at four-year privates increases institutional scholarships by 6 cents and lowers tuition and fees by 13 cents. The only significant effect of state and local grants and contracts at four-year publics is an unexpected negative effect on instruction: a $1 increase leads to a 31 cent decline in instructional expenditures.[16] On the other hand, a $1 increase in state and local grants and contracts at two-year publics increases instructional expenditures by 38 cents, although it unexpectedly lowers institutional scholarships by 11 cents and raises tuition and fees by 17 cents.

Besides the results relating to external funding reported above, there are a number of other interesting findings. As expected, changes in state per capita income affect institutional scholarships and tuition and fees -- a $1 increase in per capita income lowers growth in institutional scholarships at four-year private institutions by 6 cents and raises the growth in tuition and fees by 26 cents, while increasing tuition and fee growth at two-year publics by 3 cents. An increase in institutional wealth also leads to an increase in scholarships, with a $1 rise in the market value of the endowment raising scholarships by 1 cent at four-year privates and 5 cents at four-year publics. A $1 increase in annual income (INCRES) raises instructional expenditures by 3 cents at four-year privates and 5 cents at two-year publics, but unexpectedly leads to a decline in instructional expenditures at four-year publics of 4 cents. The results relating to the scale effects on instructional expenditures differ among sectors: at four-year publics, the larger the enrollment at the beginning of the period (a higher value of ENROLL79),

[16]However, the causality may go from low instructional expenditures to high levels of state and local grants and contracts. That is, state and local governments may allocate these funds to institutions in which instructional spending is quite low, in an effort to increase these expenditures.

federal student aid, we find that, at four-year private institutions, increases in federal student aid expenditures do not induce schools to raise tuition and fees, although increases in federal financial aid lead to higher tuition and fees at four-year public institutions; (2) federal grants and contracts have important effects on tuition and fees, institutional scholarships and instructional expenditures throughout higher education. Our results indicate that cutbacks in these revenue sources would lead to higher tuitions at private four-year and public two-year institutions, lower institutional financial aid at four-year privates and both four- and two-year publics, and lower instructional expenditures for all three groups; (3) increases in state and local appropriations significantly increase instructional spending in all three of the institutional categories we examined.

Understanding these various relationships is important in order to lessen the chances that changes in government policy will have unanticipated, undesirable effects on the educational sector. **At** the same time, the results suggest that some widely discussed negative side effects of federal student aid spending do not exist.

Table 1: Descriptive Statistics for Regression Analysis

Private Four-Year Colleges and Universities

Variable	N	Mean	Std. Dev.	Mean Value for 1978-79	
CHINTSCH	896	266.1	374.0	INTSCH	699.0
CHT&F	896	768.3	665.2	T&F	3602.7
CHINSTRUCT	896	250.6	634.3	INSTRUCT	2052.1
CHFEDFINAID	896	9.3	147.8	FEDFINAID	319.5
CHS&LGR&CNT	896	45.8	504.2	S&LGR&CNT	153.5
CHS&LAPP	896	-7.1	113.1	S&LAPP	50.8
CHFEDGR&CNT	896	-73.3	482.2	FEDGR&CNT	399.7
CHENDOW	896	1983.1	5013.4	ENDOW	6802.7
CHINCRES	896	1298.0	4877.2	INCRES	2989.7
CHPERCAP	896	1009.1	659.2	PERCAP	8754.4
ENROLL79	896	1721.1	2307.3		
%CHENROLL	896	5.2	32.2		

Public Four-Year Colleges and Universities

Variable	N	Mean	Std. Dev.	Mean Value for 1978-79	
CHINTSCH	371	28.9	130.4	INTSCH	144.4
CHT&F	371	219.8	224.2	T&F	1009.7
CHINSTRUCT	371	132.0	574.1	INSTRUCT	2256.5
CHFEDFINAID	371	37.9	85.0	FEDFINAID	266.0
CHS&LGR&CNT	371	8.9	178.7	S&LGR&CNT	126.5
CHS&LAPP	371	187.9	1549.0	S&LAPP	3391.2
CHFEDGR&CNT	371	-103.4	477.6	FEDGR&CNT	441.8
CHENDOW	371	78.4	401.1	ENDOW	372.0
CHINCRES	371	-188.6	2244.7	INCRES	737.8
CHPERCAP	371	890.1	660.4	PERCAP	8424.6
ENROLL79	371	7792.0	7343.7		
%CHENROLL	371	8.0	16.6		

Public Two-Year Colleges

Variable	N	Mean	Std. Dev.	Mean Value for 1978-79	
CHINTSCH	667	9.5	118.4	INTSCH	60.1
CHT&F	667	86.2	153.7	T&F	500.3
CHINSTRUCT	667	89.5	472.3	INSTRUCT	1454.1
CHFEDFINAID	667	52.0	99.4	FEDFINAID	221.9
CHS&LGR&CNT	667	28.3	243.5	S&LGR&CNT	106.4
CHS&LAPP	667	120.7	572.8	S&LAPP	2117.6
CHFEDGR&CNT	667	-20.8	287.0	FEDGR&CNT	153.3
CHENDOW	667	20.9	155.0	ENDOW	40.9
CHINCRES	667	-231.5	1201.6	INCRES	245.6
CHPERCAP	667	968.3	641.5	PERCAP	8733.6
ENROLL79	667	2423.5	2292.1		
%CHENROLL	667	11.8	32.2		

Table 2: Expected Signs for Regression Analysis

	Dependent Variables		
Explanatory variables	**CHINTSCH**	**CHT&F**	**CHINSTRUCT**
CHFEDFINAID	?	?	+
CHENDOW	+	. . .	. . .
CHINCRES	. . .		+
CHS&LAPP	+		+
CHFEDGR&CNT	+		+
CHS&LGR&CNT	+		+
CHPERCAP		+	. . .
ENROLL79	. . .	. . .	
CHENROLL	. . .	. . .	?
CHT&F	+	. . .	+
CHINTSCH	. . .	+	. . .

Table 3: Regression Results

	4-YEAR PRIVATES (n=896)		4-YEAR PUBLICS (n=371)		2-YEAR PUBLICS (n=667)	
	PARAMETER ESTIMATE	STANDARD ERROR	PARAMETER ESTIMATE	STANDARD ERROR	PARAMETER ESTIMATE	STANDARD ERROR
Equation 1 - CHINTSCH						
INTERCEPT	137.0	35.8[a]	45.2	33.5	-15.8	10.3
CHFEDFINAID	.203	.091[b]	-.154	.097	-.006	.092
CHENDOU	.009	.003[a]	.050	.029[c]	-.012	.032
CHS&LAPP	.215	.111[c]	.008	.006	-.008	.013
CHFEDGRBCNT	.108	.027[a]	.040	.014[a]	.076	.018[a]
CHS&LGR&CNT	.057	.024[b]	.063	.040	-.106	.025[a]
CHPERCAP	-.061	.023[a]	.001	.011	-.011	.013
CHT&F	-232	.064[a]	-.061	.156	.489	.195[b]
F VALUE	20.60[a]		2.67[b]		9.54[a]	
ADJ R-SQ	.133		.031		.082	
Equation 2 - CHT&F						
INTERCEPT	-173.9	138.4	156.5	39.5[a]	25.7	17.2
CHFEDFINAID	-.197	-274	.502	.221[b]	.135	.130
CHINCRES	-.016	.011	-.007	.009	.002	.007
CHS&LAPP	-.a61	.297[a]	.010	.012	.027	.017[c]
CHFEDGRBCNT	-.220	.104[b]	-.047	.039	-.099	.055[c]
CHS&LGR&CNT	-.132	.078[c]	-.021	.084	.170	.051[a]
CHPERCAP	.264	.047[a]	-.004	.023	.032	.015[b]
CHINTSCH	2.565	.488[a]	1.388	.681[b]	1.388	.539[b]
F VALUE	14.64[a]		1.01		7.87[a]	
ADJ R-SQ	.096		.ooo		.067	
Equation 3 - CHINSTRUCT						
INTERCEPT	-43.8	68.5	-317.2	108.9[a]	49.9	40.7
CHFEDFINAID	-.047	.128	-.240	.343	-.031	.215
CHINCRES	.025	.004[a]	-.038	.014[a]	.054	.012[a]
CHS&LAPP	1.389	.163[a]	.299	.021[a]	.377	.034[a]
CHFEDGR&CNT	.220	.041[a]	.132	.055[b]	.311	.051[a]
CHS&LGR&CNT	-.017	.037	-.310	.146[b]	.377	.069[a]
ENROLL79	.035	.009[a]	-.013	.006[b]	-.003	.007
%CHENROLL	-2.216	.689[a]	2.364	1.691	-1.142	.656[c]
CHT&F	.314	.098[a]	2.237	.617[a]	.299	.488
F VALUE	46.30[a]		37.94[a]		47.74[a]	
ADJ R-SQ	.288		.444		.360	

[a] significant at the .01 level
[b] significant at the .05 level
'significant at the .10 level

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