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RESEARCH REPORT

## Expanding College Access:

*The Impact of  
State Finance  
Strategies*

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# Executive summary

**A**lthough substantial attention has been given to federal strategies for improving college access, too little attention has been given to the impact of state finance strategies on academic preparation and access for prepared students. This report provides:

- A review of prior access studies.
- A new conceptual model for assessing the impact of state finance strategies.
- An analysis of the impact of state finance strategies.
- Simulations of alternative state and federal strategies.

## Prior research

The early economic studies of college access documented that student financial aid had a direct influence on enrollment. However, the old consensus behind this research broke down after the net price concept used in these studies did not adequately explain the impact of new finance policies that influence access. In this study of the impact of state finance strategies, we considered the impact of tuition, need-based grants and non-need grants as a means of measuring the multiple effects of state finance policies on access.

Recent research by the National Center for Education Statistics (NCES) examined the impact of taking a college preparatory curriculum on college enrollment.

Although advanced high school courses are crucial, the definition of preparation used by NCES overlooked the role of high schools in preparing students for community colleges, an integral part of the access strategy used in

many states. High school graduation serves as a proxy for community college preparedness in this study, which examined the impact of public finance (K-12 funding and student financial aid) on high school graduation rates.

## A new approach

New logical models for assessing the impact of state finance strategies on academic preparation and financial access for prepared students were developed. The researchers looked at these two factors as follows:

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*This study examined the impact of public finance on high school graduation rates.*

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- **Academic preparation:** The analyses examined the influence of demographic contexts (e.g., income diversity and education level in the states), financial controls (tax rates and K-12 expenditures), and higher education finance strategies (public sector tuition and grants [need-based and non-need<sup>1</sup>] two years prior to graduation) on high school graduation rates.
- **Financial access:** The analyses examined the influence of demographic contexts, financial controls, system capacity of the state system (percent enrollment in community colleges and private colleges), and higher education finance strategies (public sector tuition, need-based grants and non-need grants during the freshman year) on college enrollment by high school graduates.

The study developed and used a state-level database of the 50 states for the 1992, 1994, 1996, 1998, and 2000 fiscal years. The database was assembled from sources compiled by NCES, National Association of State Student Grant and Aid Programs (NASSGAP) and other sources. Fixed-effect regressions were used to control for state effects on academic preparation and financial access.

## The impact of state finance strategies

**Academic preparation:** Controlling for state contexts and demographics, state finance strategies (tax rates and K-12 expenditures) were not significantly associated with high school graduation rates. *Non-need grants and public college tuition* (both measured two years prior to graduation) *were negatively and significantly associated with high school graduation rates.* Need-based grants had a positive (non-significant<sup>2</sup>) association with high school graduation rates in the fixed-effects analysis.

**Financial access:** College enrollment rates for high school graduates were influenced by system

capacity and state financial strategies, controlling for state contexts and demographic variables:

- The percentage of full-time equivalent enrollment in public two-year colleges was positively and significantly associated with overall college enrollment rates for high school graduates.
- The percentage of full-time equivalent enrollment in private colleges was also associated with higher college enrollment rates.
- Need-based grants had a substantial, positive influence on enrollment rates. Need-based grants had a stronger influence (i.e., larger standardized beta) than any other financial variable in the model.
- Non-need grants were significant and positively associated with college enrollment rates by high school graduates.

## Simulations of alternative strategies

These findings support arguments that states should coordinate need-based state grants with public sector tuition charges as a means of promoting financial access for students who are prepared for college. If states allow tuition to rise due to shortfalls in tax revenues or for other reasons, then need-based grants should be sufficient to ensure financial access. Simulations examine two possible strategies for expanding access:

- **Coordination of public sector tuition and state grants.** The first simulation estimated the effects of funding state need-based grants on a level equal (on a per-FTE basis) to one-quarter of the public sector tuition charge, a reasonable equity standard. *If this level of coordination had been maintained in the 1990s, then 1.21 million more low-income students would have had the opportunity to enroll in college across the U.S.*

- **A new state-federal partnership.** The second simulation estimated the impact of a new need-based grant (jointly funded by states and the federal government) that would have been funded at a level equaling an additional one-quarter of each state's average public sector tuition charge (i.e., new funds on top of existing grants). *Had the proposed partnership been implemented in the 1990s, an additional 2.55 million low-income college-prepared students would have had the opportunity to enroll in the 1990s.*

## Conclusions

To maintain financial access for low-income students, states must raise funding for need-based grants. If the federal government does not make any additional investment in grants, each state should maintain funding for need-based grants at least equal to one-quarter of the average tuition charge.

## Recommendations

The states and the federal government should authorize and adhere to a two-tier grant strategy.

1. The basic federal need-based grant should have a maximum award equaling the national average for room and board charges.
2. A second-tier grant program should involve state-federal collaboration. The program should:
  - Provide a maximum need-based award equaling public tuition (and possibly a higher award level for private colleges).
  - Be funded at an amount in each state equaling one-quarter the average public tuition charge on an FTE basis. (The funding should be equal to total state enrollment multiplied by a factor equaling one-quarter of the average public tuition).
  - Be funded by one-third federal funds and two-thirds state funds.
  - Require an approved plan for coordinating state grants and tuition with other state finance strategies for higher education, raising state grants as tuition increases.
  - Make awards based on financial need, consistent with federal needs analyses.
  - Require states to provide information about the grant program to all eighth-grade students who receive subsidies from the Department of Agriculture's Free and Reduced Lunch Program.



# Introduction

**A**ttaining at least some postsecondary education — a degree from a two-year or four-year college — is increasingly necessary for meaningful employment (Pascarella & Terenzini, 1991; Paulsen, 2001a, 2001b). While college funding was considered central to expanding access during most of the 20th century, for the past two decades the debates about policies for expanding access have broadened to include education reform aimed at improving academic preparation for college and postsecondary encouragement programs (King, 1999; National Center for Education Statistics [NCES], 1997a; Tierney & Hagedorn, 2002). As more high school students take the steps to prepare for college, states will need to consider how to make efficient use of tax dollars in efforts to expand postsecondary opportunities for low-income students, especially given the competing demands on state tax dollars. Whether or not state education reforms are successful, the concept of equal opportunity posits that a student's socioeconomic background should not affect his or her opportunity to attend college.

The Advisory Committee on Student Financial Assistance (2002) estimated that about 4 million college-qualified students from low- and moderate-income families would be denied access to four-year colleges in the first decade of the 21st

century because the remaining costs of college, after loans and grants, are higher than these students can afford. Given the large number of qualified students being left behind because of college prices, many states face an access challenge. With the decline in the buying power of federal need-based grants over the past two decades, states should consider altering their financial strategies to ensure access for low-income, college-qualified students. The goal of ensuring access is complicated by the great variability in the capacity and mix of two-year and four-year colleges across the states as well as the significant differences in state financial aid programs.

The federal government and states share the goal of expanding access for academically prepared students. Opportunity for college enrollment has been the intent of federal need-based grant aid for four decades. States have the primary responsibility for ensuring financial access, and the declining value of federal grants (Advisory Committee for Student Financial Assistance, 2002) adds to the severity of the access challenge facing states. This report examines the impact of state financing strategies on college access in the 1990s and proposes two cost-efficient approaches for expanding access over the next decade.





# Access research

**T**here is a long history of effort to conceptualize and measure the impact of state and federal financing strategies on college access; however, there is little agreement about which methods are most appropriate for this task. To build an understanding of the reasons why a new approach is needed, we review the uses of statistical models in higher education policy research over the last half of the twentieth century. This review considers: (1) early efforts to assess the impact of public finance strategies on access to higher education, (2) recent efforts to focus on the role and influence of academic preparation on the college merit process, and (3) the challenge facing policy research on college access.

## The impact of public finance strategies

Economists began to study the impact of tuition on college enrollment in the 1960s and early 1970s (Hansen & Weisbrod, 1969; Jackson & Weathersby, 1975; Manski & Wise, 1983; McPherson, 1978). The early studies used both time-series data and samples of high school students to examine the impact of price differentials on enrollment. Reviews of these early studies found that higher tuition charges reduced

enrollment rates, a finding that was often used to argue that student aid was the most efficient possible means of promoting college access

(Jackson & Weathersby, 1975; Leslie & Brinkman, 1988; McPherson, 1978). These early studies informed efforts by the National Commission on the Financing of Postsecondary Education (NCFPE), which estimated the effects of expanding the Pell grant program on college enrollment (NCFPE, 1973). The NCFPE concluded that need-based grants for students constituted a more efficient means to expand access than did direct federal subsidies to colleges and universities.

During the 1970s and 1980s, substantial progress in research on public finance strategies occurred through the development of national longitudinal databases to study the impact of student financial aid on college enrollment. For example, using the National Longitudinal Study of

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*The NCFPE concluded that need-based grants for students constituted a more efficient means to expand access than did direct federal subsidies.*

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the High School Class of 1972 (NLS:72), Jackson (1978) and Manski and Wise (1983) found that student aid expanded access for students in the high school class of 1972. Manski and Wise also examined the impact of implementing Pell grants and estimated that expansion of grants would

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*States that maintain adequate grant aid can equalize persistence across diverse groups.*

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increase access to two-year colleges more than four-year colleges. Analyses of the High School and Beyond (HSB) study of the high school classes of 1980 and 1982 found that student grants were positively associated with enrollment by low-

income students in the early 1980s, as they had been a decade earlier (Jackson, 1988; St. John, 1990, 1991; St. John & Noell, 1989).

There were also numerous attempts to develop and refine price response measures based on reviews of both time-series studies and studies using national longitudinal databases (Heller, 1997; Jackson & Weathersby, 1975; Leslie & Brinkman, 1988; McPherson, 1978). Most of these researchers concluded that \$100 in price (tuition) differential was associated with some percentage point change in the college enrollment rate. The research evidence was clear on this point: Low-income students were more responsive to college prices and student grants than were middle-income students (Heller, 1997; Leslie & Brinkman, 1988). Even so, analysts have lacked a generally accepted method of linking indicators of public spending on student financial aid with changes in college enrollment.

Recent analyses that considered trends in federal need-based and non-need grants, trends in state grants, and trends in school reform found a correspondence between changes in grant funding and college enrollment rates by high school graduates during the last three decades (St. John, 2003). States that maintain adequate grant aid can

equalize persistence across diverse groups (Hu & St. John, 2001; St. John, 1999). The research literature reinforces the importance of both state need-based and non-need grants on postsecondary access — moreover, responses to charges (tuition and living costs) and different types of aid have different effects on different groups (Dresch, 1975; St. John & Starkey, 1995). Thus, there is still good reason to consider the relationships between trends in state financial strategies and changes in postsecondary enrollment patterns.

### Academic preparation

During the past two decades many policy analysts have focused on the role of academic preparation for college in efforts to build a better understanding of college access (Choy, 2002; Gladieux & Swail, 1999; King, 1999; NCES, 1997a). Policy research on the role of academic preparation grew out of efforts by the Reagan administration to respond to concerns about the gap in enrollment rates between white students and African-American students after 1978. The official reports prepared in response to this concern examined the relationship between the academic courses taken in high school and college enrollment (Pelavin & Kane, 1988, 1990). Although previous studies controlled for the impact of taking a college preparatory curriculum (e.g., Jackson, 1978; St. John, 1991; St. John & Noell, 1989), they did not examine the impact of specific high school courses, such as algebra. Pelavin and Kane (1988, 1990) examined the effects of taking specific math courses. NCES reports have also documented the association between academic preparation, as measured by high school courses, and college enrollment. A recent report published by the American Council on Education summarizes these studies, concluding that academic preparation influences college enrollment (Choy, 2002). Thus, in addition to the effects of tuition and student aid on college enrollments, academic preparation plays an important role in postsecondary access.

## The challenge

Research on college access should find a balanced approach that considers both academic preparation and financial access for prepared students. Research using a balanced approach to assess the impact of state finance strategies on enrollment has been limited, but compelling. A few studies that reanalyzed NCES reports found that large numbers of college-qualified students were left behind in the 1990s because of low funding for need-based grants (Advisory Committee on Student Financial Assistance, 2002; St. John, 2002). Using NCES data (NELS:88), Perna and Titus (2002) found that need-based aid influenced college access and concluded that states' financial access policies play a central role in expanding access.

States play a fundamental role in college access and have the primary responsibility for providing education and ensuring equity in postsecondary educational opportunity. The policies that states use to finance higher education influence financial access (i.e., whether students who are qualified for college can afford to attend). States also set graduation requirements that influence academic access (whether high school students are academically prepared for college). The intent of this report is to examine the effect of state financial strategies on college access; thus, we do not consider variations in high school curricula or differing graduation requirements among states. Although we recognize that high school graduates are not necessarily academically prepared for college, students who graduate from high school can nonetheless enroll in community colleges and many non-selective four-year institutions.



# The influence of state finances on college access

Our model of the effects of public finance strategies on college enrollments is based on an understanding of social and economic theory, research on educational attainment,<sup>3</sup> and research on price response and public finance (St. John, 2003; St. John & Paulsen, 2001). This conceptual model (see Figure 1 on the next page) recognizes that there is an educational attainment pipeline in each state that is affected by the public finance strategies used in the state. The educational attainment pipeline is influenced by:

- **Demographic context:** The ethnic composition of the state's population and the extent of wealth, poverty and attained education.<sup>4</sup> The demographic context represents the state-level equivalent of variables for family income and parents' education, which are frequently used in studies of college access that use individual-level data.
- **High school graduation rates:** Studies of enrollment in four-year colleges indicate it is desirable to consider the specific courses that students take in high school. However, most states accommodate for enrollment in two-year colleges if students receive a high school diploma. Given the

limitations of available data on statewide secondary school curricula requirements, and the intent of this study to examine access to two-year *and* four-year colleges, we consider the role of high school graduation rates as a proxy for minimal academic preparation.

- **Postsecondary attainment:** We use college enrollment rates for high school graduates as our initial measure of educational attainment. Ideally, measures of college graduation or other persistence indicators would provide useful information about the returns on state investments in post-secondary education.

The systems of public finance are the primary means that states can use to promote educational attainment, especially college attainment among their resident populations. The system of state finance links to the educational attainment pipeline in several ways:

- **Tax rates:** A state's tax rate, controlling for the wealth of the population, can influence both academic preparation and college attainment. The tax rate measure used here was total taxes collected by a state divided



by the sum of personal income of the state's residents (from the U.S. Census Bureau).

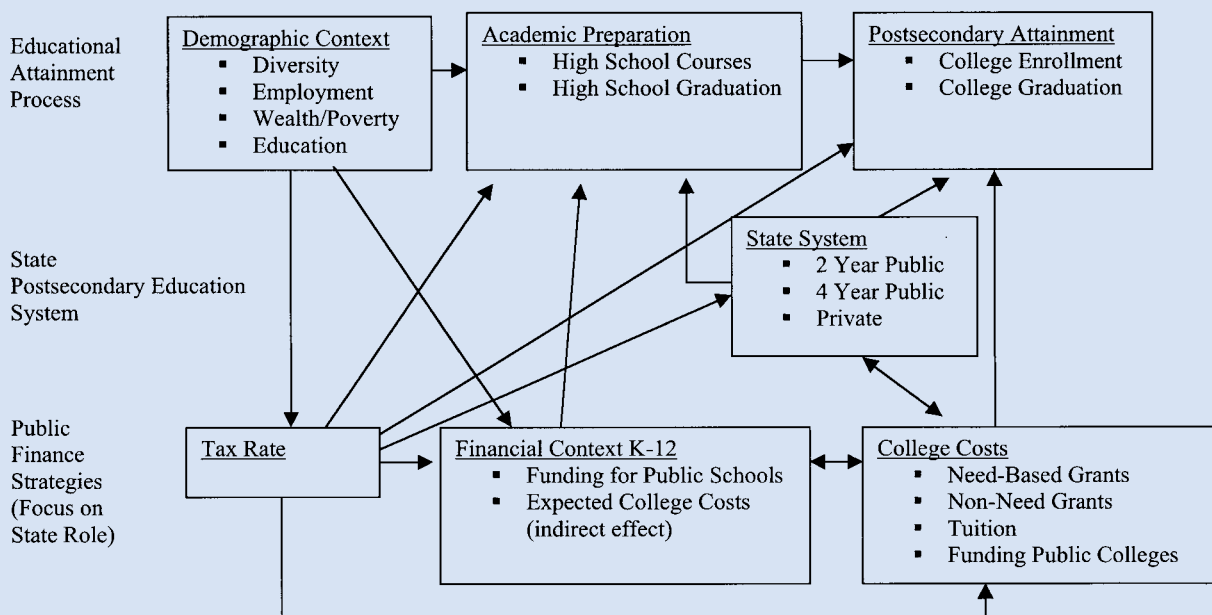
- **School funding:** The level of state funding for public K-12 education can be influenced by the wealth and tax rates in a state.<sup>5</sup> The level of school funding could influence the high school graduation rate in a state and has a direct effect on the availability of certain high school courses.
- **Expected tuition and grants:** There is a common-sense linkage between student expectations about tuition and grants and their desire to prepare for college (St. John, 2002). Therefore, there is reason to expect that average public tuition charges and average state grants two years prior to graduation can influence the high school graduation rate in a state.
- **Expected system capacity:** Limited opportunity can constrain access and discourage graduation.
- **Actual college prices:** States finance college access and persistence through student grants (need-based and non-need) and tuition subsidies to public colleges. At

a given level of educational expenditures by public colleges, state subsidies to public colleges reduce tuition prices charged to college students.

In addition to public finance strategies, the *composition of a state postsecondary education system* has an influence on college access. Extensive two-year college systems can expand access as can the existence of private colleges in a state. Thus, it is appropriate to control for the structure of state systems of higher education.<sup>6</sup> While some resident students enroll in out-of-state institutions, this emigration of college students is unlikely to be influenced by state finance strategies unless states provide grant subsidies to students who enroll out of state.<sup>7</sup>

Using the conceptual model described on the previous page (and illustrated in Figure 1 below), this report examines the impact of demographic indicators and state financial strategies on college enrollment rates. (A model testing the impact of state financial strategies on high school graduation rates is described in Appendix 2). To test this model, the study team developed a set of indica-

Figure 1. Framework for assessing the impact of public finance strategies on postsecondary attainment



tors of financial and demographic variables for each of the 50 states for the 1992, 1994, 1996, 1998, and 2000 fiscal years. All dollar amounts were adjusted to 2000 dollars. The analyses of high school graduation rates used tuition and financial aid amounts for two years prior to graduation. This was done to reflect the financial conditions that prevailed when students in a cohort were enrolled in high school and were making future plans. The indicators are described in Appendix 1.

### Analyses of the impact of state finance strategies

Analyses of state student aid programs have been done in a few state-level comparisons (Binder & Ganderton, 2001; Cornwell, Mustard, & Sridhar, 2001; Dynarski, 2000), but this is the first study to use fixed-effects regression with multiple years of data on all states. Earlier state-level comparisons indicate that state grant programs do affect college enrollment. This report builds on those approaches. (OLS regression results are presented in Appendix 3 so readers can compare the two

analysis methods.)<sup>8</sup> A two-step procedure was used to estimate the impact of state finance strategies on enrollment. This method overcomes some of the limitations of prior efforts to simulate the impact of changes in public finance policies on enrollment rates.<sup>9</sup> Variables considered in the analysis of the impact of public finance strategies on college enrollment of high school graduates are presented in Table 1 below. The analysis of the impact of financial strategies on college enrollment rates follows.<sup>10</sup>

### Limitations

The analyses assume current funding levels for Pell grants and other types of federal aid:

- The regression analyses assess the additional impact of state grants that supplement federal need-based grant awards (Pell). Pell is awarded based on uniform criteria across states.
- The simulations of alternative grant strategies also assume that the existing federal programs will be continued at the current award levels. If a new federal-state grant program were

**Table 1. Independent variables used in analysis of college enrollment rates by high school graduates**

- **Demographic context**
  1. Percent of the state population below the poverty level
  2. Percent of African Americans in the population
  3. Percent of Hispanics in the population
  4. Percent of other minorities in the population
  5. Size of the ninth-grade cohort four years prior
- **State system**
  1. Percent public two-year institution FTE
  2. Percent private institution FTE
- **Financial controls (tax rate)**
- **Higher education finance strategies**
  1. Need-based grants per FTE (for first year of college eligibility)
  2. Non-need grants per FTE (for first year of college eligibility)
  3. Tuition charges weighted per FTE (for first year of college eligibility)

created but Pell grants were reduced, then access would be reduced as a consequence of these reductions in Pell.<sup>11</sup>

Although we focus exclusively on the impact of state finance strategies on expanding postsecondary access, there is a sound basis for assuming state investments in postsecondary education would also affect student success. For example, a substantial body of research indicates state grants influence persistence. State-level studies have found that funding for state need-based grants helped equalize the opportunity for persistence in Washington state (St. John, 1999) and Indiana (Hu & St. John, 2001; St. John, Hu, & Weber, 2000, 2001). Further, Indiana's Twenty-first Century Scholars Program has been shown to

influence academic preparation, college enrollment, and college persistence for low-income high school students (St. John, Musoba, Simmons, & Chung, 2002; St. John, Musoba, Simmons, Schmit, Chung, & Peng, 2002). In the future, the state indicators approach used in this report should be extended to include analyses of student persistence and degree completion.

This report provides an analysis of the impact of financial aid on postsecondary access using a new methodology. It is the first study to use fixed-effects regression with a state-level database composed of state indicators. Using states as the unit of analysis provides appropriate logical and statistical controls for simulations of the impact of state grant strategies on college enrollment rates. This approach provides a method of assessing the

**Table 2. Fixed-effect regression: the influence of population characteristics and state finance strategies on college enrollment rates in the 1990s**

	Regression coefficient		Sig.
	Unstand.	Standard.	
Percent poverty	-0.462	-0.238	***
Percent African-American	-1.810	-2.326	
Percent Hispanic	-1.174	-1.316	*
Percent other minorities	2.388	3.001	
Enrollment when the cohort was ninth grade	-0.000	-0.694	*
Percent of population with bachelor's degree or higher	0.299	0.182	*
Percent public two-year institution FTE	0.211	0.328	*
Percent private institution FTE	0.643	1.089	***
Tax rate (=State tax collection/personal income)	-0.071	-0.015	
Per-FTE need-based grant amount (\$/1,000)	0.115	0.426	***
Per-FTE non-need grant amount (\$/1,000)	0.089	0.204	***
Undergrad in-state tuition and fees for public system (\$/1,000)	0.100	0.146	
Adjusted R square	0.789		
N	244		
P-value for F test that all $u_i=0$	0.000		

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

impact of financial aid — need-based and non-need — on enrollment rates in states, controlling for state demographic differences and the minimal level of college preparedness.<sup>12</sup>

## Results

While the first aim of this report — to measure the effects of state finance strategies on access — may seem straightforward, it is a complex process that is further complicated by methodological considerations. To illuminate the role of public finance in promoting access, the report examines high school graduation rates (Appendix 2) both as an indicator of the indirect effects of financial access on high school graduation and as an indicator of the direct effects of financial strategies on college enrollments (by high school graduates).

Table 2 illustrates the results of the statistical analysis of college enrollment rates. State finance strategies had a substantial and direct effect on college enrollment by high school graduates, controlling for demographic contexts and the structure of higher education in the states. On average, for every \$1,000 of need-based grant aid, enrollment rose 11.5 percentage points. Similarly, for every \$1,000 of non-need grant aid, enrollment

rose 8.9 percentage points. At the same time, state demographics and system capacity also influence college enrollment. The poverty level in a state was significant and negatively associated with college enrollment rates. The percentage of the population with college degrees was also positively associated with college enrollment rates, further indicating that demographic variables related to socioeconomic status (SES) have a substantial and direct influence on college enrollment by students who graduated from high school.<sup>13</sup>

The capacity of state higher education systems also affects postsecondary opportunity. The percentages of students enrolled both in community colleges and private colleges were positively associated with enrollment rates in the states.<sup>14</sup> Tax capacity was not associated with college enrollment.

Both need-based grants and non-need grants were significant and positively associated with enrollment rates, although the direct effects of need-based grant aid were much more substantial (double the standardized beta).<sup>15</sup> Tuition charges were not significantly associated with enrollment. These results suggest the most efficient way for states to expand access is to expand need-based grant aid.<sup>16</sup>





# Coordinating state finance strategies

**T**he analyses above reveal that need-based grant aid influences college enrollment rates for high school graduates more substantially than do non-need grants or tuition levels. In this context, states can realize more efficient use of tax dollars by coordinating tuition and need-based grants in ways that expand access, especially for low-income students. During the recent federal policy debate surrounding the reauthorization of the Higher Education Act, some groups recommended a substantial increase in Pell grants as a strategy for ensuring financial access (Advisory Committee on Student Financial Assistance, 2002; College Board, 2003). Although the authors agree with the intent of these recommendations, which is to increase need-based grants, we believe it is more politically viable to seek better coordination of tuition levels with need-based financial aid.

The results from these statistical models were used to inform simulations that estimate the enrollment effects of additional federal and/or state investments in postsecondary education. The simulations provide a useful tool to inform the federal and state policy discourse around expanding access to college. These simulations consider two distinct approaches to state and federal collaboration on financial access: (1) a threshold

for a state need-based grant program that represents improved state policy coordination, and (2) a new second-tier need-based grant program funded through a 1:2 federal:state match.

## Option 1: Improved state policy coordination

In the 1990s, public sector tuition charges rose substantially as the percentage of educational costs supported by state appropriations declined (Price, 2003; St. John, 2003; St. John, Simmons, Hoezee, Wooden, & Musoba, 2002). For the majority of families with children attending college, there was a tradeoff in the 1990s: Lower tax subsidies to public higher education meant lower individual taxes but higher direct costs while their children were enrolled in college. In addition, higher tuitions made college less affordable for low-income students

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*States can realize more efficient use of tax dollars by coordinating tuition and need-based grants.*

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(National Center for Public Policy and Higher Education, 2002). As public sector tuition increases, students from the lowest-income families require corresponding grant increases to maintain access (Advisory Committee on Student Financial Assistance, 2002). In this environment, states could increase need-based grants to ensure financial access given the negative impact of higher prices on college access for low-income students.

The notion that an award threshold should be defined for grants is not new. The original legislation for Pell grants set a maximum award level, a program feature that has been carried forward in subsequent reauthorizations of the Higher Education Act. Recently, an expert panel for the College Board (2003) recommended that the Pell award should be raised to a maximum of \$9,700, and the Alliance for Equity in Higher Education (2003) recommended doubling the authorized maximum (\$5,100) within the next six years. While it may be desirable to increase Pell grants, it probably is not feasible in the current political climate given current budget deficits and political support for tax decreases.

Based on prior analyses (St. John 2003; St. John, Simmons, Hoezee, Wooden, & Musoba, 2002), we consider one-quarter of weighted average tuition charges for all students in a state as the minimum average level for state grant aid. To the extent that states allow tuition in public

colleges to rise due to inadequate state funding for institutions, they should invest a portion of tax revenue saved in need-based grants. Given the base provided by federal grants (including Pell grants), this would represent a minimum threshold for state need-based grants if states intended to maintain financial access when tuition increased. Very few states maintain grants at this target level (average need-based grants equaling one-quarter of the average tuition charge).

Trends in tuition charges and student aid (Table 3 below) reveal that states have not maintained grants at levels that represent the "equity standard" (one-quarter of the weighted average tuition charge). In states that are under political pressure both to expand college access and restrain tax increases, coordination of tuition and need-based grant aid provides a clear alternative to maintaining lower tuition. Increasing need-based grants at this level, given a tuition increase of \$1,000, would cost these states an average of \$250 in need-based grant aid per FTE (25 percent of \$1,000). In contrast, maintaining low tuition would cost an additional \$1,000 per student.<sup>17</sup> Because the additional grant dollars are need-based, students from the lowest-income families could receive awards equal to full tuition, while moderate-income students would receive smaller awards, and students from high-income families would not receive additional state grants.

**Table 3. Trends in tuition charges and need-based grants in the United States (in 2000 dollars)**

	Tuition and fees weighted per FTE	Need-based grant per FTE	Targeted need-based grant per FTE	Equity gap in state need-based grants
1992-93	\$2,332	\$344	\$583	(\$239)
1994-95	\$2,541	\$404	\$635	(\$232)
1996-97	\$2,661	\$396	\$665	(\$269)
1998-99	\$2,741	\$419	\$685	(\$266)
2000-01	\$2,728	\$366	\$682	(\$316)
<b>Average</b>	<b>\$2,601</b>	<b>\$386</b>	<b>\$650</b>	<b>(\$264)</b>

Source:

Coordinating state need-based grants with tuition provides a means of making more efficient use of tax dollars while maintaining financial access for low-income students. The average tuition charge increased from \$2,332 in 1992-93 to \$2,728 in 2000-01, while the average need-based grant increased from \$583 to \$682. The average gap between the targeted grant amount and the actual amount grew 32 percent from \$239 per FTE in 1992-93 to \$316 per FTE in 2000-01. Of course need-based grants for students with high need would be at least equal to their tuition if all states maintained this minimum targeted award strategy.

## Option 2: A new federal-state partnership

This option is based on a proposal by St. John (2003) to minimally raise the maximum Pell award and encourage states to coordinate their public finance strategies for tuition and grants in a way that ensures financial access for low-income students.<sup>18</sup> This proposed state-federal partnership would provide a new second-tier state grant equaling one-quarter of the weighted average public sector tuition charges. States would be required to fund two-thirds of the grant program but would receive federal matching grants equal to one-third of the total new investment in need-based grants.<sup>19</sup> States would be required to continue their current investment in grants to realize the new federal support, which ensures that both states and the federal government share responsibility for the new investment. Resident students attending in-state private colleges should be eligible for the new grants.

The recommended state-federal partnership includes:

- **A basic federal grant:** The federal government should maintain a maximum Pell award level of about \$4,500 or an amount set at the level of the average room and

board in colleges and universities in the U.S., adjusted for inflation. This amount is approximately equal to the Pell maximum in 1980 when access was more equitable.

- **A state equalization grant:** States should maintain a maximum award for low-income students equaling tuition charges at the public college they attended.<sup>20</sup> This approach would encourage states to provide adequate aid to ensure that financial access is maintained.

Put simply, if states provided need-based grant awards equaling the tuition charges of public institutions for low-income students attending those colleges (and an equivalent amount for private colleges), then federal and state policy would be better coordinated. In the proposed scenario, the maximum award of a Pell grant plus the maximum for the state grant would equal \$8,500 for the lowest-income students attending public colleges that charged \$4,000 in tuition and fees.

In contrast, the highest-need students in a state with \$3,000 as the tuition for a public institution would receive a total of \$7,500 in the two-tier grant program. Because not all students require need-based grant aid, a mean award equal to one-quarter of tuition would allow for full-tuition grants for students with the greatest need, offset by no awards to high-income students without financial need.

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*Coordinating state need-based grants with tuition provides a means of making more efficient use of tax dollars.*

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## The costs and benefits of improved policy coordination

**A**lthough the idea of coordinating student financial aid strategies has a long history in policy analysis (Hansen & Weisbrod, 1969; Hearn & Anderson, 1989, 1995; Hearn & Longanecker, 1985), previous state-level analyses have not

analysis would be needed to estimate the full costs for future years.

### Setting a minimum standard of coordination

The idea that states should coordinate need-based aid with other public finance strategies has a long history, but since a minimum standard has never been proposed, it has been difficult for any group to make reasonable judgments about whether states have maintained equal postsecondary opportunity. The concept of affordability used in some reports (National Center for Public Policy and Higher Education, 2002; 2000) relates the price of college to the ability of a state's population to pay those prices. However, states can have low tuition and still not be equitable if they do not provide adequate grant aid for the lowest-income students.

Based on a review of trends in the financing of public and private colleges, St. John (2003) recommended that states invest in need-based grant programs at a level equaling one-quarter of the average public sector tuition charge. In the

shown clearly how best to achieve this coordination. In other words, no minimum standard for policy coordination has been proposed. In this section, we (1) review the concept of a minimum standard that is most often espoused in economics and policy analysis (Paulsen, 2001b), (2) summarize the cost-benefit analysis of implementing this minimum standard, and (3) consider the implica-

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*States can have low tuition and still not be equitable if they do not provide adequate grant aid for the lowest-income students.*

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tions of the recommended coordination strategy. The analyses estimate costs and benefits for the average freshman class in the 1990s. Further data



1990s, private colleges typically had institutional grants equaling about one-quarter of tuition revenue. Grant aid in private colleges was often leveraged as a means of reaching enrollment goals (McPherson & Schapiro, 1997), an approach that mixes merit and need in the awarding of aid (Ehrenberg, 2002; Hossler, in press). The minimum equity standard can protect low-income, college-qualified students in periods when tuition charges increase. Making a sufficient investment in need-based grant aid is necessary in most states to equalize opportunity for high- and low-income students who are college-qualified.

To achieve the public policy goal of equal postsecondary opportunity, states should balance four goals:

- Provide sufficient opportunity to improve college enrollment rates for high school graduates (a structural measure of *access*) in quality institutions.
- Provide sufficient student aid to equalize opportunity for similarly prepared high- and low-income students (*equity*) — this report suggests a minimum standard for that goal.
- Maintain reasonable tax costs per student, as measured by tax expenditures per student (*tax efficiency*).
- Maintain sufficient revenues per student in public colleges to be competitive with peer institutions (*adequacy*).

## Assessing alternative strategies: Results from the simulations

The Advisory Committee on Student Financial Assistance (2002) estimated that 4 million college-qualified students were denied financial access to four-year colleges during the 1990s because of inadequate need-based grants. Lee (2001) used a more conservative analysis. He estimated that 140,666 college-qualified, low-income students in the high school class of 1992 did not enroll, in

part due to shortfalls in need-based grants. If this number of students were left behind each year of the 1990s, then 1.4 million college-qualified, low-income students would have been denied access in that decade. Regardless of which estimate of enrollment shortfall one uses, it is apparent that a large number of college-qualified students would have enrolled in college in the 1990s had there been adequate need-based student financial aid.

The next two sections of this report examine the costs and benefits of two possible strategies for meeting the minimum equity standard:

**Option 1: Improved state coordination:** The first option would raise the average need-based state grant to an amount equaling one-quarter of tuition. This increase would vary by state, but each state would bring its average grant up to one-quarter of public sector tuition.

**Option 2: A new state-federal partnership:** In the second option, we propose a second-tier grant program. This new grant would be awarded on top of any grant programs states currently offer. The federal government would fund one-third of the total cost of this new grant program. The proposal for the \$2-to-\$1 match is based on the current formula used in the federal Leveraging Educational Assistance Partnership Program (LEAP).

## Estimated enrollment effects

Table 4 on the next page presents the estimated enrollment effects for Option 1, improved state policy coordination. (The method used to estimate the enrollment effects option is summarized in Box 1 on Page 19.) The baseline of the enrollment effects for this option suggests that 120,500 additional high school graduates would have enrolled in college each year during the 1990s. Thus, an additional 1.2 million new high school graduates would have enrolled throughout the decade.

High- and low-range estimates of enrollment effects are also presented in Table 4 below. If for

*The amount of investment necessary to reach the minimum equity standard varies substantially across states.*

some reason the supply of opportunity (openings in colleges) or number of qualified high school graduates was severely limited, then the program could result in a smaller increase in college enrollment. However, analyses of high school preparation indicate there are ample qualified high school graduates to fill the seats if sufficient aid is available. At the other extreme, if the percentage of college-

qualified students had been higher and there had been ample postsecondary opportunity, then more students would probably have enrolled. The high-range estimates illustrate this type of scenario.

The analysis of the costs and effects of coordinating public finance strategies is also presented in Table 4. States would need to invest an additional \$533 million per year to meet the minimum threshold based on data from the 1990s. This amount represents about a 10 percent increase in state grant programs based on the latest data from the National Association of State Student Grant and Aid Programs (NASSGAP, 2003). We estimate that this additional investment would have resulted in 1.2 million more students enrolling as freshmen over the decade. According to the baseline estimates, the average cost would be \$4,400 in new grant dollars per additional student enrolled across the U.S. Of course, the amount of investment necessary to reach the minimum equity standard varies substantially across states.

Table 5 on Page 20 illustrates the costs and benefits of Option 2, a proposed state-federal partnership to fund a new second-tier state grant program. (For simulation methods, refer to Box 2 on Page 21.) Clearly, if this partnership had existed

**Table 4. Estimated costs and benefits of meeting the minimum equity standards in funding for need-based grant: baseline, low-range and high-range estimates**

	Baseline	Low-range effect	High-range effect
<b>Estimate of enrollment effects</b>			
High school graduation			
Rate increase	1.0% points	1.0% points	1.0% points
New graduates	38,000	38,000	38,000
College enrollment			
Rate increase	3.8% points	1.1% points	6.5% points
New enrollment	120,500	50,000	191,000
<b>Estimate of costs</b>			
Cost per new student	\$4,400	\$10,000	\$3,000
Additional funding for need-based grants (in millions)	\$ 533	\$ 498	\$ 568

## Box 1 – Estimation of costs for Option 1: Minimum equity standards in need-based state grants

The United States' figures were estimated as follows.

- **Step 1:** For each state, the average tuition (weighted by enrollment) in the 1990s was multiplied by .25, setting a new state grant standard. For the nation, the new grant standard was \$650, based on an average national weighted tuition of \$2,601.
- **Step 2:** For each state, the actual average need-based grant in the 1990s was subtracted from the standard for that state, producing the additional grant funding necessary for the minimum equity standard. The national average shortfall, weighted for enrollment, was \$264.
- **Step 3:** Estimated increases in the rate and number of high school graduates were calculated for each state using the regression coefficient from a model predicting high school graduation rates. The national rate of increase (1 percent) was calculated by averaging state rates. Total new graduates (38,000) were calculated by summing state numbers.
- **Step 4:** Estimated increases in the rate of college enrollment were calculated for each state using the regression coefficients from the model predicting college enrollment rates, taking into consideration the adjusted number of high school graduates from Step 3. The national rate of increase (3.8 percent) was calculated by averaging the rates of increase for all states. State increases were summed to produce a national total of new enrollment (120,500).
- **Step 5:** Program costs for each state were calculated by multiplying the new college freshman enrollment (original freshman enrollment + increase) by the additional grant funding required for the minimum equity standard (Step 2). Costs for each state were summed to produce a national total of \$533.1 million.
- **Step 6:** For each state, the cost per new student enrolled was calculated by dividing total costs by the number of new students. Nationally, the cost per new student enrolled was \$4,400.
- **Step 7:** Low- and high-range effects were produced following the same steps, but applying 95 percent confidence limits around the regression coefficient for college enrollment.

NOTE: State-level profiles and calculations are available on the Indiana Education Policy Center Web site at this URL: <http://www.indiana.edu/~iepc/hepolicy/fiscalindicators.pdf>

in the 1990s, it would have had a substantial, direct impact on enrollment. The baseline estimates indicate that, had the partnership been in effect, 255,300 additional students would have enrolled each year in the 1990s — 2.56 million new students during the decade, at a cost per student of about \$4,800 (a total price tag of about \$1.23 billion).

It is important to note, however, that the high- and low-range estimates assume no change in the current number of high school graduates. If current K-12 reform efforts (including the No Child Left Behind Act) succeed, then more students will graduate from high school and would be eligible for grants offered under such a partnership. If the reform efforts fall short of their goals, the effects of any new aid program would be more limited.

**Table 5. Estimated costs and benefits of prospective state-federal partnership for need-based grants: baseline, low-range and high-range estimates**

	Baseline	Low-range effect	High-range effect
<b>Estimate of enrollment effects</b>			
High school graduates			
Rate increase	2.1% points	2.1% points	2.1% points
New graduates	77,000	77,000	77,000
College enrollment			
Rate increase	7.9% points	2.3% points	13.5% points
New enrollment	255,300	106,100	404,500
<b>Estimate of costs</b>			
Cost per new student	\$4,800	\$10,400	\$3,300
Additional funding for need-based grants (in million \$)			
State	\$ 817	\$ 738	\$ 896
Federal	\$ 409	\$ 369	\$ 448

## Box 2 – Estimation of costs for Option 2: State-federal partnership for need-based state grants

The United States' figures were estimated as follows.

- **Step 1:** For each state, the average tuition (weighted by enrollment) in the 1990s was multiplied by .25, setting a new state grant standard. For the nation, the new grant standard was \$650, based on an average national weighted tuition of \$2,601.
- **Step 2:** Estimated increases in the rate and number of high school graduates were calculated for each state using the regression coefficient from a model predicting high school graduation rates. National rates of increase (2.1 percent) and total new graduates (77,000) were calculated by averaging state rates and summing state numbers.
- **Step 3:** Estimated increases in college enrollment were calculated for each state using the regression coefficient from the model predicting college enrollment rates. A national rate of increase (7.9 percent) was calculated by averaging the rates of increase for all states. State increases were summed to produce a national total (255,300).
- **Step 4:** Program costs for each state were calculated by multiplying the new college freshman enrollment (original + increase) by \$650, the state standard set in Step 1. Costs for each state were summed to produce a national total of \$1.226 billion. For each state, the federal share was assumed to be 1/3 and the state's share was assumed to be 2/3. Nationally, the federal share was estimated at approximately \$408.6 million and the states' share was estimated at \$817.2 million.
- **Step 5:** For each state, the cost per new student enrolled was approximated by dividing total costs by the number of new students. The national average cost per new student enrolled was \$4,800.
- **Step 6:** Low- and high-range effects were produced following the same steps, but applying 95 percent confidence limits around the regression coefficient for college enrollment.

NOTE: State-level profiles and calculations are available on the Indiana Education Policy Center Web site at this URL: <http://www.indiana.edu/~iepc/hepolicy/fiscalindicators.pdf>





# Conclusions and implications

**A**lthough there has been substantial disagreement in the policy literature about underlying causes of the current access challenge, there is general agreement that college access should be expanded, especially for college-prepared, low-income students.

During the 1990s, states allowed public tuition charges to rise when they lacked tax revenues to

provide continuity in funding for state colleges and universities. However, funding of state need-based grants did not increase at a rate that held harmless students from low-income and other disadvantaged backgrounds. This lack of investment had significant negative consequences for college enrollments. This study examined the effects of state finance strategies on college enrollment rates and documented the substantial

direct influence of need-based grant aid on college enrollment during the 1990s (Table 2). Based on our analyses, had states coordinated increases in need-based grants with increases in tuition, an

estimated 1.21 million additional students would have enrolled in the 1990s.

Investing sufficiently in student grants represents an efficient use of tax dollars, especially if the goal of public policy is to equalize postsecondary opportunity. Although a state that provided an across-the-board new investment in terms of per-FTE direct appropriations may have kept tuition at a reasonable level, the tuition reduction resulting from the increased state investment is not likely to have yielded as many new students. Moreover, the taxpayer cost per student enrolled in higher education would have increased.

The proposed state-federal partnership represents a more workable approach for improving financial access for qualified students than any of the other options now open to the federal government. The cost to the federal government per new student enrolled would be \$1,600, substantially less than other forms of federal student aid. For states, the new program would cost about \$3,200 per new student, which is significantly less than the investment necessary for states to maintain a minimum need-based grant threshold on their own.

The challenge facing state and federal policy is to expand access while making more efficient use of tax dollars that are available for higher educa-

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*A state-federal partnership represents a more workable approach for improving financial access.*

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tion. If the United States is to meet the college-access challenge of the early 21st century, then changes in higher education finance are necessary. The federal government can help states meet this access challenge by:

- Providing a basic grant that meets a minimum adequacy threshold (i.e., a Pell grant that is equal to room and board cost in public colleges).
- Initiating a new state-federal grant program that provides tuition support for college-qualified students who have financial need.

The basic grant could be achieved by setting the Pell maximum at the average living costs of public colleges in the U.S., then indexing the grant to inflation so there would be no incentive to raise living costs. The maximum Pell awards during the past four years have been relatively close to this standard. Therefore this modification to the Pell grant program would represent a modest additional investment in this crucial federal program.

The proposed state-federal partnership (Option 2, Page 21) would set a maximum need-based award in each state at the tuition level of public colleges. Students in private colleges could be eligible for the maximum award, possibly with a modest tuition equalization supplement.<sup>21</sup> The cost-benefit analysis for this proposal indicates

that the nation would realize gains in enrollment rates with a sufficient investment in need-based grant aid. This state-federal partnership would provide a low-cost approach for the federal government to ensure financial access for college-qualified, low-income high school graduates.

In the current context, the burden of paying for expanding college access falls substantially on states. In this proposed state-federal grant program, the federal government would make a modest new investment. States would have an incentive to develop more economical approaches for financing the expansion of the public and private colleges. In addition, the state-federal collaboration would have substantially lower costs for federal taxpayers than the widely advocated option of doubling or tripling the size of Pell grants.

Although this program may result in additional increases in tuition during the first few decades of the 21st century, the public investments in higher education would become more efficient and more progressive. That is, higher-income families would pay the "market" price for college, while state support would make that price more affordable for moderate- and low-income families. It is time to make tough choices. It simply is not possible to continue to reduce taxes, allow tuitions to increase to inaccessible levels, and expand access to four-year colleges. Coordination of federal and state finance strategies is a feasible way to meet the access challenge.



# Appendices

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## Appendix I: State indicators for demographic and financial variables

Annual reports by NCES in the Integrated Postsecondary Education Data System (IPEDS), as well as supplemental analyses provided by Tom Mortenson at Postsecondary Education Opportunity, provided data for state indicators. The indicators related to school outcomes were:

- High school graduation rate, used as an outcome measure (calculated from NCES high school graduation data and the enrollment when the cohorts were in ninth grade).
- College enrollment rate, used as an outcome measure (fall enrollment reports were used to calculate the percentage of high school graduates enrolled in higher education in the following fall<sup>22</sup>).

In addition, we used one indicator related to the size of the K-12 population as a control for population size:

- Size of the ninth-grade cohort, used as an independent variable to control for population size (from NCES's Common Core of Data).

IPEDS was the primary data source for the indicators related to tuition and financial aid. Analysis of IPEDS represented a major part of the work required to complete this project, given the complexity of this information system.<sup>23</sup> IPEDS was used for information on:

- College finances (College tuition weighted per FTE).<sup>24</sup>
- State system and college enrollment (Fall enrollment data were used to develop weights<sup>25</sup> for financial indicators and to calculate the percentage of FTE students enrolled in the various sectors of higher

education, public four-year, public two-year, and private colleges in the state. These analyses used total FTE rather than college freshman enrollment because this provided a better indicator of capacity.

The other indicators related to public financing of higher education included:

- Tax rate (state tax collection in a given year divided by personal income, an indicator from U.S. Census Bureau, State Government Tax Collections).
- Need-based grants adjusted per FTE. (Total need-based grants were derived from NASSGAP, Annual Survey Reports and divided by undergraduate FTE in the state.)
- Non-need grants adjusted per FTE. (The sum of total merit and other grants, calculated from NASSGAP, Annual Survey Reports, divided by undergraduate FTE.)
- K-12 expenditures per FTE (NCES, National Public Education Financial Survey).

In addition, this report uses the following state indicators, developed from other data sources:<sup>26</sup>

- Percent poverty in the population<sup>27</sup> (U.S. Census Bureau, Current Population Survey).
- Percent African-American (U.S. Census Bureau, Population Estimates).
- Percent Hispanic (U.S. Census Bureau, Population Estimates).
- Percent other minority (calculated by adding the percentages of Native Americans and Asians and dividing by the state population, U.S. Census Bureau, Population Estimates).
- Percent of the population with bachelor's degrees or higher<sup>28</sup> (U.S. Census Bureau, Current Population Survey).

## Appendix 2: The impact of state financial strategies on high school graduation rates

As explained in the report, state finance strategies can influence high school graduates in two ways (see Figure 1, Page 9). State funds for school and tax rates have a direct effect. In addition, the tuition charges and grant aid programs in a state two years prior to a cohort's graduation can influence enrollment rates because they influence perceptions of college affordability.

### Model specifications

When assessing the impact of state finance policies on high school graduation rates, it is appropriate to use linear models because the outcomes are continuous variables. This report presents the results of two fixed-effect regression analyses of the impact of public finance policies on access using the state indicators data<sup>29</sup> (see Appendix 1). Variables considered in the regression predicting high school graduation rates are shown in Table 2.1 below.

In addition to these variables, the capacity of state systems (number of enrollment slots in the public system) can constrain or expand opportu-

nity. Unfortunately, we did not have an appropriate indicator for total capacity of public systems.

This analysis used a fixed-effects regression. This method includes a latent variable for each state, so the analysis essentially controls for the unique characteristics of states.<sup>30</sup>

### High school graduation rates

The availability of financial aid has an indirect effect on college enrollment rates because it influences the will of low-income students to finish high school (Advisory Committee on Student Financial Assistance, 2002; St. John, 2003). Simply put, students may drop out if they do not think they can get the money they need to pay for college. By the junior year, most students have some understanding of college affordability and available grant aid. If a junior has a 2.5 GPA, but the states give grants only to students with a 3.0, then the state's aid system could have a negative effect on graduation. High school graduation rates were influenced by the demographic context of the state and the strategies used to finance higher education, controlling for public finance of schools (Table 2.2 on the next page).

Table 2.1. Independent variables used in analysis of high school graduation rates

#### ■ Demographic context

1. Percent of the state population below the poverty level
2. Percent of African-Americans in the population
3. Percent of Hispanics in the population
4. Percent of other minorities in the population
5. Size of the ninth-grade cohort four years prior
6. Percent of the population with a bachelor's degree or higher

#### ■ Financial controls

1. Tax rate
2. K-12 expenditures (two years before graduation)

#### ■ Higher education finance strategies

1. Need-based grants per-FTE (two years before high school graduation)
2. Non-need grants per-FTE (two years before high school graduation)
3. Tuition charges weighted per-FTE (two years before high school graduation)



Three of the demographic variables were significant in the fixed-effects regression analysis. The percentage of Hispanics in a state's population was positively associated with high school graduation. The percentage of the population that comprises other minorities and the percentage that had a bachelor's degree or higher were negatively associated with high school graduation rates.

The reasons why education level was negatively associated with high school graduation rates are complex. Since this report provides the first state-level study of this type, it is likely these methods can be improved upon. The fixed-effects analysis statistically controls for the state context. First, we can only speculate about the explanations of the finding on education levels of the popula-

tion. If states import highly educated citizens, they may have artificially depressed high school graduation rates in these statistical models because the population with children is less well-educated (on average) than new citizens attracted to these states. Alternatively, an educated citizenry could keep educational standards high, which may dissuade low-achieving students. Second, high school graduation rates actually declined in the 1990s, which adds to the complexity of interpreting this finding. The decline in graduation rates is partially attributable to the impact of state education reforms.<sup>32</sup> The impact of school reforms is "controlled for" by the state variables implicit<sup>33</sup> in fixed-effects models. Therefore the effects of some reforms could confound these analyses.

**Table 2.2. Fixed-effect regression: the influence of population characteristics and state finance strategies on public high school graduation rate in the 1990s**

	Regression coefficient		Sig.
	Unstand.	Standard.	
Percent poverty	0.063	0.025	
Percent African-American	0.774	0.803	
Percent Hispanic	1.222	1.103	*
Percent other minorities	-5.356	-5.366	***
Enrollment when the cohort was ninth grade	0.000	0.262	
Percent of population with bachelor's degree or higher	-0.310	-0.151	**
Tax rate (=state tax collection/personal income)	0.100	0.015	
Per student K-12 expenditures (\$/1,000) two years prior	-0.003	-0.027	
Per-FTE need-based grant amount (\$/1,000) two years prior	0.031	0.094	
Per-FTE non-need grant amount (\$/1,000) two years prior	-0.061	-0.097	**
Undergrad in-state tuition and fees for public system (\$/1,000) two years prior	-0.321	-0.371	***
Adjusted R square	0.933		
N	200		
P-value for F test that all $\alpha_i=0$ <sup>31</sup>	0.000		

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

This analysis addresses questions about the influence of a state's demographic composition on high school graduates. The fixed-effects approach controls for specific state contexts in a set of uncoded variables for the state. When this approach is used, the education level of the population has a substantially different effect on high school graduation rates than we would expect from research on academic preparation. This result suggests that further research is needed on the effects of school reform policies on high school graduation rates.

Tuition charges and state grants, both measured two years prior to graduation, also had an influence

on high school graduation rates. Both tuition charges and non-need grants were negatively associated with high school graduation rates.<sup>34</sup> Need-based grants were not significant, but had a positive association with high school graduation rates.<sup>35</sup> Higher need-based grants had a positive association with high school graduation rates,<sup>36</sup> while higher merit-based grants were negatively associated with graduation rates. This statistical association may have occurred because students with low grades believe they cannot afford to attend college in their states if they do not maintain the grade point requirements necessary to attain merit-based grants.

### Appendix 3: Ordinary least squares regressions

This appendix presents the ordinary least squares (OLS) regression for high school graduation rates (Table 3.1) and college enrollment rates (Table 3.2). These tables are provided for comparison purposes and are discussed in the text and end notes.

**Table 3.1. OLS regression: The influence of population characteristics and state finance strategies on public high school graduation rate in the 1990s**

	Regression coefficient		Sig.
	Unstand.	Standard.	
Percent poverty	-0.206	-0.081	
Percent African-American	-0.612	-0.634	***
Percent Hispanic	-0.416	-0.375	***
Percent other minorities	-0.118	-0.118	**
Enrollment when the cohort was ninth grade	-0.000	-0.063	
Percent of population with bachelor's degree or higher	0.274	-0.134	**
Tax rate (=state tax collection/personal income)	0.241	0.037	
Per student K-12 expenditures (\$/1,000) two years prior	-0.013	-0.129	*
Per-FTE need-based grant amount (\$/1,000) two years prior	0.102	0.311	***
Per-FTE non-need grant amount (\$/1,000) two years prior	-0.060	-0.097	**
Undergrad in-state tuition and fees for public system (\$/1,000) two years prior	-0.039	-0.045	
Adjusted R square	0.630		
N	200		

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 3.2. OLS regression: The influence of population characteristics and state finance strategies on college enrollment rate in the 1990s

	Regression coefficient		Sig.
	Unstand.	Standard.	
Percent poverty	-0.206	-0.081	
Percent African-American	-0.612	-0.634	***
Percent Hispanic	-0.416	-0.375	***
Percent other minorities	-0.118	-0.118	**
Enrollment when the cohort was ninth grade	-0.000	-0.063	
Percent of population with bachelor's degree or higher	0.274	-1.134	**
Tax rate (=state tax collection/personal income)	0.241	0.037	
Per student K-12 expenditures (\$/1,000) two years prior	-0.013	-0.129	*
Per-FTE need-based grant amount (\$/1,000) two years prior	0.102	0.311	***
Per-FTE non-need grant amount (\$/1,000) two years prior	-0.060	-0.097	**
Undergrad in-state tuition and fees for public system (\$/1,000) two years prior	-0.039	-0.045	
Adjusted R square	0.630		
N	200		

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$



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# Endnotes

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- <sup>1</sup> The term “non-need” is used for merit and other specially directed grants that do not use financial need for eligibility.
- <sup>2</sup> In the ordinary least squares analysis, need-based grants had a significant and positive association with graduation rates. These relationships are confounded by the use of state context variables in the fixed-effects analysis.
- <sup>3</sup> The measurement of the impact of social variables (i.e., parents’ education and income) on educational attainment is rooted in sociological theory and research (Alexander & Eckland, 1974, 1977, 1978; Blau & Duncan, 1967) and recent studies that examine social capital formation (Ellwood & Kane, 2000; Hearn, 2001; Steelman & Powell, 1993).
- <sup>4</sup> This study tested the use of both poverty rates and income per capita. However, the two variables were highly correlated, therefore poverty rate was used as a predictor because it related more directly to the financial access issues that were of concern in this report. In addition, since tax rate was used in the analyses, we had an additional statistical control for the influence of wealth. In response to inquiries from reviewers of an earlier version of this analysis, the study team also tested the use of unemployment rates as a predictor variable. However, as expected, unemployment was very highly correlated with poverty rate; therefore, it was not included in the final model.
- <sup>5</sup> This study controls for the influence of school funding, but not school reform policies. High school graduation rates dropped during the 1990s, a period during which more stringent requirements were implemented. Therefore, to fully assess the impact of school funding on graduation rates, it would also be necessary to examine the impact of school reform policies.
- <sup>6</sup> In earlier analyses the research team had developed separate analyses of enrollment rates in public two-year colleges, public four-year colleges, private colleges and colleges in other states. The project advisory committee suggested modifying the base access model to consider the role of system complexity, as an alternative to presenting a larger number of statistical models. In particular, Laura Perna was helpful in conceptualizing the role of system capacity in the access models presented in the paper.
- <sup>7</sup> The early analyses included an analysis of the impact of state financial strategies on the percentage of high school graduates who enroll out of state. These analyses will be published separately, along with the analyses of



the impact of state financial strategies on the distribution of high school graduates within state systems.

<sup>8</sup> The OLS regressions provide a useful set of analyses for comparison purposes. The endnotes are used to provide comments on the OLS regressions in comparisons to the fixed-effect regressions.

<sup>9</sup> Dresch (1975) was among the first to critique simulations that used price response measures to predict the effects of changes in policy on enrollment. Although there was a substantial effort after Dresch's critique to improve the methods used to standardize price response measures (Jackson & Weathersby, 1975; Leslie & Brinkman, 1988; McPherson, 1978), these analyses did not overcome the logical problems identified by Dresch. St. John (1993, 1994a, 2003) has systematically tested Dresch's assumptions, which hold up well. The simulation methods used in this paper carry these efforts to the next step by using a specially assembled state database to examine the effects of state grants and to simulate the impact of alternative methods of awarding grants.

<sup>10</sup> The analyses in Table 2 and Appendix 2 used a fixed-effects regression. Appendix 3 presents the OLS regression for the same model. Comparisons between the two models are made in endnotes.

<sup>11</sup> There is a substantial body of research to indicate that access by low-income students is directly affected by changes in need-based aid (see reviews by Heller [1997] and St. John [2003]).

<sup>12</sup> The readers are reminded that since this analysis considers the population that has graduated from high school, it controls for a minimum level of academic preparation. Further, high school graduation is an appropriate measure of preparation for enrollment in community colleges. While federal aid policies, including need-based and non-need grants, vary over time with changes in enrollment

rates, especially for low-income students (St. John, 2003), they cannot be used to examine the effects of state finances. Since federal programs have consistent award criteria across the states, Pell grants and other federal aid do not substantially vary across states within years.

<sup>13</sup> One difference between the OLS regression and the fixed-effects regression is that the percentage of African-Americans in the population was positively associated with enrollment in the OLS regression. The positive effects noted in the OLS analyses were related to state contexts. Most states with larger percentages of African-Americans in their populations have historically black colleges and universities (HBCUs) in their public systems. The presence of HBCUs is one possible explanation for this statistical artifact.

<sup>14</sup> The findings were similar in the OLS analysis.

<sup>15</sup> In addition, non-need grants were not significant in the OLS model.

<sup>16</sup> Need-based grants are efficient, not only because of the statistical significance, but also because they cost less than direct subsidies to institutions that benefit all students, by holding down tuition.

<sup>17</sup> While it is conceivable that economies could be maintained by constraining expenditures, it is difficult to reduce expenditures in research universities that compete nationally for the top faculty. For a full discussion of approaches for coordinating public finance strategies see St. John (2003).

<sup>18</sup> Price (2003) also recommends an alternative hybrid policy of federal/state coordination that includes an increase in the Pell Grant linked to additional state grants and/or a specific level of public tuitions. See *Borrowing inequality: race, class and student loans*. Boulder, CO; Lynne Rienner Publishers.

<sup>19</sup> This proposal adapts and simplifies the two-tier grant strategy proposed by St. John (2003). The initial proposal recommended setting the maximum of the base grant at half



- the average cost of attending a low-cost public college and limiting the second tier to twice the first tier as a cost-control strategy. The proposal in this paper sets the maximum for the base grant at room and board, which would equal about half of total cost. The second tier in this proposal would not be limited. Rather, it would depend on market and political forces to limit increases (in both prices and grants).
- <sup>20</sup> The maximum award could be higher for private colleges, depending on state priorities. However, the minimum priority should be to coordinate public tuition charges with need-based grants.
- <sup>21</sup> A similar approach for private college grants has been used in Indiana, a state that made substantial gains in access in the 1990s (St. John, Musoba, Simmons, & Chung, 2002).
- <sup>22</sup> The study team used IPEDS, along with data reported annually by Tom Mortenson in Postsecondary Education Opportunity newsletter and available from postsecondary.org. Using NCES data, Mortenson calculated college continuation rates by state based on the number of high school graduates from the Current Population Survey of the Census Bureau and college freshmen from the IPEDS Fall Enrollment.
- <sup>23</sup> It was frequently necessary to sum information for campuses and states across different IPEDS data files in order to develop appropriate indicators.
- <sup>24</sup> Education revenues and expenditures as well as state appropriations were considered in preliminary analyses but not included in the final model.
- <sup>25</sup> College tuition charges in public colleges were weighted for each state to reflect the actual pattern of enrollment in the state. The number of undergraduates enrolling in each public college was multiplied by the undergraduate in-state tuition charge for the college, then these numbers were summed and divided by the total number of undergraduates enrolling in the state. This weighted tuition charge reflects the composition of enrollment in the state.
- <sup>26</sup> These indicators were generally available as state averages. We generated these indicators by abstracting information from generally available sources, which did not require the extensive reanalysis necessary to work with the cumbersome IPEDS databases.
- <sup>27</sup> We also examined other possible indicators related to state economic conditions, including unemployment rates and income per capita.
- <sup>28</sup> This variable provides a logical control for the influence of parents' education. There is a high correlation between the percentage of high school students in a state whose parents attended college and the percentage of the population with a four-year degree or higher. We also tested the inclusions of a variable for the percent of the population with at least a high school diploma and/or some college. Including this variable had no discernible effect on the results, so it was left out of the final model.
- <sup>29</sup> Fixed-effects regression provides the appropriate method of analysis given the fact that multiple years (or a time series) are included in the data set. The fixed-effects method provides a means of controlling for the state context. Don Heller, a member of the advisory committee, consulted with the research team on the selection of a regression method.
- <sup>30</sup> Appendix 3 provides the ordinary least squares regression tables for comparison with the fixed-effects regression reported in Table 2 (Page 11) and Table 2.2 (Page 27).
- <sup>31</sup> The null hypothesis of the F test is that the state-specific, fixed-effect terms are all zeros. The fixed-effect model can be judged to be significantly different from the OLS model when we reject the null hypothesis.
- <sup>32</sup> Jacob (2001) and Berger & Coelen (2002) both found that high school graduation rates were negatively associated with high-stakes graduation exams.

<sup>33</sup> When the fixed-effects method of regression is used, the analysis provides a coefficient for each state. The data reported in the tables suppress these individual state variables because they have no meaning other than providing a statistical control.

<sup>34</sup> Non-need grants and tuition charges were negatively associated with graduation rates in

the OLS analysis as well, even though tuition charges were not significant.

<sup>35</sup> In the OLS regression the need-based grant amount was significant and positively associated with high school graduation rates. This means that state contexts reduce the measurable effects of need-based grants.

<sup>36</sup> These positive effects are illustrated in the simulations presented in the paper.

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