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ABSTRACT

This study sought to quantify economic impacts associated with Texas state expenditures on higher education by (1) quantifying the reduction in Texas' economic activity associated with reduced spending by the private sector due to taxes levied for higher education; and (2) quantifying the increase in Texas' economic activity associated with the expenditure of state tax funds for higher education. The study used a series of economic models to analyze input/output and benefit/cost. In particular equations were developed for the areas of income (or gross state product), payroll, and employment for use with data from "The Almanac of Higher Education: 1989-90", the "1988 Federal Tax Manual", the Texas Higher Education Coordinating Board, the Texas Comptroller of Public Accounts, the Census Bureau, the Department of Education, the Department of Commerce and the "1988 Texas Annual Financial Report." Results found that the state received an additional $1.13 in economic activity for every dollar invested in the public higher education industry in Texas. In addition, the study showed a net gain of $1,068 million in state income, a net gain of $345 million in state payrolls, and a net gain of 13,779 jobs. Included are 19 references. (JB)

THE DIRECT ECONOMIC IMPACT OF TEXAS' EXPENDITURE ON PUBLIC BACCALAUREATE AND POST BACCALAUREATE EDUCATION

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INTRODUCTION

Over recent years, the federal government has shifted many services and obligations to the states. This shift in financial responsibility is being combined with an economic recession across the United States. The decade of the 1990's has been greeted with severe economic stress in most states which may have long term and serious implications for higher education.

State governments must continually evaluate the tax base and allocation of funds for services. To increase funding to a service or function, such as higher education, means reallocation from another service or an increase in taxes imposed on the population of the state. This has become a serious issue in most states where the state is faced with demands for more services and the public is becoming more vocal about the level of taxes being imposed. Some states are faced with court orders that require state expenditures on functions such as prisons and/or secondary education. This focuses attention on state expenditures for services such as higher education as possible targets for reduced appropriations.

The level of expenditures for higher education obviously impacts the local communities where facilities of higher education are located. Changes in appropriations to higher education have serious economic implications for the local communities as "external" state funds are reduced.

A more global (statewide) short-term issue relates to the reduced economic impact due to taxation versus the positive economic impact due to spending for higher education. In other words, how much is economic activity reduced due to taxes that reduce expenditures by the private sector compared to how much is economic activity increased by the expenditure of these funds by institutions of higher education? The economic impact issues listed above ignore the increased earning power of those educated, attraction of business and industry due to existence of a quality higher education system, new technologies developed and other economic and athestic benefits associated with higher education. Simply put, what is the tangible change in economic activity in a state due to taxation for supporting higher education and the expenditure of these funds by higher education?

The overall purpose of this study was to quantify economic impacts associated with state expenditures on higher education. Specific objectives were as follow:

1. Quantify the reduction in Texas' economic activity associated with reduced spending by the private sector due to taxes levied for higher education

2. Quantify the increase in Texas' economic activity associated with the expenditure of state tax funds for higher education.

The hypothesis, in this case, was that the loss in economic activity by the private sector attributable to taxes was exactly offset by the gain in economic activity due to expenditures by higher education. The hypothesis regarding economic impact of taxes for and expenditures by higher education can be interpreted as a zero sum gain to the State of Texas. The hypothesis will be tested by estimating the respective economic impacts.

REVIEW OF LITERATURE

Two effective tools for economic analysis are input-output models and benefit/cost analysis. Input-output models have been used to define national and regional economies and to estimate the relationship between two or more sectors of that economy (Miernyk, 1965). Analysts use multipliers in these input-output models to show the ripple effect of funds attracted to the economy due to the presence of an industry. Benefit/cost analysis, on the other hand, is defined as identifying and measuring the ratio of benefits to costs for a program or project, typically a government funded activity (Davis & Morrall, 1974).

Most studies that have evaluated the effect of higher education on a considered economy have used input-output models. Local studies have used the Caffrey and Iasscs (1971) model to estimate the effects on the local economy (Leslie & Brinkman,

1988). These studies used the original multipliers developed by Caffrey and Isaacs (1971) or developed their own.

In Texas, several researchers have worked on an input-output matrix for the state to develop applicable state-level multipliers. Jones and Mustafa (1972) developed a computer program for estimating regional interindustry multipliers based on state and national information. Perryman (1988) also developed a system of determining interindustry multipliers which improved on the Jones and Mustafa (1972) work. Currently the Comptroller of Public Accounts maintains the multipliers for analyzing the effects of various sectors on the Texas economy (Texas Comptroller of Public Accounts, 1989).

Local studies have used the Caffrey and Isaacs (1971) model to show short term effects of institutions on local area economy. These studies included Altmann (1985), Breslin (1979), Lange (1980), McEnany (1979), Taylor and Byrden (1973), and Wellsfry (1987). These local studies show income in the form of state support as new dollars to the local economy. The benefits are calculated in the areas of business volume, payrolls, and employment. In all cases, the studies have ignored the costs to other areas of the state, seeing the state economy as outside the local arena and as a source of external funding (Creech, 1991).

There are also studies which estimate the impact of higher education on the state economy including Kennedy (1984) for Arkansas and California Postsecondary Education Commission (1984) for California. These studies aggregated the local impacts

estimated by using the Caffrey and Isaacs (1971) model. By aggregating local impacts, these studies ignored the reduction of spending potential due to taxation in those areas which do not have an institution in favor of gains for those localities which do have an institution.

Eade (1977) used aggregate data from all higher education institutions in Washington state to show the net impact of expenditures by these institutions. The Eade (1977) study evaluates the alternative of eliminating that portion of the state sales tax which was appropriated to higher education to show the net effect thus incorporating benefit/cost analysis by evaluating two alternatives.

METHODOLOGY

State Impacts

State studies have used the equations from the Caffrey and Isaacs (1971) model. The model developed equations for analysis in such areas as business volume, employment, and payroll and deliberately ignored any long range economic impacts. Studies using the Caffrey and Isaacs (1971) model typically use only portions rather than the entire model. In addition, state studies using the Caffrey and Isaac (1971) model estimate the local impacts of each institution in the portion of the state higher education system being studied and then aggregate these impacts to show the state economic impact. In the studies using the Caffrey and Isaacs (1971) model, the state appropriations are shown as external funds entering the local economy.

Eade (1977) used an alternative cash flow model to determine the impact on the state economy of all of Washington state's public-higher education industry. The Eade (1977) considered two alternatives and three estimates of the first alternati . In the Eade (1977) study, the second alternative assumed that all public institutions would cease to exist with the removal of public funding. State appropriations were shown as returned to the taxpayers as a reduced sales tax rate thus increasing household spending ability.

Creech (1991) evaluated the impact of only the public baccalaureate and post baccalaureate institutions in the Texas economy. Three alternatives were considered. First, the impacts with state appropriations and external contracts and grants were considered. Second, the impacts with appropriations removed and external contracts and grants held constant were calculated. Finally, the impacts with appropriations removed and external contracts and grants reduced proportionally were considered. The alternatives consider the return of appropriations to state households in the form of reduced sales tax which is the primary source of tax revenues in Texas currently. For the purposes of this paper, alternatives 1 and 3 from the Creech (1991) study are used. The return of sales tax funds from higher education back to the general population would result in an increase in purchasing power to state households. The Creech (1991) study assumed the continuation of public baccalaureate and post baccalaureate education as an industry but recognized that the number of

institutions would probably be reduced due to the removal of state appropriations.

The impacts considered in the Creech (1991) study were the same as Eade (1977). These impacts included (1) state income, or gross state product, (2) payroll, and (3) employment. Although the equations from the Eade (1977) study were used as a basis, the Creech (1991) study made extensive changes to reflect the differences in the tax structures of the two states and the changes in the federal tax regulations.

The Model

Income Model

This study considers Alternatives 1 and 3 of the Creech study (1991) and uses the equations developed for the areas of income (or gross state product), payroll, and employment.

The income, or gross state product, model considers income for three areas: (1) income impact from the considered institutions, (2) income impact from the students at the considered institutions and (3) income impact from state government due to the considered institutions. In the second and third alternatives of the Creech (1991) study, the income impact of increased purchasing power for state households is also included.

The equation for Alternative 1 from the Creech (1991) study for state income, or gross state product, is as follows:

$$Y=CY+SY+GY \quad (1)$$

Where:

Y = gross income impact from the various components

CY = gross income impact from considered institutions

SY = gross income impact from students from the considered institutions

GY = gross income impact from state government including sales tax from institution employees

The equation from the Creech (1991) study for the considered institutions' portion is:

$$CY=k_{cy}[(S_1)(C_n+C_z+C_c)+P_e(1-T_m)(1-I_H)] \quad (2)$$

Where:

CY = gross income impact of the considered institutions on the GSP

k_{cy} = the final demand multiplier for education in the state of Texas

S_1 = percentage of expenditures by the considered institutions in state of Texas

C_c = college capital expenditures of the considered institutions not funded by the Permanent University Fund (PUF)

C_n = college non-salary related, non-capital expenditures of the considered institutions

C_z = staff benefit payments for college employees of the considered institutions

P_e = payments to faculty and staff of the considered institutions

T_m = average tax rate paid by considered institutions' employees

I_H = probable household propensity to import

The equation from the Creech (1991) study for the student portion is:

$$SY=k_{Hy}E_s \tag{3}$$

Where:

$$E_s=D_s(1-t_1(1-I_H)) \tag{3a}$$

$$D_s=[W_s(1-T_s)+F_n+F_L+F_V+F_G]Z_s \tag{3b}$$

and

SY = gross income impact from students from the considered institutions

E_s = tax income available to the state from students with income from federal sources

D_s = disposable student income from federal sources

I_H = percent of probable imports by state households

k_{Hy} = final demand multiplier for state households

W_s = wages to student workers of the considered institutions paid by federal workstudy funds only

F_n = scholarship payments to students of the considered institutions from federal sources and excluding state scholarships from state appropriations

F_L = net federal Perkins loan payments to students of the considered institutions excluding loans from private sources since they would probably be removing funds from the Texas economy

F_V = estimated veterans benefits to students of considered institutions

F_G = federal Pell Grants to students of the considered institutions ignoring all other federal and state grants

T_s = average tax rate paid by students of the considered institutions based on average wages less the standard deduction and one exemption

Z_s = percentage of student expenditures not used for tuition and fee payments

The equation from the Creech (1991) study for the state government portion is:

$$GY=k_{Gy}gy \tag{4}$$

Where:

$$gy=t_1[b_H P_e(1-T_m)+D_s](1-I_H) \tag{5}$$

and:

GY = gross income impact from state government including sales tax from considered institution employees

gy = initial state government expenditures from considered institutions' related tax receipts

T_m = average tax rate paid by faculty and staff of considered institutions

b_H = marginal propensity to consume

t_1 = Texas sales tax rate at 1987-88 level

k_{GY} = final demand multiplier for Texas state government

For Alternative 3 of the Creech (1991) study for state income, the equation is as follows:

$$Y_3 = CY_3 + SY_3 + HY_3 + GY_3 \quad (6)$$

The equation from the Creech (1991) study for the considered institution is:

$$CY_3 = k_{cy}[(C_n + C_z + C_c)(S_1) + P_e(1 - T_m)(1 - I_H)](1 - R_3) \quad (7)$$

Where:

CY_3 = reduced gross impact of the considered institutions on the gross state product (GSP)

R_3 = the combined percent reduction due to the loss of appropriations and the loss of contract and grant income to the considered institutions

All other variables are as previously discussed.

The equation from the Creech (1991) study for student income is:

$$SY_3 = k_{HY}E_{s3} \quad (8)$$

Where:

$$E_{s3} = D_{s3}(1 - t_2(1 - I_H)) \quad (9)$$

$$D_{s3} = [(W_s(1 - T_s) + F_n + F_L + F_V)(1 - R_3) + F_{G3}]Z_s \quad (10)$$

and

E_{s3} = available portion of reduced student income

D_{s3} = reduced disposable student income from federal sources

F_{G3} = reduced Pell Grant funds to the considered institutions due to reduced number of available students and reduced number of students receiving Pell Grant funds

All other variables are as previously discussed.

The equation from the Creech (1991) study for household income is:

$$HY_3 = k_{HY} X_C [1 - t_2 (1 - I_H)] b_H \quad (11)$$

Where:

HY_3 = gross income impact of state households with Alternative 3

b_H = state household marginal propensity to consume

k_{HY} = final demand multiplier for households

t_2 = sales tax rate excluding support to the considered institutions

X_c = amount of state appropriations to the considered institutions

Other variables are as previously discussed.

The equation from the Creech (1991) study for the government income portion is:

$$GY_3 = k_{GY} gy_3 \quad (12)$$

Where:

$$gy_3 = t_2 [b_H P_e (1-R_3) (1-T_m) + D_{s3} + X_C b_H] (1-I_H) \quad (13)$$

gy_3 = government expenditures impact from Alternative 3

All other variables are as previously discussed.

Payroll Model

The equation for the payroll model for Alternative 1 of the Creech (1991) study is:

$$N = CN + GN + SN \quad (14)$$

Where:

$$CN = k_{cN} [(S_1) (C_n + C_Z + C_c) + P_e (1-T_m) (1-I_H)] \quad (15)$$

$$GN = k_{GN} gy \quad (16)$$

$$SN = k_{HN} E_s \quad (17)$$

and:

N = estimate of state payroll level related to expenditures on considered institutions

CN = estimate of the state payroll related to direct institutional operations

GN = estimate of the state payroll related to state government expenditures from the considered institutions' related tax receipts

SN = estimate of the impact of students on state payroll

K_{CN} = state payroll impact multiplier for education

k_{GN} = state payroll impact multiplier for government

k_{HN} = state payroll impact multiplier for state households

All other variables are as previously discussed.

For Alternative 3 of the Creech (1991) study, the equation is:

$$N_3 = CN_3 + GN_3 + HN_3 + SN_3 \quad (18)$$

Where:

$$CN_3 = k_{CN}[(C_n + C_Z + C_c)(S_1) + P_e(1 - T_m)(1 - I_H)](1 - R_3) \quad (19)$$

$$GN_3 = k_{GN} gy_3 \quad (20)$$

$$HN_3 = k_{HN} X_C [1 - t_2 (1 - I_H)] b_H \quad (21)$$

$$SN_3 = k_{HN} E_{s3} \quad (22)$$

All other variables are as previously discussed.

Employment Model

The equation for calculating the employment or jobs for Alternative 1 of the Creech (1991) study is:

$$E = EC + EG + ES \quad (23)$$

Where:

$$EC=k_{EC}[(C_n+C_Z+C_c)(S_1)]+\frac{P_e}{A_e}(1-T_m)(1-I_H) \quad (24)$$

$$EG=k_{EG}gy \quad (25)$$

$$ES=k_{EH}E_s \quad (26)$$

and:

A_e = average salaries for full-time equivalent faculty and staff employees of the considered institutions

E = gross impact of the considered institutions on employment levels

EC = estimate of employment impact of direct institutional operations

EG = estimate of employment impact of government expenditures

ES = estimate of employment impact of students

k_{EG} = employment multiplier for government

k_{EH} = employment multiplier for households

k_{EC} = employment multiplier for education

For Alternative 3 of the Creech (1991) study the equation for employment is:

$$E_3=EC_3+EG_3+EH_3+ES_3 \quad (27)$$

Where:

$$EC_3 = k_{EC}[(C_n + C_Z + C_c)(S_1)(1-R_3)] + \frac{P_e}{A_e}(1-R_3)(1-T_m) \quad (28)$$

$$EG_3 = k_{EG} gy_3 \quad (29)$$

$$EH_3 = k_{EH} X_C [1 - t_2(1-I_H)] b_H \quad (30)$$

$$ES_3 = k_{EH} E_{S3} \quad (31)$$

All variables are as previously discussed.

Operationalization

Sources of data for the Creech (1991) study included the Almanac of Higher Education: 1989-90, 1988 Federal Tax Manual, Texas Higher Education Coordinating Board, Texas Comptroller of Public Accounts, U.S. Bureau of Census, U.S. Department of Education, U.S. Department of Commerce, and 1988 Texas Annual Financial Report. The methodology was programmed in spreadsheet format to provide a user friendly model.

For estimating the actual purchases made by the considered institutions within the state, the information from the state purchasing office as a percentage of total purchases was used. The assumption was that since purchases of the considered institutions are part of the purchases made through the state purchasing office, they would likely follow the average of all state agencies using that office. In addition, the average salary for employees of the considered institutions was based on the average gross income for Texas citizens and the average faculty salary. This information was needed to calculate the average effective

federal tax rate for all employees of the considered institutions (Creech, 1991).

For the student portion of the models, the Almanac of Higher Education: 1989-90, (1989) is used extensively by the Creech (1991) study. The student wages for federal work study program was calculated using the percentage of total students receiving wages under this program then multiplying by the average wage to determine the amount of work study wages (Creech, 1991).

The Creech (1991) study applied similar logic to determine scholarship payments, Pell Grants, and Perkins Loan payments to students. However, veterans benefits were calculated by dividing the number of student in the considered institutions by the total number of students in the state higher education to obtain a percentage and then this percentage applied to the total Veteran's benefits paid to the state. The assumption was that an equal portion of veterans existed in both private and public institutions (Creech, 1991).

The state sales tax rate for Alternative 3 of the Creech (1991) study was based on removing the appropriations to the considered institutions and recalculating the sales tax rate with the sales tax income reduced. This calculation had the effect of increasing the purchasing power of state households. In addition, the considered institutions total federal contracts and grants were reduced by the percentage that the state appropriations represented and a new total income calculated. The result was a percentage reduction from the original available income in

Alternative 1 (Creech, 1991). Each equation was modified to reflect the reduction and the models recalculated.

RESULTS

In the Creech (1991) study, the three areas analyzed produced the result shown in Table I. The first alternative shows the gross impact with households taxed and the state appropriations flowing to the institutions. The second alternative shows the impact of the sales tax reduced to state households and the appropriations removed as well as external grants and contracts proportionly reduced. In the area of income, or gross state product, there is a difference of $1,068 million between the two alternatives. The net of the gross state product attributable to the spending of the considered institutions and related student and state government spending was $1,068 million instead of the expected zero sum gain based on our hypothesis. Likewise, there was a net difference of $345 million in payrolls and a difference of 13,779 jobs when the hypothesis predicted zero (Creech, 1991). Therefore the hypothesis is rejected.

The greater economic activity in higher education is due to the following reasons. First, institutions as an industry, tend to spend more than individuals based on a marginal propensity to spend of 1.0 for higher education compared to less than 1.0 for individuals due to savings. Second, economies of scale would indicate that the greater pooling of money allows more investment in capital intensive purchases which fuels the other sectors of the state economy or has a higher multiplier effect. Texas made

Table I: Economic Impacts of Texas' Public Higher Education

Considered Institutions
Fiscal Year 1987-88

	Income	Payroll	Jobs
	(Millions of Dollars)		
Gross Impact Alternative 1			
Considered Institutions	$3,521	$1,073	51,278
Students	1,106	339	17,224
State Government	159	51	2,594
Total	$4,786	$1,463	71,116
Gross Impact Alternative 3			
Considered Institutions	$ 724	$ 199	10,547
Students	240	74	3,748
State Government	144	46	2,347
State Households	2,609	799	40,695
Total	$3,717	$1,118	57,337
Net Impact	$1,068	$ 345	13,779

79% of its expenditures within the state in 1987-88. Finally, the payroll/personnel costs are greater in higher education and these individuals put more money into the economy through personal spending.

CONCLUSIONS AND LIMITATIONS

Returns to the State

State appropriations to the considered institutions totalled $944 million for the 1987-88 fiscal year. By calculating the ratio between the net state income (or gross state product) and the appropriations, the state received an additional $1.13 in economic activity for every dollar invested in the public higher education industry in Texas (Creech, 1991). The study showed that there is a net gain of $1,068 million in state income, a net gain of $345 million is state payrolls, and a net gain of 13,779 jobs. Each area showed a positive net increase as a result of the considered institutions business activity without quantifying the other benefits attributable to higher education as compared to leaving the tax dollars with the general population.

Limitations

This study did not address the issues of the estimated effect of higher education, increased productivity, or increased learning capacity. There is an immediate need to determine what effect the projected increased earning power of an educated populace has on the economy. In addition, the effect of a quality higher education system on the location decisions of business and industry needs to be quantified. All of these issues are believed to show favorable results for higher education, but quantification is necessary to further the cause of higher education systems across the nation.

Conclusions

University administrators need an increased awareness of the monetary value of the institutions they serve. This study and others like it can facilitate their need to address issues of economic gains for the state for the support received.

State legislators have a responsibility to taxpayers to assure that the tax dollars collected are spent wisely. This type of study compares two alternative uses for tax dollars. The expected result is that state legislators should look to the state's higher education industry when they consider investment for their state's economic development.

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