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Cover Page Footnote

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Does Merit-Based Aid Improve College Affordability? Testing the Bennett Hypothesis in the Era of Merit-Based Aid

By Jungmin Lee

This study tested the Bennett hypothesis by examining whether four-year colleges changed listed tuition and fees, the amount of institutional grants per student, and room and board charges after their states implemented statewide merit-based aid programs. According to the Bennett hypothesis, increases in government financial aid make it easier for colleges to raise their tuition. Because many statewide merit-based aid programs covered full tuition and fees for students enrolled in their state colleges, I hypothesized that colleges in states that implemented merit-based aid programs would raise student charges or reduce institutional aid for more revenue. Using the difference-in-differences method, I analyzed data from the Integrated Postsecondary Education Data System (IPEDS) from 1987 to 2009. My results showed that colleges significantly changed their prices, but did not always increase the net price that students had to pay. Public colleges in many states with merit-based aid reduced published tuition and fees and increased the amount of institutional grants per student. These results suggest that the implementation of merit-based aid programs could make college education more affordable for those who receive the aid, and may not harm non-recipients.

Keywords: *merit-based aid, Bennett hypothesis, tuition, institutional aid*

College affordability has become an important concern across the country. According to a national survey in 2009, more than half of American adults surveyed believe that academically qualified students do not have enough opportunities for college education in spite of its importance to their future success (Immerwahr et al., 2010). Rising college costs and student debt levels also suggest that college education is out of reach even for those coming from middle-income households. To mitigate the financial burden of students and families, governments and colleges have spent a huge amount of money on financial aid. In 2010, federal and state governments invested approximately \$141.3 billion, and colleges spent \$29.7 billion on undergraduate financial aid (College Board, 2011).

Among many scholarship programs, statewide merit-based aid is a new type of financial aid that covers tuition and fees for in-state college students exclusively based on their academic merit. Due to its simple rules and broad coverage, statewide merit-based aid has become widely available across the country and gained lots of attention from researchers. To date, researchers have shown that merit-based aid largely increased freshman enrollments across all racial groups, particularly in four-year public colleges (Cornwell, Mustard, & Sridhar, 2006; Dynarski, 2002). Given these results, it seems that merit-based aid is successful at boosting freshman enrollments. However, little is known about its other potential, and possibly negative, effects on students and colleges.

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One of the potential consequences is its impact on college tuition as suggested in the Bennett hypothesis. According to the Bennett hypothesis, increases in federal aid make it easier for colleges to raise their tuition because the aid will help students pay tuition (Bennett, 1987). The hypothesis seems plausible in the case of merit aid, given that merit aid programs cover a substantial portion of listed tuition and fees for a majority of students in state public colleges. If state governments are covering the full cost of tuition, then why would students care if their colleges increase tuition and fees?

This study examined how colleges responded to the creation of statewide merit-based aid and the impact of these responses on college affordability. Although many studies have reported the positive impact of financial aid on student demand, little is known about its impact on the supply side (Leslie & Brinkman, 1987; Heller, 1997). Understanding institutional responses to financial aid is important because colleges can modify the impact of financial aid by changing tuition, room and board charges, and the amount of institutional grants (Long, 2004). This study investigated a relatively unexplored area of institutional responses to financial aid, and tested whether a financial aid policy that provided institutions with different incentives was as effective as originally intended. Results from this study can inform state policymakers who are interested in whether their merit-based aid has improved college affordability, especially given the recent tuition hikes and economic recession (Baum & Ma, 2011; Quizon, 2011).

Background

Since the early 1990s, statewide merit-based aid has been popular across the country. After Arkansas started its Academic Challenge Scholarship in 1991, more than a dozen states implemented statewide merit-based aid programs. By the 2010-11 academic year, all but seven states provided non-need-based aid, with some state aid considering financial need as well as academic performance (NASSGAP, 2011). Following the example of previous studies (e.g., Dynarski, 2002; Zhang & Ness, 2010), I defined statewide merit-based aid programs as those which determined eligibility solely by students' academic achievement and those that targeted a wide population of resident students rather than a few elite students. Using this standard, a financial aid program that determined eligibility by both financial need and academic performance (e.g., Cal Grant A) was not considered. Table 1 summarizes each of these programs' inception year, eligibility requirements, and award amounts when each program was first implemented. In some states, eligibility standards and award amounts have changed over time. Because my study examined changes in student costs right before and after states implemented merit-based aid, I focused on the academic requirements and award amounts applied when each aid program was first implemented.

According to Table 1, merit-based aid programs have some common features, although their academic requirements and award amounts differ. First, most programs set the academic standard around a 3.0 high school GPA. This standard made it possible for these programs to benefit a large number of resident students considering that approximately "40% of high school seniors in 1999 met this standard" across the country (Dynarski, 2002, p. 64). Second, most programs covered more than half of tuition and fees at their state's public four-year colleges, especially after each of these programs was adopted.

Table 2 provides the average tuition and fees at public and private four-year institutions when each state started its merit-based aid program. Several states (e.g., Georgia and Florida) subsidized 100% of tuition and fees for students enrolled in public four-year colleges, while other states, such as New Mexico and Nevada, provided a fixed amount of money that was sufficient to pay tuition and fees at public four-year colleges.

Table 1. Statewide Merit-Based Scholarship Programs

State (Start Year)	Initial Criteria	Award Amounts Per Year
Alaska (1999/2011)	<ol style="list-style-type: none"> UA Scholars Program <ul style="list-style-type: none"> (UA System only; top 10% of graduating class) Alaska Performance Scholarship <ol style="list-style-type: none"> 3.5 GPA & 25 ACT or 1680 SAT 3.0 GPA & 23 ACT or 1560 SAT 2.5 GPA & 21 ACT or 1450 SAT 	\$2,750 <ol style="list-style-type: none"> \$4,755 \$3,566 \$2,378
Arkansas (1991)	Arkansas Academic Challenge Scholarship <ul style="list-style-type: none"> 2.5 GPA in HS core & 19 ACT 	Public & Private: 1 st year: \$2,500 2 nd year: \$2,750 3 rd year: \$3,000 4 th year: \$3,500
Florida (1997)	Florida Bright Futures Scholarship (two-tiered) <ol style="list-style-type: none"> Florida Academic Scholar H.S. (3.5 GPA & 1270 SAT or 28 ACT) Florida Medallion Scholar H.S. (3.0 GPA & 970 SAT or 20 ACT) 	Public <ol style="list-style-type: none"> 100% tuition & fees 75% tuition & fees Private The average public tuition & fees
Georgia (1993)	Helping Outstanding Pupils Educationally <ul style="list-style-type: none"> 3.0 GPA 	Public: Full tuition & fees Private: \$3,000
Kentucky (1999)	Kentucky Educational Excellence Scholarship <ul style="list-style-type: none"> 2.5 GPA 	Public: \$125-\$2,500 Private: Equivalent (Award varies based on a high school GPA from 9 th to 12 th grade. Additionally, students can earn a bonus amount based on SAT/ACT scores and AP/IB exams)
Louisiana (1998)	Taylor Opportunity Program for Students (three-tiered) <ol style="list-style-type: none"> Honors Award <ul style="list-style-type: none"> 3.0 GPA & 27 ACT Performance Award <ul style="list-style-type: none"> 3.0 GPA & 23 ACT Opportunity Award <ul style="list-style-type: none"> 2.5 GPA & ACT score above the state's average 	Public: <ol style="list-style-type: none"> Tuition & fees + \$800 Tuition & fees + \$400 Tuition & fees Private: The average public tuition & fees
Massachusetts (2005)	The John and Abigail Adams Scholarship <ul style="list-style-type: none"> Score "advanced" or "proficient" and top 25% of graduating class in their district in MCAS math and English 	Public only: Tuition only (up to six semesters)
Maryland (2002-2005)	Maryland HOPE Scholarship <ul style="list-style-type: none"> 3.0 GPA in HS Core 	Public & private: \$3,000 (subject to availability of fund)
Michigan (2000-2008)	Michigan Merit Award & Promise Scholarship <ul style="list-style-type: none"> Level2 on all four components of MEAP test or Level2 on two components of MEAP test and 75th percentile of SAT/ACT 	In-state public & private: \$2,500 Out-of-state public & private: \$1,000 Not renewable (one-time award)
Mississippi (1996)	<ol style="list-style-type: none"> Mississippi Resident Tuition Assistance Grant (MTAG) <ul style="list-style-type: none"> GPA & 15 ACT Mississippi Eminent Scholars Grant (MESG) <ul style="list-style-type: none"> GPA & 29 ACT 	Public & private: Freshman/Sophomore: \$500 Junior/Senior: \$1,000 Up to \$2,500 per year (no more than tuition and fees)

continued on next page

Table 1–Continued. Statewide Merit-Based Scholarship Programs

State (Start Year)	Initial Criteria	Award Amounts Per Year
Missouri (1987)	Bright Flight Scholarship <ul style="list-style-type: none"> • Top 3-5% of all MO students taking either ACT or SAT 	Up to \$3,000 for public and private, depending on annual funds
Nevada (2000)	Millennium Scholarship <ul style="list-style-type: none"> • 3.0 GPA & pass the state's exit exam 	Public only: Up to \$2,500
New Mexico (1997)	Lottery Success Scholarship <ul style="list-style-type: none"> • No high school criteria • GPA at the first semester in college 	Public only: Tuition & fees
South Carolina (1998)	LIFE Scholarship <ul style="list-style-type: none"> • 3.0 GPA and 1100 SAT or 24ACT 	Public and private: \$2,000
Tennessee (2004)	Tennessee Educational Lottery Scholarship (four-tiered) <ol style="list-style-type: none"> 1. GAMS <ul style="list-style-type: none"> • 3.75 GPA & 28 ACT 2. HOPE Base <ul style="list-style-type: none"> • 3.0 GPA or 19 ACT 3. ASPIRE <ul style="list-style-type: none"> • 3.0 GPA or 19 ACT & adjusted gross income <\$36,000 4. ACCESS <ul style="list-style-type: none"> • 2.75 GPA & 18 ACT & adjusted gross income <\$36,000 	Public & private: <ol style="list-style-type: none"> 1. \$4,000 2. \$3,000 3. \$4,000 4. \$2,000
West Virginia (2002)	PROMISE <ul style="list-style-type: none"> • 3.0 GPA & 1000 SAT or 21 ACT 	Public: Tuition & fees Private: Average tuition & fees

Sources: Dynarski (2002); Dynarski (2005); Hu, Trengove, and Zhang (2012); Orsuwan & Heck (2009); Zhang & Ness (2010); States' web sites.

Lastly, most of these programs, except those in Massachusetts, Nevada, and New Mexico, provided students enrolled in private colleges in their states with amounts equivalent to those provided to their students in public institutions. The amount was not sufficient, but it still helped these students to pay their tuition. Considering the lenient academic standards and generous award amounts, merit-based aid might be an easier target from which colleges can gain revenue compared to other financial aid programs.

Conceptual Framework

I grounded this study on the Bennett hypothesis and Bowen's revenue theory of costs. The Bennett hypothesis suggests that colleges increase listed tuition and fees to capture additional revenue resulting from an increase in federal financial aid. Although the hypothesis was initially proposed to predict tuition changes in responses to increases in federal aid, researchers also tested the hypothesis against increases in state aid (e.g., Long, 2004). This study also tested the hypothesis against creation of statewide merit-based aid.

The Bennett hypothesis rests on the revenue theory of costs, which argues that colleges try to increase revenue as long as it does not harm their reputations (Bowen, 1980). According to Bowen, there is a spiral effect among college finances (including tuition and institutional aid), educational quality, and reputation. Colleges with large external subsidies from governments and philanthropies can afford charging less for

Table 2. Merit-Based Aid Award Amounts and the Average Tuition Levels

State	Minimum Award Amount	Average Tuition & Fees (in Current Dollars)	
		Public Four-Year	Private Four-Year
AK	\$2,378	\$5,578	\$21,070
AR	\$2,500	\$1,805	\$5,721
FL	Public: 75% to 100% of tuition & fees Private: Weighted average tuition & fees of Public 4-year colleges	\$1,911	\$11,525
GA	Public: Tuition & fees Private: \$1,500	\$1,886	\$9,040
KY	\$500-\$2,500 (Depending H.S GPA & ACT score)	\$2,723	\$9,614
LA	Public: Tuition & fees Private: Weighted average tuition & fees of public 4-year colleges	\$2,390	\$14,003
MA	Tuition only (up to 8 semesters)	\$7,290	\$27,335
MD	\$3,000	\$5,406	\$20,156
MI	\$1,250 (for the first two years)	\$4,615	\$11,155
MO	Up to \$3,000 (depending on funding availability)	\$1,532	\$7,170
MS	MTAG: Freshman & Sophomore: \$500 Junior & Senior: \$1,000 MESG: \$2,500	\$2,497	\$7,226
NM	Public: Tuition only (from the second semester)	\$2,073	\$8,943
NV	\$2,500	\$2,344	\$11,465
SC	Public: \$2,000	\$3,414	\$10,660
TN	\$4,000	\$4,039	\$15,074
WV	Public: Tuition & fees Private: Equivalent to public amount	\$2,898	\$12,441

Source: U.S. Department of Education (1990-2011).

Note: Due to data availability, the average tuition in Missouri is tuition for the academic year of 1989-1990 rather than 1987-1988.

students and spending more on education. This investment, in turn, attracts high-performing students and scholars to their institutions, which enhances the reputations of the colleges. Colleges with high-achieving students and scholars then attract more external funding from government and private sectors, and the spiral goes on. Because most colleges are nonprofits, they can also spend as much revenue as they have (Martin, 2011).

To summarize, colleges seek more revenue to invest in their students, scholars, and facilities to enhance their reputation. Because most merit-based aid programs covered a substantial portion of tuition and fees for a majority of their state resident students, I hypothesized that colleges attempted to capture this new source of revenue by increasing their listed tuition and fees, reducing their own spending on institutional grants, or increasing room and board charges.

Literature Review

Positive Effects of Merit-Based Aid

Researchers have found positive effects from merit-based aid on students' academic preparation, college enrollment, and graduation. First, merit-based aid seems to motivate high school students to work hard to meet the academic requirements. After the Helping Outstanding Pupils Educationally (HOPE) scholarship started in Georgia, the average SAT scores of high school seniors and college freshmen significantly increased (Cornwell, Mustard, & Sridhar, 2006; Henry & Rubenstein, 2002). In Tennessee, the number of students who scored at least a 19 on ACT, which was the cut-off score to receive the state's merit-based aid at the time, increased after the implementation of the merit-based aid (Pallais, 2009).

The availability of merit-based aid also increases college enrollment across all racial groups, especially in four-year colleges (Cornwell, Mustard, & Sridhar, 2006; Dynarski, 2002). After analyzing the data for seven southern states that adopted merit-based aid before 2000, Dynarski (2002) showed that merit-based aid in almost all of these states had significant and positive effects on college enrollments. Zhang and Ness (2010) argued that merit-based aid kept the best and brightest students in their home states, as research universities, which are typically more selective than other types of institutions, experienced the greatest the enrollment increases following implementation of merit-based aid.

Furthermore, merit-based aid promotes degree attainment. At the state level, the share of adults with college degrees (Dynarski, 2005) and the number of bachelor's degree holders (Zhang, 2011) have increased in states that adopted statewide merit-based aid. At the student level, HOPE scholarship recipients in Georgia were more likely to persist and graduate within four years compared to students who lost or never received the HOPE scholarship (Henry, Rubenstein, and Bugler, 2004). In West Virginia, Scott-Clayton (2011) found that the state's merit-based aid recipients were more likely to take sufficient credits to graduate within four years in order to maintain their merit-based aid than non-recipients.

Unintended Consequences and the Bennett Hypothesis

Despite these positive effects, there are concerns about unintended consequences of merit-based aid. First, Heller and Marin (2002, 2004) suggested that merit-based aid could limit college access for racial minority students or low-income students due to its sole focus on academic achievement. As a result, a large sum of state money is awarded to students who would have gone to college anyway instead of students who really need it to attend college. However, Singell Jr., Waddell, and Curs (2004) found that in regions where students qualify for the HOPE scholarship, the number and proportion of low-income students have not decreased in both two-year and four-year colleges since the HOPE scholarship started. In addition, there is

some evidence that merit-based aid actually increases enrollment and degree attainment of both White and non-White students (Cornwell, Mustard, & Sridhar, 2006; Dynarski, 2002, 2005). Considering these results, merit-based aid appears to have positive effects across racial and income groups.

Another concern regarding merit-based aid is its impact on institutions. Because merit-based aid reduces net costs of attending public colleges for a majority of students, it may have affected students' college choice between public and private institutions. Even worse, the availability of statewide merit-based aid may have led to public colleges engaging in "rent-seeking" behaviors. Rent-seeking occurs when agents attempt to influence the social or political environment so as to guarantee their profits following the instatement of government restrictions on economic activities (Krueger, 1974; Pasour, 1987). After states adopt merit-based aid, colleges may seek to increase their revenue, or "capture rents," by raising their prices, as suggested by the Bennett hypothesis.

To date, only a few studies have examined whether the Bennett hypothesis has held true in the context of state merit-based aid. Long (2004) found that private four-year colleges in Georgia directly increased tuition and fees, while public four-year colleges indirectly raised their price by increasing room and board charges. These price increases were the most pronounced in colleges with many HOPE recipients. In contrast, since the inception of Florida's Bright Futures Scholarship, community colleges in the state have spent more money on institutional grants without changing tuition and fees (Calcagno & Alfonso, 2007). According to the authors, community colleges were covering their students' unmet needs (the difference between listed tuition and fees and the grants from all sources) because many community college students were only eligible for the Florida Medallion Scholars, which provided only 75% of tuition and fees to students who satisfied less stringent academic requirements. Results from both studies suggest that colleges are well aware of additional revenue state merit-based aid generates and change prices in a way that would increase their revenue.

Several studies also tested the Bennett hypothesis against federal aid or state need-based aid. However, their results are inconclusive. More revenue from the Federal Pell Grants or federally subsidized loans led to tuition increases in public four-year colleges (McPherson & Shapiro, 1991), state flagship universities (Rizzo & Ehrenberg, 2004), and both public and private four-year colleges (Singell & Stone, 2007). These results suggest that colleges change their tuition in response to changes in federal financial aid. In contrast, Lan and Winters (2011) did not find significant tuition changes in colleges that enrolled many Washington D.C. residents after the District of Columbia College Access program began.

When researchers test the Bennett hypothesis, it is important that they look at institutional grants in addition to listed tuition and fees. Although it is less visible, colleges often change the amount of institutional grants in response to government aid. For example, students who received more Federal Pell Grants (L. J. Turner, 2012) or students who received federal tax credits (N. Turner, 2012) were awarded lower amounts of institutional grants. These results demonstrated that the intended benefit of federal aid programs—to ease the financial burden of students and families by subsidizing tuition and fees—was offset by decreased institutional grants.

Curs and Dar (2010) showed that colleges responded differently to state financial aid depending on their governance structures. Public colleges in states with coordinating governing boards and private colleges, both of which enjoy more institutional autonomy, raised their net price in response to increased state aid. In contrast, public colleges in states with consolidating boards, which are granted less autonomy, reduced listed tuition and increased institutional grants. These findings suggest that there can be many factors that moderate the way institutions respond to government financial aid.

In summary, colleges and universities respond to federal and state government financial aid policies. Their response is more pronounced in colleges where a large number of students benefit from the policy, or in colleges with more market power and institutional autonomy over tuition setting. Colleges also change the dollar amount of institutional grants, as well as the listed tuition and fees, in response to external aid changes.

Data and Sample

Based on the literature, this study addressed three research questions. First, after the states implemented merit-based aid policies, did four-year colleges in merit-based-aid states increase tuition and fees more than colleges in states without merit-based aid? Second, after the states implemented merit-based aid policies, did four-year colleges in those states reduce the dollar-value of institutional grants awarded per student more than colleges in states without merit-based aid? Third, after the states implemented merit-based aid policies, did four-year colleges in those states increase room and board charges more than colleges in states without merit-based aid?

By looking at all three price measures, this research provides a more complete picture of whether and/or how four-year colleges responded to their state's merit-based aid policy. It is important to examine all three prices because colleges sometimes indirectly raise their prices instead of directly increasing their tuition, as Long (2004) demonstrated.

In addition, this research examined all thirteen states that have adopted merit-based aid. This allowed me to explore whether colleges' responses differed depending on each state's merit-based aid design, which has rarely been considered in previous studies.

I acquired data from the Integrated Postsecondary Educational Systems (IPEDS) that the National Center for Education Statistics collected from 1987 to 2009. IPEDS is the most appropriate existing dataset to study postsecondary education institutions because it provides college characteristics, enrollments, and financial information for every postsecondary institution that applied for or participated in any federal financial aid program authorized by Title IV.

Of the states that implemented statewide merit-based aid (shown in Tables 1 and 2), I did not include Alaska, Maryland, and Missouri for the following reasons. Because the Alaska Performance Scholarship started in 2010, there were only a few years of data to compare before and after the program implementation. I excluded Maryland from the analysis because its merit-based aid program lasted only four years. I did not include Missouri because it restricted eligibility to only the top 5% of its resident students, which made the program very selective compared to other states' programs.

I limited my sample to public four-year colleges and nonprofit private four-year colleges across the United States. I first excluded for-profit colleges because they may have different pricing policies given their explicit goal of making profit and heavy reliance on federal aid. Moreover, a majority of students enrolled in for-profit colleges were non-traditional adult students who were ineligible for state merit aid in most states. I also omitted two-year colleges because introducing merit-based aid could have different effects on these institutions compared to four-year colleges, as illustrated in Calcagno and Alfonso (2007). Some colleges, mainly branch campuses or community colleges, were originally classified as two-year institutions, but changed into four-year institutions in later years. I treated these colleges as two-year colleges and excluded them from my study. Lastly, I dropped specialized institutions (e.g., seminary or art school) and tribal colleges, as designated by the Carnegie Classification 2000/2005, because many of these colleges are very

small, pursue a specific educational goal, and have different revenue structures compared to four-year colleges.

After excluding these colleges, the analysis included 449 public four-year colleges and 840 private four-year colleges. Table 3 provides the descriptive statistics of my sample in the academic year of 1990-91. At this time, there was no statewide merit-based aid program available, with the exception of the Missouri Bright Flight Scholarship which was not considered for this study because it only selected those with the top SAT or ACT scores. The top panel in Table 3 shows the descriptive statistics for colleges in all 50 states, while the bottom panel provides the descriptive statistics only for colleges in Southern states. I compare the descriptive statistics of the treatment group to other Southern states because most states in the treatment group are located in the South.

Across the country, colleges in future merit-based-aid states charged slightly lower tuition and room and board charges, provided less amounts of institutional grants per student, and received less amounts of external resources than colleges in non-merit-based-aid states. This pattern was consistent when I focused on Southern states, except that public colleges in future merit-based-aid states charged slightly higher tuition and fees than public colleges in non-merit-based-aid states. This pre-policy trend adds credibility to the argument that many states adopted statewide merit-based aid programs because their colleges charged comparatively higher tuition in the first place.

Methods

To answer my research questions, I used the difference-in-differences method. The difference-in-differences method compares the before-and-after-policy change in an outcome variable for the treatment group to that of the control group. For example, in my study, I compared the change in tuition observed in the treatment group (colleges whose states implemented merit-based aid policies) to that of the control group (colleges in other states that have not adopted merit-based aid policies) four years before and after the introduction of merit-based aid. I chose this eight-year window because it took at least four years for a newly adopted merit-based aid program to be available for all students from freshmen to seniors.

When using the difference-in-differences method, it is important to choose appropriate control groups that are similar to the treatment group except in the policy of interest (Angrist & Pischke, 2009). In this study, I employed two control groups: 1) colleges located in the neighboring states of the treatment group and 2) colleges in all 50 U.S. states. The first control group is colleges located in neighboring states that have not adopted merit-based aid programs during the period studied (i.e., four years before and after a treatment state implemented merit-based aid). For example, I compared colleges in Georgia to colleges in the rest of the South that never adopted merit-based aid from 1989 to 1996. I compared colleges in the treatment group states located outside the South (e.g., Michigan) to colleges in states that belong to the same regional compact (e.g., the Midwestern Higher Education Compact).

In addition to neighboring states, I also used as a control group colleges in all U.S. states that never adopted merit-based aid during the period studied. Previous studies used Southern states as a control group because most merit-based aid states are located in the South, and these states are comparable in terms of higher education demand and economic condition (Dynarski, 2002; Long, 2004; Zhang & Ness, 2010). However, my study looked at thirteen states that adopted merit-based aid programs in different years, and I excluded these states from the control group once they adopted merit-based aid. This decision resulted in only five states left in the control group for the treatment group that adopted merit-based aid in the mid-2000s. For this reason, I employed the second control group (colleges in all U.S. states) and checked if the

Table 3. Descriptive Statistics of Samples in 1990-1991 (in Current Dollars)

All 50 States				
	Public (N=449)		Private (N=840)	
	Merit	Non-merit	Merit	Non-merit
Tuition and fees	1,713.3 (460.4)	1,816.1 (683.4)	7,681.4 (3,555.8)	8,632.3 (2,989.0)
Institutional grant aid per FTE student	237.7 (212.0)	245.0 (274.9)	1649.0 (1204.1)	1789.7 (1124.0)
Room & board charges	2,813.0 (654.6)	3,129.4 (809.5)	3,648.9 (1,203.9)	3,719.3 (915.5)
State appropriation	51,293,205.0 (71,667,659.5)	64,142,718.7 (97,174,295.8)	1,737,566.7 (3,155,878.4)	1,639,749.7 (3,793,545.5)
Private gifts, contracts, endowments, & investments	7,116,868.8 (17,706,073.0)	8,717,136.8 (20,883,783.7)	8,032,662.3 (32,652,977.1)	7,253,309.6 (24,931,330.2)
Southern States Only				
	Public (N=187)		Private (N=258)	
	Merit	Non-merit	Merit	Non-merit
Tuition & fees	1,595.8 (334.8)	1,566.3 (697.2)	6,312.4 (2,783.6)	6,990.9 (2,498.8)
Institutional grant aid per FTE student	232.5 (189.2)	257.1 (282.2)	1474.9 (1085.9)	1489.8 (797.5)
Room and board charges	2,668.9 (615.0)	2,997.7 (766.0)	3,246.5 (983.3)	3,411.6 (877.0)
State appropriation	47,769,720.8 (67,380,897.3)	53,827,388.6 (105,777,121.4)	4,500,639.2 (5,800,593.0)	1,639,556.6 (3,021,694.5)
Private gifts, contracts, endowments, and investments	5,651,463.6 (14,615,697.6)	8,361,070.6 (22,783,298.9)	4,365,614.1 (10,043,727.8)	7,797,420.9 (24,378,874.9)

estimates significantly differed. Using this second control group addressed the sample size issue although it may not be as comparable to the treatment group as the first control group was.

I used the statistical equation (1) to answer my research questions. I ran the model separately for public and private four-year colleges because these two types of colleges substantially differ in terms of tuition

levels and the major source of revenue. I also ran the model separately for each of the thirteen merit-based-aid states because each state has a different higher education context and merit-based aid program, which could lead to different effects across states. In equation (1), y_{ist} is the dependent variable of institution i located in state s in year t . Note that y_{ist} refers to listed tuition and fees for the first research question, the amount of institutional grants awarded per FTE student for the second research question, and room and board charges for the third research question. I took a natural logarithm of these dependent variables so that I could interpret a coefficient as a percent change as a result of a one-unit change in an independent variable.

$$(1) y_{ist} = \alpha + \gamma(\textit{merit}) + \lambda(\textit{post}) + \delta(\textit{merit} * \textit{post}) + \phi_s(\textit{state}_s) + \theta_t(\textit{year}_t) + X_{ist}'\beta + \varepsilon_{ist}$$

In the model above, *merit* is a dummy variable for each of the treatment states analyzed, and *post* is a dummy variable that indicates whether or not merit-based aid has been adopted in the treatment state. The interaction term between these two variables (*merit*post*) is the key independent variable of this study. If the Bennett hypothesis holds, the coefficient on the interaction term (δ) will be statistically significant and positive for the first and third research questions, suggesting increased tuition and fees and increased room and board charges, respectively. For the second research question, the negative and statistically significant coefficient on the interaction term (δ) means that colleges reduced the amount of institutional grants per student in response to the creation of merit-based scholarships. I also added year (θ_t) and state fixed effects (ϕ_s) to capture potential year-specific and state-specific effects on college prices.

X_{ist} is a vector of state-level and college-level covariates that are known to affect tuition and financial aid. At the college level, I added a dummy variable that indicates a doctoral-granting institution. I also included state appropriation revenue (only for public college), revenue from private sources (such as investment return, endowment income, private gifts, grants, and contracts), the number of full-time and equivalent (FTE) students, and the number of full-time faculty members. I added these variables because selectivity and size of institutions are closely related to the amount of revenue from external sources (Curs & Dar, 2010; Long, 2004; Lowry, 2001; Rizzo & Ehrenberg, 2004; Singell & Stone, 2007). In addition, there are several state-level time-varying covariates in the model: the size of young adult population (20 to 24 years old), state unemployment rates, the percentage of bachelor's degree holders among the population, per capita income, and the total amount of state need-based grants awarded. These state-level covariates are related to a state's higher education demand, which in turn affects college enrollment and tuition levels (Cheslock & Hughes, 2011; Lowry, 2001).

When using a panel dataset, serial correlation is a serious problem that significantly reduces the standard error of estimates, and hence, falsely rejects the null hypothesis (Bertrand, Duflo, & Mullainathan, 2004; Wooldridge, 2005). To address this issue, I used cluster-robust standard errors which minimized the impact of heteroskedasticity of errors (Drukker, 2003).

Limitations

There are some limitations in this study. First, it did not examine why colleges responded to merit-based aid in certain ways. Although I explored possible explanations such as governance structure, testing all possibilities was outside the scope of this study. Second, it is possible that other factors related to tuition or college finance could have occurred in the treatment states at the same time merit-based aid was adopted. For example, a state might have adopted performance-based funding or started a statewide need-based grant. If any of these events occurred, it also could have affected my estimates.

Results

Changes in Tuition and Fees, Institutional Grants, and Prices

Tables 4 through 7 provide the difference-in-differences estimates. Tables 4 and 5 show the results for public four-year colleges using neighboring states and all 50 states as control groups, respectively. Tables 6 and 7 present the results for private four-year colleges using neighboring states and all U.S. states, respectively. Table 8 summarizes all these results. In order to save space, only the coefficient on the interaction term between merit-based aid and post-policy dummy variables (δ) are presented.

Table 4 provides coefficients and standard errors for public colleges in each of the thirteen treatment states compared to public colleges in their neighboring states. The first column shows the name of each treatment state and the sample size used in the model for each state. The next three columns show price changes in tuition and fees, the amount of institutional grants per FTE student, and room and board charges after each treatment state implemented its merit-based aid program. For example, I used 1,298 public four-year colleges in total to analyze price changes in response to Arkansas' Academic Challenge Scholarship. After the scholarship was implemented in 1991, public colleges in Arkansas significantly increased in-state tuition and room and board charges by 2.1% and 10.3%, respectively. However, they did not significantly change the amount of institutional grants compared to public colleges in other Southern states.

Overall, colleges in many states experienced changes in the three outcomes of this study: listed tuition and fees, the dollar amount of institutional grants per student, and room and board charges (hereafter referred to as *college prices* or simply *prices*). However, colleges' responses to the implementation of merit-based aid differed across states and college types. Due to the heterogeneity in the estimates, I explain a few common patterns across states and then discuss two factors that partially explain the heterogeneous responses. When discussing my results, I focus on the results that were consistent across the two control groups. In general, most estimates especially for public colleges were consistent regardless of control groups used. However, estimates tended to be more sensitive when the sample size used in the analysis was relatively small (e.g., estimates for room and board charges or private colleges). The abbreviations of states with consistent results are bold and italicized in Table 8.

Four-year colleges in several states increased either tuition and fees or room and board charges, if not both, after adopting merit-based aid programs. For instance, both public and private four-year colleges in Arkansas significantly raised both types of student charges after their state adopted merit-based aid. Public colleges in Kentucky, Massachusetts, and South Carolina, as well as private colleges in Georgia, Nevada, and New Mexico, also raised their tuition and fees more than their comparison groups. These results showed that in many states, colleges raised their student charges in response to the adoption of merit-based aid.

However, the increased student charges do not necessarily mean that the net price students paid out of pocket also increased. When I looked at all three outcomes simultaneously, colleges in some states increased the amount for institutional aid per student when they raised student charges. For example, public colleges in Georgia and Massachusetts, as well as private colleges in New Mexico and Nevada, increased the dollar amount of both institutional aid and tuition. If colleges provided more money for institutional aid per student, then the negative impact of tuition increases were mitigated to some extent. Moreover, colleges in many of the states did not significantly change in all three areas of interest (e.g., Tennessee), or increased institutional aid without raising student charges (e.g., Florida). In these states, attending four-year colleges has not become more expensive than their comparison groups.

Table 4. Difference-in-Differences Results for Public Colleges (Using Neighboring States)

	In-State Tuition (1)	Institutional Grant (2)	Room & Board Charge (3)
Arkansas (N=1,298)	0.021* (0.012)	-0.001 (0.045)	0.103*** (0.010)
Florida (N=955)	-0.067*** (0.015)	0.214** (0.071)	-0.012 (0.009)
Georgia (N=1,357)	-0.125*** (0.019)	0.414*** (0.061)	0.056*** (0.010)
Kentucky (N=924)	0.052* (0.025)	-0.069 (0.045)	0.018 (0.019)
Louisiana (N=988)	-0.048 (0.047)	0.058 (0.080)	-0.035* (0.016)
Massachusetts (N=137)	0.126*** (0.010)	0.272* (0.130)	0.054** (0.017)
Michigan (N=867)	-0.017 (0.013)	0.359 (0.347)	-0.027* (0.013)
Mississippi (N=985)	-0.147*** (0.021)	0.176** (0.067)	-0.004 (0.010)
Nevada (N=604)	0.097** (0.032)	-0.482* (0.229)	-0.053* (0.027)
New Mexico (N=642)	-0.035 (0.051)	0.010 (0.104)	0.057** (0.025)
South Carolina (N=972)	0.052** (0.020)	0.066 (0.040)	-0.085*** (0.015)
Tennessee (N=727)	-0.017 (0.022)	0.144 (0.099)	-0.113*** (0.019)
West Virginia (N=748)	0.008 (0.027)	-0.065 (0.099)	0.054*** (0.007)

Note. Every model includes state and year fixed effects and covariates. Cluster-robust standard errors are used.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5. Difference-in-Differences Results for Public Colleges (Using All U.S. States)

	In-State Tuition (1)	Institutional Grant (2)	Room and Board Charge (3)
Arkansas (N=3,182)	0.032** (0.013)	-0.076 (0.059)	0.086*** (0.009)
Florida (N=2,856)	-0.006 (0.031)	0.148** (0.061)	0.016* (0.009)
Georgia (N=3,276)	-0.080*** (0.019)	0.304*** (0.059)	0.041*** (0.010)
Kentucky (N=2,726)	0.042** (0.019)	-0.009 (0.071)	0.008 (0.011)
Louisiana (N=2,781)	-0.042 (0.026)	0.179 (0.137)	-0.021* (0.013)
Massachusetts (N=2,424)	0.099*** (0.030)	0.189** (0.087)	0.044*** (0.010)
Michigan (N=2,652)	-0.029* (0.017)	-0.002 (0.175)	-0.027*** (0.009)
Mississippi (N=2,895)	-0.144*** (0.015)	0.191** (0.083)	-0.001 (0.005)
Nevada (N=2,729)	0.053 (0.029)	-0.588* (0.242)	-0.061*** (0.012)
New Mexico (N=2,548)	0.065** (0.024)	-0.435*** (0.160)	-0.051*** (0.012)
South Carolina (N=2,765)	0.047*** (0.014)	0.037 (0.066)	-0.087*** (0.009)
Tennessee (N=2,473)	0.003 (0.018)	0.010 (0.114)	-0.085*** (0.012)
West Virginia (N=2,558)	0.018 (0.033)	-0.643* (0.374)	0.040*** (0.008)

Note. Every model includes state and year fixed effects and covariates. Cluster-robust standard errors are used.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6. Difference-in-Differences Results for Private Colleges (Using Neighboring States)

	In-State Tuition (1)	Institutional Grant (2)	Room and Board Charge (3)
Arkansas (N=1,806)	0.091*** (0.020)	-0.095** (0.037)	0.080*** (0.016)
Florida (N=1,441)	-0.005 (0.011)	0.330*** (0.029)	-0.003 (0.006)
Georgia (N=1,914)	0.018** (0.007)	0.111*** (0.023)	-0.058*** (0.011)
Kentucky (N=1,360)	0.005 (0.011)	0.017 (0.021)	-0.017* (0.009)
Louisiana (N=1,305)	-0.005 (0.025)	-0.128** (0.048)	-0.005 (0.018)
Massachusetts (N=644)	0.023 (0.016)	0.045 (0.050)	-0.015 (0.011)
Michigan (N=1,931)	-0.023*** (0.006)	0.153*** (0.037)	-0.001 (0.007)
Mississippi (N=1,412)	-0.007 (0.013)	0.081** (0.026)	0.023** (0.008)
Nevada (N=701)	0.238*** (0.011)	0.729*** (0.050)	-0.028 (0.019)
New Mexico (N=708)	0.111*** (0.020)	0.322*** (0.060)	0.130*** (0.031)
South Carolina (N=1,377)	0.004 (0.009)	-0.168*** (0.023)	0.035*** (0.007)
Tennessee (N=1,122)	-0.025* (0.012)	-0.051 (0.029)	-0.013* (0.006)
West Virginia (N=966)	0.048 (0.027)	0.236* (0.111)	-0.015 (0.012)

Note. Every model includes state and year fixed effects and covariates. Cluster-robust standard errors are used.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7. Difference-in-Differences Results for Private Colleges (Using All U.S. 50 States)

	In-State Tuition (1)	Institutional Grant (2)	Room & Board Charge (3)
Arkansas (N=6,065)	0.095*** (0.010)	-0.087*** (0.025)	0.064*** (0.008)
Florida (N=5,763)	0.026*** (0.007)	0.279*** (0.018)	0.009** (0.004)
Georgia (N=6,242)	0.023*** (0.006)	0.064** (0.026)	-0.064*** (0.007)
Kentucky (N=5,559)	0.020*** (0.004)	0.009 (0.011)	-0.012*** (0.005)
Louisiana (N=5,497)	0.018** (0.008)	-0.133*** (0.020)	0.000 (0.006)
Massachusetts (N=4,831)	-0.026*** (0.009)	-0.051* (0.029)	-0.019*** (0.007)
Michigan (N=5,458)	-0.027*** (0.005)	0.097** (0.020)	-0.013** (0.005)
Mississippi (N=5,741)	0.008 (0.006)	0.041* (0.024)	0.023*** (0.006)
Nevada (N=5,620)	0.215*** (0.008)	0.859*** (0.021)	-0.018* (0.008)
New Mexico (N=5,317)	0.207*** (0.005)	0.836*** (0.020)	-0.019*** (0.005)
South Carolina (N=5,569)	0.019*** (0.005)	-0.169*** (0.014)	0.035*** (0.004)
Tennessee (N=4,976)	0.002 (0.006)	-0.046** (0.018)	0.002 (0.005)
West Virginia (N=5,128)	0.052*** (0.011)	0.242*** (0.031)	-0.011 (0.018)

Note. Every model includes state and year fixed effects and covariates. Cluster-robust standard errors are used.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8. Results Summary Table by Outcomes

Outcome	Sign	Public		Private	
		Neighbors	All	Neighbors	All
Tuition	+	5 <i>(AR, KY, MA, NV, SC)</i>	5 <i>(AR, KY, MA, NM, SC)</i>	4 <i>(AR, GA, NV, NM)</i>	9 <i>(AR, FL, GA, KY, LA, NV, NM, SC, WV)</i>
	-	3 <i>(FL, GA, MS)</i>	3 <i>(GA, MI, MS)</i>	2 <i>(MI, TN)</i>	2 <i>(MA, MI)</i>
Institutional aid	+	4 <i>(FL, GA, MA, MS)</i>	4 <i>(FL, GA, MA, MS)</i>	7 <i>(FL, GA, MI, MS, NV, NM, WV)</i>	7 <i>(FL, GA, MI, MS, NV, NM, WV)</i>
	-	1 <i>(NV)</i>	3 <i>(NV, NM, WV)</i>	3 <i>(AR, LA, SC)</i>	5 <i>(AR, LA, MA, SC, TN)</i>
Room and board	+	5 <i>(AR, GA, MA, NM, WV)</i>	5 <i>(AR, FL, GA, MA, WV)</i>	4 <i>(AR, MS, NM, SC)</i>	4 <i>(AR, FL, MS, SC)</i>
	-	5 <i>(LA, MI, NV, SC, TN)</i>	6 <i>(LA, MI, NV, NM, SC, TN)</i>	3 <i>(GA, KY, TN)</i>	6 <i>(GA, KY, MA, MI, NV, NM)</i>

Note. States whose results are consistent regardless of their control groups are bold and italicized. Neighbors refer to states that belong to the same region with the treatment state. For example, neighbors of Tennessee are all other southern states that never adopted merit-based aid.

Considering all three outcomes within each state, Table 9 summarizes the direction of the net price change in each state. With the exception of the last (fifth) category, Table 9 presents the common patterns observed in the order of less affordable to more affordable. For example, colleges in the first category raised student charges without increasing student aid. This was the worst scenario observed. If students did not receive merit-based aid, they would pay higher prices than before, compared to their peer students in other states. Public colleges in Arkansas, Kentucky, and West Virginia, as well as private colleges in Arkansas, South Carolina, and Louisiana, belonged to this category. Colleges in the second category raised student aid in addition to increasing student charges. Although these colleges charged their students more than before, the increased aid would most likely help students pay the additional costs for their education.

For the states in the third or fourth category, college education has become more affordable. Colleges in the third category increased the amount of student aid without changing student charges. Private colleges in Florida and West Virginia fell into this category. After the adoption of merit-based aid, students at these colleges had more money to pay their tuition, a cost that did not significantly increase compared to colleges in other states. The colleges in the fourth category decreased student charges relative to colleges in other states. In other words, after adopting merit-based aid, going to college in these states has been less expensive than going to college in other states. Public colleges in five states and private colleges in two states showed these results. Moreover, some of these colleges (e.g., public colleges in Florida and Mississippi and private

Table 9. Results Summary Table (Common Patterns)

Pattern	Description	Public	Private
Increased student charges	Colleges increased tuition and/or room & board charges without raising institutional aid	3 (AR, KY, WV)	3 (AR, SC, LA)
Increased student charges (Increased aid)	Colleges increased institutional aid as well as tuition and/or room & board charges	1 (MA)	3 (MS, NV, NM)
Increased aid	Colleges increased institutional aid without changing student charges	–	2 (FL, WV)
Decreased student charges (Increased aid)	Colleges decreased tuition and/or room & board charges (and increased aid in some cases)	5 (FL, MS, LA, MI, TN)	2 (KY, MI)
Inconclusive results	1) Results are sensitive depending on control groups, or 2) One type of student charges (e.g., tuition) increased, while the other (e.g., room & board charges) decreased.	4 (GA, NV, SC, NM)	3 (GA, MA, TN)

colleges in Michigan) increased the amount of institutional aid per student. As a result, college education in these states could become more affordable than before.

Lastly, for some states I did not have sufficient evidence to determine the overall direction of the net price changes. In the fifth category, estimates for some states (e.g., public colleges in New Mexico) were sensitive depending on the control group choice. In some instances, colleges in other states showed contrasting results between tuition and fees and room and board charges. For example, public colleges in Georgia significantly reduced tuition and fees and increased room and board charges. Long (2004) found the same results and explained that these contrasts suggested a limited capability of public colleges in determining their own tuition. Although this is totally plausible, it is difficult to directly compare the percentage point changes between the two price measures (tuition and fees versus room and board charges). Therefore, I made a separate category for these states with contrasting estimates and left them as inconclusive.

Possible Explanations for Heterogeneous Results

Thus far, I have described a few common patterns in my results and demonstrated the heterogeneity of these estimates. My results were strikingly different across states and college types. In order to explain the heterogeneity, I explored whether each state's merit-based aid design, as well as higher education governance structures, were related to colleges' responses. As seen in Tables 1 and 2, eligibility requirements and award amounts varied widely across states. These differences in merit-based aid design could provide

colleges with different incentives. I hypothesized that colleges whose states set less rigorous requirements and provided generous funding were more likely to raise their student charges and reduce the amount of institutional aid per student. In contrast, colleges in states with more rigorous requirements and that provided less institutional aid would be less likely to raise student charges and reduce institutional aid.

Figure 1 shows states based on the rigorousness of the academic requirements for their merit-based aid and the generosity of their funding. The x -axis represents the rigorousness based on the minimum high school GPA required, while the y -axis represents the generosity in terms of the percentage of the average tuition and fees at in-state public four-year colleges covered by merit-based aid. If a state's merit-based aid program was multi-tiered (e.g., Florida's Bright Future Scholarships), I used the least rigorous standard and the minimum award amount. In Massachusetts and Michigan, scholarship eligibility has been determined by their state exam scores or standardized test scores rather than high school GPAs. Because students in these two states were required to be within the top 25% on these tests to be eligible for merit-based aid, I assumed that this requirement was more rigorous than having a 3.0 GPA in high school.

As shown in Figure 1, states on the top left corner (e.g., Arkansas and Louisiana) covered almost 100% of tuition and fees in public four-year colleges, and set the minimum requirement for eligibility around a 2.5 GPA. Hence, I hypothesized that colleges in these two states would be more likely to take advantage of the system by raising student charges and/or reducing institutional aid. In contrast, states on the far right bottom corner (e.g., Massachusetts and Michigan) limited the eligibility around the top 25% within their state and provided only a portion of tuition and fees. Because the number of eligible students was very limited, I expected colleges in these states not to raise student charges and/or reduce institutional aid. These hypotheses partially explained the results. Among the four states that I mentioned above, the hypotheses explained the results for Arkansas and Michigan. Colleges in Arkansas (with large incentive) raised student charges without increasing institutional aid, while colleges in Michigan (with small incentive) decreased student charges. However, the hypotheses did not explain results for Louisiana and Massachusetts well. Although merit-based aid provided 100% of the tuition and fees for students with a 2.5 high school GPA, public colleges in Louisiana decreased student charges. In Massachusetts, public colleges raised all three price measures although their state merit-based aid covered tuition only, leaving a large portion of required fees unsubsidized. These results suggest that colleges do not always respond to the incentives embedded in merit-based aid programs.

Moreover, private colleges significantly changed their prices in some states, even though students enrolled in private colleges were not eligible for the states' merit-based aid. Of the thirteen states examined in this study, three states (Massachusetts, New Mexico, and Nevada) limited the merit-based aid eligibility to students in their public colleges. If private colleges in these states had responded to their state's merit-based aid (or incentive generated from the aid), they would not have increased their tuition due to the possible loss of students. However, private colleges in New Mexico and Nevada increased their tuition, as well as the amount of institutional aid per student. These responses in private colleges also call into question whether colleges change their prices in response to merit-based aid.

Another factor that can explain the heterogeneous responses observed is whether individual institutions in a state have the capability of setting their own tuition costs. As Long (2005) mentioned, public colleges have less authority over their tuition than private colleges. Instead, their tuition levels are monitored or determined by many stakeholders such as state legislature, state higher education agency, or system board (Bell, Carnahan, & L'Orange, 2011). Following Curs and Dar (2010), I hypothesized that the way public colleges responded to merit-based aid was different depending on the level of autonomy that individual colleges had regarding their tuition levels. In particular, colleges with less autonomy would reduce their student charges or increase the amount of institutional aid per student so that their tuition policy can be aligned with their state initiative.

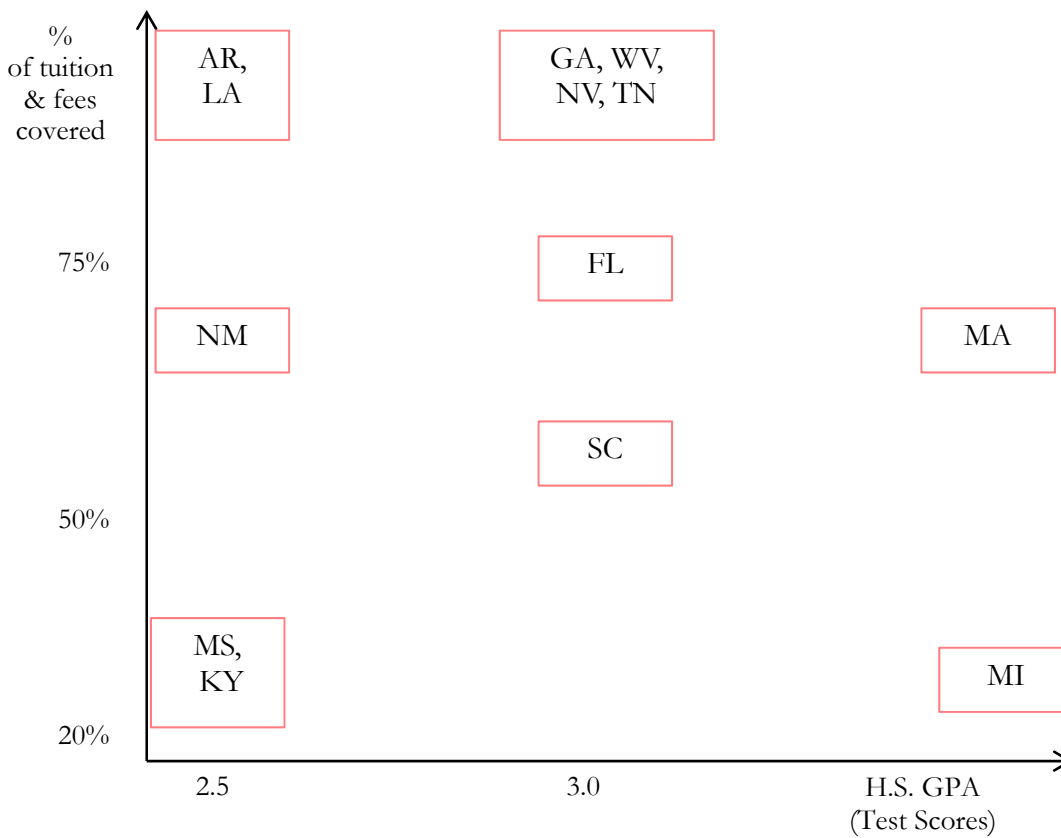


Figure 1. Academic Requirements and Award Amounts of Merit-Based Aid

Table 10 provides information about higher education governance structure in each state. Based on the survey conducted by State Higher Education Executive Officers, panel (A) shows the agency that had the primary authority over tuition setting within a state when its merit-based aid was adopted. The information is placed in the order of the level of centralization, from the most centralized (e.g., state legislature) to the least centralized (e.g., individual institutions).

Panel (B) provides the type of higher education governance structure in each state at the time of merit-based aid adoption. As Richardson et al. (1999) explained, the decision-making process is more centralized in a state with a consolidating board, while individual institutions have more autonomy in a state with a coordinating board or a planning agency. According to both panels, state agencies (or external boards) appeared to have more influence on public colleges in Florida, Louisiana, Georgia, Mississippi, and Nevada than other states. Of the five states with a more centralized form of governance, public colleges in Florida, Louisiana, and Mississippi decreased student charges and sometimes increased the amount of institutional aid per student. Public colleges in the other two states (Georgia and Nevada) showed mixed results. In addition, anecdotal evidence suggested that there was an initiative to keep public college tuition low in Florida and Georgia because tuition increases would directly call for more funding for merit-based aid (Rasmussen, 2003). Although higher education governance structure did not perfectly explain the way colleges responded to merit-based aid, it explained why public colleges in some states might not be able to raise their net prices in response to their state merit-based aid.

Table 10. Higher Education Governance Structure

(A) Primary Authority over Tuition	
Primary authority	States
State legislature	FL, LA
Statewide agency for multiple systems	GA, KY, MA, NM, NV
Governing boards for individual systems	TN
Individual institutions	AR, MI, MS, SC, WV
(B) Higher Education Governance Structure	
Structure	States
Consolidating board	FL, GA, MS, NV
Regulatory coordinating board with budget authority	AR, KY, LA, MA, NM, SC, TN, WV
Planning agency	MI

Source: Panel (A) Christal (1997); Rasmussen (2003); Bell, Carnahan, & L'Orange (2011), Panel (B) Doyle (2013).

Note. Higher education governance structure implemented at the time of adoption of merit-based aid (or the closest year, if not available) is reported.

Falsification Test

As described above, I found that both public and private colleges in many states significantly changed tuition and fees, the amount of institutional grants per student, and room and board charges in response to the creation of merit-based aid. However, I cannot entirely rule out the possibility that my treatment states (i.e., states that have adopted merit-based aid) have a tendency to change their prices more than the control states regardless of their state merit-based aid policy. In the appendix, I present the results from the falsification test that examined whether colleges in each of the treatment states significantly changed their prices more than their control groups at least six years before or after their state merit-based aid was implemented. Although estimates varied widely across states, the estimates for some states were still statistically significant and consistent to the main results. These results suggest that colleges in the treatment states were more likely to raise their student charges or decrease the amount of institutional aid per student even when merit-based aid was not available, and the main results might just reflect these overall trends. The results from the falsification test again support the main finding of this study: The adoption of merit-based aid does not necessarily lead colleges in most states to take advantage of their state merit-based aid by raising college prices.

Discussion

As college tuition has increased more rapidly than family income, financial aid plays a critical role in students' college decisions. Both federal and state governments spend an increasing amount of money in order to make college education affordable. Although it appears that an increase in government aid is inevitable in order to keep pace with rising tuition, there is a concern that more aid may lead to tuition increase. If so, increasing government aid may help colleges earn more revenue rather than improve college affordability.

My study showed that this was not the case when it came to statewide merit-based aid. In response to statewide merit-based aid, colleges significantly changed tuition and fees, the amount of institutional grants per student, and room and board charges. However, these price changes did not always increase the net price that students actually paid for their education. For example, public colleges in some states that adopted merit-based aid did not significantly raise their tuition and fees, and private colleges in many merit-based-aid states increased the amount of institutional grants per students. The direction and magnitude of college responses differed across states, but each program's academic requirements and award amounts were not always related to the way colleges responded to merit-based aid. State higher education governance structure explained the way colleges responded to merit-based aid to some extent.

These results can be interpreted in two ways. First, the adoption of merit-based aid does not necessarily make our public colleges more expensive in most states. Although colleges in a few states significantly raised tuition and/or room and board charges, some of them also increased institutional aid per student. Moreover, public colleges in many states either decreased or did not significantly change tuition and fees. Considering these results, attending public college in most merit-based-aid states has become more affordable for students eligible for merit-based aid. As listed tuition and fees have remained stable or decreased in many states, receiving merit-based aid helps students pay for their education. If these students received financial aid from other sources (e.g., Federal Pell Grants) in addition to their merit-based aid, the adoption of merit-based aid would significantly reduce their unmet needs. Even for students who were not eligible for the aid programs, the introduction of merit-based aid did not significantly raise the cost of attending public four-year colleges in most states.

Second, colleges may have used the additional revenue from state merit-based scholarships to subsidize their students rather than to reduce the amount of institutional grants per student and secure more revenue. Both public and private colleges in many states significantly increased the dollar value of institutional grants that each student received. Although it is not clear to whom these colleges distributed the additional institutional aid money, they might have spent it on subsidizing out-of-state students or needy students who were not eligible for state merit-based scholarships. In either case, the creation of state merit-based scholarships may have allowed these colleges to provide more institutional grants and enhance college affordability for their students.

Finally, based on my findings, the Bennett hypothesis does not always hold in the context of state merit-based aid. The Bennett hypothesis assumes that colleges attempt to maximize their utility by raising tuition in response to increases in government financial aid, up to the point where it does not harm their reputation. However, this study showed that colleges in many states did not significantly increase their tuition and fees. Moreover, colleges were not responsive to the incentive embedded in their state's merit-based aid programs, with the exception of a couple of states. This result further calls into question the validity of the Bennett hypothesis in the context of merit-based aid. The fact that some states intentionally kept college costs low at their public colleges suggests that individual institutions might not be capable of raising their tuition even if they would like to.

Practical Implications

In summary, this study demonstrates that there is little empirical evidence to support the Bennett hypothesis in the context of statewide merit-based aid. This finding has implications for state legislators and campus financial aid officials. Combined with previous studies (e.g., Cornwell, Mustard, & Sridhar, 2006; Dynarski, 2005), research shows that merit-based aid increases college attendance and attainment without raising tuition prices. State legislators may use the evidence as a foundation for continuing their state merit-based aid or expanding their programs. In addition, results from this study can be also considered when state legislators should prioritize their higher education budget. It is timely, given that several states have considered or implemented tightening their eligibility requirements for merit-based aid due to budget constraints (Postal, 2014; Sisk, 2014).

However, it is still important to note that this result does not occur in vacuum. Without appropriate state monitoring, colleges may respond differently to government financial aid, possibly in a way that increases their revenue as demonstrated in Turner's research (2012). Hence, I recommend that policymakers and state legislators monitor changes in college prices when a new financial aid program is implemented. In addition to tuition and fees, policy makers should pay attention to changes in room and board charges and institutional grants. Although these prices are directly related to college affordability, policymakers and the public rarely monitor them.

Lastly, campus officials should consider to whom colleges distribute their institutional grants. Because many students in public colleges are eligible for statewide merit-based aid that covers a substantial portion of tuition and fees, public colleges have more flexibility in spending their institutional grants. When financial aid practitioners make a decision, they need to pay special attention to two groups of students: students from low-income families and students who lose eligibility for merit-based aid. Many low-income students not only lack financial resources to pay their tuition but also have grades that are too low for statewide merit-based aid eligibility. As a result, many of them still have difficulty paying tuition even though their state governments have a generous merit-based aid program. Such students are still eligible for federal and state need-based aid, but award amounts from need-based aid are often insufficient to pay tuition and fees in most four-year institutions. In addition, many merit-based aid recipients lose their merit aid after a couple of years because they fail to maintain their GPA above a renewal eligibility requirement (Tennessee Higher Education Commission, 2015). It is difficult for these students to find another source of financial aid because most institutional aid award decisions are made before they enter their college. Given these possibilities, financial aid practitioners need to secure a portion of institutional grants for low-income students who are not eligible for merit-based aid in the first place and merit-based-aid recipients who lose their aid eligibility later.

Conclusion

This study tested the Bennett hypothesis against statewide merit-based aid by examining whether four-year colleges changed listed tuition and fees, the dollar amount of institutional grants per student, and room and board charges after the implementation of merit-based aid. Results from this study suggest that there is little reason to anticipate that the adoption of merit-based aid will lead to rising college prices. Colleges in most merit-based aid states neither significantly raised their tuition and fees nor decreased their institutional grants per student after their states implemented merit-based aid programs.

Although this study contributes to the literature by exploring institutional responses to merit-based aid, there remain more questions to be answered in order to understand the economic behavior of colleges. Above all, future research needs to address potential factors that affect the way colleges respond to the

creation or expansion of government financial aid. Second, future research needs to examine to whom colleges in merit-based-aid states distribute their institutional grants. Did colleges spend their money on students who already received merit-based aid in order to supplement their unmet needs, or on students who were not eligible for merit-based aid such as low-achieving students or nonresident students? Exploring these questions will provide another important, but mostly missing, piece to the puzzle of how colleges respond to increased state government aid.

Nexus: Connecting Research to Practice

- Results suggest that there is little evidence that adopting a statewide merit-based aid program leads colleges to raise student charges or decrease the amount of institutional grants. State legislators and policymakers may use this evidence to advocate for continuing or expanding their state merit-based aid.
- Legislators and policymakers should keep monitoring changes in student charges and institutional aid after their state governments starts a new financial aid program or expands an existing one. In particular, they should pay attention to changes in the amount of institutional grants per student and room and board charges. These prices clearly affect college affordability, but tend to be overlooked by the public and policymakers.
- Campus-level financial aid practitioners should secure institutional grants for low-income students and students who lose state merit-based aid in later years. Although these students may still be eligible for federal and state need-based aid, award amounts from need-based aid are often not sufficient to pay tuition and fees in most four-year colleges. In addition, it is difficult for these students to get additional institutional grants because financial aid packages are often determined before students enter college.

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Appendix. Falsification Test**Table A1. Falsification Test Results (Public 4-Year Colleges)**

State (Available Years)	Control Groups	Tuition & Fees (1)	Institutional Grants (2)	Room & Board Charges (3)
Arkansas	Neighboring	57%	N/A	0%
(7 years)	All	57%	N/A	0%
Florida	Neighboring	100%	0%	N/A
(1 year)	All	N/A	0%	0%
Georgia	Neighboring	100%	0%	80%
(5 years)	All	100%	0%	80%
Kentucky	Neighboring	100%	N/A	N/A
(2 years)	All	100%	N/A	N/A
Louisiana	Neighboring	N/A	N/A	0%
(1 year)	All	N/A	N/A	0%
Massachusetts	Neighboring	N/A	N/A	N/A
(8 years)	All	37.5%	87.5%	25%
Michigan	Neighboring	N/A	N/A	N/A
(3 years)	All	33%	N/A	0%
Mississippi	Neighboring	100%	0%	N/A
(2 years)	All	100%	0%	N/A
Nevada	Neighboring	N/A	N/A	N/A
(3 years)	All	N/A	N/A	N/A
New Mexico	Neighboring	N/A	N/A	N/A
(1 year)	All	N/A	0%	N/A
South Carolina	Neighboring	0%	N/A	0%
(1 year)	All	0%	N/A	0%
Tennessee	Neighboring	N/A	N/A	50%
(7 years)	All	N/A	N/A	N/A
West Virginia	Neighboring	N/A	N/A	0%
(5 years)	All	N/A	N/A	N/A

Note. I ran the same model as specified in equation (1) for all years available at least six years from the actual implementation year. For example, Arkansas implemented merit-based aid policy in 1991. Thus, I set its false implementation year as every year from 1998 to 2004, ran my model for each of the false years, and checked whether the result was consistent with the main result. The percentages in the table indicate the percentage of false years that show consistent results among all available false years. N/A (not applicable) indicates that the main result is not statistically significant.

Appendix—Continued. Falsification Test

Table A2. Falsification Test Results (Private 4-Year Colleges)

State (Available Years)	Control Groups	Tuition & Fees (1)	Institutional Grants (2)	Room & Board Charges (3)
Arkansas	Neighboring	57%	43%	86%
(7 years)	All	86%	57%	100%
Florida	Neighboring	N/A	0%	N/A
(1 year)	All	0%	0%	0%
Georgia	Neighboring	40%	20%	20%
(5 years)	All	40%	20%	20%
Kentucky	Neighboring	N/A	N/A	0%
(2 years)	All	100%	N/A	N/A
Louisiana	Neighboring	N/A	0%	N/A
(1 year)	All	N/A	0%	N/A
Massachusetts	Neighboring	N/A	N/A	N/A
(8 years)	All	75%	25%	62.5%
Michigan	Neighboring	N/A	N/A	N/A
(3 years)	All	0%	100%	33%
Mississippi	Neighboring	N/A	0%	100%
(2 years)	All	N/A	0%	100%
Nevada	Neighboring	100%	100%	N/A
(3 years)	All	N/A	N/A	N/A
New Mexico	Neighboring	N/A	N/A	N/A
(1 year)	All	100%	100%	0%
South Carolina	Neighboring	N/A	100%	0%
(1 year)	All	0%	100%	0%
Tennessee	Neighboring	N/A	N/A	N/A
(7 years)	All	N/A	N/A	N/A
West Virginia	Neighboring	0%	0%	N/A
(5 years)	All	N/A	N/A	N/A

Note. I ran the same model as specified in equation (1) for all years available at least six years from the actual implementation year. For example, Arkansas implemented merit-based aid policy in 1991. Thus, I set its false implementation year as every year from 1998 to 2004, ran my model for each of the false years. N/A (not applicable) indicates that the main result is not statistically significant.