An Analysis of State-level Efforts to Enroll Students at In-state Institutions of Higher Education

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I. Introduction

Higher education is a key determinant of economic growth. In fact, it has been found that investments in higher education predict subsequent growth far better than investment in physical infrastructure (Florida 2002). More importantly, individuals do not capture all of the benefits from their own investments in education. Because of spillover effects, which allow other to gain from someone else's educational attainment, an individual's educational investments increase not only his or her-own productivity but also the productivity of other workers (Glaeser 1998). Therefore, in the presence of this externality effect, the growth rate will be higher in those regions that invest more in education (Mathur 1999).

The connection between knowledge spillovers and increased economic growth in regions with concentrations of highly educated individuals should increase the willingness to provide government subsidies to support the accumulation of knowledge through higher education. Rauch (1993) notes that education is a public good with positive externalities, which enhances the performance of economic and political institutions while quickening the pace of scientific achievements.

In recent years, states with poor high school to college retention records have been trying to induce college students to enroll in in-state institutions in a variety of ways, including but not limited to offering merit scholarships and other forms of financial aid. In the 2002 gubernatorial campaigns around the country many candidates have stood on platforms that included objectives concerning the retention of college-bound graduating high school students. Notably, campaigns in Alaska, Maryland and Oregon have focused on this issue (Margulies 2002). In Idaho, Democrat Jerry M. Brady

proposed an increase in state funds for higher education aimed at retaining that state's best students for college and to start their careers. In Iowa, Democrat Tom Vilsack supports interest-free loans to college students who agree to live and work in Iowa for a minimum of five years after the earn a degree. Both candidates in Pennsylvania propose ways to entice high school students to choose a college or university in that state for their post-secondary educations. Scott McCallum, incumbent Republican in Wisconsin, proposed a program forgiving the student loans of graduates who agree to live and work in Wisconsin (Margulies 2002).

The implicit goals of such proposals have received support in the economics literature. Although it seems paradoxical in the information age where people who work together do not necessarily need to be together, geography and local proximity have remained important factors for economic growth. The human capital theory states that the key to growth is in the accumulation of highly educated and productive people (Florida 2002). This theory has been supported by studies showing that concentrations of human capital, which is increased by education and the sharing of knowledge, are the driving force behind regional economic growth.

This study seeks to determine whether state governments are able to increase the number of in-state college students by increasing financial aid packages or lowering tuition at state colleges and universities or if some other factors are contributing to the in-state enrollment rates. The policy implications affect both the level and forms of financial aid, if that is in fact the major reason students choose to remain in their home states to attend college. The analysis preformed in this study reveals that need-based financial aid does not have a statistically significant impact on the percentages of students

who choose to attend college in their home states. However, a one-percentage point increase in the growth rate of the GSP reduces the percentage of students who attend college in state by 1.2. Also, the estimates suggest that a $1000 cut in tuition at state colleges raises the percentage of students who attend college in-state by about 1.5.

II. Background

Glaeser (1998) points out that firms cluster together to reap the benefits of large pools of human capital. The jobs are following the people, not the reverse. This makes it possible for places with greater numbers of highly educated people to grow faster and attract even more talented and entrepreneurial people, leading to subsequent economic growth. The gathering of people, companies and resources into particular places with particular specialties and capabilities generates efficiencies that power economic growth (Florida 2002).

Lucas (1988) explains why the clustering of people in firms generates efficiencies. He demonstrates that the diminishing returns of land and labor can be over come by human capital, which creates technology. He also outlines the importance of clusters of human capital in regional economic growth by showing that the acquisition of knowledge by individuals has spillover effects to others that increase with the concentration of human capital. It is these spillover effects of shared knowledge that augment the power of place. Information is costly to attain therefore cities with greater concentrations of highly educated people should be relatively more productive and grow at a faster rate. In support, Simon (1998) finds a robust positive relationship between employment growth and the average level of human capital across United States cities. Moreover, Jaffe (1989) agrees that location becomes increasingly important if this transfer of information occurs in small inform conversations. This type of information

spreading is likely to occur among alumni who remain in contact and live in the same area.

For instance, Silicon Valley, California is an example of a place that has grown around a group of educated people. Stanford alumni with expertise in information technology gathered here to take advantage of the flows of ideas from the university and the movement of workers across firms. The residences of Silicon Valley do in fact share ideas in both formal and informal settings, making their physical proximity essential (Glaeser 1998).

The literature on migration and location decisions shows that the choice between in-state and out-of-state institutions exerts a significant effect on subsequent location decisions. Upon graduation it is likely that a person will remain in the same state as the college or university that he or she attended. During his or her college years a person may have made personal or professional connections that would be lost with a move or he or she may have accrued an affinity for a particular region or city. Kodrzycki (2001) finds that one year after college graduation only about fifteen percent of college graduates moved to a different state than the one where they attended college. In addition, students who go out of state for college are 54% more likely to be out of state five years after graduation than someone who went to college in state (Kodrzycki 2001). Upon entering the work force, people become taxpayers, adding to both the revenue and wealth of a state. In losing the most intelligent residents, a state would not only lose people who are likely to earn large salaries and pay high taxes, but it would also lose the ability to attract other highly educated people. Since it is difficult to change the number of colleges in a state or the per-capita income, it seems logical that state institutions

would try to attract more students by means of lower tuition and fees and/or increased student aid.

Much of the current literature on college enrollment concerns student responses to price. These studies discuss not only tuition, but also financial aid packages. Tuition can be seen as a sticker price for attending a college, which is then lowered through the receipt of various forms of financial aid. All previous studies in this area seem to concur that as tuition increases, enrollment decreases. Furthermore, as financial aid increases, effectively lowering tuition, enrollment increases. (McPherson and Shapiro 1991).

Schwartz (1985) established that enrollment decisions are affected by an individual's household's ability to pay for college and/or its ability to attract grants, thus distorting price and improving access. This means that individuals from higher income households are overall more likely to attend college. The likelihood of attendance for lower income individuals, who are eligible for need-based aid, increases as aid increases.

Leslie and Brinkman (1987) suggest that students do not often act as if they view aid as a reduction in net price the same way the conceptualize lower tuition. This is because it may be easier to compare different initial tuition than varying financial aid packages. Also, students may avoid higher tuition by choosing lower-cost alternatives rather than by relying on financial aid.

Not surprisingly then, Schwartz (1985), Leslie and Brinkman (1987) and Savoca (1991) find that financial aid packages increase access to higher education for individuals from lower income households. Leslie and Brinkman (1987) argue that financial aid is a better alternative than lower tuition for improving access because lower tuition is a subsidy to everyone, not just those with greater need.

Schwartz (1985) reports that public grants have a significant and positive effect on attendance decisions and tend to increase college enrollments of low-income individuals, while private grants and low interest loans exhibit no statistically significant effect. The government supplies public grants. The Pell Grant and tuition breaks that are provided to deserving students by state run institutions serve as examples. Private grants, on the other hand, are awarded by privately run scholarship funds or given by private institutions. Savoca (1991) shows that a shift away from grants towards loans in financial aid packages tends to lower the probability of attendance and limits access to higher education. The reasoning here is that grants are a gift while loans must be repaid. Students may not be willing to acquire debt when future earnings are uncertain.

A 1996 report by the Department of Education found that six states, Alaska, Connecticut, Maine, New Hampshire, New Jersey and Vermont lost more than one third of their graduating seniors to out-of-state colleges (Gose 1998). California has the best retention rate, only losing 6.4% of its potential college freshmen, closely followed by Mississippi and Washington, each losing a mere 7% of their students (Gose 1998).

III. Formulation of the General Model

It seems likely that the percentage of students who enroll in colleges in their home state would be directly related to the number of colleges in the state and the presences of a Tier 1 research university. A greater menu of quality choices increases the likelihood that a student will be able to find and institution of higher education that suits his or her needs and desires. Also, the availability of student aid and enrollment in state institutions should be directly related, because those schools would be relatively cheaper to attend. Furthermore, greater increases in real Gross States Product, which indicates an improving

job market, should encourage students to attend college in their home state. On the other hand, it seems probable that in-state enrollment would be inversely related to per-capita income and average tuition and fees. As people become wealthier they can afford the added expanse associated with attending college out of their home states. Additionally as tuition and fees rise, people have more incentive to invest time in searching for less expensive alternatives.

The hypothesis of this study is that in-state enrollment in public four-year colleges is dependent upon the number of colleges and personal income per capita of a state, average tuition and fees of a state's public institutions, the amount of financial aid per student in each state, the change in real Gross State Product and the existence of a "Tier 1" research university as determined by *US News & World Report* in a state. The number of colleges in a state reflects the diversity of choices available. With a greater selection a student is more likely to find an institution that caters to his or her individual needs and/or interests. It is assumed that an education at a private institution or a public institution out of one's home state is a normal good. Personal income determines the ability to afford an out-of-state or private education. As incomes rise demand for these also should rises. Along these same lines it is assumed that tuition and fees and availability of grant and/or scholarships affect choice in that people will opt for a cheaper alternative. Also, larger positive growth in real Gross State Product indicates greater opportunities in the future job market, which should cause students to remain in their home states. Furthermore, the prestige and comparatively low price of a "Tier 1" research university in a state may entice students to remain in their home state to acquire a degree from this institution.

Accordingly, it is assumed that the percentage of students who remain in their home state to enroll in college (stud) is a function of: (i) the number of colleges within a state (nocol); (ii) a state's real median personal income per capita (inc); (iii) the average undergraduate tuition and fees paid by full-time students at public colleges in a state (tuit); (iv) the dollar amount of need based financial aid and grants per student award by a state (grants); (v) the change in real Gross State Product (gsp); and (v) the presence of a "Tier 1" research university (tier1).

This study employs panel-data and a fixed-effects model to analyze the migration of college bound high school seniors across the United States for the years 1988, 1994 and 1998. A fixed-effects model assumes that differences across states are captured by differences in the constant term. The primary benefit of a fixed-effects approach is that the fixed-effects estimator is robust to the omission of any relevant time-invariant regressors. An F-test rejects the null of no fixed effects (F-test results are reported in Table 2 below). Also, a Hausman test rejects the null of random effects. Thus, the fixed effects is superior to the common intercept and random-effects model in this case.

IV. Data Sources and Description

Data for this study pertain to the fifty states of the United States of America for 1988, 1994 and 1998. The 1988, 1994 and 1998 figures for percentage of students who remain in their home state to enroll in college and the real dollar amount of need-based financial aid and grants per student award by a state are used directly. Data on merit-basted aid was unavailable. Nevertheless, the *Digest of Education Statistics* reports that need-based financial aid and grants comprise about 74.7% to 81.0% of all aid in most years (1993). However, since it is assumed that students base there enrollment decisions,

in part, on college ranking, income, tuition and economic growth, the 1987, 1993 and 1997 figures are used, because this would have been the information available to the students at the time they chose a school. Unfortunately, the 1997 tuition information for Hawaii was not available, rendering the data for this state unusable for the overall regression. The 1987-88, 1993-94 and 1997 statistics for the number of colleges located within each state were used because these were the most appropriate numbers that were available.

The data was collected from: the *Statistical Abstract of the United States* (per capita personal income and number of colleges 1997); various editions of the *Digest of Education Statistics* (student migration, number of colleges, tuition and fees, scholarship and grants); the United StatesDepartment of Commerce Bureau of Economic Analysis website (change in Gross State Product); and the October 26, 1987, October 4, 1993 and September 1, 1997 issues of *US News & World Report* (Tier 1).

Limitations may exist in the choices of x-independent variables. For instance, this study did not include the tuition and fees of private institutions and it only considered need based aid rather then merit or athletic scholarships. These other types of grants and scholarships may be important factors in keeping students in their home states to attend college. If this is the case the current policy considerations would in fact be effective.

V. Results

The mean value, standard deviation, sum, minimum and maximum values of each variable are presented in Table 1. The percentage of students who remain in their home states for college varies greatly from 9.00% in Arkansas (1988) to 92.00% in Michigan (1988). The question here is what is causing such great differences and what, if anything,

can a state do to improve its retention of college-bound graduating high school students. Lower tuition and large grants are programs that would theoretically entice a student to attend college in his or her home state. Large differences among states can also been seen in these variables. For example the states with the lowest tuition in 1998 are Oklahoma ($5,076), Arkansas ($5,402) and New Mexico ($5,428), while the states with the highest tuition in that year were Vermont ($11,360), Rhode Island ($9,648) and New Jersey ($9,661). The amount of grants per student given in each state in 1998 varies from $0 in South Dakota to $9,907.42 in New York.

Table 2 shows the results of fixed-effects regressions on the percentage of students who remain in their home states to attend college. In Table 2, equation (1) includes all variables. This equation shows that both real average undergraduate tuition and fees of full-time students at public colleges and that change in real Gross State Product impact the percentage of students who remain in their home states to attend college. Equation (2) deletes the change in real Gross State Product. Exclusion of this variable makes real average undergraduate tuition and fees of full-time students at public colleges insignificant, suggesting a link between these variables. However, equation (3) excludes tuition, which has no impact on the other estimates. Equation (4) excludes real median personal income per capita. When this variable is removed, real average undergraduate tuition and fees of full-time students at public colleges becomes more significant than in the original equation. This suggests a link between tuition and real median personal income per capita.

Table 2 shows that the change in real Gross State Product has a statistically significant negative impact on the percentage of students remaining in their home states

to attend college. This result is unexpected. It suggests that a one-percentage point increase in the growth rate of the GSP reduces the percentage of students who attend college in state by 1.2. Rather than future job market prospects encouraging students to remain in their home states, current increases in economic growth in part causes students to choose to leave their home state. This may be because rapid growth makes the families of prospective college students feel wealthier and more able to afford the presumably more expensive alternatives of attending a private and/or out of state college. An alternative possibility is that more rapid growth in GSP raises the number of college students. Larger numbers of college students cause capacity problems in state and the overflow goes to out-of-state institutions.

The statistically significant negative impact of real average undergraduate tuition and fees of full-time students at public colleges was expected, because it makes state colleges a cheaper alternative. The estimates suggest that a $1000 cut in tuition at state colleges raises the percentage of students who attend college in-state by about 1.5. Though the tuition variable is not significant in specification (2), the parameter estimate is nearly constant across all specifications. Apparently, the addition of ΔGSP reduces the standard error for the tuition variable. It is particularly surprising that real need passed financial aid and grants per student did not have a significant impact on the percentage of students remaining in their home states to attend college, considering the recent attention given to this variable.

To further investigate the relationship between state support for higher education, income and economic growth, we regress income and growth and growth in gross state product on tuition and grants. Table 3 shows the results of fixed-effects regressions on

real average undergraduate tuition and fees of full-time students at public colleges. Equation (1) uses the changes in real Gross State Product as the only independent variable. The high level of significance suggests higher growth in Gross State Product reduces real average undergraduate tuition and fees of full-time students at public colleges. A one-percentage point increase in growth of state product reduces tuition at state colleges by about $100. Equation (2) shows that higher income states have higher tuition. A $1000 increase in per-capita income raises tuition by about $200.

The relationship between real average undergraduate tuition and fees of full-time students at public colleges and the change in real Gross State Product presented in Table 3 suggests that tuition rises less-rapidly when states are experiencing economic growth. This is a logical result because higher education support is discretionary and higher growth (and as a consequence higher tax collections) reduce pressure on state budgets. This allows the schools to keep tuition increases low. Furthermore, Table 3 shows that higher real personal incomes per capita lead to higher real average undergraduate tuition and fees of full-time students at public colleges. This likely occurs because wealthier people can afford more expensive schools. Therefore colleges in those states with higher real personal incomes can charge higher tuitions.

Table 4 shows the results of fixed-effects regressions on real need based financial aid and grants per student awarded. Equation (1) and equation (2) use the changes in real Gross State Product and real median personal income per capita as the only independent variables, respectively. Neither of these variables have a significant relationship to real need based financial aid and grants per student awarded by each of the 50 states.

VI. Conclusions

This study has examined some factors that may help explain why students chose to attend college in their home state. The fixed-effects regressions reveals that the real average undergraduate tuition and fees of full-time students at public colleges and the change in real Gross State Product affects a student's decision. It is interesting that the real amount of need based financial aid and grants per student awarded had no statistically significant impact on the percentage of students remaining in their home states to attend college. This suggests that policies that uses scholarships to keep students in their home states my not be effective. The results of this study show that lowering tuition may be more effective than any program that revolves around need-based grants and financial aid to achieve the goal of greater retention of college-bound graduating high school students.

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Table 1. Means and Standard Deviations

Variable	Mean	Standard Deviation	Minimum	Maximum
% Students that Remain In-state[a]	69.1156	14.441	9.00	92.00
Number of Colleges[b]	75.8367	72.5117	8.00	396.00
Personal Income Per Cap[c]	21613.80	4518.75	13266.31	41010.57
Tuition[d]	6317.00	1570.81	2405.26	11142.72
Grants[e]	2294.19	2585.73	0	12397.53
Tier 1[f]	0.0884	0.2849	0	1.00
Δ GSP[g]	3.7604	2.7889	-4.0807	14.7362

[a]Percentage of college students that attend college at in-state institutions.
[b]Number of colleges in each of the 50 states (in sq. miles) for 1996.
[c]Real median personal income per capita for each of the 50 states (in 1996 dollars).
[d]Real average undergraduate tuition and fees of full-time students at public colleges for each of the 50 states (in 1996 dollars).
[e] Real need based financial aid and grants per student awarded by each of the 50 states (in 1996 dollars).
[f]Presence of a Tier 1 research university in the state.
[g]Change in real Gross State Product in each of the 50 states (in millions of 1996 dollars).

Table 2. Fixed-effects regression results for percentage of students remaining in their home states to attend college

	(1)	(2)	(3)	(4)
Variable				
Constant	69.6879***	69.5836***	69.0332***	69.8543***
	(12.05)	(10.99)	(11.80)	(14.93)
Number of Colleges	0.0315	-0.0461	0.0079	0.0317
	(0.47)	(-0.64)	(0.12)	(0.47)
Personal Income Per Cap	0.000013	-0.0002	-0.00027	
	(0.05)	(-0.70)	(-1.18)	
Tuition	-0.00146*	-0.0015		-0.0014**
	(-1.87)	(-0.19)		(-2.23)
Grants	-0.00059	-0.00051	-0.00066	-0.00059
	(-0.66)	(-0.51)	(-0.73)	(-0.66)
Tier 1	-3.4779	-0.4919	-2.6845	-3.5020
	(-0.82)	(-0.11)	(-0.62)	(-0.83)
Δ GSP	-1.2321***		-1.0477***	-1.2298***
	(-4.57)		(-4.12)	(-4.65)
	n = 147	n = 147	n = 147	n = 147
	R^2 = 0.8699	R^2 = 0.8401	R^2 = 0.8649	R^2 = 0.8699
	CS = 49	CS = 49	CS = 49	CS = 49
	F = 6.82	F = 6.21	F = 8.75	F = 7.02
	Pr > F = .0001	Pr > F = .0001	Pr > F = .0001	Pr > F = .0001

Dependent variable: %Students = Percentage of students remaining in their home states to attend college.
t-statistics in parentheses. *** = significant at 0.01, ** = significant at 0.05, * = significant at 0.1
All cross-section estimates are suppressed.
[a]Number of colleges in each of the 50 states (in sq. miles) for 1996.
[b]Real median personal income per capita for each of the 50 states (in 1996 dollars).
[c]Real average undergraduate tuition and fees of full-time students at public colleges for each of the 50 states (in 1996 dollars).
[d]Real need based financial aid and grants per student awarded by each of the 50 states (in 1996 dollars).
[e]Presence of a Tier 1 research university in the state.
[f]Change in real Gross State Product in each of the 50 states (in millions of 1996 dollars).

Table 3. Dependent Variable: Rtuition

	(1)	(2)
Variable		
Constant	4435.657***	4435.657***
	(6.92)	(6.92)
Personal Income Per Cap[a]		0.2057***
		(6.88)
Δ GSP[b]	-102.037**	
	(-2.49)	
	n = 147	n = 147
	R^2 = 0.6711	R^2 = 0.7652
	CS = 49	CS = 49
	F = 4.06	F = 3.93
	Pr > F = .0001	Pr > F = .0001

Dependent variable: Rtuition = Real average undergraduate tuition and fees of full-time students at public colleges for each of the 50 states (in 1996 dollars).
t-values in parentheses. *** = significant at 0.01, ** = significant at 0.05,
* = significant at 0.1.
All cross-section estimates are suppressed.
[a]Real median personal income per capita for each of the 50 states (in 1996 dollars).
[b]Change in real Gross State Product in each of the 50 states (in millions of 1996 dollars).

Table 4. Dependent Variable: Rgrants

	(1)	(2)
Variable		
Constant	313.0367	44.4627
	(0.68)	(0.07)
Personal Income Per Cap[a]		0.0131
		(0.52)
Δ GSP[b]	11.2879	
	(0.38)	
	n = 147	n = 147
	R^2 = 0.9379	R^2 = 0.9382
	CS = 49	CS = 49
	F = 30.11	F = 26.22
	Pr > F = .0001	Pr > F = .0001

Dependent variable: Rgrants = Real need based financial aid and grants per student awarded by each of the 50 states (in 1996 dollars).
t-values in parentheses. *** = significant at 0.01, ** = significant at 0.05,
* = significant at 0.1.
All cross-section estimates are suppressed.
[a]Real median personal income per capita for each of the 50 states (in 1996 dollars).
[b]Change in real Gross State Product in each of the 50 states (in millions of 1996 dollars).