

# IMPLEMENTATION AND IMPACT OF OUTCOMES-BASED FUNDING IN TENNESSEE

Prepared by *Research for Action* • July 2017

M. Kate Callahan, Ph.D. • Kasey Meehan • Kathleen M. Shaw, Ph.D.  
Austin Slaughter • Dae Y. Kim, Ph.D. • Virginia R. Hunter • Joshua Lin • Lenny Wainstein



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## Outcomes-Based Funding in Tennessee: Implementation and Impact

Executive Summary • July 2017

### Introduction

Outcomes-based funding (OBF) is a term used to define state and system-level higher education funding policies that link public higher education dollars to key student outcomes such as credit completion, retention and graduation (Snyder, 2016). Outcomes-based funding models have evolved from traditional approaches to public higher education funding that include base-plus funding, enrollment-based funding, and early versions of performance-centered funding (Hearn, 2015). Within the past decade, OBF policies have become increasingly prevalent and now exist in some form in about 30 states (Harnisch, 2011).

Research for Action (RFA) has conducted comprehensive, mixed methods research on the development, implementation and effects of robust OBF policies in three states: Indiana, Tennessee, and Ohio. This brief highlights the most policy-relevant findings of our work in Tennessee.

### Policy Overview

In 1979, Tennessee incorporated its first performance metric in the state's funding formula for public higher education institutions. Now, nearly 40 years later, Tennessee has implemented a robust outcomes-based funding model following the adoption of the Complete College Tennessee Act (CCTA) in 2010. As an early adopter of performance measures to align state goals with state funding, Tennessee has been highlighted as an exemplar of OBF. In 2015 and 2016, HCM Strategists recognized Tennessee as an "advanced" implementer of OBF for the following reasons:

- Its focus on completion as a primary metric in alignment with state goals;
- Its prioritization of at-risk students;
- Differentiation between the two-year and four-year sectors;
- The high level of funding allocated by performance on outcomes; and
- Continuity of the model since adoption in 2010.

Tennessee's formula is explicitly designed to recognize variation in institutional missions.<sup>1</sup> Although the state has a single funding formula, it includes a separate set of indicators for two-year and four-year institutions, as seen in Table i. Tennessee institutions also have agency to prioritize certain metrics over

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1 Retrieved from: <http://prichardcommittee.org/wp-content/uploads/2016/06/Tennessee-Kentucky-Prichard-Committee-Presentation-062916.pdf>

others to further reflect their individual missions. Each sector receives premiums for success of targeted student populations as well.

**Table i. Metrics in Tennessee’s 2010-2015 Outcomes-Based Funding Formula, by Sector**

	UNIVERSITY	COMMUNITY COLLEGE
<b>Progression</b>	<ul style="list-style-type: none"> <li>Accumulating 24/48/72 Credit Hours</li> <li>Transfer with at Least 12 Credit Hours</li> </ul>	<ul style="list-style-type: none"> <li>Dual Enrollment</li> <li>Remedial and Developmental Success</li> <li>Accumulating 12/24/36 Credit Hours</li> <li>Workforce Training Hours</li> <li>Transfer with at Least 12 Credit Hours</li> </ul>
<b>Completion</b>	<ul style="list-style-type: none"> <li>Associate, Bachelor’s, Master’s, Ed Specialists, Doctoral, and Law Degrees</li> <li>Degrees per 100 FTE</li> <li>Six-Year Graduation Rate</li> </ul>	<ul style="list-style-type: none"> <li>Associate Degree’s and Certificates</li> <li>Awards per 100 FTE</li> <li>Job Placement</li> </ul>
<b>Productivity</b>	<ul style="list-style-type: none"> <li>Research and Service</li> </ul>	
<b>Premiums for:</b>	<ul style="list-style-type: none"> <li>Adults</li> <li>Low-Income Students</li> </ul>	<ul style="list-style-type: none"> <li>Adults</li> <li>Low-Income Students</li> </ul>
<b>% State Funding Based on Outcomes</b>	<ul style="list-style-type: none"> <li>85%</li> </ul>	<ul style="list-style-type: none"> <li>85%</li> </ul>

## Enrollment Trends and OBF Impact on Student Outcomes in Tennessee

From 2014-2016, RFA worked closely with state officials in Tennessee to obtain, verify, and analyze data obtained from SLDS to both track enrollment, and to determine the impact of the state’s OBF policy on student outcomes over time.<sup>2</sup>

### Enrollment Trends

- **First-time enrollment** increased significantly in community colleges beginning in 2010. In contrast, first-time enrollment levels at universities remained consistent over the eight years of data analyzed;
- **The proportion of full-time and part-time students** at universities and community colleges remained consistent, despite enrollment increases at community colleges;
- The number and proportion of **Pell-eligible students** increased in both community colleges and universities between 2006 and 2013;

<sup>2</sup> Results were produced by utilizing interrupted time series analysis, a quasi-experimental research design that measures the degree to which an outcome deviates from its historical trend following the implementation of a policy. Additionally, we controlled for student characteristics such as gender, race, socioeconomic status, ACT score, and choice of major, further isolating the effect of OBF on student outcomes. Cohorts are defined by students’ entering academic year. It is important to note that figures for overall students, Pell students, and underrepresented minority students were estimated using separate regressions for each population, which have unique pre-OBF trends, N-sizes, and student characteristics.

- The proportion of **underrepresented minority students** (black and Hispanic) enrolled in community colleges and universities did not change substantially over the eight years of data examined. However, the total number enrolled in community colleges increased beginning in 2010.

## OBF Impact on Student Outcomes: Significance and Trends over Time

For each outcome that we could track in Tennessee’s SLDS, we conducted analyses of OBF impact for both full- and part-time students in community colleges and for full-time students in four-year universities.<sup>3</sup> We also conducted separate analyses for two important subgroups: Pell-eligible and underrepresented minority students. For each OBF formula-related outcome and student group, we asked three questions:

- Is there evidence that OBF is having a significant impact, either positive or negative?
- Is the effect of OBF changing (increasing/ decreasing) over years of OBF implementation?
- If so, is change in OBF’s effect occurring in the same direction (e.g. either increasing/ decreasing) consistently?

The analyses have been checked with state officials in Tennessee to ensure that our results are both comprehensive and accurate. Results are summarized in Table ii below.

**Table ii. Summary of Key Findings: Impact for Most Recent Post-OBF Cohort and Trends in OBF Formula-Related Student Outcomes across Post-OBF Cohorts (2011 through 2013)**

	UNIVERSITIES			COMMUNITY COLLEGES					
	FULL-TIME			FULL-TIME			PART-TIME		
	ALL	PELL	URM	ALL	PELL	URM	ALL	PELL	URM
<b>Degree 100%-Time</b>	+	∅	∅	∅▲	∅	∅			
<b>Degree 150%-Time</b>				+▲	+▲	∅	-▼	-▼	∅▲
<b>Degree 200%-Time</b>							-	∅	∅
<b>25% Credit Benchmark</b>	+▲	∅	+▲	+▲	+▲	∅	-▼	-▼	-▼
<b>50% Credit Benchmark</b>	+▲	∅	∅▲	+▲	∅	∅	-▼	-▼	-▼
<b>75% Credit Benchmark</b>	∅▲	∅▲	∅▲	∅▲	∅▲	∅	-▼	-▼	-▼
<b>Certificate in Two Years</b>				+▼	+▼	+▼	∅	∅	∅▼
<b>Transfer</b>				∅▲	∅	∅▼	-	-▼	∅▼

+ = statistically significant, positive impact; 95% confidence or above

-- = statistically significant, negative impact; 95% confidence or above

∅ = no statistically significant impact

▲ = trending positive

▼ = trending negative

Shaded = Not included in analysis

Table ii illustrates evidence of significant and accumulating impact of OBF policy in Tennessee. Plus and negative signs indicate statistically significant effects; and the green and red arrows show in which direction the OBF impact has trended. The lack of a green or red arrow indicates either that there was no clear trend or there were not enough years of data to observe a trend. In most instances, our positive findings are becoming more positive over time and our negative findings are becoming more negative over time, suggesting that the effect of the policy is increasing as it becomes more fully implemented at the

<sup>3</sup> We did not analyze the impact of OBF on part-time university students due to an insufficient N size.

institutional level. Also, and importantly, many null results ( $\emptyset$ ) are trending towards positive for both university and community college full-time students. Specific notable findings are as follows:

## Full-Time University Students

**OBF had a significant, positive impact on the most recent cohort on three of the four student outcomes examined.** Positive impacts, most of which have increased over time, were found on the following outcomes:

- Degree 100%-Time (bachelor's degree completions within four years) for *full-time students overall*, but no effect was found for either subgroup.
- 25% Credit Benchmark (accumulating 24 credits within the first year) for *full-time students overall* and for *underrepresented minority students*. No effect was found for Pell-eligible students.
- 50% Credit Benchmark (accumulating 48 credits within the first two years) for *full-time students overall*, but no effect was found for either subgroup. While not significant, positive effects have grown stronger over time for underrepresented minority students.

**There is no evidence of any OBF effect found for the 75% Credit Benchmark (accumulating 72 credits within the first three years).**

- However, for students overall, Pell-eligible, and underrepresented minority students, results have trended positive between the two cohorts observed in that analysis.

## Community College Students

### i. Full-Time Students

**OBF had a significant positive impact on four of the seven student outcomes examined. For the most part, these effects have increased over time.** Positive impacts in the most recent cohort of students were found on the following outcomes:

- Degree 150%-Time (associate degree completions within three years) for *full-time students overall* and for the subgroup of *full-time students who were Pell eligible*. For students overall and Pell-eligible students, these results have become or grown more positive.
- Earning a certificate within two years for *full-time students overall* and both subgroups of *full-time, Pell-eligible students* and *full-time, underrepresented minority students*. However, the size of the impact has dropped over time for students overall and for each subgroup.
- 25% Credit Benchmark (accumulating 12 credits within the first semester) for *full-time students overall* and for the subgroup of *full-time students who were Pell eligible*. In addition, results have become more positive over time.
- 50% Credit Benchmark (accumulating 24 credits within the first year) for *full-time students overall*. For these students, results have become more positive over time. We do not see an effect from OBF for either subgroup.

**No evidence of significant OBF effect on the most recent cohort was found for Degree 100%-Time (associate degree completions within two years), 75% Credit Benchmark (accumulating 36 credits within the first three semesters), or for Transfers.**

- However, results are trending towards a positive impact for each of these outcomes in the *overall full-time community college* students.

## ii. Part-Time Students

**OBF had a significant negative impact on the most recent cohort on six of the seven outcomes examined. The size of negative impact has grown larger over time for most outcomes.** Negative impacts were found on the following outcomes:

- Degree 150%-Time (associate degree completions within three years) and Degree 200%-Time (associate degree completions within four years) for *part-time students overall*. A negative impact on degree attainment with 150% time was also detected for the subgroup of *part-time students who were Pell eligible*
- 25% Credit Benchmark (accumulating 12 credits within the first year), 50% Credit Benchmark (accumulating 24 credits within the first two years), and 75% Credit Benchmark (accumulating 36 credits within the first three years) for *part-time students overall* and for both subgroups of *part-time, Pell-eligible students* and *part-time, underrepresented minority students*.
- Transferring to a university within three years for *part-time students overall* and for the subgroup of *full-time students who were Pell eligible*.

## Pell-Eligible Students

- OBF had a significant positive impact on early credit accumulation, certificate and degree completion for full-time community college Pell-eligible students. Impacts for credit accumulation and degree completion have grown stronger over time.
- In contrast, OBF had a significant negative effect on credit accumulation, transfer, and associate degree completion among part-time community college Pell-eligible students. These results have become more negative over time.
- There were no effects on Pell-eligible students in Tennessee's public universities.

## Underrepresented Minority Students

- OBF had a negative impact on credit accumulation for part-time underrepresented minority students in the community college sector. For the most part, these results have become more negative over time.
- OBF had a positive impact on earning a certificate for full-time underrepresented minority community college students; however the size of that impact is decreasing over time. Otherwise, full-time underrepresented minority students were unaffected in the two-year sector.
- OBF had a positive impact on accumulating 24 credits within one year for full-time underrepresented minority students in the four-year sector. Other findings for this subgroup were not statistically significant; however, they have become more positive over time.

## Policy Formation, Implementation and Institutional Response

RFA conducted intensive case studies of six public Tennessee postsecondary institutions: two research universities, a comprehensive university, and three community colleges. Across all six, there is ample evidence that policies and practices changed in ways designed to increase student success. Yet response was not monolithic, nor did it begin when OBF was adopted in 2010. Rather, for many institutions, the policy served as an accelerant to existing efforts to improve student outcomes, and institutional response varied by factors such as mission, capacity, and leadership.

We present high-level findings below.

**Statewide, comprehensive commitment to a student completion policy agenda supported the adoption and implementation of outcomes-based funding.** Tennessee has enacted a comprehensive set of reforms and initiatives aligned to its statewide completion agenda. Most notable are the 2010 adoption of the Complete College Tennessee Act (CCTA), Tennessee’s 2010-2015 statewide master plan which includes specific goals for education attainment rates, institutional quality and rigor, and an additional 26,000 undergraduate degrees by 2015;<sup>4</sup> and Drive to 55, a 2013 initiative aimed at increasing the state’s education attainment rate to 55% by 2025.

**Tennessee Board of Regents (TBR) provided significant support and guidance across its system of community colleges and universities.** Institutional leaders reported that TBR offered technical assistance and created and implemented initiatives and mandates that advanced the goals of OBF. In addition, institution administrators viewed senior staff at TBR as leaders, steering institutions as they implemented Tennessee’s OBF model.

**Institutions are aligning strategic plans, programs, and policies to the goals of OBF.** We compared strategic plans developed before and after the implementation of OBF and found that student outcomes aligned to the OBF formula received significantly more emphasis in the wake of policy adoption. While the amount of change varied to some degree, variation does not appear to be due to size or sector. For example, while the two institutions exhibiting the least change were community colleges, the two whose strategic plans changed the most were a community college and a research university.

Not surprisingly, interviews and document review reveal that institutions are investing in efforts designed to increase student success. Changes at community colleges were concentrated in academic affairs and student services. In contrast, administrative changes, such as a shift towards responsibility-centered management and investments in data analytics, are seen in two of the three universities. Results are summarized in Table iii.

**Table iii. Institutional Policies or Programs Intentionally Aligned with Degree Completions and Persistence**

FOCUS AREAS	INSTITUTIONAL POLICIES AND PRACTICES	COMMUNITY COLLEGES	COMPREHENSIVE UNIVERSITY	RESEARCH UNIVERSITIES
Academic Affairs	Decrease time needed for degree	●	●	●
	Increase access to degrees			●
	Increase access to courses	●	●	●
	Increase use of data analysis	●	●	●
	Change in faculty roles and staffing	●	●	●
	Improve developmental education	●	●	●
Student Services	Change in advising and counseling methods	●	●	●
	Improve communications between students and administrators	●	●	●
	Improve student support programs	●	●	●
	Increase student services capacity		●	●
Other Institution Responses	Change financial aid policies		●	●
	Add administrative staff for performance tracking	●		●
	Adopt Responsibility-Centered Management practices		●	●

4 Tennessee Higher Education Commission (THEC). (n.d.). *The public agenda for Tennessee higher education 2010-2015*. Retrieved from: [https://www.tn.gov/assets/entities/thec/attachments/CMSummer2010\\_CMSummer2010\\_I.A.1.%20Attachment%20-%20Master%20Plan.pdf](https://www.tn.gov/assets/entities/thec/attachments/CMSummer2010_CMSummer2010_I.A.1.%20Attachment%20-%20Master%20Plan.pdf)

### **Institutional change has been focused on rapidly increasing certificate and degree completion.**

Institutions across the state were increasing efforts to identify students who were close to graduating when they dropped, encourage them to return to school, and advise them on the most cost-effective way to finish their degrees. Institutions also sought to increase their certificate productivity by creating new credentials as well as offering milestone credentials. However, the rapid rise in certificates led some administrators to question the value of the credential. The 2015-2020 funding formula attempts to address concerns regarding the proliferation of certificates by only awarding a completion for the highest degree awarded to a student.

## Remaining Challenges

Tennessee's OBF policy is having concrete, measurable effects on both institutional practices and policies and on outcomes for full-time students. Full-time Pell-eligible students and underrepresented minorities are also performing better than expected on several outcomes included in the policy. Yet outcomes for part-time community college students of all types have either not been affected, or have been negatively affected, by the policy, and institutional response has varied as well. What challenges remain? Our analysis identifies a range of factors that may have erected barriers to fully achieving the intended effects of OBF. As such, they bear continued scrutiny and consideration.

**Institutions across all sectors remain concerned that the formula does not adequately recognize or account for variation in institutional missions or students served.** Despite a policy that was developed with significant institutional input and a relatively high level of institutional autonomy to emphasize appropriate metrics, institutional leaders were still concerned that the formula did not adequately recognize and reward unique institutional missions.

**Differences in institutional capacity greatly influenced the implementation process.** Tennessee's OBF model challenges institutions to reallocate resources to more directly influence outcomes included in the OBF formula. Yet institutions are not equally well-positioned to quickly and strategically align resources with target outcomes. A lack of fiscal resources, in particular, was often cited as a challenge.

**Appropriations to public higher education in Tennessee fall short of what institutions would receive if the formula were fully funded.** The Tennessee Higher Education Commission presents calculations of what each institution should receive in appropriations based on their outcomes as a budget recommendation to the legislature. However, the legislature still awards a fixed amount of appropriations, resulting in institutions receiving a share of the appropriations based on their outcomes, which may not fully reward their improvements.

**Tennessee's funding process creates a high-stakes environment that is perceived as competitive and difficult for planning.** Because a fixed amount of appropriations are awarded, institutions receive a share of overall appropriations based on their outcomes. This means that if an institution makes progress on outcomes but other institutions make more progress towards outcomes, it won't necessarily receive the funding that reflects their progress. The mechanism of relative gain in awarding funding is perceived to create a competitive dynamic across institutions, rather than a collaborative environment in which institutions work together to achieve state goals. While this may be an intended element of the policy and may, in fact, drive change, it is unpopular among most institutions.



## Implementation and Impact of Outcomes-Based Funding in Tennessee

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### Setting the Stage

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#### I. Introduction

Outcomes-based funding (OBF) is a term used to describe state- and system-level higher education funding policies that link public dollars to key student outcomes such as credit completion, retention and graduation. Outcomes-based funding models are a significant shift away from traditional approaches to funding public higher education based on enrollment or previous levels of funding. Within the past decade, OBF policies have become increasingly prevalent and are now present in a majority of states. When taken together, these policies determine how hundreds of millions of dollars are distributed to public colleges and universities across the country.

Yet OBF is not consistent across states. Policy formation and implementation varies significantly across states, as do specific elements of each policy. For this reason, generalizations are not particularly helpful to policymakers. To provide more practical analysis to guide state policymakers who are considering adopting or refining OBF, Research for Action (RFA) conducted a comprehensive, mixed methods research study on the development, implementation and effects of OBF in three states: Indiana, Tennessee, and Ohio. This brief highlights the most policy-relevant findings of our work in Tennessee.

#### A. Trends in Higher Education Funding

States have taken multiple approaches to funding public higher education institutions over the decades. Prior to the 1990s, state funding to public higher education was primarily allocated through base-plus or enrollment-based funding formulas. Under base-plus models, institutions were awarded a “base” each year, derived from conversations between policymakers and institutional leaders on the costs needed to continue operating. As student enrollment boomed in the 1950s, states shifted their models to allocate funding based on the number of students being served. However, as noted by Hearn (2015) neither model can be considered strategic. These models tend to rely on historic assumptions, cost, and enrollment figures and largely ignore institutional mission.

From 1979 through the 1990s, many states began adopting early performance funding models. Early performance funding provided a bonus for performance in addition to base appropriations. The bonus provided an incentive for institutions to improve student performance on key outcomes, such as increased graduation rates or job placement rates, although funding was still primarily driven through historic enrollment or base-plus models.

Recently, performance funding through bonus appropriations has evolved into outcomes-based funding models. Outcomes-based funding (OBF) differs from early performance in both design and implementation (Snyder, 2015). First, under OBF, funding for performance is allocated as part of an institution's base funding (Dougherty, 2015). Secondly, Snyder notes that OBF policies are more explicitly aligned to a state's higher education attainment goals and student success priorities. Lastly, OBF models provide a more comprehensive mechanism to hold higher education institutions accountable for their performance.

While most states now tie at least some portion of postsecondary support to student outcomes, it would be a mistake to categorize OBF as a coherent or consistent policy intervention. Rather, the term encompasses a wide array of formulas and designs, as noted in a recent typology developed by HCM Strategists (Snyder, 2016). States vary in terms of whether the funding for performance is allocated through a bonus (early performance funding model) or within an institution's base funding through an OBF model. Additionally, states vary in whether an OBF model affects all postsecondary institutions or sectors and by the percentage of funding affected by the policy. Even among states that have enacted the most robust policies to date, the percentage of state dollars affected varies from roughly 6% in Indiana to 100% in Ohio.

Also notable is the fact that OBF policies have been implemented in states whose governance structures, funding apparatus, student demographics, and political environments vary enormously. It comes as little surprise, then, that the development and implementation of OBF policy is considerably different as well. The degree of institutional involvement in policy development, the pace of change, the stability of the formula, the type and effectiveness of communication about the formula—all these factors have a significant effect on policy development, enactment, and implementation.

The complexity extends even further. There is a world of difference between adoption of formal policy and policy implementation at an institution. It takes time for institutions to adjust to such a high-stakes change in funding, and institutional response is affected by a wide range of factors, including mission, capacity, resources, leadership, and student demographics.

## B. Research Examining Outcomes-Based Funding Policies: Past and Present

Outcomes-based funding models have received much scrutiny and study in recent years. Our study enters a robust conversation in the academic literature regarding the efficacy and impacts of OBF policies.

### iii. Past Research on OBF Policy Implementation

In a series of published reports and recently released volumes, a research team led by Dougherty examines outcomes-based funding policies across Indiana, Tennessee, and Ohio utilizing interviews with state officials, state-level policymakers, and institution administrators and faculty across 18 institutions. Dougherty summarizes that OBF models “are influencing higher education institutions, through financial incentives, awareness of state priorities, and awareness of institutional performance” (Dougherty et al, 2016). In addition, he states that “performance funding clearly spurred institutions to change their institutional policies and programs in order to improve student outcomes” (Natow, Pheatt, Dougherty, Jones, Lahr & Reddy, 2014). Dougherty also argues that institutional response to OBF depends upon factors

such as size, type of institution, capacity, and quality of leaders (Dougherty et al, 2014b Dougherty et al, 2016). He identifies the potential for unintended impacts of OBF policies, such as admission restrictions and weakening academic standards. However, as much of his work occurred prior to full implementation of OBF policies, Dougherty recognizes that these unintended impacts were forecasts of what may occur, not what has actually occurred.

Additional qualitative efforts include an ethnographic case study of community colleges and universities in Tennessee funded by the Ford Foundation (Ness, Deupree, & Gandara, 2016). Pulling from interviews with over 100 campus and system actors, the authors found “robust campus-level completion activity” following the implementation of outcomes-based funding. Findings also highlight potential challenges of outcomes-based funding models, such as increased campus competition and insufficient premiums for at-risk students.

#### iv. Past Research on the Impact of OBF

To date, published quantitative studies examining the impact of OBF on student outcomes have relied exclusively on institution-level, aggregate data, mostly sourced through IPEDS, to examine the impact of OBF on institutional completion rates, student enrollment, and institutional selectivity in a variety of states that have adopted or implemented OBF (e.g., Hillman, Fryar, Tandberg & Crespín-Trujillo, 2015; Hillman, Tandberg & Fryar, 2015; Hillman, Tandberg & Gross, 2014; Rutherford & Rabovsky, 2014; Tandberg & Hillman, 2014; Tandberg, Hillman & Barakat, 2014; Kelchen & Stedrak, 2016; Umbricht, Fernandez, & Ortagus, 2015). Results of these IPEDS studies are mixed. Below, we summarize early and more recent results.

**Early examinations of OBF impact.** Most early examinations of OBF reveal no effects of the policies on student outcomes (e.g., Hillman et al., 2014; Dougherty et al., 2014; Hillman et al., 2015; Tandberg & Hillman, 2014; Tandberg, Hillman & Barakat, 2014). However, these studies focus on less robust OBF models (Tandberg, Hillman & Gross, 2014) and in several cases utilize data collected prior to full implementation of the policy. In doing so, they search for effects in student cohorts that had little to no exposure to the policy (Shin and Milton, 2004; Tandberg, Hillman, & Barakat, 2014) or immediately following OBF implementation (Rutherford & Rabovsky, 2014; Tandberg, Hillman & Barakat, 2015). This can be particularly problematic because many states adopted hold-harmless policies, which delayed the full impact of the policy for several years. Thus, the lack of significant findings in early examinations of OBF could be due to weaknesses in the policies themselves or because analyses were conducted prior to full implementation of the policy.

**More recent examinations of OBF impact.** More recent studies of OBF utilizing IPEDS data correct for some of the shortcomings of earlier studies and reveal some positive impacts of OBF on student outcomes. These include an increase in associate degrees conferred and short-term certificates in the two-year sector (Tandberg, Hillman, & Barakat, 2015; Hillman, Tandberg, & Fryar, 2015), as well as increases in bachelor’s degrees and degrees per 100 FTE (Hillman, Fryar, Tandberg, & Crespín-Trujillo, 2015; Slaughter et al, 2017). Yet while these studies are based on data collected post-OBF implementation, there are still not enough years of post-OBF data available for many states in the IPEDS database to support a definitive analysis of the policy’s impact on institutional outcomes.

In addition, a few researchers have begun to examine whether there is any evidence that OBF is having the “unintended impacts” that Dougherty forecasted, such as increases in selectivity and limiting access to historically underserved student populations. Results of these analyses suggest that institutional selectivity

may have increased in Indiana under OBF (Umbricht, Fernandez, & Ortagus, 2015; Rutherford & Rabovsky, 2014) and that there has been a decline in Pell enrollments under OBF (Kelchen & Stedrak, 2016).

Due to the limitations of IPEDS and the relatively recent implementation of the most robust OBF models, many questions remain about the effectiveness of various OBF policies, how these policies influence changes in institution behaviors, and whether these changes in behaviors impact student outcomes. Institutions are the intended targets of OBF policies; however, the formulas award dollars based on improved student outcomes. Thus, research is needed that examines whether and how the outcomes of students have improved under OBF when controlling for key student factors like age, gender, race/ethnicity, and socioeconomic status.

### C. A Different Kind of Research on Outcomes-Based Funding

The sheer variation and complexity of OBF policies beg for a more nuanced, comprehensive policy-relevant analysis as states consider either adopting or refining these policies. To that end, and with the support of the Bill and Melinda Gates Foundation and the Lumina Foundation, RFA has conducted a detailed, mixed-methods study of OBF implementation and outcomes in three states—Indiana, Ohio, and Tennessee.

This report presents our findings on Tennessee and is designed to provide the specificity and utility state policymakers need as they consider specific elements or approaches to OBF policy development or refinement. It draws from extensive, state-specific qualitative and quantitative data, as outlined below.

#### i. Quantitative Data: Tracking Student Outcomes Using Statewide Longitudinal Data Systems

Research for Action worked closely with the Tennessee Commission for Higher Education (THEC) to obtain data from its State Longitudinal Data System (SLDS) to examine the effects of OBF on key student metrics included in Tennessee's funding formula. State Longitudinal Data Systems (SLDS) are important analytical tools that provide the opportunity to conduct far more nuanced analyses of student outcomes in individual states over time than is possible using IPEDS. First, SLDS assigns each student an individual identifier and allows for analyses of institutional outcomes at the student-level that can control for key student characteristics (e.g., race/ethnicity, Pell eligibility status, and enrollment status). Moreover, SLDS includes a wide range of indicators included in OBF formulas that are not available in IPEDS, such as credit accumulation, major, and certificate attainment. Finally, because these datasets are more up-to-date than IPEDS, which has a two-year lag, SLDS analyses can provide more real-time results for informing policy change and providing feedback to states on formula effectiveness.

#### ii. Qualitative Data: Examining Policy Formation, Implementation and Institutional Response Using Interviews and Extensive Document Review

Our examination of OBF policy implementation in Tennessee builds upon Dougherty's efforts by examining whether there is concrete evidence of institutional change several years after robust models of OBF have been implemented (Dougherty et al, 2016).. We pay particular attention to state contextual factors influencing policy adoption and implementation, documenting and understanding how institutions are responding to OBF, investigating potential unintended impacts of the funding formula following implementation, and further examining the challenges Dougherty highlights to help states in their thinking and design of OBF policies.

Qualitative data was collected across two levels—states and institutions.

**State Policy Analysis.** Comprehensive analyses of Tennessee’s OBF policy and formula were conducted using documents drawn from state- and system-level websites. We identified state websites and downloaded relevant documents, including legislation, descriptions of policy, meeting minutes, PowerPoint presentations, and state- and system level strategic plans (both pre and post OBF). Analyses of state policy were refined and deepened via repeated interviews with four state policymakers between February 2015 and July 2016.

**Institutional Case Studies.** We conducted in-depth analyses of institutional response to OBF using case studies of six public institutions: two research universities, a comprehensive university, and three community colleges. We conducted interviews, either face-to-face or over the phone, with 67 administrators and faculty. Importantly, we triangulated our analysis of institutions by also collecting and analyzing strategic plans developed both prior to and after OBF implementation in 2011, institution planning documents, and reports on student success initiatives from each institution.

## II. Why Tennessee? An Overview of State OBF Policy and Conditions Affecting Implementation

In 1979, Tennessee incorporated its first performance metric in the state’s funding formula for public higher education institutions. Now, nearly forty years later, Tennessee has implemented a robust outcomes-based funding model following the adoption of the Complete College Tennessee Act (CCTA) in 2010. As an early adopter of performance measures to align state goals with state funding, Tennessee has been highlighted as an exemplar of OBF. In 2015 and 2016, HCM Strategists recognized Tennessee as an “advanced” implementer of OBF for the following reasons:

- Its focus on completion as a primary metric in alignment with state goals;
- Its prioritization of at-risk students;
- Differentiation between the two-year and four-year sectors;
- The high level of funding allocated by performance on outcomes; and
- Continuity of the model since adoption in 2010.

In addition, Tennessee has been examined in prior research (HCM Strategists, 2011, Natow et al, 2014, Ford Foundation, 2015) allowing our work to advance efforts in understanding the development and implementation of OBF in Tennessee, as well as its effects on student outcomes.

### A. Tennessee’s OBF Formula: An Overview

In 2010, Tennessee Governor Phil Bredesen signed the Complete College Tennessee Act (CCTA), which established a direct link between statewide postsecondary attainment goals and the state’s funding for higher education. Under the CCTA, Tennessee adopted its first OBF model, which was implemented during the 2011-2012 academic year under a three-year “phase-in” period designed to ensure institutional funding stability. Currently, Tennessee is implementing its second iteration of the OBF model. Under Tennessee’s OBF policy, 85% of state postsecondary appropriations to all public universities and community colleges are based on outcomes.<sup>5</sup>

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<sup>5</sup> The remaining 15% is allocated based on an institution’s fixed costs and their Quality Assurance score. Tennessee’s Quality Assurance score is the remnants of Tennessee’s original performance metric and includes additional outcome measures – general education course assessments, job placement rates, and student satisfaction studies, among others.

Four features of OBF in Tennessee stand out: the embedded mechanisms for recognizing mission differentiation among institutions; the ability of institutions to further differentiate metrics to align with their missions; the use of the formula as a lever to incentivize institutions to serve target student populations; and the stability of the formula. We describe each of these distinguishing elements below.

i. Key Feature of Tennessee’s Outcomes-Based Funding Formula: Mission Differentiation

Tennessee’s formula is explicitly designed to recognize variation in institutional missions.<sup>6</sup> Although the state has a single funding formula, it includes a separate set of indicators for two-year and four-year institutions. As seen in Table 1, university- and community college-specific metrics include performance measures aimed at recognizing and awarding institutions on completion and progression goals aligned with each sector’s mission. Each sector also receives premiums for success of targeted student populations, which we discuss in more detail below.

**Table 1. Metrics in Tennessee’s 2010-2015 Outcomes-Based Funding Formula, By Sector**

	UNIVERSITY	COMMUNITY COLLEGE
<b>Progression</b>	<ul style="list-style-type: none"> <li>Accumulating 24/48/72 Credit Hours</li> <li>Transfer with at Least 12 Credit Hours</li> </ul>	<ul style="list-style-type: none"> <li>Dual Enrollment</li> <li>Remedial and Developmental Success</li> <li>Accumulating 12/24/36 Credit Hours</li> <li>Workforce Training Hours</li> <li>Transfer with at Least 12 Credit Hours</li> </ul>
<b>Completion</b>	<ul style="list-style-type: none"> <li>Associate, Bachelor’s, Master’s, Ed Specialists, Doctorate, and Law Degrees</li> <li>Degrees per 100 FTE</li> <li>Six-Year Graduation Rate</li> </ul>	<ul style="list-style-type: none"> <li>Associate Degrees and Certificates</li> <li>Awards per 100 FTE</li> <li>Job Placement</li> </ul>
<b>Productivity</b>	<ul style="list-style-type: none"> <li>Research and Service</li> </ul>	
<b>Focus Populations</b>	<ul style="list-style-type: none"> <li>Adults</li> <li>Low-Income Students</li> </ul>	<ul style="list-style-type: none"> <li>Adults</li> <li>Low-Income Students</li> </ul>

ii. Key Feature of Tennessee’s Outcomes-Based Funding Formula: Institutional Agency

Tennessee institutions have agency to prioritize certain metrics over others to further reflect their individual missions. Under the first iteration of the formula (2010-2015), institutions submitted their individual lists of prioritized outcomes to the Tennessee Higher Education Commission (THEC), which then applied numeric weights to each outcome with respect to the priority assigned by the institutions. Funding was then calculated using a weighted, three-year average of each outcome metric, which provides additional stability to funding in instances of dramatic annual changes in outcomes.

Under the second iteration of the formula (2015-2020) all institutions are still permitted to submit priorities for their metrics. However, the weightings for a subset of metrics for community colleges have

<sup>6</sup> THEC. (2016). *A state perspective: Tennessee’s implementation of outcomes-based funding*. [Powerpoint slides]. Retrieved from: <http://prichardcommittee.org/wp-content/uploads/2016/06/Tennessee-Kentucky-Prichard-Committee-Presentation-062916.pdf>

been standardized across the sector.<sup>7</sup> Appendix A provides examples of how institutions prioritized different outcome measures across both iterations of Tennessee’s OBF policy.

iii. Key Feature of Tennessee’s Outcomes-Based Funding Formula: Incentives to Serve At-Risk Student Populations

Tennessee’s formula includes premiums for a range of at-risk student populations. The first iteration of the OBF model (2010-2015) awarded institutions additional dollars for the success of low-income and adult students. The second iteration of the model (2015-2020) was expanded to include a third target population for community colleges: students identified as academically underprepared. In addition, whereas the first iteration of the formula included a standard premium of 40% when a low-income student or adult persisted or completed, the second iteration increased the premiums and includes “graduated” premium levels. An 80% premium is applied for students included in one focus population; a 100% premium is applied for students included in two populations; and students who fall in three — at community colleges only—will garner a 120% premium.<sup>8</sup>

iv. Key Feature of Tennessee’s Outcomes-Based Funding Formula: Formula Stability

Since adopting outcomes-based funding in 2010, Tennessee has only changed its formula once. By intent, the first formula remained consistent for five years (2010-2015). Institutional leaders considered the five-year stability a strength of the formula. An administration at a research university noted “I think having it run for a five-year period is a really good idea because we can use it, count on it, and measure progress that way.”

During the summer of 2015, the Tennessee Higher Education Commission led a review of the 2010-2015 model, engaging institutions and state stakeholders in the process. The result was a refined model to be implemented for the next five years, 2015 to 2020. The 2015-2020 OBF model is outlined in Table 2.

**Table 2. Metrics in Tennessee’s 2015-2020 Outcomes-Based Funding Formula, By Sector**

	UNIVERSITY	COMMUNITY COLLEGE
<b>Progression</b>	<ul style="list-style-type: none"> <li>Accumulating 30/60/90 Credit Hours</li> <li>Transfer with at Least 12 Credit Hours</li> </ul>	<ul style="list-style-type: none"> <li>Dual Enrollment</li> <li>Remedial and Developmental Success</li> <li>Accumulating 12/24/36 Credit Hours</li> <li>Workforce Training Hours</li> <li>Transfer with at Least 12 Credit Hours</li> </ul>
<b>Completion</b>	<ul style="list-style-type: none"> <li>Associate, Bachelor’s, Master’s, Ed Specialists, Doctorate, and Law Degrees</li> <li>Degrees per 100 FTE</li> <li>Six-Year Graduation Rate</li> </ul>	<ul style="list-style-type: none"> <li>Associate Degrees and Certificates</li> <li>Awards per 100 FTE</li> <li>Job Placement</li> </ul>
<b>Productivity</b>	<ul style="list-style-type: none"> <li>Research and Service</li> </ul>	
<b>Focus Populations</b>	<ul style="list-style-type: none"> <li>Adults</li> <li>Low-Income Students</li> </ul>	<ul style="list-style-type: none"> <li>Adults</li> <li>Low-Income Students</li> <li>Academically Underprepared Students</li> </ul>

7 THEC. (2015). 2015-2020 outcome-based funding formula overview. Retrieved from: [https://www.tn.gov/assets/entities/thec/attachments/2015-2020\\_Formula\\_Review\\_Website\\_101615.docx](https://www.tn.gov/assets/entities/thec/attachments/2015-2020_Formula_Review_Website_101615.docx)

8 THEC. (2015). 2015-2020 outcome-based funding formula overview. Retrieved from: [https://www.tn.gov/assets/entities/thec/attachments/2015-2020\\_Formula\\_Review\\_Website\\_80101615.docx](https://www.tn.gov/assets/entities/thec/attachments/2015-2020_Formula_Review_Website_80101615.docx)

Note: Revisions to the 2010-2015 model are bold, metrics that have been removed from the model are strikethrough.

Tennessee also implemented its formula through a three-year phase-in, or hold-harmless period, to further ensure institutional stability. During the phase-in period, institutions were shown what their appropriation would be if based entirely on the formula. In 2013, Tennessee ended the phase-in process and began funding institutions solely based on outcomes. Tennessee’s transition to the 2015-2020 model does not include a phase-in period.

Table 3 depicts the stages of implementation in Tennessee’s OBF policy.

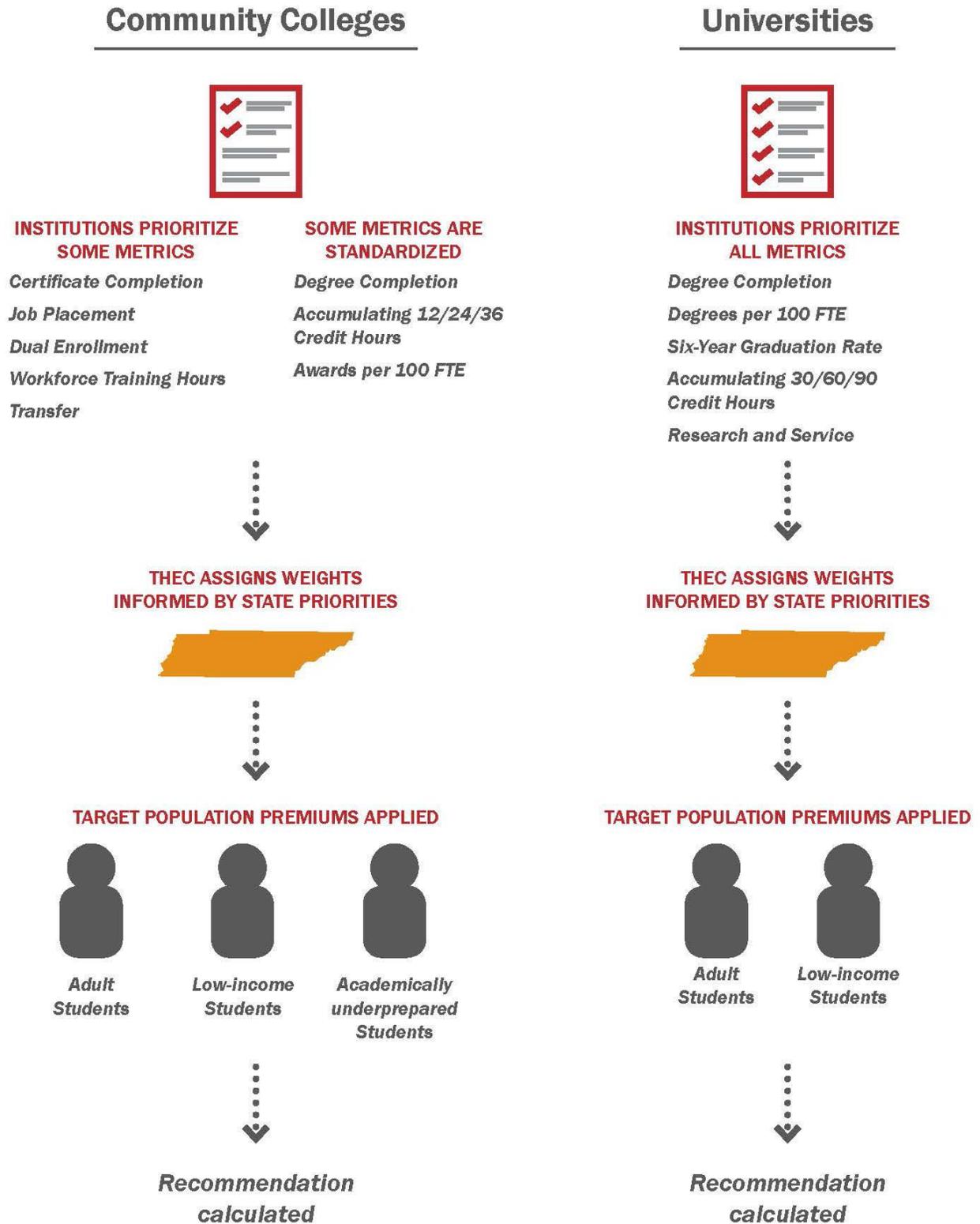
**Table 3. Timeline for Tennessee Implementation of OBF Policy**

<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
Outcomes-based funding policies are adopted in Tennessee	Phase-in of outcomes model, phase-out of hold harmless policy		Removal of hold harmless policy	Final distributions for FY 15-16 under 2010-2015 model	Revisions made to 2010-2015 model; introduced 2015-2020 model

### B. Tracing Tennessee’s OBF Dollars

Figure 1 provides an illustration of how institutions in both sectors may be awarded state dollars based on their outcomes. The total amount “earned” by each institution is then presented to the state by the Tennessee Higher Education Commission (THEC) as an appropriation recommendation. The General Assembly is then responsible for deciding the amount of funding allocated to higher education institutions in alignment with THEC’s recommendations.

Figure 1. Process for Awarding Funding through Tennessee’s 2015-2020 Outcomes-Based Funding Model



## C. The Tennessee Context: State-Level Factors Affecting the Development and Implementation of Outcomes-Based Funding

No state implements policy in a vacuum; Tennessee’s outcomes-based funding model is no different in this regard. We identified three important factors that have influenced the state’s OBF policy formation and implementation: the existence of a statewide completion agenda; the presence of centralized and supportive state leadership; and funding cuts to higher education as the formula has been implemented.

### **Statewide, comprehensive commitment to a student completion policy agenda supported the adoption and implementation of outcomes-based funding.**

Tennessee has enacted an unusually comprehensive set of reforms and initiatives aligned to its statewide completion agenda. This state policy environment both supports and accelerates efforts to increase postsecondary attainment across the state. The 2010 adoption of the Complete College Tennessee Act (CCTA) passed a “comprehensive reform agenda that seeks to transform public higher education through changes in academic, fiscal, and administrative policies at the state and institutional level.”<sup>9</sup> The reform agenda as outlined in Tennessee’s 2010-2015 statewide master plan highlighted specific goals addressing the state’s education attainment rate, economic demands and research needs, and institutional quality and rigor. Notably, the master plan called on institutions to produce an additional 26,000 undergraduate degrees by 2015.<sup>10</sup> This completion goal was reinforced in 2013 with the introduction of Tennessee’s Drive to 55, an initiative aimed at increasing the state’s education attainment rate to 55% by 2025.

Today, Tennessee’s current master plan outlines goals for 2015-2025 and places “certificate training and undergraduate education at the center of the state’s college completion policy agenda.”<sup>11</sup> The current plan aligns both timeline and agenda to Tennessee’s Drive to 55 initiative, calling for 871,309 credentials to be awarded between 2015 and 2025. The 2015-2025 Master Plan also highlights the need to focus on the three student populations recognized in the OBF model – adult learners, low-income students, and academically underprepared students—in order to achieve the goals of Drive to 55 and the state’s completion agenda. Tennessee has also employed a host of additional strategies to facilitate the state’s completion agenda. Appendix B illustrates the multitude of completion-focused state initiatives implemented prior to or concurrently with outcomes-based funding.

State and institutional-level leaders across sectors described the impact of the interconnection between Tennessee’s broad-based college completion agenda and outcomes-based funding:

*The funding formula is... the measurement of what we’re trying to do and the strategies to meet the needs of Drive to 55 and the Complete College Act and other things that we’re doing, like Tennessee Reconnect for Adults. It’s a way to set the metric really. – Community College Administrator*

*It was fortuitous for us that at the time [OBF] was rolled out, the Governor’s goal for 25, 55% by 2025, had been endorsed by the TBR. So we all are in this together, and all are working toward generating better outcomes associated with all levels of higher education. – Research University Administrator*

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9 THEC. (n.d.) *Complete college TN act of 2010*. Retrieved from: <http://www.tennessee.gov/thec/topic/complete-college-tn-act>

10 THEC. (n.d.) *The public agenda for Tennessee higher education 2010-2015*. Retrieved from:

[https://www.tn.gov/assets/entities/thec/attachments/CMSummer2010\\_CMSummer2010\\_I.A.1.%20Attachment%20-%20Master%20Plan.pdf](https://www.tn.gov/assets/entities/thec/attachments/CMSummer2010_CMSummer2010_I.A.1.%20Attachment%20-%20Master%20Plan.pdf)

11 THEC. (n.d.) *Postsecondary attainment in the decade of decision: The master plan for Tennessee postsecondary education 2015-2025*.

Retrieved from: <http://www.tennessee.gov/assets/entities/thec/attachments/MasterPlan2025.pdf>

**Strong state leadership that provided clear and consistent communication drove broad-based understanding and support of Tennessee’s OBF policy.** This leadership stemmed from the Tennessee Higher Education Commission (THEC) and the Tennessee Board of Regents (TBR).

Created by the General Assembly in 1967, the Tennessee Higher Education Commission’s (THEC) mission is to achieve coordination and unity within Tennessee’s higher education landscape.<sup>12</sup> In doing so, THEC is charged with coordinating two systems of higher education—the University of Tennessee institutions and the community colleges and universities governed by the TBR.<sup>13</sup> Table 4 provides an overview of the structure of Tennessee’s postsecondary sector.

**Table 4. Tennessee’s Higher Education Landscape through 2016**

	TENNESSEE		
<b>State-Level Coordinating Agency</b>	Tennessee Higher Education Commission (THEC)		
<b>Sectors</b>	Community Colleges	Universities	
<b>System/ Institutional Governing Boards</b>	Tennessee Board of Regents (TBR)	Tennessee Board of Regents (TBR)	Board of Trustees of the University of Tennessee (UT)
<b>Statutory Responsibility</b>	12 community colleges	6 senior universities	5 senior universities

Across both systems, THEC played a pivotal role in disseminating information regarding the Complete College Tennessee Act and Tennessee’s outcomes-based funding model. Senior leadership at THEC offered annual trainings, made campus visits, and provided additional support in understanding and communicating how the funding formula operates. Institutional administrators consistently noted the accessibility of THEC as the policy rolled out:

*I said, ‘I really think I need to get somebody from THEC to come and really just talk...’ So we already had that conversation. I think, [the funding formula] just needs somebody that can break it down in simple terms. – Community College Administrator*

*When we got the new one [funding formula], I just pulled all the data off the THEC website and started emailing [THEC leader] on a regular basis and just figured it out. – Research University Administrator*

Similarly, the Tennessee Board of Regents (TBR) provided significant support and guidance across institutions within its system of community colleges and universities. Institutional leaders reported that TBR offered technical assistance and created and implemented initiatives and mandates that advanced the goals of OBF. In addition, institution administrators viewed senior staff at TBR as leaders, steering institutions as they implemented Tennessee’s OBF model. One noted:

*I think [TBR leader] and our two previous presidents are really, to me, the driving forces behind [OBF]. – Research University Administrator*

**Support from the Tennessee Board of Regents was most evident in the coordination of Completion Teams and Completion Academies to advance implementation of outcomes-based funding and student success initiatives.**

<sup>12</sup> THEC. (n.d.) *About THEC*. Retrieved from: <https://www.tn.gov/thec/topic/about-thec>

<sup>13</sup> All six of the four-year institutions will leave the TBR system in 2017, each forming their own governing boards.

Tennessee's community colleges and universities under the Tennessee Board of Regents each developed a Completion Team, which included representatives from both senior administration and faculty to focus on advancing an institution's completion goals in alignment with the priorities of the outcomes-based funding model. Completion Teams attend annual Completion Academies at which higher education leaders across TBR institutions discuss strategies for student success, receive technical assistance, and hear from experts on best practices such as the use of predictive analytics.

One community college administrator described TBR's approach to Completion Academies in this way:

*TBR was "very supportive in our efforts to build a Completion Team...Different members of their team are responsible for different regions of the state and providing guidance for institutions. So we had a team come in from Tennessee Board of Regents and say, "you need to set up a Completion Team. Here are the reasons why. Here are ten initiatives at the state level that we would like to see happen at our institutions." – Community College Administrator*

Another noted how critically important the Academies are in communicating the interconnection of Tennessee's broad range of completion initiatives:

*The Completion Academy "was the first place where I got an overall picture for what Tennessee was trying to do. Before that it felt like initiative after initiative and I couldn't see how they all connected. They did a relatively good job of connecting all of the little bits and pieces which was helpful... what they're really looking to do is bring people in and finish. – Community College Administrator*

**Cuts in higher education funding provide less incentive for institutions to respond to state goals, but the increase in accountability helped maintain political interest in preserving resources for higher education.**

The adoption of outcomes-based funding in Tennessee coincided with cuts to public higher education funding. Since 2008, Tennessee state appropriations per FTE enrollment have fallen 22.5%, a steeper decline than the U.S. average of 15.3%.<sup>14</sup> An administrator noted that the decline in state funding reduces the impact of OBF:

*When state funding is going down at such a dramatic level, to come in and say, "Let's do performance funding," it may not be in the most ideal of times versus an environment where there's growth. Because you can really incentivize folks, if there's growth. I certainly think that when state funding is high then it's easier to implement performance funding. – Research University Administrator*

Yet amidst declining investment, state-level stakeholders suggest that shifting to an outcomes-based formula was critical for correcting a prior emphasis on enrollment. One state policymaker noted:

*We were getting what we were paying for in terms of the way we funded institutions. By primarily funding enrollment, institutions that were in high-growth areas grew, and others didn't ... so [smaller institutions] were happy to change the funding mechanism up, because they certainly weren't getting any benefit from the current one. – Tennessee Policymaker*

State policymakers also noted that moving towards outcomes-based funding was essential for maintaining the state's interest in funding higher education by explicitly connecting the goals of Tennessee's higher education system to the success of the state. As one stated:

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<sup>14</sup> State Higher Education Executive Officers Association (SHEEO). (2016). *State higher education finance (SHEF): FY 2015*. Retrieved from: [http://sheeo.org/sites/default/files/project-files/SHEEO\\_FY15\\_Report\\_051816.pdf](http://sheeo.org/sites/default/files/project-files/SHEEO_FY15_Report_051816.pdf)

*One of the most impactful pieces of [Complete College Tennessee Act] was a clear statement that what the state expected its higher education system to do was to contribute to the state's vitality by growing the number of graduates, whether they be certificate holders or degree holders. And then secondly, by the way, we want the Higher Education Commission to come up with a new funding formula that allocates dollars to higher education institutions in a way that incentivizes institutions to achieve these state goals. – Tennessee Policymaker*

A university administrator recognized the connection between accountability and interest in funding higher education in this way:

*So the whole system has a real push in that direction, to try to show that we're good stewards of tuition dollars and state funding. And how are we ever going to get more money from the state or have the formula funded if we don't do that? – Comprehensive University Administrator*

In sum, the environment was ripe for the adoption of OBF in Tennessee. A comprehensive and statewide commitment to college completions, under strong state leaders, provided the foundation and conditions for implementing OBF in Tennessee. A broad understanding of the link between funding and accountability allowed the state to maintain this commitment even in the face of budget cuts.

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## **Institutional Response to Outcomes-Based Funding in Tennessee: Buy-In, Alignment, and Challenges**

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While state-level factors clearly influenced the development and implementation of OBF in Tennessee, institutional response played a central role in determining the success of the policy. As summarized by one state policymaker, “if we were to change our finance policy and it did not have an impact on how campuses behave, then it wouldn't be worth it.” Through interviews conducted with over 60 administrators and faculty across three community colleges and three universities, this section provides a robust analysis of how colleges and universities responded to outcomes-based funding in Tennessee.

It is important to note that colleges and universities in Tennessee did not respond to OBF as a monolithic whole. Indeed, our institution-level examination purposefully included a sample of six colleges and universities that varied by sector, mission, size, and student demographics so that we could examine how these differences affected their response to the policy.

Our findings highlight two key elements that heavily influenced institution response to OBF in Tennessee:

- Institutional input in the design and refinement process; and
- Institutional capacity to align policies and practices to the metrics and goals of outcomes-based funding.

The following section explores these two elements by examining the opinions and perceptions of institutional actors, strategic plans, and institutional changes in policy and practice in the wake of the policy's implementation. Our analysis highlights both successes and challenges.

### III. Institutional Perceptions of Outcomes-Based Funding

#### **Institutional input during the development and revisions of the formula resulted in a deeper engagement with the funding formula.**

The legislation behind the Complete College Tennessee Act did not specify the particular metrics of the outcomes-based funding formula. Instead, this task was left to the Tennessee Higher Education Commission. As detailed by various state policymakers, the process of developing the formula was fairly collaborative. THEC organized the Formula Review Committee, a working group made up of institutional representatives from both systems and sectors across various positions. As one state policymaker explained, the committee was “a combination of institutional representatives, community colleges, universities, academic folks, finance people, some faculty representation, [and] representation from both UT system office and TBR system office.”

The Formula Review Committee provided counsel to THEC on the creation of the outcomes-based funding formula. One community college administrator recalled:

*I actually worked on the Committee at THEC to do the revisions toward outcomes-based funding... what the outcomes ought to look like, at the community college and the university, and how much flexibility needs to be given to each institution to determine what they need to choose as their outcomes, and what weight they give to those outcomes in the formula, and how they were going to be measured. – Community College Administrator*

Most institutional leaders, but not all, were satisfied with their institution’s level of engagement in developing the first iteration of Tennessee’s funding formula. However, even when institutions felt that their feedback was not considered, there was recognition of the value of being included in the process. One community college administrator noted:

*We had input. Of course they didn’t do what we told them to do. But, at least we had a chance to comment on it and to set some weights and some areas that we wanted to emphasize. – Community College Administrator*

In addition, THEC also facilitated regional meetings across Tennessee, gathering feedback from all of the state’s public universities and community colleges. The result, as summarized by one policymaker, was “a pretty broad consensus on what those metrics ought to be.”

Following implementation of the funding formula, THEC has continued to convene the Formula Review Committee annually to track the successes and challenges of the policy. After the first five-year cycle, the Formula Review Committee was charged with recommending structural changes to the funding formula based on their annual reviews. Following a process similar to that used in the first iteration of the formula, THEC and Formula Review Committee developed the 2015-2020 model. As described by institutional administrators:

*You know, you go in thinking one way and of course when you hash it out and everybody gives their perspective you really do end up seeing it is for the greater good. So, it has been good, it has been enlightening. – Research University Administrator*

*I’m on a funding formula review committee – I think they do it every five years – the time is up and I was thrilled to get to serve on this committee because we had a lot of things influencing our decisions on our level. The committee is advisory only, so THEC will still do what it wants, but they’re doing a*

*very good job of listening and we're doing a very good job of talking.* – Community College Administrator

### **Institutional administrators philosophically “bought in” to the formula due to its emphasis on student success.**

Institutional administrators across campuses were consistent in reporting that the funding formula was “fair” or a “good idea.” Specifically, the funding formula was credited for bringing new or heightened attention on student success rather than enrollment, as noted by the following institutional administrators:

*Completion, of course, is our new focus. It's not a new focus, by any means, but it's – emphasized. Yeah. Because it is going to impact that formula more so than in the past.* – Community College Administrator

*I do think it's a good idea to incentivize people towards what you want to accomplish. I mean, that's just human nature, and that's good.* – Community College Administrator

*We've really started focusing on student success. I think Complete College Tennessee has had a large role there.* – Comprehensive University Administrator

*I think, without a doubt, the funding formula is helping to shift our attention to focus to student success.* – Research University Administrator

The shift away from a focus on enrollment was particularly notable in the community college sector, as illustrated by the quotations below.

*And what changes are we going to have to make as institutions to be able to go from having a big party at the boat house on the 14th day at census because their enrollment is here? It was a total culture shift, at least on this campus.* – Community College Administrator

*The basic understanding is that FTE no longer matters—it's your graduation rate. It made a huge impact. Everybody can grasp that and get their hands around that. It's the graduation rate, it's the certificates awarded. That's what matters and that's what people understand, and that's where the big night-and-day focus has changed, from throwing bodies into classrooms to getting bodies graduated.* – Community College Administrator

In addition, institutions were well-versed and in agreement on how the outcomes-based funding policy supports institutional goals. One research university president noted, for example, that “the formula is entirely consistent with our mission.”

### **Yet institutional buy-in was hampered, in some cases, by specific aspects of the formula or elements of implementation.**

Institution leaders noted a disconnect between OBF's intended purpose and its implementation. They described how important contextual factors, including state politics, institutional competition, and differences in capacity between institutions, could damage the policy's effectiveness. One administrator at a community college put it this way: *I think it [the funding formula] would be equitable in a fair, even place.*

The perception that the funding formula did not fully recognize differences in institutions was also shared by an administrator from a research university:

*What I love about the formula – please be very clear, no matter what criticism I may have – is that when it went to an outcomes-based formula, it put in things I'd been trying to push for years, so I was happy. But I think the very nature of the kind of institution that we have--with stop-outs, for example; with poor folk... the formula still is a little bit too much, I think, towards a traditional research university. – Research University Administrator*

Other administrators, primarily from community colleges, noted the challenges in capacity and demands required under the new funding formula:

*[OBF] is more focused towards completions rather than putting people in seats. You know I think that they're on board with that. They're not on board with filling out more paperwork. – Community College Administrator*

*That's where I kind of feel like it's a little unfair, because we don't compete on the same level, we don't have the same resources, but we have the same requirements. – Community College Administrator*

A state policymaker elaborated on the distance between the stated goals of outcomes-based funding and the realities of the policy as it has been implemented:

*Initially, if you look back five years ago, there was hardly any philosophical opposition. In other words, when you tell people we're going to start funding you based on degrees produced and those things rather than enrollments, I think people philosophically thought that was the right idea. Now of course, there were vast disagreements when you get down to the details about what outcomes, and how you define the outcome, and what you're measuring, and all those things. – Tennessee Policymaker*

## IV. Institutional Alignment of Policies and Practices of Outcomes-Based Funding

In addition to examining the opinions of institutional leaders, we also examined whether and to what degree institutions adjusted concrete policies and practices in the wake of OBF. We therefore expanded our analysis to include institutional strategic plans and planning documents to collect evidence of change in concrete policies and practices.

### A. Strategic Plan Alignment

We examined strategic plans and planning documents for all six institutions that were included in our Tennessee case study to better understand how institutions were aligning policies and practices to outcomes-based funding. Our analysis focused on two questions. First, to what degree were strategic plans that were in place prior to OBF reflective of student success goals, such as retention and graduation? And second, to what degree did strategic plans shift in the wake of OBF towards alignment of OBF outcomes? To answer these questions, we obtained current and historic strategic plans and related documents from our study institutions. Strategic plans developed prior to OBF implementation (i.e. before the 2010-2011 academic year) were considered pre-OBF. We also obtained each institution's most recent strategic plan, put in place after the implementation of OBF.

The strategic plans were then coded to identify where and if OBF goals are mentioned, and also to determine levels of alignment to OBF. <sup>15</sup> Changes in alignment were then calculated to identify a degree of total change. Table 5 summarizes the results of our analysis.

**Table 5. Formula Metrics and Strategic Plan Alignment Pre- and Post-OBF (Average Scale Components)**

KEY							
= Not Aligned		= 2	= 3	= 4	= Highly Aligned		
	DEGREE COMPLETIONS		PROGRESSIONS (COURSE COMPLETIONS)		AT-RISK STUDENT SUCCESS		TOTAL CHANGE
	PRE	POST	PRE	POST	PRE	POST	
Community Colleges	3	4	3	4	4	5	+3
	3	4	3	4	4	5	+3
	2	4	1	4	4	5	+6
Comprehensive University	1	4	3	4	3	3	+4
Research Universities	3	4	3	4	3	5	+4
	3	5	3	5	2	4	+6

Our analysis revealed a number of notable findings.

**Strategic plans are more focused on key student success goals in the wake of outcomes-based funding implementation.**

The current strategic plans in place at all six Tennessee case study institutions reflect a relatively high degree of alignment with OBF goals of degree completions, progression (i.e., course completions), and the success of at-risk students. Notably, the strategic plans of one research university and one community college in particular became markedly more aligned with OBF following implementation of the policy. Other institutions entered the OBF era with strategic plans already more aligned; the strategic plans of these institutions exhibited somewhat less change over time.

**Tennessee’s postsecondary governance system likely influenced the alignment of strategic plans to the outcomes-based funding formula.**

The Complete College Tennessee Act set into motion the development of a unified two-year sector under the Tennessee Board of Regents. TBR required its institutions to align strategic plans with the Board of Regents’ 2010-2015 system-wide Strategic Plan and, more recently, the current 2015-2020 Strategic Plan. As a result, changes to the strategic plans of all institutions under the Tennessee Board of Regents, which

<sup>15</sup> A scale of 5 indicates that improving the metric in question was mentioned as the number one priority or goal of the institution. This would mean that degree completions, course completions and/or at-risk student success was listed as the first goal in the strategic plan.

A scale of 4 indicates that improving the metric in question was mentioned as one of several top priorities for the institution. This was usually the case for institutions who had no clear prioritization of goals in their strategic plans or where the language suggests that the order of the goals does not indicate their importance to the institution’s mission.

A scale of 3 indicates that improving the metric in question is mentioned in the strategic plan, but is not the focus of any goal in particular. This was the case when degree completions, course completions, or at-risk student success rates were mentioned as one of several measures for other goals (“indirect priority”) or as a secondary or tertiary priority to other goals.

A scale of 2 indicates that the metric is mentioned in the strategic plan but there is no goal seeking to improve them. This was the case when strategic plans mentioned a metric as important, but did not attach it to any particular goal or strategy.

A scale of 1 indicates that the metric is not mentioned at all in the strategic plan. Even if the institutional goals contribute to these metrics, there was no indication that the institution was measuring or factoring these metrics into their decision-making.

include all three community colleges as well as both research universities, likely reflect some influence of the Board of Regents.

## B. Policy and Practice Alignment

We also examined the degree to which changes in strategic plans filter down to concrete institutional practice. Generally speaking, the capacity to respond effectively to a major policy such as OBF varies significantly across institutions. Factors such as size, resources, and leadership in particular can determine how quickly and effectively a college or university adjusts to a new policy, and it is important to note that institutions varied in the degree to which their practices aligned to OBF goals prior to the policy’s implementation. As a result, interviews across six Tennessee institutions, as well as examination of a range of institutional documents, revealed both similarities and differences in institutional response.

### **Institutions are investing in student success initiatives that align with the goals of OBF.**

We examined a broad range of institutional documents to determine the degree to which concrete policies and practices aligned to OBF were in place. Table 6 presents some of the many initiatives and programs institutions in Tennessee are implementing in response to, or in alignment with, OBF policies. Primarily spanning across academic affairs and student services, there is strong evidence that all institutions in our sample are investing in student success efforts aligned with outcomes-based funding goals. Reforms range from revising math pathways and adding co-requisite courses to hiring student advisors and increasing support to first-year students.

**Table 6. Institutional Policies or Practices Intentionally Aligned with the Outcomes-Based Funding Formula**

FOCUS AREAS	INSTITUTIONAL POLICIES AND PRACTICES	COMMUNITY COLLEGES		COMPREHENSIVE UNIVERSITY	RESEARCH UNIVERSITIES	
Academic Affairs	Decrease time needed for degree		● ●	●		●
	Increase access to degrees			●		
	Increase access to courses		● ●		●	
	Increase use of data analysis	●		●	●	● ●
	Change in faculty roles and staffing	●		●		●
	Improve developmental education	●	● ●			●
Student Services	Change in advising and counseling methods		● ●	●		●
	Improve communications between students and administrators	●		●	●	● ●
	Improve student support programs		●	●		● ●
	Increase student services capacity			●	●	●
Other Institution Responses	Change financial aid policies			●		●
	Add administrative staff for performance tracking	●			●	●
	Adopt Responsibility-Centered Management practices				●	●

Notable findings include:

- At community colleges, OBF-aligned policies and practices were concentrated in academic affairs and student services. All community colleges noted efforts to improve developmental education through practices such as co-requisite models. While currently not included in the funding formula, remedial success was an outcome included in Tennessee’s 2010-2015 formula.

- The use of data analytics and efforts to improve communication between students and administrators were noted across all universities and two community colleges.
- Two noteworthy changes within universities include the adoption of Responsibility-Centered Management systems and the addition of administrators to track institutional performance. Two universities in Tennessee reported new management systems that include measurements from the funding formula to better allocate resources at the institution-level. The same universities also added new staff positions in performance-related roles. One university added positions in Institutional Research after recognizing the need to better track student and performance data. Institutions also added positions to promote stronger institution performance on outcomes included in the funding formula.

While institutional alignment to student success is evident, institutions did not necessarily begin aligning their policies and practices to completion goals at the onset of OBF implementation. Many reported movement in this direction prior to OBF in response to a postsecondary policy environment that had already begun shifting towards an emphasis on student completion. Others indicated that OBF served as an accelerant of sorts, speeding up and concentrating efforts to ensure that barriers to key student outcomes—particularly degree or certificate completion—were removed. As administrators noted:

*I have a hard time deciding: Is this the funding formula driving that, or would we be doing this anyway? I mean, students are why we're here, the success of our students is why we're here. That has been the focus. But, for years, I guess, the focus was: Bring them in and let's just get them here. Without a doubt, the funding formula is helping to shift our attention to focus to student success. – Research University Administrator*

*And now we have this completion team. We have a completion team that was put together because of their [TBR] push. Would we have had one had they not really pushed it so much? I think we might have, but it would have taken us longer to really make that a priority. – Community College Administrator*

Further, there is significant evidence that both universities and community colleges are increasing investments designed to promote student success. One university administrator described his institution's increased investments on student success in this way:

*We're implementing [a one-stop shop] this fall to try to eliminate having to go to all those offices, to try to get it taken care of in one place. And so, it's helped us to be more service-oriented in what we do for students...We're part of the EAB Student Success Collaborative. We started that a little over a year ago, and we jumped on it...I mean, with both feet. – Comprehensive University Administrator*

Administrators also acknowledge the potential of future investments to continue advancing the goals of completion and progression.

*We're looking at earlier Alert Systems, we're looking at Degree Compass, we're looking at any kind of technology that will help the student to better take control of their own schedules while they're here on campus and while they're with us so they'll know how they're progressing and they can see it for themselves, and they can ask questions if they aren't sure. But we're also trying put into place Completion Coaches – Community College Administrator*

**State mandates and initiatives aligned with the goals of Tennessee’s OBF policy are driving some institutional response.**

Tennessee’s completion agenda includes a suite of completion-focused state initiatives and mandates. Appendix B illustrates the multitude of initiatives implemented prior to or concurrently with OBF in Tennessee. For example, the Tennessee Higher Education Commission unveiled a host of policies and mandates pertaining to successful articulation and transfer between schools and sectors—e.g. Universally Transferrable Common General Education Core—as well as remedial education reform that concentrates students with such needs in the community college sector. Similarly, the Tennessee Board of Regents has also implemented multiple reforms that align with Tennessee’s OBF model, including the system-wide adoption of academic pathways and the adoption of co-requisite instruction rather than traditional pre-college, developmental coursework. As described by administrators at two community colleges:

*We have got THEC...doing this reform to base funding, but at the same time the Tennessee Board of Regents are doing initiatives such as learning support, becoming a co-requisite with college level classes, which is great for our learning support students. – Community College Administrator*

*We also have something we implemented here that’s called the Corequisites Model which is being implemented at every institution here coming down from TBR—13 community colleges...Students were getting stuck in [developmental] courses and we put them in the developmental course at the same time that they were being put into the college-level course. So now we have them married together, co-reqs, not pre-reqs. Community College Administrator*

**However, resources affect how institutions respond to both Tennessee’s OBF policy and related mandates.**

Mandates and initiatives being driven out by the Governor, the Tennessee Higher Education Commission, and/or Tennessee Board of Regents are generally unaccompanied by additional funds—a fact that challenges many institutions. Community college administrators in particular expressed concerns:

*It’s just a mandate. And that’s part of the problem. It could require more instructors, and there’s no funding for that. It could also require more space, and there’s no assistance for that. So it creates some significant issues, especially when developmental education is 20%. – Community College Administrator*

*So when anything is mandated, it’s mandated across the board, and here’s little [institution name]. Just struggling to keep our head above water, not that we don’t work twice as hard, but we don’t have the resources. We don’t have the student base, we don’t have the population, and we don’t have the education levels. – Community College Administrator*

**Institutions have implemented a range of policies and practices designed to rapidly increase certificate and degree completion.**

Institutions across the state were increasing efforts to identify students who were close to graduating when they dropped, encourage them to return to school, and advise them on the most cost effective way to finish their degrees. One university administrator explained their focus on bringing back students:

*The “Finish Line” program is targeted at kids with 90+ hours who dropped out and went nowhere else. They didn’t go anywhere else because they had no more loan available. We identified almost 6,000 people. – Research University Administrator*

Institutions also increased communication to students nearing graduation to ensure they have the resources to complete and guidance on how best to do so. These quotations from community college and university administrators illustrate how widespread this practice has become:

*We went out to search for people that had 45 hours or more that might have been just a semester away from graduating to see what we did have out there in terms of students. And we tried to communicate with them and figure out what we could do to help them finish up. – Community College Administrator*

*Because of the difficulties of students getting into teacher preparation, they started a non-licensure program three or four years ago. It was another aha! moment. All of the students that got up to the Praxis and couldn't pass it, what happened to them? I don't know, they probably didn't get a degree. So [they created] a list of about 25 students to go back and look at those transcripts. Let's contact the student and do X, Y, and Z instead of continually trying to take the Praxis to finish the degree program. – Research University Administrator*

*It was probably at the onset when we started talking about the new funding formula and everything that was going to change. But what we did was we identified students that were reaching their Pell loan limits. Students that say are 90 credits or more, that haven't graduated. They're reaching out to those students. – Research University Administrator*

Institutions also sought to increase their certificate productivity by creating new credentials as well as offering milestone credentials. However, the rapid rise in certificates led some administrators to question the value of the credential:

*If you can't take the certificate out in the workforce and get some meaningful job, then you shouldn't be counting them as a completer... I know one of the community colleges put in, I don't know how many certificates. We had certificates back in the day, you know, a long time ago, and we still have some of those same ones, like pharmacy technician, you know, those kind of things. But they take that and go and get a job...So, some of them are legitimate, but some of them are just.....We're going to call them completers four times before they actually complete. – Community College Administrator*

The 2015-2020 funding formula attempts to address concerns regarding the proliferation of certificates by only awarding a completion for the highest degree awarded to a student. Yet this practice may not count some credentials that could be valuable. One community college administrator noted:

*We've had certificates here. One- and two-year certificates here for people who already have bachelor's degrees, or associate degrees, but they are coming here in the health professions, they're coming here for an extra skill, well, we're teaching those. So because of the timeframe that they fell into, we've always counted those as completers. THEC decided they weren't going to count those anymore. – Community College Administrator*

## V. A Summary of Challenges and Criticisms of Tennessee's Outcomes-Based Funding Policy

Our analysis of Tennessee provides ample evidence that Tennessee's postsecondary institutions are redoubling efforts to address student success and are adjusting policies and practices to align with the OBF formula. Concurrently, the probability that students will achieve outcomes included in the formula has

been steadily improving, as we describe in the following section. Yet as the analysis presented above suggests, this progress is neither consistent nor uniform to date.

Our comprehensive analysis of institutional response to Tennessee's OBF policy identifies a range of factors—including how the state has developed and refined the policy, as well as particular elements of the policy itself—that institutions perceive as challenges to achieving the intended effects of OBF. Below, we identify the most salient of these factors.

**Institutions across all sectors remain concerned that the formula does not adequately recognize or account for variation in institutional missions or students served.**

Despite a policy that was developed with significant institutional input and a relatively high level of institutional autonomy to emphasize appropriate metrics, institutional leaders were still concerned that the formula did not adequately recognize and reward unique institutional missions. The following quotations illustrate this critique:

*The piece [the formula] completely misses are those folks that come to us in flux. They came to get more training on computer software, because that was what they felt was keeping them from being able to find a job. They come and take their computer classes, gain those skills, they find a job. They attained their goal for themselves. – Community College Administrator*

*The flagship school in the state... they have a higher admittance standard, they have higher ACT scores, higher GPAs. So, you would expect their performance to be better. We have a lower income level of our students, and we have a lot of first-time...first-generation college students. A lot of adult students that are coming back. And our admittance criteria is lower. So, we're accepting students that are lower. So, we acknowledge on the front end, it's going to be harder for them to be successful here. – Research University Administrator*

*One of the things that distinguishes us from some of the other institutions is our mission. When you have these productivity indicators and funding based on that, and at the same time you have a mission that you are trying to lift a whole group of people that other institutions wouldn't even look at—you know that is a big burden on us. – Comprehensive University Administrator*

**Differences in institutional capacity greatly influenced the implementation process.**

Tennessee's OBF model challenges institutions to reallocate resources to more directly influence outcomes included in the OBF formula. Yet institutions are not equally well-positioned to quickly and strategically align resources with target outcomes. A lack of fiscal resources in particular was often cited as a challenge:

*I'm taking resources from one pocket and putting [them in] another. We're going to do what we have to do, whatever it is. But money's tight. – Community College Administrator*

*We're poor. That's one of our challenges... what's stretching us terribly is at the same time we're trying to be a research university, then and to give high-touch services to students, and to pay the faculty, it just gets stretched. – Research University Administrator*

**Appropriations to public higher education in Tennessee fall short of what institutions would receive if the formula were fully funded.**

The Tennessee Higher Education Commission presents calculations of what each institution should receive in appropriations based on their outcomes as a budget recommendation to the legislature. However, the

legislature still awards a fixed amount of appropriations, resulting in institutions receiving a share of the appropriations based on their outcomes, which may not fully reward their improvements.

*Not that we would have had any big gains had it been fully funded. But that's problematic because you can't maintain the infrastructure. So, it leads legislators to believe: Well, you're doing it with nothing now, so why should we fund it? – Research University Administrator*

*The problem is where it's not [fully] funded [by the legislature]. Last year, it wasn't [fully] funded, and so there was a redistribution of money for universities that weren't doing as well, and that was the only thing that happened. And we lost the first year or two, and last year we gained a million dollars. But it was at the expense – if you look at the distribution of funds, it looked like the community colleges was where they were hit the hardest. So I think there has to be a commitment to fund that formula. – Comprehensive University Administrator*

### **Tennessee's funding process creates a high-stakes environment that is perceived as competitive and difficult for planning.**

Because a fixed amount of appropriations are awarded, institutions receive a share of overall appropriations based on their outcomes. This means that if an institution makes progress on outcomes but other institutions make more progress towards outcomes, they will not necessarily receive the funding that reflects their progress. Institutional administrators report that this results in a competitive, rather than cooperative, dynamic among institutions.

*The funds are distributed from a pool of dollars. So if everyone does well, the dollars are distributed to the ones who do the best, even though everyone may have improved. I think that that's a challenge. Not every state works that way, but because Tennessee works that way—you are effectively pitted against people who are in your same category. And I think that creates a different level of concern than it would if you were in an area all by yourself and you knew you were going to get some dollars and it's not based on you taking them away from somebody else or someone getting a larger piece of the pie. – Comprehensive University Administrator*

*It's relative to all the other institutions. Which is the most difficult part... If you were racing against your own metrics, and that's where your financial gain was determined, it would be great. So, if someone has farther to go, they have more potential. If some institutions are already performing at a higher level, they have less opportunity to push that needle up. – Research University Administrator*

While institutions perceive the competition within the funding formula as a challenge, state policymakers affirm this concept was by design. By allocating funding based on relative gain, the state is inciting a high-stakes nature toward receiving higher education funding. However, other design elements, such as using a three-year average and selecting more stable metrics, prevent drastic funding swings. One policymaker noted:

*You know, you're trying to have a competitive system but not one's that as competitive where there's huge redistributions of money every year. – Tennessee Policymaker*

Outcomes-based funding in Tennessee was developed and implemented through the direction of strong state leaders who purposefully included institutions in the process. Institution involvement in the design process created a better understanding of the funding formula and ultimately led to relatively strong statewide “buy-in” to the concept of tying higher education funding to key student outcomes. Following implementation of the policy, our analyses show that colleges and universities have aligned policies and

practices to the goals of outcomes-based funding. However, the perception of insufficient mission differentiation and differences in institutional capacity is of concern to institutional administrators, as are significant fiscal constraints at both the institutional and state levels. These factors create a high-stakes environment that is not perceived as wholly fair. Yet when taken together, the context and conditions under which OBF was implemented in Tennessee have created incentives for institutions to focus available resources on outcomes targeted in the formula. The following section examines whether institutional response to outcomes-based funding has had an impact on key student outcomes included in Tennessee's funding formula.

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## How Students Fare Under Outcomes-Based Funding in Tennessee

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We utilize Tennessee's Statewide Longitudinal Data System (SLDS) to examine student-level changes in the rates of OBF formula-specific outcomes for cohorts of students who entered pre- and post-OBF adoption. Our analyses examine changes in outcomes for students at both universities and community colleges. In addition, we consider how the impact of the policy varies for traditionally underserved student populations, including underrepresented minorities and low-income students, as well as for part-time students at community colleges.<sup>16</sup>

Tennessee's Statewide Longitudinal Data System allows for a more nuanced analyses of the effects of OBF than has previously been possible. Specifically, we:

1. Customize analyses to Tennessee by tracking changes across specific interim and long-term outcomes included in the funding formula;
2. Track OBF effects on student-level outcomes while controlling for key student characteristics;
3. Analyze the unique impact of OBF on traditionally underserved students; and
4. Identify trends in OBF impact on specific outcomes over time.

The level of specificity that student-level data provides makes a unique and significant contribution to our understanding of the effects of OBF on student outcomes. However, it is also important to note that every database and research methodology has weaknesses as well as strengths. Our use of statewide longitudinal databases is no exception. We utilize the most robust methodology possible with such data—a quasi-experimental technique called Interrupted Time Series Analysis—to determine whether students exposed to OBF have better (or worse) outcomes than we would have predicted if OBF had not been implemented. Yet because the time series analyses are conducted using the treatment group only, we cannot completely rule out the possibility that the results could be influenced to some degree by contemporaneous policy changes or unobserved changes in the population.

Lastly, while Tennessee's OBF policy rewards universities and community colleges for a range of outcomes, missing or incomplete data from the state's SLDS prevented us from tracking the full range of outcomes included in Tennessee's funding formula. For more information about our methodology and our data, please see Appendix B.

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<sup>16</sup> Part-time analyses for students at Tennessee's public universities was not completed since the proportion of first-time, part-time students in our dataset is small, roughly 3-5%. In addition, available data does not allow for enough years to provide a part-time student sufficient time to achieve an outcome.

## VI. Overview of Findings

This section provides an overview of our analyses of how students fare under outcomes-based funding. Specifically, we use student-level data from Tennessee’s SLDS to examine trends in enrollment before and after Tennessee adopted OBF and the impact of OBF policy on student outcomes in Tennessee’s community colleges and public universities.

### A. Enrollment in Tennessee’s Community Colleges and Public Universities from 2006-2013

We begin with descriptive analyses of enrollment trends of full-time and part-time students, as well as Pell-eligible students and underrepresented minority students, in Tennessee’s public universities and community colleges covering five years before the adoption of OBF and three years post adoption.

- It is important to track enrollment for two reasons. First, under Tennessee’s OBF formula, postsecondary institutions are awarded for the total numbers of students that meet each of the performance metrics. Because of this, institutional performance can be influenced by enrollment fluctuation. Second, early research on OBF suggested that a potential, unintended impact of the policy could be that institutions increase their admissions standards, making it more difficult for traditionally underserved populations to enroll in college. Table 7 summarizes findings from the enrollment analyses. Complete results are shown in Appendices E and F.

**Table 7. Enrollment Trends in Tennessee’s Public Universities from 2006 to 2013.**

STUDENT POPULATION	TREND	DETAILS			
		AVERAGE PRE-OBF 2006-2010		AVERAGE POST-OBF 2011-2013	
		%	#	%	#
<b>Community Colleges</b>					
<b>Full-Time Students</b>	<ul style="list-style-type: none"> <li>• Proportion: No substantial change</li> <li>• Total enrollment: Substantial increase beginning in 2010</li> </ul>	72%	10,083	69%	17,717
<b>Part-Time Students</b>	<ul style="list-style-type: none"> <li>• Proportion: No substantial change</li> <li>• Total enrollment: Substantial increase beginning in 2010</li> </ul>	28%	3,813	31%	7,999
<b>Pell-Eligible Students</b>	<ul style="list-style-type: none"> <li>• Proportion: Substantial increase between 2006 and 2013</li> <li>• Total enrollment: Substantial increase between 2006 and 2013</li> <li>• Highest increases in 2011</li> </ul>	61%	10,859	75%	16,952
<b>Underrepresented Minority Students</b>	<ul style="list-style-type: none"> <li>• Proportion: No substantial change</li> <li>• Total enrollment: Substantial increase in 2010</li> </ul>	23%	5,130	26%	6,795
<b>Universities</b>					
<b>Full-Time Students</b>	<ul style="list-style-type: none"> <li>• Proportion: No substantial change</li> <li>• Total enrollment: No substantial change</li> </ul>	96%	19,530	95%	20,947
<b>Part-Time Students</b>	<ul style="list-style-type: none"> <li>• Proportion: No substantial change</li> <li>• Total enrollment: No substantial change</li> </ul>	4%	718	5%	947

<b>Pell-Eligible Students</b>	<ul style="list-style-type: none"> <li>• Proportion: Substantial increase between 2009 and 2013</li> <li>• Total enrollment: Substantial increase between 2006 and 2013</li> <li>• Proportion, total number of Pell-eligible students highest in 2012.</li> </ul>	36%	6,180	49%	9,364
<b>Underrepresented Minority Students</b>	<ul style="list-style-type: none"> <li>• Proportion: No substantial change</li> <li>• Total enrollment: No substantial change</li> </ul>	22%	4,562	23%	5,140

Key takeaways:

- **First-time enrollment** increased in community colleges beginning in 2010. In contrast, enrollment levels at universities remained consistent over the eight years of data analyzed;
- **The proportion of full-time and part-time students** at universities and community colleges remained largely consistent, despite enrollment increases at community colleges;
- The number and proportion of **Pell-eligible students** increased in both community colleges and universities between 2006 and 2013;
- The proportion of **underrepresented minority students** (black and Hispanic) enrolled in community colleges and universities did not substantially change over the eight years of data examined. However, the total number of underrepresented minority students enrolled in community colleges increased beginning in 2010.

## B. Outcomes-Based Funding Effects on Targeted Student Outcomes

Next, we look for evidence of OBF impact on student outcomes that are included in Tennessee’s OBF formula. It is important to note that Tennessee’s OBF formula *does not* assign time limits to completion and progression outcomes. We imposed timeframes (e.g., “within two years”) for each outcome to enable a balanced comparison of pre-OBF and post-OBF student cohorts, recognizing that without time limits, pre-OBF cohorts would have several more years to attain a given outcome in our eight-year dataset than students who enrolled post-OBF.

For **community colleges**, we examine the impact of OBF on the following student outcomes:

- Associate degree completions within two, three, and four years;
- Certificate completion within two years;
- Accumulating 12, 24, and 36 credits; and
- Transferring to a university within three years.

For **universities**, we examine the impact of OBF on each of the following:

- Bachelor’s degree completions within four years;
- Accumulating 24, 48, and 72 credits; and
- “Crossing the finish line.”<sup>17</sup>

Table 8 summarizes the results of the impact analyses conducted for each of the student outcomes listed above. All analyses were conducted using a quasi-experimental technique called Interrupted Time Series,

<sup>17</sup> For this outcome we examine whether students who entered their junior year “on time” graduated within four years, a concept termed “crossing the finish line.” In examining this outcome we are interested in how students advance during their last two years of study.

wherein the pre-OBF trend for a given outcome serves as the comparison group to which the post-OBF trend is compared. All analyses were conducted at the student level using data extracted from Tennessee’s Statewide Longitudinal Data System (SLDS).

Analyses of OBF impact were conducted using cohorts of first-time students who enrolled between 2005-06 and 2012-2013. Results are provided for both *full-time* and *part-time community college students*. However, only results for *full-time university students* are shown because there were insufficient numbers of part-time university students to complete a separate analysis. Also, sub-group analyses were conducted to examine the effects of OBF on outcomes for Pell-eligible and underrepresented minority students.

Finally, results presented in Table 8 are for the most recent cohort that might have attained each outcome (i.e., the cohort that has had the most exposure to potential OBF policy effects). Complete results for all cohorts are provided in section II. Results in Table 8 are shown for the full cohort indicated “All,” and for the subgroups of Pell-eligible students (“Pell”) and underrepresented minority students (“URM”).

**Table 8. Summary of Impact of Outcomes-Based Funding in Tennessee on Key Student Outcomes for Community Colleges and Universities**

Community College Student Outcomes	PART-TIME STUDENTS		
	ALL	Pell	URM
Associate Degree Completion within Three Years	- Impact	- Impact	No significant findings
Associate Degree Completion within Four Years	- Impact	No significant findings	No significant findings
Earning a Certificate within Two Years	No significant findings	No significant findings	No significant findings
Accumulating 12 Credits within the First Year	- Impact	- Impact	- Impact
Accumulating 24 Credits within the First Two Years	- Impact	- Impact	- Impact
Accumulating 36 Credits within the First Three Years	- Impact	- Impact	- Impact
Transferring within Three Years	- Impact	- Impact	No significant findings
Community College Student Outcomes	FULL-TIME STUDENTS		
	ALL	Pell	URM
On-Time Associate Degree Completion	No significant findings	No significant findings	No significant findings
Associate Degree Completion within Three Years	+ Impact	+ Impact	No significant findings
Earning a Certificate within Two Years	+ Impact	+ Impact	+ Impact
Accumulating 12 Credits within the First Semester	+ Impact	+ Impact	No significant findings
Accumulating 24 Credits within the First Year	+ Impact	No significant findings	No significant findings
Accumulating 36 Credits within the First Three Semesters	No significant findings	No significant findings	No significant findings
Transferring within Three Years	No significant findings	No significant findings	No significant findings
University Student Outcomes	FULL-TIME STUDENTS		
	All	Pell	URM
Bachelor’s Degree Completion within Four Years	+ Impact	No significant findings	No significant findings
Accumulating 24 Credits within the First Year	+ Impact		+ Impact
Accumulating 48 Credits within the First Two Years	+ Impact		No significant findings
Accumulating 72 Credits within the First Three Years	No significant findings		No significant findings
Crossing the Finish Line	+ Impact		No significant findings

Key takeaways:

**Community College Students**

**A. Full-Time Students**

- **OBF had a significant positive impact on the most recent cohort on four of the seven student outcomes examined.** Positive impacts were found on the following outcomes:

- Associate degree completions within three years for *full-time students overall* and for the subgroup of *full-time Pell-eligible students*;
  - Earning a certificate within two years for *full time students overall* and both subgroups of *full-time Pell-eligible students* and *full-time underrepresented minority students*;
  - Accumulating 12 credits within the first semester for *full-time students overall* and for the subgroup of *full-time Pell-eligible students*;
  - Accumulating 24 credits within the first year for *full-time students overall*, but no effect was found for either subgroup.
- **No evidence of any OBF effect was found for associate degree completions within two years or accumulating 36 credits within the first three semesters.**

## B. Part-Time Students

- **OBF had a significant negative impact on the most recent cohort on six of the seven outcomes examined.** Negative impacts were found on the following outcomes:
  - Associate degree completions within three years for *part-time students overall* and for the subgroup of *part-time Pell-eligible students*;
  - Associate degree completions within four years for *part-time students overall*, but no effect was found for either subgroup;
  - Accumulating 12 credits within the first year for *part-time students overall* and both subgroups of *part-time Pell-eligible students* and *part-time underrepresented minority students*;
  - Accumulating 24 credits within the first two years for *part-time students overall* and both subgroups of *part-time Pell-eligible students* and *part-time underrepresented minority students*;
  - Accumulating 36 credits within the first three years for *part-time students overall* and both subgroups of *part-time Pell-eligible students* and *part-time underrepresented minority students*;
  - Transferring to a university within three years for *part-time students overall* and for the subgroup of *part-time Pell-eligible students*.

## Full-Time University Students

- **OBF had a significant positive impact on the most recent cohort on four of the five student outcomes examined.** Positive impacts were found on the following outcomes:
  - Bachelor's degree completions within four years for *full-time students overall*, but no effect was found for either subgroup.
  - Accumulating 24 credits within the first year for *full-time students overall* and for the subgroup of *full-time students who were underrepresented minority students*;
  - Accumulating 48 credits within the first two years for *full-time students overall*, but no effect was found for either subgroup; and
  - "Crossing the finish line" (i.e., graduating within two years of becoming a junior) for *full-time students overall*, but no effect was found for either subgroup.
- **No evidence of any OBF effect was found for completing 72 credits within the first three years.**

## C. Examining Trends over Time

We examined our results to determine whether the impact of OBF is trending in a particular direction over time as the policy becomes fully implemented. To do so, we examined whether the OBF effect on each outcome has changed in each year of implementation, and, if so, whether change occurred in the same direction consistently (e.g., either positive or negative). Also, in instances in which we did not find significant results, this analysis allowed us to determine whether change has been trending towards significance—either positive or negative—over time. Results are summarized in Table 9 below.

**Table 9. Summary of Key Findings: Significant Impact for Most Recent Post-OBF Cohort and Trends in OBF Formula-Related Student Outcomes across Post-OBF Cohorts (2011 through 2013)**

	UNIVERSITIES			COMMUNITY COLLEGES					
	FULL-TIME			FULL-TIME			PART-TIME		
	ALL	PELL	URM	ALL	PELL	URM	ALL	PELL	URM
Degree 100%-Time	+	∅	∅	∅▲	∅	∅			
Degree 150%-Time				+▲	+▲	∅	-▼	-▼	∅▲
Degree 200%-Time							-	∅	∅
25% Credit Benchmark	+▲	∅	+▲	+▲	+▲	∅	-▼	-▼	-▼
50% Credit Benchmark	+▲	∅	∅▲	+	∅	∅	-▼	-▼	-▼
75% Credit Benchmark	∅▲	∅▲	∅▲	∅▲	∅▲	∅	-▼	-▼	-▼
Certificate in Two Years				+▼	+▼	+▼	∅	∅	∅▼
Transfer				∅▲	∅	∅▼	-	-▼	∅▼

+ = statistically significant, positive impact; 95% confidence or above

- = statistically significant, negative impact; 95% confidence or above

∅ = no statistically significant impact

▲ = trending positive

▼ = trending negative

Shaded = Not included in analysis

Table 9 illustrates evidence of accumulating impact of OBF policy in Tennessee. First, outcomes showing positive impact from OBF are in most instances growing stronger over time, as indicated by green arrows. Also, and importantly, many null (∅) results are trending positive. These findings suggest that the effect of the policy is increasing as it becomes more fully implemented at the institutional level. Specific notable findings are as follows:

- OBF's impact on credit accumulation outcomes for full-time university and full-time community college students trended positive, growing in impact or becoming positively statistically significant with time.
- Degree 150%-time (associate degree within three years) for full-time community college students shows positively trending impact with time for all students and Pell-eligible students.
- Several null results for full-time university students and community college students are trending positive, such as achieving the 75% Credit Benchmark.
  - This trend is also present for across outcomes for both subgroups: underrepresented minority university students, as well as Pell-eligible students.

Second, negative results also mostly became more negative with time. Specifically:

- In four of the five part-time community college student outcomes that were negatively affected by OBF, the impact of OBF is becoming increasingly negative over time.

#### D. Exploring Equity in Student Outcomes under OBF

The limited impact of OBF on both Pell-eligible students and underrepresented minority students could indicate a widening achievement gap between traditionally underserved students and more advantaged students. We therefore conducted further analyses to test whether the OBF effects for students who were *not* Pell eligible and students who were *not* underrepresented minority students were significantly different than the OBF effects for Pell-eligible and underrepresented minority students.

In most cases, we did not find statistically significant differences in the OBF effects between the underserved and more advantaged student populations and, therefore, did not find strong quantitative evidence of a widening achievement gap.<sup>18</sup> In addition, we document promising trends for full-time Pell-eligible students and underrepresented minority students at both universities and community colleges as changes to outcomes following OBF have been positive, despite not reaching statistical significance at the 95% confidence level. However, further analyses that compare performance outcomes for underserved student populations in Tennessee to similar populations in a non-OBF state during the same time period are needed.

#### E. Identifying the Types of Institutions Showing Impacts of Outcomes-Based Funding

The intent of Tennessee’s OBF policy is to impact all types of public universities and community colleges. Because it is possible that overall results were driven by specific institutions, we also conducted analyses of OBF impact for individual institutions on several outcomes that were found to be significant.

For each of the 13 community colleges, we examined certificate attainment within two years and associate degree completion within three years. For each of the nine universities (six research universities and three comprehensive universities), we examined bachelor’s degree completions within four years. Tables 10 and 11 summarize results for community colleges and universities respectively. In both tables, institutions are ordered from largest to smallest to show whether impacts were isolated in higher-enrollment institutions. Effects shown in Tables 10 and 11 are for the most recent post-OBF cohort. Analysis of certificate attainment within two years was not possible for some institutions because they awarded so few (or no) certificates before the implementation of OBF. More detailed results of the analyses for all cohorts are provided in Appendix G.

**Table 10. Estimating the Effect of Outcomes-Based Funding on Certificate and Associate Degree Completions within Three Years**

INSTITUTIONS	Student Sample	MOST RECENT POST-OBF COHORTS	
		Certificate in Two Years	Associate Degree in Three Years
Pellissippi State Community College (Largest Enrollment)	6,660	Not available	+ Impact
Volunteer State Community College	6,482	No significant findings	+ Impact

<sup>18</sup> Out of 80 coefficients, only 9 were found to be statistically significant. Seven indicated a widening attainment gap and two indicated a shrinking attainment gap.

Walters State Community College	5,385	+ Impact	- Impact
Chattanooga State Community College	5,360	No significant findings	No significant findings
Northeast State Community College	4,981	+ Impact	No significant findings
Jackson State Community College	4,755	+ Impact	+ Impact
Southwest Tennessee Community College	4,523	No significant findings	No significant findings
Columbia State Community College	3,586	No significant findings	No significant findings
Roane State Community College	3,575	No significant findings	No significant findings
Motlow State Community College	3,433	Not available	No significant findings
Nashville State Community College	3,396	+ Impact	No significant findings
Cleveland State Community College	3,221	+ Impact	No significant findings
Dyersburg State Community College (Smallest Enrollment)	2,643	Not available	No significant findings

**Table 11. Estimating the Effect of Outcomes-Based Funding on Bachelor’s Degree Completions within Four Years**

INSTITUTIONS	Institution Type	Student Sample	POST-OBF COHORT
			Bachelor’s Degree Completions within Four Years
University of Tennessee – Knoxville	Research Universities	20,218	No significant findings
Middle Tennessee State University		18,258	No significant findings
University of Memphis		10,643	+ Impact
Tennessee Technological University		8,907	No significant findings
East Tennessee State University		8,646	+ Impact
Tennessee State University		4,541	No significant findings
University of Tennessee – Chattanooga	Comprehensive Universities	10,124	+ Impact
University of Tennessee – Martin		6,596	+ Impact
Austin Peay State University		6,443	No significant findings

**Key Takeaways:**

The overall effects of OBF are not a result of changes concentrated in only the highest enrollment or most selective public institutions in Tennessee. In other words, no clear pattern of results emerge. Specifically:

- OBF had a statistically significant positive impact on completing a certificate within two years for half of the community colleges.
- The impact of OBF on associate degree completions within three years was significant and positive for the most recent post-OBF cohort at three of 13 community colleges (two of those three were the largest community colleges in the state), but OBF had a negative impact on associate degree completion in one community college.
- OBF had a statistically significant positive impact on bachelor’s degree completion in four years for the most recent post-OBF cohort at four of nine public universities—two research universities and two comprehensive universities.

The following sections present the detailed findings from our quantitative analyses of enrollment trends and the impact of OBF on student outcomes in Tennessee’s community colleges and public universities. Starting with community college findings first, we track how student enrollment has changed over time, using several years of data both before and after OBF implementation for full-time, part-time, Pell-eligible, and underrepresented minority students. Next, we present findings from our quasi-experimental analyses of OBF’s impact on each of the formula-related outcomes for all four student populations.

Findings for university students follow a similar format, beginning with descriptive enrollment trends for full-time, part-time, Pell-eligible, and underrepresented minority students, followed by analyses of OBF impact on the four university student outcomes summarized above. For each outcome analysis, results are presented for the full sample of first-time, full-time students and for the sub-samples of full-time Pell-eligible students and full-time underrepresented minority students.

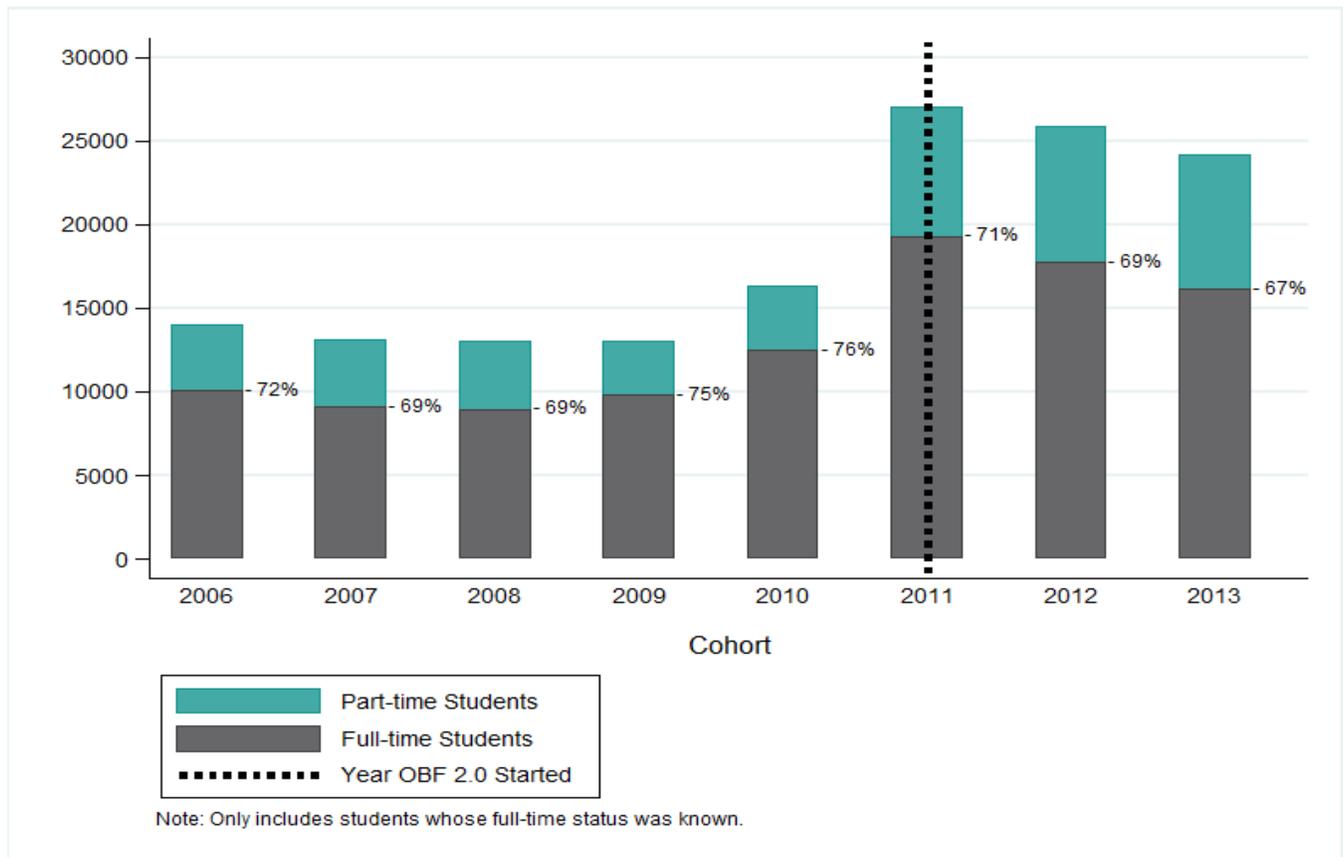
Appendix G examines OBF’s impact on student outcomes at individual institutions. Results are presented for each of Tennessee’s 13 community colleges and nine public universities.

## VII. Tracking Changes and Estimating Impact of OBF at Tennessee’s Community Colleges

### A. Overall Enrollment Trends of First-Time Undergraduate Students at Tennessee’s Community Colleges

Figure 2 displays cohort enrollment trends for Tennessee’s community colleges from academic years 2005-2006 to 2012-13.

**Figure 2. Undergraduate Cohort Enrollment of First-Time Students at Tennessee’s Community Colleges in Years Pre- and Post-OBF, 2006-13**



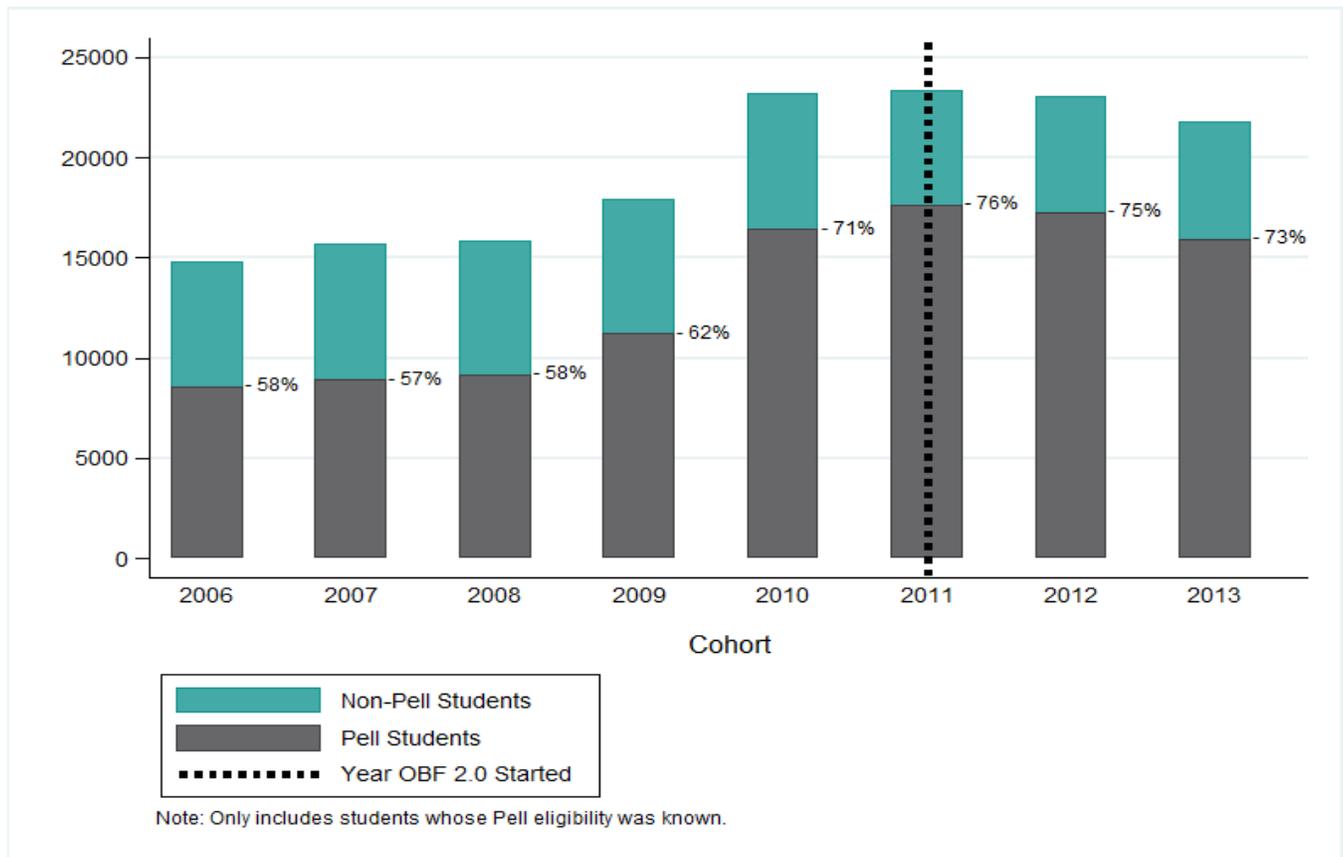
#### Key findings:

- The proportion of full-time and part-time students did not change significantly over the eight years of data examined.

## B. Enrollment Trends of Pell-Eligible Students at Tennessee’s Community Colleges

Figure 3 displays enrollment trends of first-time students who were Pell-eligible at any time during their first two years of community college.

**Figure 3. Trends in Undergraduate Cohort Enrollment of First-Time Pell-Eligible Students at Tennessee’s Public Universities in Years Pre- and Post-OBF, 2006 through 2013**



### Key findings

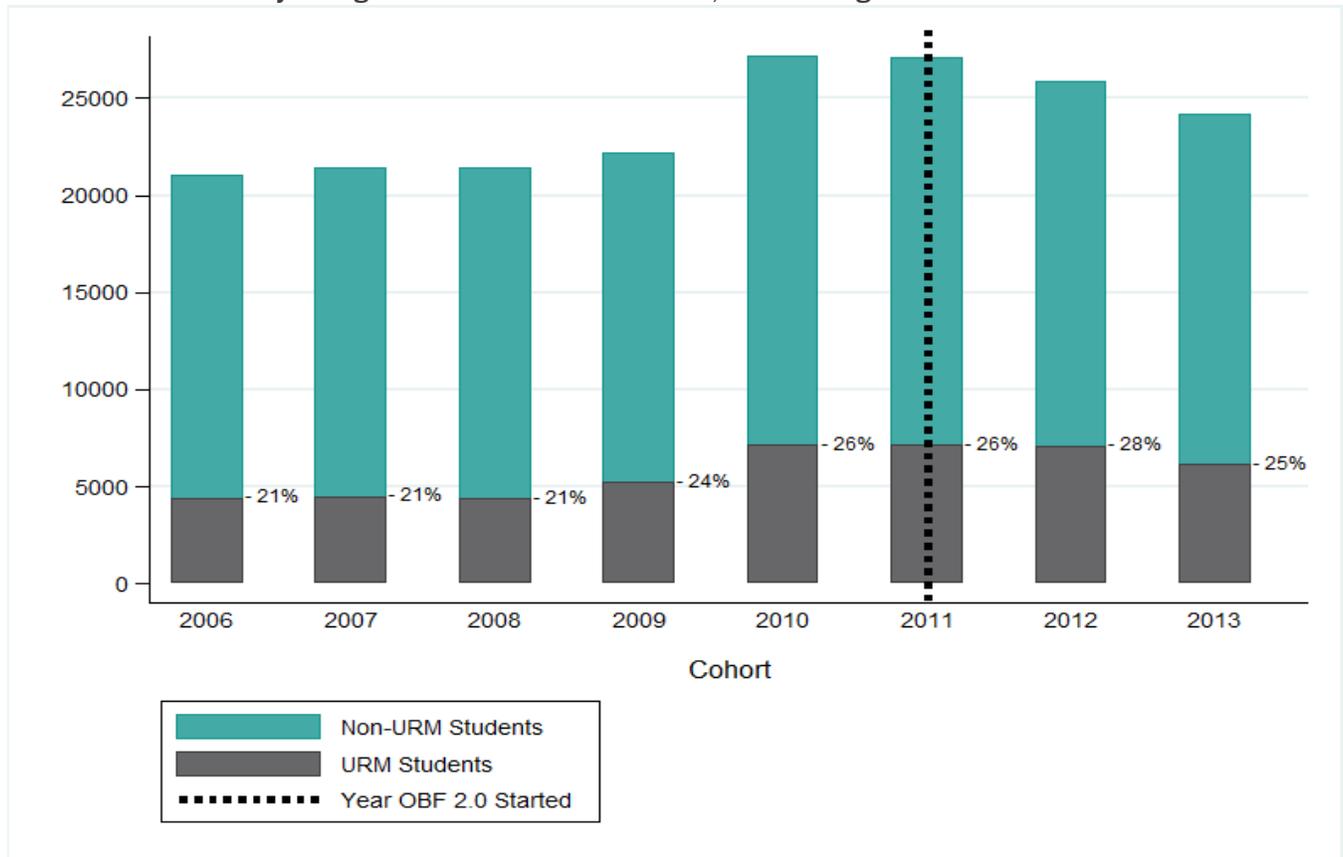
- **Number of Pell-Eligible Students.** The overall number of students eligible for a Pell grant during their first two years was markedly higher beginning in 2010. Pre-OBF enrollment saw the most significant change between 2009 and 2010, an increase of over 5,000 Pell-eligible students. Post-OBF enrollment increased to an average of nearly 17,000 Pell-eligible students each year, with the peak in Pell-eligible student enrollment occurring in 2011.
- **Percentage of Pell-Eligible Students.** The percentage of first-time community college students eligible for a Pell grant during their first two years also increased significantly, growing by over 10 percentage points between the 2009 and 2011 academic year.

- It is important to note that changes in the Pell program through investments as part of the American Recovery and Reinvestment Act of 2009, coupled with the Great Recession between 2007 and 2009, may have influenced the increased number and proportion of Pell-eligible students in Tennessee.<sup>19</sup>

### C. Enrollment Trends of Underrepresented Minority Students at Tennessee’s Community Colleges

Figure 4 displays cohort enrollment trends of first-time students in Tennessee’s community colleges who are black or Hispanic. The percent of underrepresented minority students did not change significantly over the eight years of data examined, although the number of these students increased beginning in 2010.

**Figure 4. Trends in Undergraduate Cohort Enrollment of First-Time Underrepresented Minority Students at Tennessee’s Community Colleges in Years Pre- and Post-OBF, 2006 through 2013**



### D. Estimating the Effect of Outcomes-Based Funding on Key Outcomes for Full-Time Students Enrolled in Tennessee’s Community Colleges

In this section we present the results of analyses of OBF impact on the following community college student outcomes that are included in Tennessee’s OBF formula:

<sup>19</sup> McCann, C. (n.d.) *Pell grants*. Retrieved from: <http://www.edcentral.org/edcyclopedia/federal-pell-grant-program/>

- Associate degree completions within two and three years;
- Certificate completion within two years;
- Accumulating 12, 24, and 36 credits; and
- Transferring to a university within three years.

Results are provided on each outcome for full-time students, controlling for Pell eligibility status, race/ethnicity, gender, age (i.e., adult or not), ACT Score, and major. We also examine the impact of OBF on key outcomes for two subgroups: Pell-eligible and underrepresented minority students.

Each table includes the following:

- **N.** The total analytical sample of first-time, full-time, community college students.
- **Pre-OBF Trend.** The probability of attaining the outcome of interest for an average student, estimated from pre-OBF data.
- **Post-OBF Trend.** The probability of attaining the given outcome for an average student, estimated from post-OBF data.
- **OBF Impact: Probability.** The increased probability of attaining the given outcome as a result of OBF.
- **OBF Impact: Student Count.** The estimated number of additional students who attained the outcome of interest as a result of OBF.

The following section provides our analyses on the impact of OBF on outcomes for full-time community college students. In cases where a significant (positive/negative) effect of OBF was found, we include a graph to depict the differences in the pre- and post-OBF trends.

i. Attaining an Associate Degree

Table 12 presents the effect of OBF on graduating on time with an associate degree for full-time students, shown graphically in Figure 5.

**Table 12. Estimating the Effect of OBF on Associate Degree Completion within Two Years for First-Time, Full-Time Students, 2006 through 2013.**

	PRE-OBF COHORTS					POST-OBF COHORT		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>N</b>	6,347	5,706	5,815	6,293	8,156	13,092	12,716	11,831
<b>Pre-OBF Trend</b>	3.6	3.6	3.6	3.6	3.5	3.5	3.5	3.5
<b>Post-OBF Trend</b>						2.9	3.5	3.8
<b>OBF Impact: Probability</b>						-0.6**	θ	θ
<b>OBF Impact: Student Count</b>						-74**	θ	θ

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

**Figure 5. Estimating the Effect of OBF on Associate Degree Completion within Two Years for First-Time, Full-Time Students, 2006 through 2013**

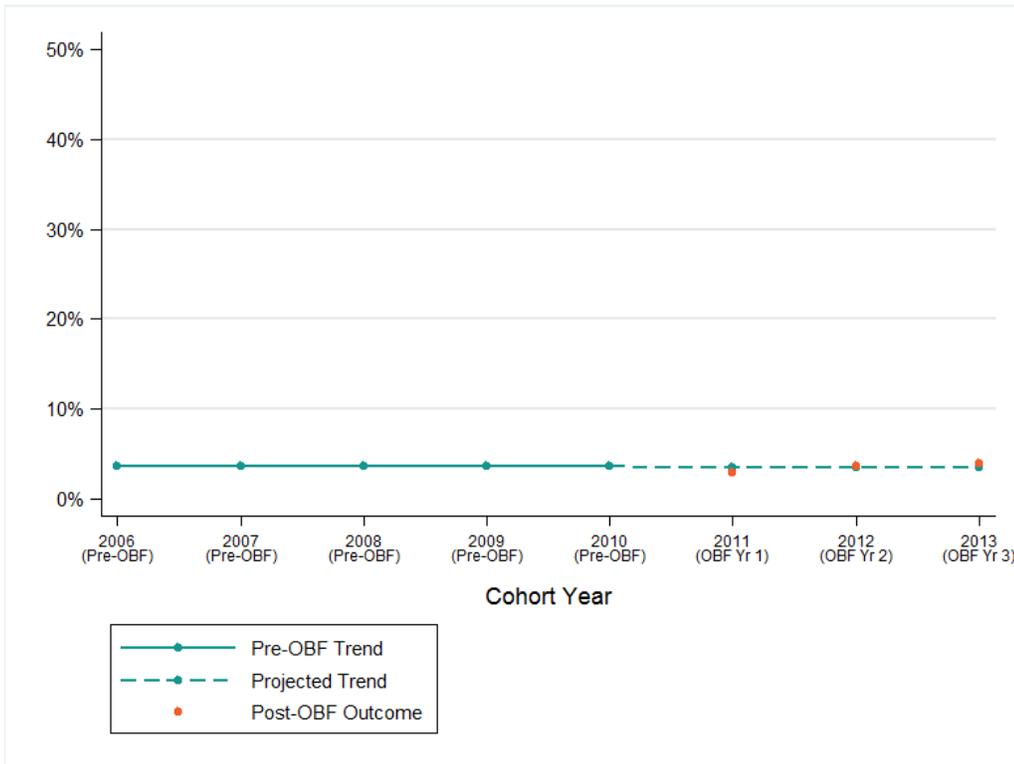


Table 13 presents the effect of OBF on graduating with an associate degree within three years for full-time students, shown graphically in Figure 6.

**Table 13. Estimating the Effect of OBF on Associate Degree Completion within Three Years for First-Time, Full-Time Students, 2006 through 2012.**

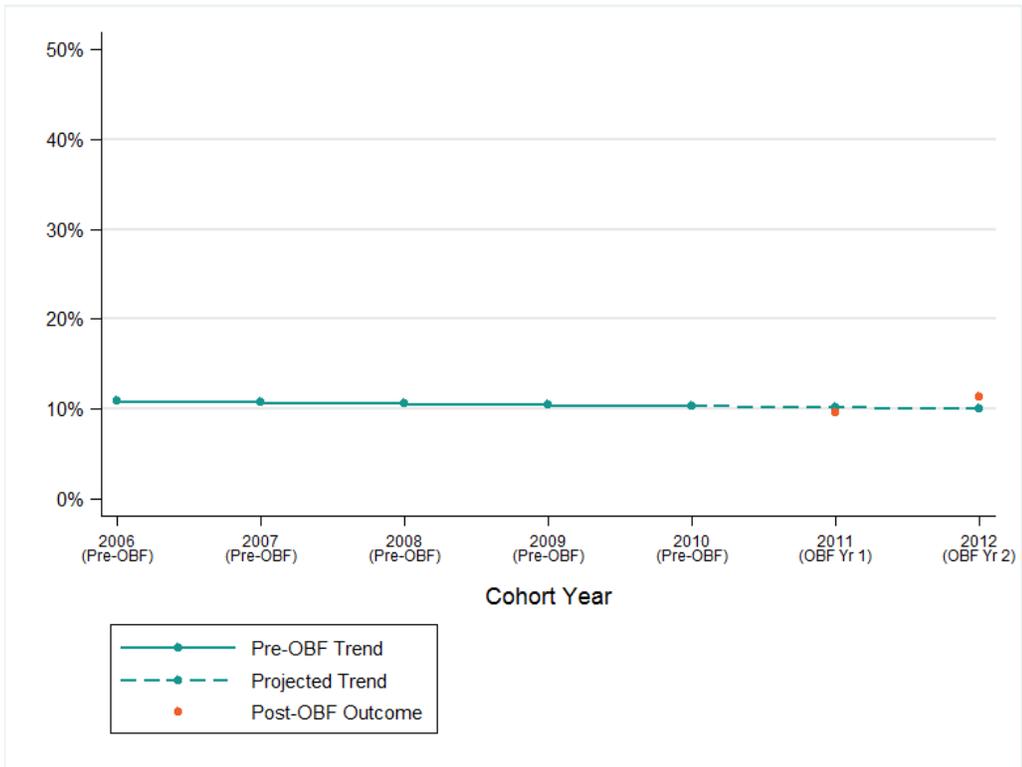
	PRE-OBF COHORTS					POST-OBF COHORT	
	2006	2007	2008	2009	2010	2011	2012
<b>N</b>	6,347	5,706	5,815	6,293	8,156	13,092	12,716
<b>Pre-OBF Trend</b>	10.8	10.7	10.5	10.4	10.3	10.1	10.0
<b>Post-OBF Trend</b>						9.6	11.3
<b>OBF Impact: Probability</b>						θ	1.3*
<b>OBF Impact: Student Count</b>						θ	166*

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

**Figure 6. Estimating the Effect of OBF on Associate Degree Completion within Three Years for First-Time, Full-Time Students, 2006 through 2012.**



ii. Earning a Certificate

Table 14 presents the effect of OBF on earning a certificate within two years for full-time students, shown graphically in Figure 7.

**Table 14. Estimating the Effect of OBF on Earning a Certificate within Two Years for First-Time, Full-Time Students in Years Pre- and Post-OBF Implementation, 2006 through 2013.**

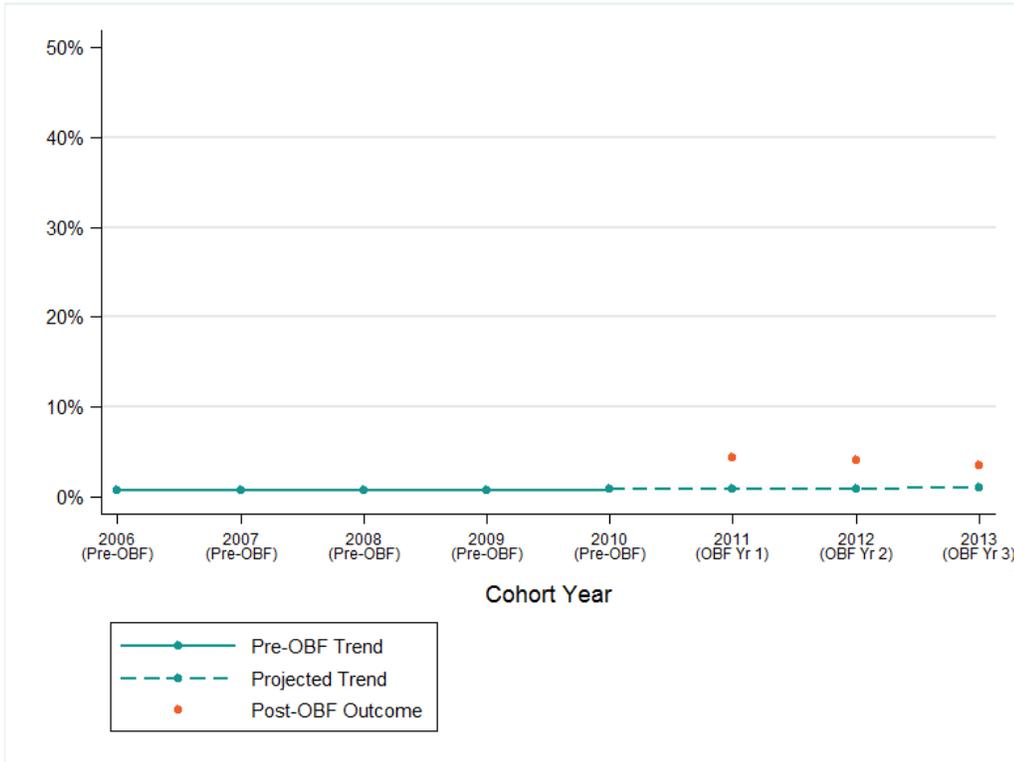
	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>N</b>	6,347	5,706	5,815	6,294	8,154	13,090	12,716	11,831
<b>Pre-OBF Trend</b>	0.6	0.7	0.7	0.7	0.8	0.8	0.9	0.9
<b>Post-OBF Trend</b>						4.3	4.0	3.4
<b>OBF Impact: Probability</b>						3.5***	3.1***	2.5***
<b>OBF Impact: Student Count</b>						456***	400***	292***

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

0 Not statistically significant

**Figure 7. Estimating the Effect of OBF on Earning a Certificate within Two Years for First-Time, Full-Time Students in Years Pre- and Post-OBF Implementation, 2006 through 2013.**



iii. Accumulating 12, 24, and 36 Credits

Table 15 presents the effect of OBF on accumulating 12 credits within the first semester for full-time students, shown graphically in Figure 8.

**Table 15. Estimating the Effect of OBF on Earning 12 Credits within the First Semester for First-Time, Full-Time Students, 2006 through 2013.**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
N	6,174	5,508	5,618	6,098	7,862	12,829	12,465	11,621
Pre-OBF Trend	51.5	51.0	50.5	50.0	49.6	49.1	48.6	48.2
Post-OBF Trend						51.1	51.5	52.7
OBF Impact: Probability						2.0*	2.8**	4.5***
OBF Impact: Student Count						255*	352**	529***

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

0 Not statistically significant

**Figure 8. Estimating the Effect of OBF on Earning 12 Credits within the First Semester for First-Time, Full-Time Students, 2006 through 2013.**

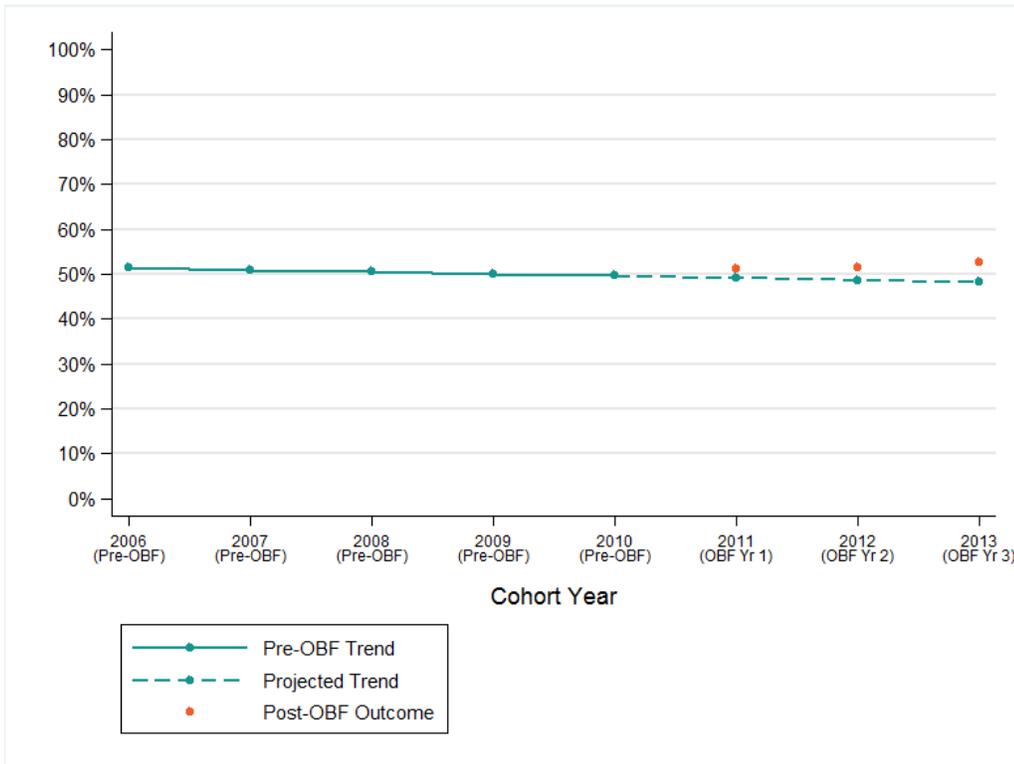


Table 16 presents the effect of OBF on accumulating 24 credits within the first year for full-time students, shown graphically in Figure 9.

**Table 16. Estimating the Effect of OBF on Earning 24 Credits within the First Year for First-Time, Full-Time Students, 2006 through 2013.**

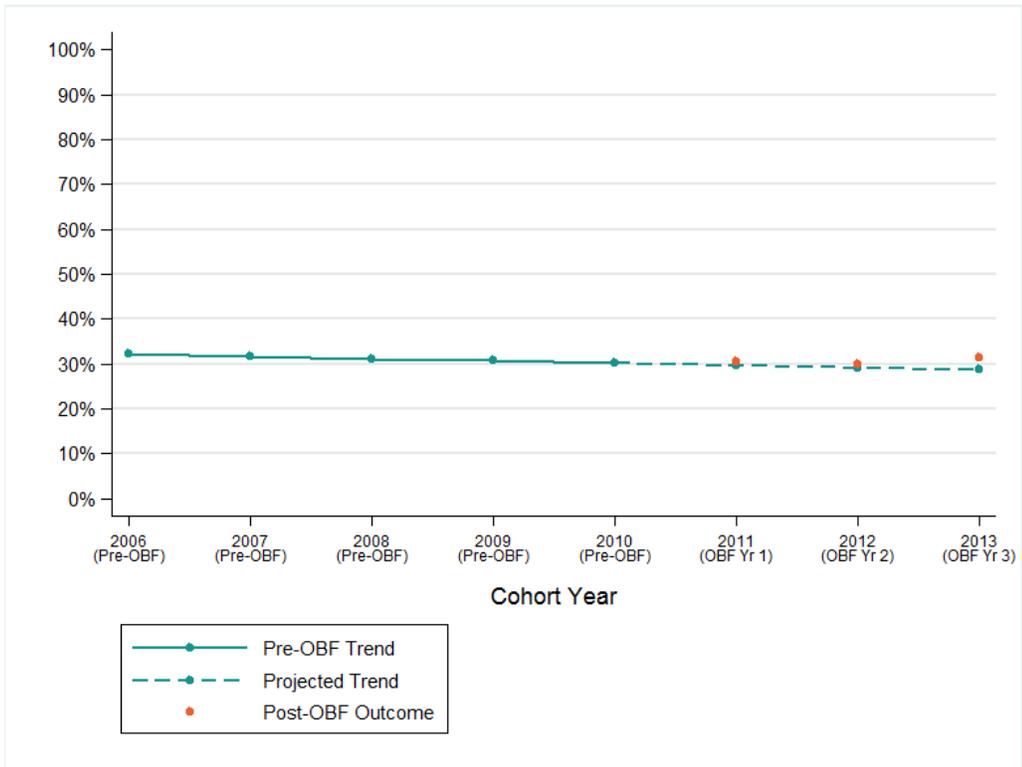
	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
N	6,162	5,487	5,589	6,090	7,892	12,790	12,430	11,595
Pre-OBF Trend	32.2	31.7	31.2	30.7	30.2	29.7	29.2	28.7
Post-OBF Trend						30.4	30.0	31.4
OBF Impact: Probability						θ	θ	2.7**
OBF Impact: Student Count						θ	θ	318**

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

**Figure 9. Estimating the Effect of OBF on Earning 24 Credits within the First Year for First-Time, Full-Time Students, 2006 through 2013.**



As shown in Table 17, there were no significant effects of OBF on accumulating 36 credits within the first three semesters for full-time students.

**Table 17. Estimating the Effect of OBF on Earning 36 Credits within the First Three Semesters for First-Time, Full-Time Students, 2006 through 2013.**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
N	6,155	5,502	5,603	6,080	7,859	12,741	12,374	11,540
Pre-OBF Trend	23.3	23.0	22.8	22.6	22.3	22.1	21.9	21.6
Post-OBF Trend						20.9	21.8	22.6
OBF Impact: Probability						θ	θ	θ
OBF Impact: Student Count						θ	θ	θ

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

iv. Transfer

Table 18 presents the effect of OBF on transferring within three years for full-time students. We found no significant effects.

**Table 18. Estimating the Effect of OBF on Transferring within Three Years for First-Time, Full-Time Students in Years Pre- and Post-OBF, 2006 through 2012.**

	PRE-OBF COHORTS					POST-OBF COHORT	
	2006	2007	2008	2009	2010	2011	2012
N	6,347	5,706	5,815	6,294	8,157	13,092	12,716
Pre-OBF Trend	11.1	10.8	10.6	10.3	10.0	9.7	9.5
Post-OBF Trend						9.7	10.1
OBF Impact: Probability						θ	θ
OBF Impact: Student Count						θ	θ

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

**Key findings:**

- OBF in Tennessee had no positive impact on on-time associate degree completions for first-time, full-time students. In fact, we estimate that OBF led to a *decrease* in the probability of achieving this outcome for the 2010-11 cohort.
- We see a positive impact of OBF on graduating with an associate degree within three years, attaining a certificate, and accumulating 12 and 24 credits.
- We see no effect of OBF on accumulating 36 credits within a student’s first three semesters or transferring within three years for full-time students.

**E. Estimating the Effect of Outcomes-Based Funding on Key Outcomes for Part-Time Students Enrolled in Tennessee’s Community Colleges**

We also examined the effect of OBF on outcomes for part-time students in Tennessee’s community colleges. For part-time students, we expanded the length of time to students had to attain an associate degree and accumulate credits. Table 19 displays the results of our analyses.

**Table 19. Estimating the Effect of OBF on Key Outcomes for First-Time, Part-Time Students in Years Pre- and Post-OBF, 2006 through 2013.**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>Associate Degree within Three Years</b>								
N	991	902	1,025	1,166	1,585	3,327	4,015	
Pre-OBF Trend	1.9	2.1	2.4	2.7	3.0	3.4	3.8	
Post-OBF Trend						1.9	2.2	
OBF Impact: Probability						-1.4**	-1.6*	
OBF Impact: Student Count						-47**	-63*	
<b>Associate Degree within Four Years</b>								
N	991	902	1,025	1,166	1,585	3,327		
Pre-OBF Trend	4.8	5.2	5.6	6.0	6.4	6.8		
Post-OBF Trend						4.6		
OBF Impact: Probability						-2.2**		

<b>OBF Impact: Student Count</b>							-74**		
<b>Earning a Certificate within Two Years</b>									
<b>N</b>	992	902	1,026	1,166	1,585	3,327	4,015	4,029	
<b>Pre-OBF Trend</b>	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	
<b>Post-OBF Trend</b>						1.3	0.7	1.1	
<b>OBF Impact: Probability</b>						0.8**	θ	θ	
<b>OBF Impact: Student Count</b>						27**	θ	θ	
<b>Accumulating 12 Credits Within the First Year</b>									
<b>N</b>	951	867	974	1,095	1,500	3,225	3,855	3,859	
<b>Pre-OBF Trend</b>	32.2	33.2	34.3	35.3	36.4	37.4	38.5	39.6	
<b>Post-OBF Trend</b>						32.3	29.6	28.1	
<b>OBF Impact: Probability</b>						-5.2**	-8.9***	-11.5***	
<b>OBF Impact: Student Count</b>						-166**	-344***	-445***	
<b>Accumulating 24 Credits Within the First Two Years</b>									
<b>N</b>	951	864	968	1,104	1,501	3,207	3,832	3,841	
<b>Pre-OBF Trend</b>	22.1	22.9	23.8	24.7	25.6	26.5	27.4	28.4	
<b>Post-OBF Trend</b>						22.1	20.5	19.5	
<b>OBF Impact: Probability</b>						-4.4**	-6.9***	-8.9***	
<b>OBF Impact: Student Count</b>						-141**	-266***	-340***	
<b>Accumulating 36 Credits Within the First Three Years</b>									
<b>N</b>	947	865	974	1,102	1,498	3,185	3,818		
<b>Pre-OBF Trend</b>	17.7	18.4	19.1	19.8	20.6	21.4	22.1		
<b>Post-OBF Trend</b>						16.4	15.0		
<b>OBF Impact: Probability</b>						-4.9***	-7.1***		
<b>OBF Impact: Student Count</b>						-157***	-271***		
<b>Transferring within Three Years</b>									
<b>N</b>	992	902	1,026	1,166	1,585	3,328	4,015		
<b>Pre-OBF Trend</b>	2.1	2.3	2.4	2.6	2.8	3.0	3.2		
<b>Post-OBF Trend</b>						1.6	1.8		
<b>OBF Impact: Probability</b>						-1.4**	-1.4*		
<b>OBF Impact: Student Count</b>						-46**	-55*		

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

### Summary findings:

- OBF had a negative impact on the probability that part-time students would attain an associate degree within three and four years, accumulating 12, 24 and 36 credits, and transferring within three years for part-time students at community colleges.

- OBF had little to no impact on earning a certificate within two years for part-time students. Our analyses show a positive impact of OBF on earning a certificate for the 2011 cohort, but the effect of OBF disappears in more recent cohorts.

## F. Estimating the Effect of Outcomes-Based Funding on Key Outcomes for Pell-Eligible and Underrepresented Minority Students Enrolled in Tennessee’s Community Colleges

As noted previously, OBF could have an unintended negative effect if institutions focused efforts on students who enter college with a greater likelihood of achieving the outcomes in the formula. To discourage institutions from doing this, Tennessee included metrics to target certain populations such as Pell-eligible students, adults, and academically underprepared students. In our analyses of Tennessee’s OBF policy, we consider the impact of OBF on the outcomes of both Pell-eligible students and underrepresented minority students.

### i. Pell-Eligible Students

Tables 20 and 21 provide results from analyses examining whether OBF had an effect on full- and part-time Pell-eligible community college students. For part-time students, we expanded the length of time to earn an associate degree and accumulate credits.

**Table 20. Estimating the Effect of Outcomes-Based Funding on Associate Degree Attainment, Certificate Completions, Credit Accumulation, and Transferring for First-Time, Full-Time Students Who Are Pell Eligible in Their First Two Years, 2006 through 2013**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>Associate Degree within Two Years</b>								
<i>N</i>	3,383	2,879	2,942	3,195	4,956	9,241	8,896	7,968
Pre-OBF Trend	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1
Post-OBF Trend						1.9	2.1	2.1
OBF Impact: Probability						0	0	0
OBF Impact: Student Count						0	0	0
<b>Associate Degree within Three Years</b>								
<i>N</i>	3,383	2,879	2,942	3,195	4,956	9,241	8,896	
Pre-OBF Trend	7.7	7.5	7.3	7.1	7.0	6.8	6.6	
Post-OBF Trend						7.0	7.8	
OBF Impact: Probability						0	1.2*	
OBF Impact: Student Count						0	105*	
<b>Earning a Certificate within Two Years</b>								
<i>N</i>	3,383	2,879	2,942	3,196	4,954	9,239	8,896	7,969
Pre-OBF Trend	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Post-OBF Trend						3.1	3.0	2.7
OBF Impact: Probability						2.5***	2.4***	2.1***
OBF Impact: Student Count						234***	217***	170***
<b>Accumulating 12 Credits within the First Semester</b>								

<b>N</b>	3,284	2,759	2,829	3,064	4,746	9,016	8,678	7,796
<b>Pre-OBF Trend</b>	45.9	45.5	45.1	44.7	44.2	43.8	43.4	43.0
<b>Post-OBF Trend</b>						45.4	45.1	46.0
<b>OBF Impact: Probability</b>						θ	θ	3.0*
<b>OBF Impact: Student Count</b>						θ	θ	235*
<b>Accumulating 24 Credits within the First Year</b>								
<b>N</b>	3,271	2,746	2,827	3,063	4,763	8,989	8,649	7,776
<b>Pre-OBF Trend</b>	25.7	25.6	25.5	25.4	25.3	25.2	25.1	25.0
<b>Post-OBF Trend</b>						25.6	24.1	25.3
<b>OBF Impact: Probability</b>						θ	θ	θ
<b>OBF Impact: Student Count</b>						θ	θ	θ
<b>Accumulating 36 Credits within the First Three Semesters</b>								
<b>N</b>	3,265	2,755	2,835	3,057	4,750	8,962	8,615	7,746
<b>Pre-OBF Trend</b>	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8
<b>Post-OBF Trend</b>						16.8	17.0	17.3
<b>OBF Impact: Probability</b>						θ	θ	θ
<b>OBF Impact: Student Count</b>						θ	θ	θ
<b>Transferring within Three Years</b>								
<b>N</b>	3,383	2,879	2,942	3,196	4,957	9,241	8,896	
<b>Pre-OBF Trend</b>	7.5	7.5	7.4	7.4	7.3	7.3	7.2	
<b>Post-OBF Trend</b>						6.8	6.9	
<b>OBF Impact: Probability</b>						θ	θ	
<b>OBF Impact: Student Count</b>						θ	θ	

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

**Table 21. Estimating the Effect of Outcomes-Based Funding on Associate Degree Attainment, Certificate Completions, Credit Accumulation, and Transferring for First-Time, Part-Time Students Who Are Pell Eligible in Their First Two Years, 2006 through 2013**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>Associate Degree within Three Years</b>								
<b>N</b>	608	539	612	698	1,103	2,626	3,172	
<b>Pre-OBF Trend</b>	1.4	1.6	1.9	2.2	2.6	3.0	3.6	
<b>Post-OBF Trend</b>						1.7	1.5	
<b>OBF Impact: Probability</b>						-1.3*	-2.0**	
<b>OBF Impact: Student Count</b>						-35*	-65**	
<b>Associate Degree within Four Years</b>								
<b>N</b>	608	539	612	698	1,103	2,626		
<b>Pre-OBF Trend</b>	4.1	4.4	4.6	4.9	5.1	5.4		
<b>Post-OBF Trend</b>						4.1		
<b>OBF Impact: Probability</b>						θ		

<b>OBF Impact: Student Count</b>						$\theta$		
<b>Earning a Certificate within Two Years</b>								
<i>N</i>	609	539	613	698	1,103	2,625	3,172	3,134
<b>Pre-OBF Trend</b>	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8
<b>Post-OBF Trend</b>						0.9	0.6	1.0
<b>OBF Impact: Probability</b>						$\theta$	$\theta$	$\theta$
<b>OBF Impact: Student Count</b>						$\theta$	$\theta$	$\theta$
<b>Accumulating 12 Credits Within the First Year</b>								
<i>N</i>	583	512	576	650	1,037	2,538	3,026	2,984
<b>Pre-OBF Trend</b>	31.0	32.2	33.3	34.5	35.6	36.9	38.1	39.3
<b>Post-OBF Trend</b>						31.5	27.8	26.4
<b>OBF Impact: Probability</b>						-5.3**	-10.3***	-12.9***
<b>OBF Impact: Student Count</b>						-135**	-311***	-386***
<b>Accumulating 24 Credits Within the First Two Years</b>								
<i>N</i>	584	512	570	659	1,039	2,529	3,008	2,969
<b>Pre-OBF Trend</b>	21.4	21.9	22.4	22.9	23.4	23.9	24.5	25.0
<b>Post-OBF Trend</b>						21.2	18.8	17.9
<b>OBF Impact: Probability</b>						-2.7	-5.6**	-7.1**
<b>OBF Impact: Student Count</b>						-69	-169**	-211**
<b>Accumulating 36 Credits Within the First Three Years</b>								
<i>N</i>	582	516	574	658	1,038	2,514	2,997	
<b>Pre-OBF Trend</b>	16.9	17.5	18.0	18.6	19.2	19.8	20.4	
<b>Post-OBF Trend</b>						15.5	13.7	
<b>OBF Impact: Probability</b>						-4.3**	-6.7***	
<b>OBF Impact: Student Count</b>						-108**	-202***	
<b>Transferring within Three Years</b>								
<i>N</i>	609	539	613	698	1,103	2,626	3,172	
<b>Pre-OBF Trend</b>	1.9	2.0	2.2	2.4	2.6	2.8	3.0	
<b>Post-OBF Trend</b>						1.4	1.4	
<b>OBF Impact: Probability</b>						-1.3*	-1.6*	
<b>OBF Impact: Student Count</b>						-35*	-50*	

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

$\theta$  Not statistically significant

### Summary findings:

- **Full-time Pell-Eligible Students:** OBF had a positive impact on graduating with an associate degree within three years, earning a certificate within two years, and accumulating 12 credits for full-time Pell-eligible students. OBF had no impact on graduating with an associate degree within two years, accumulating 24 or 36 credits, or transferring within three years for full-time Pell-eligible students.
- **Part-time Pell-Eligible Students:** OBF had negative effects on achieving multiple outcomes for part-time Pell-eligible students, including attaining an associate degree within three years, accumulating

12, 24, and 36 credits, and transferring within three years. OBF had no impact on attaining an associate degree within four years or earning a certificate.

ii. Underrepresented Minority Students

While there are no metrics in Tennessee’s OBF formula that are tailored specifically to underrepresented minorities, we conducted analyses to examine the impact of the policy on these students as well. Tables 22 and 23 present results from our analysis of the relationship between OBF and each of the outcomes for full-time and part-time underrepresented minority (black or Hispanic) students. For part-time students, we expanded the length of time students had to earn a credential and accumulate credits.

**Table 22. Estimating the Effect of Outcomes-Based Funding on Associate Degree Attainment, Certificate Completions, Credit Accumulation, and Transferring for First-Time, Full-Time Underrepresented Minority Students, 2006 through 2013**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>Associate Degree within Two Years</b>								
<i>N</i>	1,515	978	958	1,027	1,473	2,728	2,801	2,284
Pre-OBF Trend	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8
Post-OBF Trend						0.8	0.6	0.8
OBF Impact: Probability						0	0	0
OBF Impact: Student Count						0	0	0
<b>Associate Degree within Three Years</b>								
<i>N</i>	1,515	978	958	1,027	1,473	2,728	2,801	
Pre-OBF Trend	3.3	3.2	3.1	3.0	2.9	2.8	2.7	
Post-OBF Trend						2.8	2.8	
OBF Impact: Probability						0	0	
OBF Impact: Student Count						0	0	
<b>Earning a Certificate within Two Years</b>								
<i>N</i>	1,515	978	958	1,027	1,473	2,728	2,801	2,283
Pre-OBF Trend	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1
Post-OBF Trend						1.9	1.4	1.2
OBF Impact: Probability						1.7***	1.3***	1.2***
OBF Impact: Student Count						48***	37***	26***
<b>Accumulating 12 Credits within the First Semester</b>								
<i>N</i>	1,460	926	910	960	1,368	2,641	2,690	2,195
Pre-OBF Trend	35.3	35.0	34.8	34.5	34.2	33.9	33.7	33.4
Post-OBF Trend						31.9	33.9	32.6
OBF Impact: Probability						0	0	0
OBF Impact: Student Count						0	0	0
<b>Accumulating 24 Credits within the First Year</b>								
<i>N</i>	1,457	920	903	960	1,374	2,627	2,684	2,190
Pre-OBF Trend	15.8	15.9	16.1	16.2	16.4	16.5	16.7	16.8
Post-OBF Trend						16.8	13.8	14.7
OBF Impact: Probability						0	0	0

<b>OBF Impact: Student Count</b>						0	0	0
<b>Accumulating 36 Credits within the First Three Semesters</b>								
<b>N</b>	1,455	923	910	955	1,376	2,622	2,676	2,185
<b>Pre-OBF Trend</b>	9.1	9.5	9.9	10.3	10.6	11.1	11.5	11.9
<b>Post-OBF Trend</b>						10.1	8.5	9.6
<b>OBF Impact: Probability</b>						0	-2.9*	0
<b>OBF Impact: Student Count</b>						0	-79*	0
<b>Transferring within Three Years</b>								
<b>N</b>	1,515	978	958	1,027	1,473	2,728	2,801	
<b>Pre-OBF Trend</b>	5.1	5.2	5.2	5.3	5.4	5.5	5.5	
<b>Post-OBF Trend</b>						5.2	5.1	
<b>OBF Impact: Probability</b>						0	0	
<b>OBF Impact: Student Count</b>						0	0	

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

0 Not statistically significant

**Table 23. Estimating the Effect of Outcomes-Based Funding on Associate Degree Attainment, Certificate Completions, Credit Accumulation, and Transferring for First-Time, Part-Time Underrepresented Minority Students, 2006 through 2013**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>Associate Degree within Three Years</b>								
<b>N</b>	287	208	211	278	438	1,116	1,537	
<b>Pre-OBF Trend</b>	1.9	1.7	1.5	1.3	1.2	1.0	0.9	
<b>Post-OBF Trend</b>						0.6	0.7	
<b>OBF Impact: Probability</b>						0	0	
<b>OBF Impact: Student Count</b>						0	0	
<b>Associate Degree within Four Years</b>								
<b>N</b>	287	208	211	278	438	1,116		
<b>Pre-OBF Trend</b>	3.3	2.9	2.5	2.2	1.9	1.7		
<b>Post-OBF Trend</b>						2.4		
<b>OBF Impact: Probability</b>						0		
<b>OBF Impact: Student Count</b>						0		
<b>Earning a Certificate within Two Years</b>								
<b>N</b>	287	208	211	278	438	1,116	1,537	1,551
<b>Pre-OBF Trend</b>	0.1	0.1	0.1	0.2	0.3	0.4	0.6	0.9
<b>Post-OBF Trend</b>						0.6	0.2	0.4
<b>OBF Impact: Probability</b>						0	0	0
<b>OBF Impact: Student Count</b>						0	0	0
<b>Accumulating 12 Credits within the First Year</b>								
<b>N</b>	271	196	188	252	397	1,070	1,453	1,452
<b>Pre-OBF Trend</b>	27.0	27.8	28.7	29.5	30.4	31.3	32.3	33.2

Post-OBF Trend						26.4	22.3	16.9
OBF Impact: Probability						θ	-10.0**	-16.3***
OBF Impact: Student Count						θ	-145**	-236***
<b>Accumulating 24 Credits within the First Two Years</b>								
N	272	198	184	255	394	1,065	1,442	1,442
Pre-OBF Trend	16.4	17.1	17.8	18.5	19.2	20.0	20.8	21.6
Post-OBF Trend						16.2	13.4	11.7
OBF Impact: Probability						θ	-7.4**	-9.9**
OBF Impact: Student Count						θ	-106**	-143**
<b>Accumulating 36 Credits within the First Three Years</b>								
N	270	198	187	254	392	1,057	1,433	
Pre-OBF Trend	11.0	11.8	12.6	13.4	14.3	15.3	16.3	
Post-OBF Trend						11.9	9.8	
OBF Impact: Probability						θ	-6.5**	
OBF Impact: Student Count						θ	-94**	
<b>Transferring within Three Years</b>								
N	287	208	211	278	438	1,116	1,537	
Pre-OBF Trend	1.8	1.9	1.9	2.0	2.1	2.2	2.3	
Post-OBF Trend						1.4	1.1	
OBF Impact: Probability						θ	θ	
OBF Impact: Student Count						θ	θ	

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

### Summary findings:

- **Full-Time Underrepresented Minority Students:** Analyses of certificate completions show OBF had a positive impact for full-time underrepresented minority students. OBF had no statistically significant impact on the probability of attaining an associate degree or transferring for full-time students, and had mostly no effect on credit accumulation.
- **Part-Time Underrepresented Minority Students:** OBF had no effect on most outcomes for part-time students—earning an associate degree within three and four years, certificate completion, or transferring. OBF had a negative impact on accumulating 12, 24, and 36 credits.

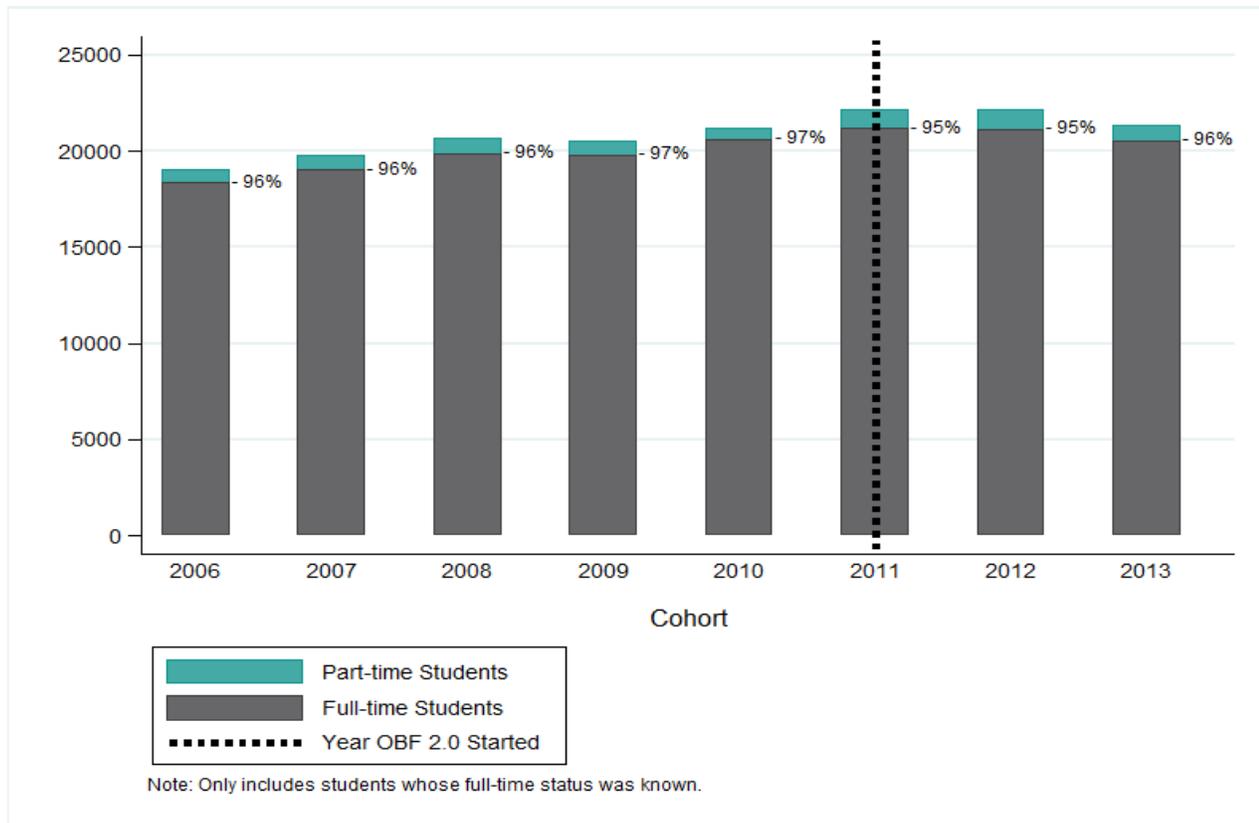
## VIII. Tracking Changes and Estimating Impact of OBF at Tennessee's Universities

The following sections provide further detail on the enrollment trends across public universities in Tennessee and present our analyses examining the impact of OBF on key student outcomes.

## A. Overall Cohort Enrollment Trends of First-Time Undergraduate Students at Tennessee’s Public Universities

Figure 10 displays cohort enrollment trends for Tennessee’s public universities from academic years 2005-06 to 2012-13. Here, we define a student’s cohort as the academic year in which the student first enrolled. For example, students who entered in the 2005-06 academic year are referred to as the 2006 cohort.

**Figure 10. Undergraduate Cohort Enrollment of First-Time Students at Tennessee’s Public Universities in Years Pre- and Post-OBF, 2006 through 2013**



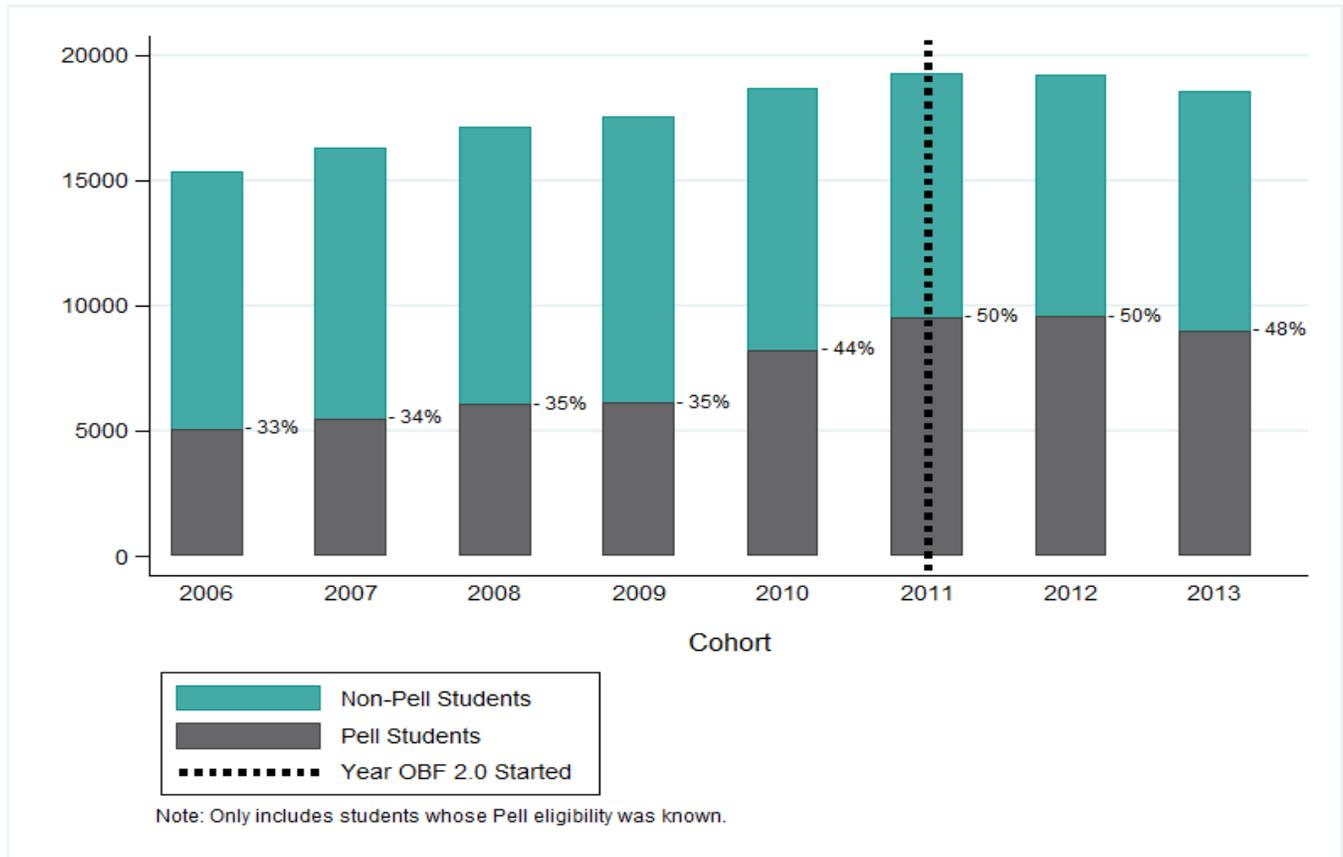
### Key findings:

- About 96% of Tennessee’s public university students are full-time, and this proportion did not change significantly over the eight years of data examined.
- The numbers of full-time and part-time students also did not vary substantially over the eight years of data examined. While numbers did rise to some degree during the first and second years of OBF implementation, they dropped subsequently to pre-OBF levels.

### i. Enrollment Trends of Pell-Eligible Students at Tennessee’s Public Universities

Figure 11 displays cohort enrollment trends of first-time undergraduate students who were Pell eligible while enrolled at a Tennessee public university. While Tennessee’s OBF formula awards institutions for serving students who were Pell eligible at any time during their college career, due to available years of data, our analysis examines students who were Pell eligible at any time during their first two years of their college career.

**Figure 11. Trends in Undergraduate Cohort Enrollment of First-Time Pell-Eligible Students at Tennessee’s Public Universities in Years Pre- and Post-OBF, 2006 through 2013**



**Key findings:**

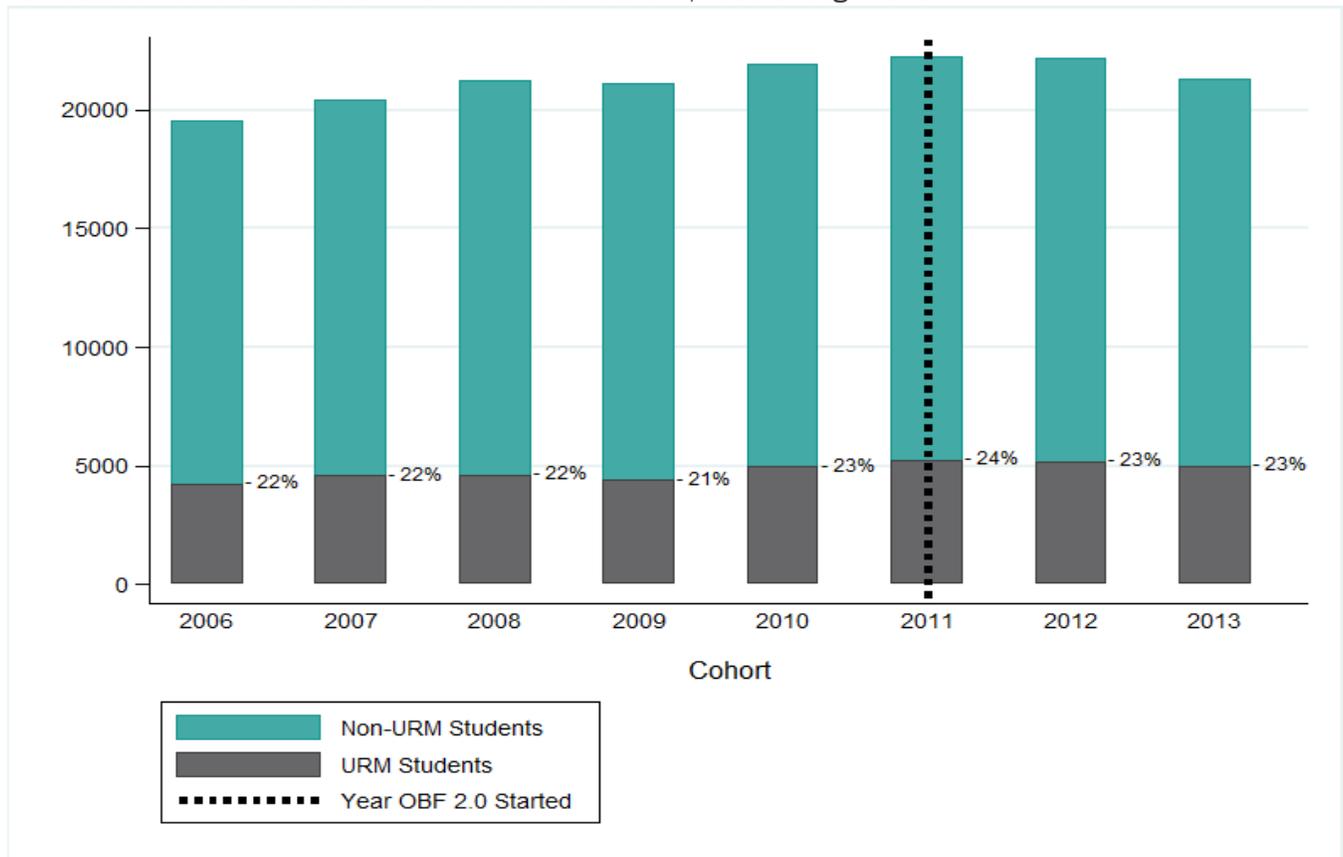
- **Number of Pell-Eligible Students.** In contrast to relatively steady enrollment overall, the number of students who were eligible for a Pell grant during their first two years is markedly higher beginning in 2010.
- **Percentage of Pell-Eligible Students.** The percentage of first-time undergraduate students who were eligible for a Pell grant increased significantly by over 10% between 2009 and 2011.
- It is important to note that changes in the Pell program through investments as part of the American Recovery and Reinvestment Act of 2009, coupled with the Great Recession between 2007 and 2009, may have influenced the increased number and proportion of Pell-eligible students in Tennessee.<sup>20</sup>

ii. Enrollment Trends of Underrepresented Minority Students at Tennessee’s Public Universities

Figure 12 displays cohort enrollment trends of first-time undergraduate students who are black or Hispanic. Both the number and percent of underrepresented minority students did not change significantly over the eight years of data examined.

<sup>20</sup> McCann, C. (n.d.) *Pell grants*. Retrieved from: <http://www.edcentral.org/edcyclopedia/federal-pell-grant-program/>

**Figure 12. Trends in Undergraduate Cohort Enrollment of First-Time Underrepresented Minority Students at Tennessee’s Public Universities in Years Pre- and Post-OBF, 2006 through 2013**



## B. Estimating the Effect of Outcomes-Based Funding on Key Outcomes for Full-time University Students

In this section we present the results of analyses of OBF impact on the following student outcomes that are included in Tennessee’s OBF formula for four-year institutions:

- Bachelor’s degree attainment within four years;
- Accumulating 24, 48, and 72 credits; and
- “Crossing the finish line.”<sup>21</sup>

We provide results on each outcome for full-time students<sup>22</sup> when controlling for Pell grant eligibility status, race/ethnicity, gender, age (i.e., adult or not), ACT score, and major. We also examine the impact of OBF on key outcomes for two subgroups: Pell-eligible and underrepresented minority students.

The tables summarizing results include the following:

- N. The total analytical sample of first-time, full-time, degree-seeking undergraduate university students;

<sup>21</sup> For this outcome we examine whether students who entered their junior year “on time” graduated within four years, a concept termed “crossing the finish line.” In examining this outcome we are interested in how students advance during their last two years of study.

<sup>22</sup> There were insufficient numbers of part-time students enrolled in universities to allow for part-time student analyses.

- Pre-OBF Trend. The probability of attaining the outcome of interest for an average student, estimated from pre-OBF data;
- Post-OBF Trend. The probability of attaining the given outcome for an average student, estimated from post-OBF data;
- OBF Impact: Probability. The increased probability of attaining the given outcome as a result of OBF;

OBF Impact: Student Count. The estimated number of additional students who attained the outcome of interest as a result of OBF.

In addition, in cases where a significant effect of OBF (positive/ negative) was found, we also include a graph to depict differences in the pre- and post-OBF trends.

i. Attaining a Bachelor’s Degree

Table 24 presents the effect of OBF on graduating on time with a bachelor’s degree for full-time students, shown graphically in Figure 13.

**Table 24. Estimating the Effect of OBF on Bachelor’s Degree Completion within Four Years for First-Time, Full-Time Students, 2006 through 2011.**

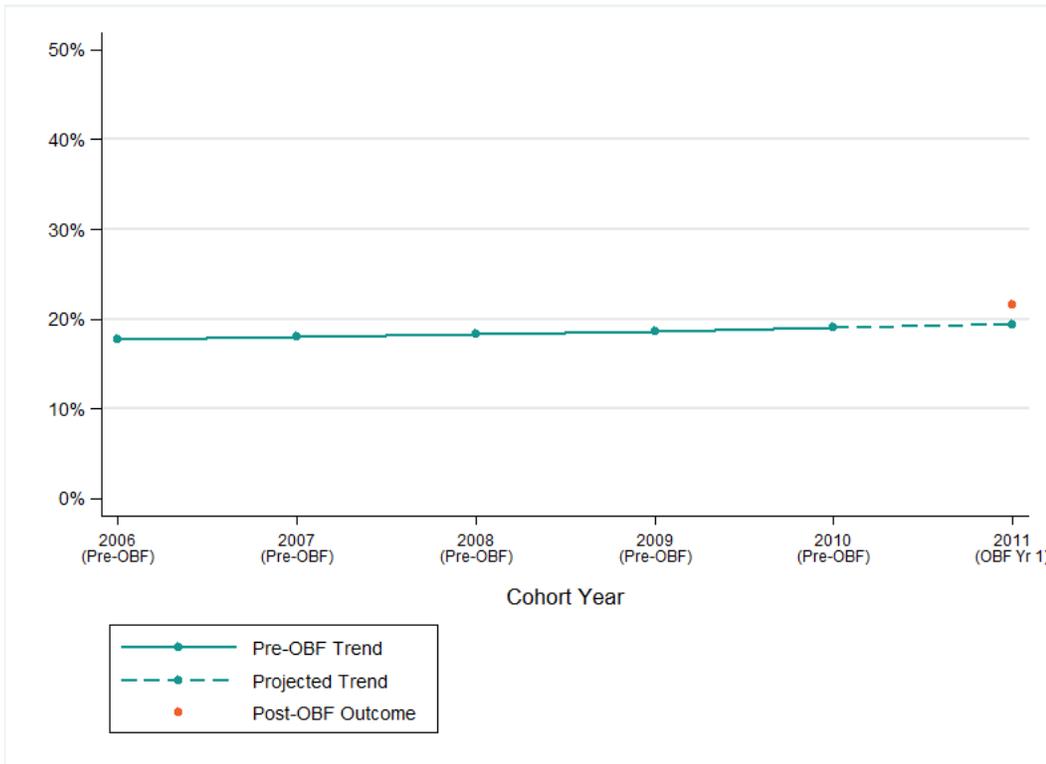
	PRE-OBF COHORTS					POST-OBF COHORT
	2006	2007	2008	2009	2010	2011
<b>N</b>	13,906	14,797	15,540	15,946	16,772	17,416
<b>Pre-OBF Trend</b>	19.1	19.5	20.0	20.5	21.0	21.5
<b>Post-OBF Trend</b>						23.6
<b>OBF Impact: Probability</b>						2.2***
<b>OBF Impact: Student Count</b>						380***

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

**Figure 13. Estimating the Effect of OBF on Bachelor’s Degree Completion within Four Years for First-Time, Full-Time Students, 2006 through 2011.**



ii. Accumulating 24, 48, and 72 Credits

Table 25 presents the effect of OBF on accumulating 24 credits within the first year for full-time students, shown graphically in Figure 14.

**Table 25. Estimating the Effect of OBF on Earning 24 Credits within the First Year for First-Time, Full-Time Students, 2006 through 2013.**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2005	2006	2007	2008	2009	2011	2012	2013
<b>N</b>	13,674	14,535	15,312	15,712	16,499	17,257	17,234	16,892
<b>Pre-OBF Trend</b>	64.1	64.1	64.1	64.2	64.2	64.2	64.2	64.2
<b>Post-OBF Trend</b>						65.2	64.8	66.8
<b>OBF Impact: Probability</b>						θ	θ	2.6**
<b>OBF Impact: Student Count</b>						θ	θ	442**

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

**Figure 14. Estimating the Effect of OBF on Earning 24 Credits within the First Year for First-Time, Full-Time Students, 2006 through 2013.**

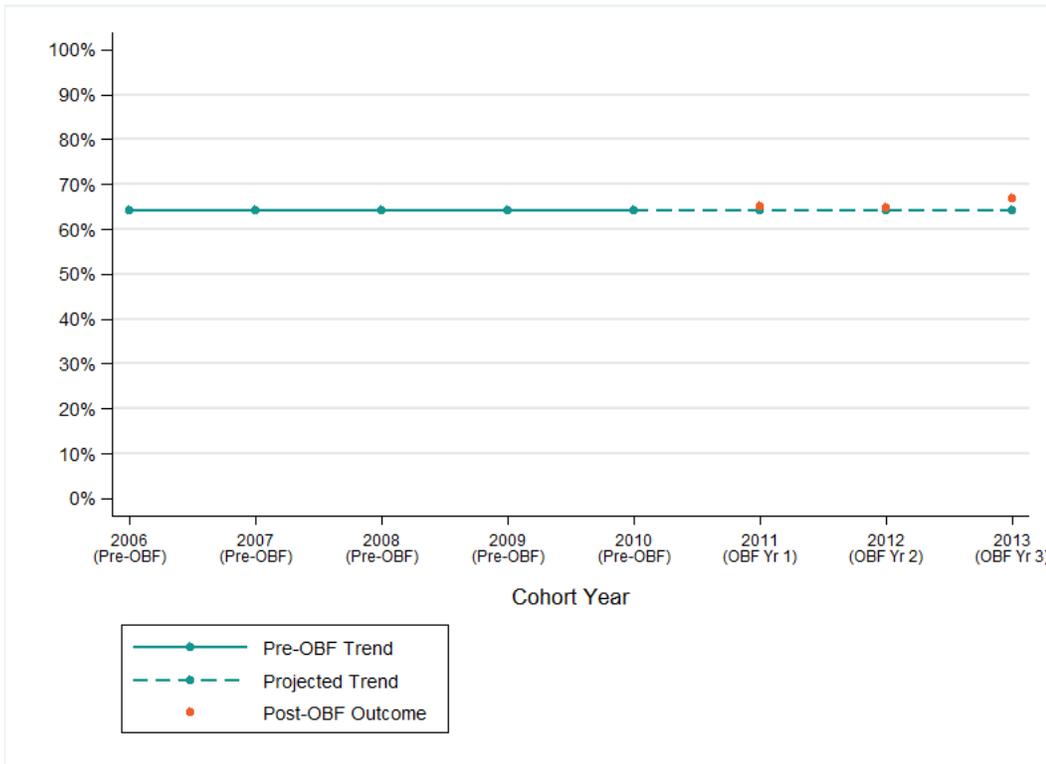


Table 26 presents the effect of OBF on accumulating 48 credits within the first two years for full-time students, shown graphically in Figure 15.

**Table 26. Estimating the Effect of OBF on Earning 48 Credits within the First Two Years for First-Time, Full-Time Students, 2006 through 2013.**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>N</b>	13,697	14,560	15,328	15,744	16,524	17,257	17,237	16,888
<b>Pre-OBF Trend</b>	56.6	56.5	56.5	56.4	56.4	56.4	56.3	56.3
<b>Post-OBF Trend</b>						56.8	57.6	59.3
<b>OBF Impact: Probability</b>						0	0	3.0***
<b>OBF Impact: Student Count</b>						0	0	505***

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

0 Not statistically significant

**Figure 15. Estimating the Effect of OBF on Earning 48 Credits within the First Two Years for First-Time, Full-Time Students, 2006 through 2013.**

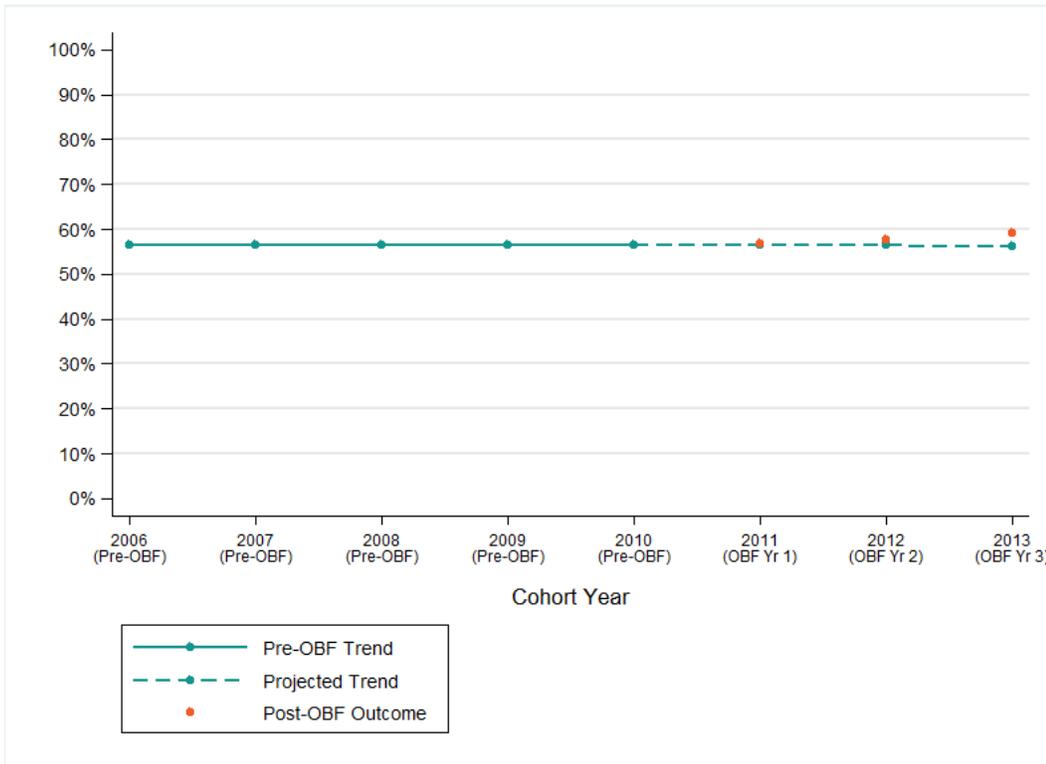


Table 27 presents the effect of OBF on accumulating 72 credits within the first three years for full-time students. As shown in Table 27, OBF had no impact on accumulating 72 credits for full-time students.

**Table 27. Estimating the Effect of OBF on Earning 72 Credits within the First Three Years for First-Time, Full-Time Students, 2006 through 2012.**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>N</b>	13,698	14,568	15,330	15,729	16,514	17,235	17,221	
<b>Pre-OBF Trend</b>	53.2	53.1	53.1	53.0	53.0	52.9	52.8	
<b>Post-OBF Trend</b>						53.3	54.0	
<b>OBF Impact: Probability</b>						θ	θ	
<b>OBF Impact: Student Count</b>						θ	θ	

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

### iii. Crossing the Finish Line

For the 2011 cohort exclusively, we detected a statistically significant increase in the probability of attaining a bachelor’s degree within four years, yet we do not detect a statistically significant increase in the probability of hitting any of the credit milestones for that cohort. To better understand, we examined whether students were “crossing the finish line,” defined here as graduating within four years when a student enters the third year of study on track. The results of this analysis are presented in Table 28. It should be noted that, unlike other analyses, the 2009 and 2010 cohorts are considered post-OBF cohorts in

this analysis, because on-time students in the 2009 and 2010 cohorts entered their junior year after OBF implementation.

**Table 28. Estimating the Effect of OBF on Crossing the Finish Line (receiving a bachelor’s degree on time, conditional on entering the third year of study on time) for First-Time, Full-Time Students, 2006 through 2011.**

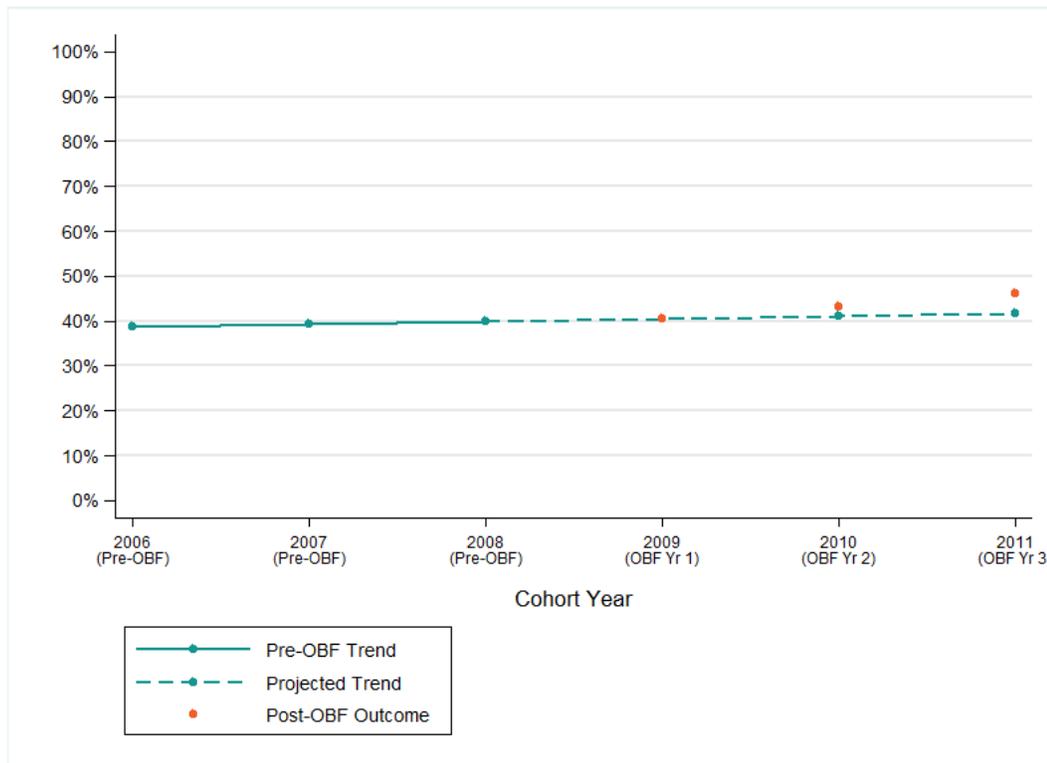
	PRE-OBF COHORTS			POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011
<b>N</b>	7,767	8,277	8,631	8,945	9,280	9,480
<b>Pre-OBF Trend</b>	38.6	39.2	39.8	40.4	41.0	41.6
<b>Post-OBF Trend</b>				40.5	43.2	46.1
<b>OBF Impact: Probability</b>				θ	θ	4.5**
<b>OBF Impact: Student Count</b>				θ	θ	430**

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

**Figure 16. Estimating the Effect of OBF on “Crossing the Finish Line” (receiving a bachelor’s degree on time, conditional on entering the third year of study on time) for First-Time, Full-Time Students, 2006 through 2011.**



**Summary findings:**

- OBF in Tennessee had a significant, positive impact on on-time bachelor’s degree completions for first-time, full-time students.
- Analyses also show a positive impact for accumulating 24 and 48 credits, but only for the most recent cohort. We see no effect of OBF on accumulating 72 credits within a student’s first three years.
- OBF had a positive impact on graduating on-time for students entering their junior years on track to graduate, but only for the most recent cohort (2011 cohort).

### C. Estimating the Effect of Outcomes-Based Funding on Key Outcomes for Pell-Eligible and Underrepresented Minority Students enrolled in Tennessee’s Public Universities

OBF could have an unintended negative effect if institutions focused efforts on students who enter college with a greater likelihood of achieving the outcomes in the formula. To discourage institutions from doing this, Tennessee awards institutions for degrees completed by Pell-eligible students. In our analyses of Tennessee’s OBF policy, we consider the impact of OBF on the outcomes of both Pell-eligible students and underrepresented minority students.

#### i. Pell-Eligible Students

Table 29 provides results from analyses examining whether OBF had an effect on full-time Pell-eligible students.

**Table 29. Estimating the Effect of Outcomes-Based Funding on Bachelor’s Degree Completions, Credit Accumulation, and “Crossing the Finish Line” for First-Time, Full-Time Students Who Are Pell-Eligible within Their First Two Years, 2006 through 2013**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>Bachelor’s Degree</b>								
<i>N</i>	4,270	4,678	5,166	5,128	6,899	8,245		
Pre-OBF Trend	11.2	11.5	11.8	12.2	12.5	12.8		
Post-OBF Trend						13.9		
OBF Impact: Probability						0		
OBF Impact: Student Count						0		
<b>Accumulating 24 Credits Within the First Year</b>								
<i>N</i>	4,152	4,542	5,063	4,998	6,715	8,127	8,176	7,849
Pre-OBF Trend	53.4	53.5	53.5	53.6	53.7	53.7	53.8	53.9
Post-OBF Trend						53.7	52.9	55.8
OBF Impact: Probability						0	0	0
OBF Impact: Student Count						0	0	0
<b>Accumulating 48 Credits Within the First Two Years</b>								
<i>N</i>	4,164	4,558	5,069	5,013	6,734	8,127	8,175	7,848
Pre-OBF Trend	43.5	43.7	43.9	44.1	44.3	44.4	44.6	44.8
Post-OBF Trend						43.7	43.7	46.4
OBF Impact: Probability						0	0	0
OBF Impact: Student Count						0	0	0
<b>Accumulating 72 Credits Within the First Three Years</b>								
<i>N</i>	4,165	4,561	5,072	5,012	6,731	8,118	8,169	
Pre-OBF Trend	39.8	39.7	39.7	39.6	39.6	39.5	39.5	
Post-OBF Trend						39.1	39.6	
OBF Impact: Probability						0	0	
OBF Impact: Student Count						0	0	

	PRE-OBF COHORTS			POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011
<b>Crossing the Finish Line</b>						
<i>N</i>	1,788	1,960	2,228	2,223	3,047	3,606
<b>Pre-OBF Trend</b>	29.4	30.1	30.8	31.4	32.2	32.9
<b>Post-OBF Trend</b>				31.7	33.0	35.7
<b>OBF Impact: Probability</b>				θ	θ	θ
<b>OBF Impact: Student Count</b>				θ	θ	θ

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), ACT score, and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

θ Not statistically significant

### Summary findings:

- OBF had no statistically significant impact on the probability of attaining a bachelor’s degree, accumulating credits, or crossing the finish line for full-time Pell-eligible students.

### ii. Underrepresented Minority Students

While there are no metrics in Tennessee’s OBF formula that are tailored specifically to underrepresented minorities, we conducted analyses to examine the impact of the policy on these students as well. Table 30 presents results from our analysis of the relationship between OBF and each of the outcomes for full-time underrepresented minority (black or Hispanic) students.

**Table 30. Estimating the Effect of Outcomes-Based Funding on Bachelor’s Degree Completions, Credit Accumulation, and Crossing the Finish Line for First-Time, Full-Time Underrepresented Minority Students, 2006 through 2013**

	PRE-OBF COHORTS					POST-OBF COHORTS		
	2006	2007	2008	2009	2010	2011	2012	2013
<b>Bachelor’s Degree</b>								
<i>N</i>	2,747	3,093	3,172	3,137	3,427	3,839		
<b>Pre-OBF Trend</b>	9.8	9.6	9.5	9.4	9.2	9.1		
<b>Post-OBF Trend</b>						9.9		
<b>OBF Impact: Probability</b>						θ		
<b>OBF Impact: Student Count</b>						θ		
<b>Accumulating 24 Credits Within the First Year</b>								
<i>N</i>	2,680	3,010	3,098	3,058	3,329	3,783	3,703	3,683
<b>Pre-OBF Trend</b>	52.1	51.6	51.2	50.7	50.3	49.8	49.3	48.9
<b>Post-OBF Trend</b>						50.5	52.1	52.4
<b>OBF Impact: Probability</b>						θ	θ	3.5*
<b>OBF Impact: Student Count</b>						θ	θ	129*
<b>Accumulating 48 Credits Within the First Two Years</b>								
<i>N</i>	2,686	3,017	3,104	3,067	3,340	3,786	3,703	3,682
<b>Pre-OBF Trend</b>	42.8	42.4	41.9	41.5	41.0	40.5	40.1	39.6
<b>Post-OBF Trend</b>						40.1	42.0	42.9
<b>OBF Impact: Probability</b>						θ	θ	θ

OBF Impact: Student Count							
Accumulating 72 Credits Within the First Three Years							
N	2,691	3,024	3,108	3,066	3,339	3,785	3,701
Pre-OBF Trend	38.8	38.3	37.9	37.5	37.1	36.7	36.3
Post-OBF Trend						35.6	37.6
OBF Impact: Probability						0	0
OBF Impact: Student Count						0	0
PRE-OBF COHORTS				POST-OBF COHORTS			
	2006	2007	2008	2009	2010	2011	
Crossing the Finish Line							
N	1,214	1,295	1,293	1,323	1,398	1,538	
Pre-OBF Trend	27.4	26.5	25.6	24.8	23.9	23.1	
Post-OBF Trend				28.8	26.7	28.6	
OBF Impact: Probability				0	0	0	
OBF Impact: Student Count				0	0	0	

OBF effects reported in the table are estimated after controlling for Pell eligibility, race/ethnicity, gender, age (i.e., adult or not), and major.

\* p<.05; \*\*p<.01; \*\*\*p<.001

0 Not statistically significant

### Summary findings:

- OBF had no statistically significant impact on the probability of attaining a bachelor’s degree, accumulating 48 or 72 credits, or crossing the finish line for full-time underrepresented minority students.
- OBF did have a significant effect on accumulating 24 credits for the latest cohort of full-time underrepresented minority students.

## IX. Findings and Conclusions

Outcomes-based funding has become an increasingly common policy tool for states interested in improving the educational attainment of their residents. As of 2016, over 30 states have either adopted, or plan to adopt, some form of OBF. Tying hundreds of millions of dollars to a range of concrete attainment goals, OBF policies are perceived as both ambitious and risky.

As a result, state policymakers have a pressing need to understand whether, how, for whom, and under what conditions OBF policies can lead to concrete, measurable completion and equity goals. This type of analysis allows policymakers to assess the suitability of OBF in their own particular state contexts, assists them in adopting a policy design and implementation processes that will most likely lead to success, and provides insight into how already-existing OBF policies might be refined to address unintended consequences or provide support to institutions without the capacity to achieve key outcomes.

This case study of Tennessee takes a first step in addressing these information needs by using a broad range of data and evidence to track changes in target outcomes and to identify state and institutional-level factors that contribute to or hinder them. In 1979, Tennessee incorporated its first performance metric in the state’s funding formula. More recently, Tennessee adopted its first OBF model as one component of

2010's Complete College Tennessee Act (CCTA), establishing a direct link between statewide education attainment goals and the state's funding for higher education.

Multiple state-wide factors contributed to the adoption and implementation of OBF in Tennessee. This included **a comprehensive state-wide plan focused on completion and state sponsored supports for institutions** as they strive to meet completion goals. **Strong state leadership and institutional engagement increased understanding and buy-in**, but under-resourced institutions stated that responding to implementation was a challenge.

Institutional-level response revealed a **connection between the OBF formula and increased institutional focus on student success** and a shift away from a focus on enrollment. Institutions further aligned their strategic plans to focus more intently on student success goals and implemented initiatives on campus to meet these goals. Some of these initiatives are supported and funded by the state, but most came to institutions as unfunded mandates, again making insufficient institutional resources and capacity a challenge to implementation. Yet despite these challenges, institutions were uniformly investing in new student success strategies, such as improved developmental education and student advising.

Evidence of institutional response likely contributed to the **positive impact of Tennessee's OBF policy on many outcomes for full-time students**. Yet **part-time community college students of all types were negatively affected** by the policy.

In addition, improvements are not consistent across all outcomes, sectors, or student targeted student populations. Institutions noted several barriers that may be inhibiting their ability to respond to the policy and improve outcomes. **Most challenging to them were insufficient recognition in the formula of institutional missions and students served, lack of resources or capacity to respond, and the competitive and unpredictable way resources were distributed**.

Large-scale debates about the overall efficacy of OBF will no doubt continue, and the question of whether long-term effects are evident is centrally important. Newer IPEDS analyses that utilize more recent data and account for limitations in some previous research have begun pointing to an affirmative answer to that question. Yet despite broadly similar goals, OBF policies vary widely by state—so much so that it is of limited utility to policymakers to generalize about the effectiveness of these policies as a whole. In order for states to make effective decisions about OBF—whether to adopt it, how to build the most effective formula, how to create a level playing field and strong buy-in, what to expect in the way of interim and longer-term outcomes—more nuanced analyses of individual states such as those provided in this report provide critically important context-based analysis.

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## Appendix A. Institution Case Student on Changes in Metrics and Weights between Tennessee's Outcomes-Based Funding Models

**Table 1A. OBF Four-Year Sector Institutional Weights for University of Tennessee – Chattanooga Based on Metrics in the 2015-2020 Model**

	2010-2015	2015-2020
<b>Bachelor's and Associate Degrees</b>	25.0%	25.0%
<b>Master's/Ed Specialist Degrees</b>	15.0%	10.0%
<b>Doctorates/Law Degrees</b>	5.0%	5.0%
<b>Degrees per 100 FTE</b>	10.0%	15.0%
<b>Six-Year Graduation Rate</b>	10.0%	15.0%
<b>Accumulating 24/30 Credit Hours</b>	3.0%	4.0%
<b>Accumulating 48/60 Credit Hours</b>	5.0%	6.0%
<b>Accumulating 72/90 Credit Hours</b>	7.0%	10.0%
<b>Research and Service</b>	10.0%	10.0%

**Table 2A. OBF Two-Year Sector Institutional Weights for Nashville State Community College Based on Metrics in the 2015-2020 Model**

	2010-2015	2015-2020
<b>Associate Degrees</b>	20.0%	22.5%
<b>Short-Term Certificates</b>	13.0%	10.0%
<b>Long-Term Certificates</b>	7.0%	10.0%
<b>Awards per 100 FTE</b>	5.0%	5.0%
<b>Job Placement</b>	10.0%	7.5%
<b>Dual Enrollment</b>	5.0%	15.0%
<b>Accumulating 12 Credit Hours</b>	4.0%	3.0%
<b>Accumulating 24 Credit Hours</b>	5.0%	5.0%
<b>Accumulating 36 Credit Hours</b>	6.0%	7.0%
<b>Workforce Training Hours</b>	5.0%	5.0%
<b>Transfers out with at Least 12 Credit Hours</b>	10.0%	10.0%

## Appendix B. Concurrent Policies in Indiana during Implementation of Outcomes-Based Funding

**Table 1B. Concurrent Policies in Tennessee during Implementation of OBF**

POLICY	YEAR	SUMMARY
Drive to 55 <sup>23</sup>	2013	Drive to 55 aims to provide 55% of TN residents with a degree or certificate by the year 2025. Initiatives in the policy include Tennessee Promise, <sup>24</sup> Tennessee Reconnect, <sup>25</sup> and Tennessee LEAP. <sup>26</sup>
Reduction in credits for degree <sup>27</sup>	2014	Requires a maximum of 120 semester hours for a bachelor's degree or 60 semester hours for an associate degree. Exceptions to this maximum must be approved by TBR.
Academic Fresh Start <sup>28</sup>	2014	Allows undergraduate students who have experienced academic difficulty in the past to make a clean start upon returning to college after an extended absence.
Course Revitalization Initiative <sup>29</sup> (to improve course structure and curricula in gateway courses)	2013	Provides grant funding to teams of faculty members looking to revitalize high enrollment gateway classes.
Degree plans/ Academic Foci <sup>30</sup>	2015	To ensure that all students are enrolled in either a degree program or academic focus, TBR is implementing a system-wide adoption of nine academic foci.
Co-requisite model <sup>31</sup>	2014	This model places students in supplemental learning support classes while they are enrolled in credit bearing English and math courses.
Remediation in High Schools – Seamless Alignment and Integrated Learning Support (SAILS) <sup>32</sup>	2013	SAILS introduces college developmental curriculum to high school students during their senior year in an attempt to improve college readiness.
Transfer Pathways <sup>33</sup>	2011	An advising tool designed to prevent loss of credits for community college students who plan to transfer to a university.
Reverse Transfer <sup>34</sup>	2014	Provides a framework for all three higher education systems to work together to award an associate degree to students who have transferred to a university, but are unable to finish a four-year degree. Reverse Transfer Degree candidates must be currently enrolled at a four-year institution, but have previously earned a minimum of 15 college credits towards an associate degree at a community college.

23 Retrieved from: <http://driveto55.org/>

24 Retrieved from: <http://driveto55.org/initiatives/tennessee-promise/>

25 Retrieved from: <http://www.tnreconnect.gov/>

26 Retrieved from: <http://driveto55.org/initiatives/tennessee-leap/>

27 Retrieved from: <https://policies.tbr.edu/policies/general-education-requirements-and-degree-requirements>

28 Retrieved from: <https://policies.tbr.edu/policies/undergraduate-academic-retention-standards#Minimum-Criteria-for-Institutional-Academic-Fresh-Start-Policies>

29 Retrieved from: <https://www.tbr.edu/academics/course-revitalization-initiative>

30 Retrieved from: <https://www.tbr.edu/academics/initiatives-academic>

31 Retrieved from: <https://www.tbr.edu/news/tennessee-board-regents-co-requisite-remediation-model-produces-giant-leaps-student-success>

32 Retrieved from: <https://www.tn.gov/thec/topic/sails>

33 Retrieved from: <http://www.tntransferpathway.org/>

34 Retrieved from: <https://policies.tbr.edu/policies/reverse-transfer-policies-procedures-and-guidelines-0>

## Appendix C. Glossary Table for Institutional Policies or Programs Intentionally Aligned with Degree Completions and Persistence

FOCUS AREAS	INSTITUTIONAL POLICIES AND PRACTICES	COMMUNITY COLLEGES			COMPREHENSIVE UNIVERSITY	RESEARCH UNIVERSITIES	
<b>Academic Affairs</b>	Decrease time needed for degree <i>Less credits to degree, AP credits, prior learning assessments, degree pathways, revisions to major selection</i>		●	●	●		●
	Increase access to degrees <i>Milestone credentialing, creation of new credentials</i>				●		
	Increase access to courses <i>Increasing online course, changes in course scheduling, summer semester expansion</i>		●	●		●	
	Increase use of data analysis <i>Software programs for students, data analysis on completion and progression for faculty/administrators, increase IR capacity</i>	●		●	●	●	●
	Change faculty roles and staffing <i>Faculty to advising, addition of new positions, budget adjustments</i>	●		●		●	
	Improving developmental education <i>Limit dev-ed; Implement co-requisite model</i>	●	●	●		●	
<b>Student Services</b>	Change advising and counseling methods <i>Intrusive advising, testing of new counseling strategies</i>		●	●	●		●
	Improve communications between students and administrators <i>Early alert systems, degree audit/curriculum mapping, one-stop student services</i>	●		●	●	●	●
	Improve student support programs <i>Student orientation and first-year programs, tutoring and supplemental instruction, career exposure programs</i>		●	●		●	●
	Increase student services capacity <i>Increases in student services staffing or changes in roles, increase in funding/budget</i>			●	●	●	
<b>Other Institution Responses</b>	Change financial aid policies <i>Tuition guarantee, financial aid incentives to take full course loads</i>			●		●	
	Change administrative staffing related to performance tracking <i>Shifting or addition of performance-related administrative roles</i>	●			●		●
	Change Responsibility-Centered Management practices <i>Strategic planning initiatives, responsibility-based management</i>				●		●

# Appendix D. Technical Appendix: Tennessee Student-level Analysis

## Introduction

Over the course of nearly two years, Research for Action (RFA) worked closely with the Tennessee Higher Education Commission (THEC) to clean, and analyze Tennessee’s Statewide Longitudinal Data System (SLDS). During this iterative process, RFA worked to ensure the dataset was as accurate and complete as possible. We shared early results of our analyses with Tennessee to ensure that we avoided any inadvertent errors in assumptions, coding, or analysis. This process, while time-consuming, allowed us to produce analyses that are accurate and complete. Our study utilizes data for first-time undergraduate students who entered Tennessee’s postsecondary education system during academic years 2006 through 2014, a time period that consists of 169,966 students in the four-year sector and 190,320 students in the two-year sector. We first examined descriptive trends in enrollment and completions (bachelor’s degrees, associate’s degrees, and certificates) and credit milestones. We then conducted multivariate logit regression analyses on the same outcomes.

The following outlines our methodological approach using data from Tennessee’s SLDS.

## Research Questions

1. Has the implementation of OBF impacted student outcomes, such as attaining a bachelor’s or associate’s degree?
2. How has the number of years of student exposure to OBF policies impacted student outcomes?
3. Has the implementation of OBF benefited underserved students (e.g. students who are eligible for the Pell grant)?

## Data

Working closely with THEC, we obtained the Tennessee SLDS data of all public university and community college students who entered Tennessee’s postsecondary education system in academic years 2006 through 2014, providing us five years of pre-OBF implementation and four years of post-OBF implementation data. While outcomes are analyzed through academic year 2014 (e.g. accumulating 48 credits within two years for the 2013 cohort), the 2014 cohort is not utilized in this analysis due to incomplete Pell eligibility data.

## Study Samples

Our data for the four-year sector consists of 169,966 students and our data for the two-year sector consists of 190,320 students from academic year 2006 through academic year 2013 (see Table 1D). These complete samples, however, were only used to analyze descriptive trends in enrollment, e.g. how the enrollment of Pell-eligible students changed over time.

**Table 1D. Undergraduate Enrollment of First-Time Students in Tennessee’s Public Institutions, Academic Years 2006 through 2013**

START YEAR	FOUR-YEAR	TWO-YEAR
2006	19,549	21,017

2007	20,404	21,408
2008	21,251	21,384
2009	21,088	22,182
2010	21,917	27,183
2011	22,250	27,070
2012	22,192	25,861
2013	21,315	24,215
<b>Total</b>	<b>169,966</b>	<b>190,320</b>

We conducted multivariate logit regression analyses to examine the impact of OBF on our outcomes of interest, controlling for various student-level characteristics including gender, race/ethnicity, age (i.e. adult student or not), ACT score, and academic major. We disaggregated students by full-time status; however, part-time students in the four-year sector are not analyzed because there were too few of them to produce rigorous analyses.

Our analytical samples were restricted to first-time, full-time undergraduates who were citizens of the U.S., entered in the Fall semester, and had complete Pell eligibility data. Table 2D below reports our analytical sample by their start year, with separate columns for (1) full-time four-year sector (university) students, (2) full-time two-year sector (community college) students, and (3) part-time two-year sector students.

**Table 2D. Size of Analytical Samples, Academic Years 2006 through 2013**

START YEAR	FOUR-YEAR, FULL-TIME	TWO-YEAR, FULL-TIME	TWO-YEAR PART-TIME
2006	13,907	6,347	992
2007	14,797	5,706	902
2008	15,540	5,815	1,026
2009	15,948	6,294	1,166
2010	16,772	8,157	1,585
2011	17,418	13,092	3,328
2012	17,244	12,716	4,015
2013	16,897	11,834	4,030
<b>Total</b>	<b>128,523</b>	<b>69,961</b>	<b>17,044</b>

Key student characteristics for students included in the full-time, university student sample are presented in Table 3D. Tables 4D and 5D do the same for the full-time and part-time community college samples, respectively.

**Table 3D. Characteristics of Full-Time Student Sample for the Four-Year Sector Analyses**

	2006	2007	2008	2009	2010	2011	2012	2013
Pell Eligible	31%	32%	33%	32%	41%	47%	47%	46%
Female	56%	55%	54%	54%	54%	54%	54%	54%
African-American	18%	19%	19%	18%	18%	20%	19%	19%
Hispanic	1%	2%	2%	2%	2%	2%	3%	3%
White	76%	75%	75%	75%	73%	67%	68%	71%
Other Race	4%	4%	5%	5%	6%	11%	10%	7%
Adult	3%	3%	2%	2%	3%	3%	2%	2%
ACT Score	22.5	22.6	22.6	22.7	22.9	22.6	22.6	22.8

Professional Major	43%	43%	45%	46%	46%	47%	51%	52%
STEM Major	16%	17%	17%	18%	19%	19%	19%	20%
Liberal Arts Major	36%	35%	34%	32%	31%	30%	27%	25%

- The proportion of students who were Pell-eligible increased over time, particularly during the Great Recession.
- The proportion of students who were white declined over time. The proportion of students reporting as “other race” conversely increased.
- ACT scores remained mostly flat over our period of study.
- The proportion of students declaring a professional or STEM major increased over time, while the proportion of students declaring a liberal arts major declined.

**Table 4D. Characteristics of Full-Time Student Sample for the Two-Year Sector Analyses**

	2006	2007	2008	2009	2010	2011	2012	2013
Pell Eligible	53%	50%	51%	51%	61%	71%	70%	67%
Female	58%	58%	56%	57%	56%	58%	58%	57%
African-American	22%	16%	15%	14%	15%	19%	19%	16%
Hispanic	2%	2%	2%	2%	3%	2%	3%	3%
White	72%	80%	80%	78%	76%	70%	72%	74%
Other Race	4%	3%	4%	6%	6%	9%	6%	7%
Adult	10%	10%	8%	9%	15%	15%	15%	13%
ACT Score	18.6	19.1	19.2	19.1	19.5	18.7	18.7	19.0
Professional Major	31%	29%	29%	29%	30%	34%	34%	32%
STEM Major	5%	5%	5%	5%	5%	5%	5%	5%
Liberal Arts Major	63%	65%	65%	65%	64%	59%	60%	63%

- The proportion of students who were Pell eligible increased over time, particularly during the Great Recession.
- The racial makeup of our sample fluctuated throughout our period of study, but did not show any particular trends.
- The proportion of students who were adults spiked during the Great Recession.
- ACT scores slightly increased over time.

**Table 5D. Characteristics of Part-Time Student Sample for the Two-Year Sector Analyses**

	2006	2007	2008	2009	2010	2011	2012	2013
Pell Eligible	61%	60%	60%	60%	70%	79%	79%	78%
Female	60%	62%	63%	59%	61%	60%	61%	61%
African-American	27%	21%	19%	21%	25%	31%	35%	35%
Hispanic	2%	2%	2%	3%	3%	2%	3%	3%
White	67%	73%	75%	71%	62%	59%	56%	55%
Other Race	4%	4%	4%	5%	10%	7%	6%	7%
Adult	41%	40%	42%	40%	44%	43%	35%	32%
ACT Score	17.9	18.4	18.7	18.3	18.2	17.6	17.3	17.2
Professional Major	39%	36%	35%	38%	39%	43%	43%	45%
STEM Major	6%	7%	6%	7%	4%	6%	6%	7%

Liberal Arts Major	50%	52%	53%	52%	55%	48%	51%	47%
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- The proportion of students who were Pell eligible increased over time, particularly during the Great Recession.
- The proportion of students who were African-American increased over time, while the proportion of students who were white conversely decreased.
- The proportion of students who were adults remained flat over the majority of our period of study; however, it dropped off in academic years 2012 and 2013.
- ACT scores first increased, then substantially decreased.
- The proportion of students who were a professional major increased over time, while the proportion of students who declared a STEM or Liberal Arts major remained flat.

## Outcome Measures

Our study examined the effects of OBF on the probability of completing a degree, as well as the probability of accumulating enough credits to remain “on track” to graduate. The outcomes that we analyzed differed for each sample. Table 6D below summarizes the studied outcome measures.

**Table 6D. Outcomes of Interest**

TWO-YEAR SECTOR STUDENT OUTCOMES	FOUR-YEAR SECTOR STUDENT OUTCOMES
<b>Full-Time Students</b>	<b>Full-Time Students</b>
<ul style="list-style-type: none"> <li>• Associate Degree Completion within Two Years</li> <li>• Associate Degree Completion within Three Years</li> <li>• Earning a Certificate within Two Years</li> <li>• Accumulating 12 Credits within the First Semester</li> <li>• Accumulating 24 Credits within the First Two Semesters</li> <li>• Accumulating 36 Credits within the First Three Semesters</li> <li>• Transferring within Three Years</li> </ul>	<ul style="list-style-type: none"> <li>• Bachelor’s Degree Completion within Four Years</li> <li>• Accumulating 24 Credits within the First Year</li> <li>• Accumulating 48 Credits within the First Two Years</li> <li>• Accumulating 72 Credits within the First Three Years</li> <li>• Crossing the Finish Line</li> </ul>
<b>Part-Time Students</b>	
<ul style="list-style-type: none"> <li>• Associate Degree Completion within Three Years</li> <li>• Associate Degree Completion within Four Years</li> <li>• Earning a Certificate within Two Years</li> <li>• Accumulating 12 Credits within the First Year</li> <li>• Accumulating 24 Credits within the First Two Years</li> <li>• Accumulating 36 Credits within the First Three Years</li> <li>• Transferring within Three Years</li> </ul>	

## Analytical Model

Using the repeated cross-sectional data of the incoming four-year college student cohorts, we conducted an interrupted time series analysis to estimate the effect of OBF (implemented in academic year 2011) on each of the student outcome measures listed above. We conducted separate analyses for three analytical samples described above.

Since all student-level outcome measures were binary variables (1=completed; 0=not completed), a logit regression model was used to estimate the effect of OBF on an outcome measure. For example, the logit of the probability of accumulating 24 credits within the first year for a full-time student  $i$  in year  $t$  can be written as follows:

$$\text{logit}(\pi_{it}) = \beta_0 + \beta_1 \text{Time}_{it} + \beta_2 \text{POST1\_OBF}_{it} + \beta_3 \text{POST2\_OBF}_{it} + \beta_4 \text{POST3\_OBF}_{it} + \sum_{k=1}^K \beta_{k+4} X_{kit} + \varepsilon_{it},$$

where:

$\pi_{it}$  = probability of achieving a given binary outcome,  $\Pr(Y_{it} = 1)$ , given the values of all explanatory variables. And,  $\text{logit}(\pi_{it}) = \log\left(\frac{\pi_{it}}{1-\pi_{it}}\right)$ .

$Y_{it}$  = One of the binary outcome measures listed above for student  $i$  in year  $t$  (e.g., 1 if a full-time student completed a BA degree and 0 otherwise.)

$\text{Time}_t$  = A continuous variable indicating year  $t$  from the start of the observation period (academic year 2006)

$\text{POST1\_OBF}_{it}$ ,  $\text{POST2\_OBF}_{it}$  &  $\text{POST3\_OBF}_{it}$

= Dummy variables indicating 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> year after the implementation of OBF, respectively

$X_{kit}$  = A vector of student-level covariates including gender, Pell eligibility, race/ethnicity, age, gender, ACT score, and major.

$\varepsilon_{it}$  = Random errors

In this logit regression model,  $\beta_1$  estimates the slope of the baseline trend in the log odds of achieving student outcome  $Y$  before OBF. And,  $\beta_2$ ,  $\beta_3$ , and  $\beta_4$  estimate deviations from the pre-OBF baseline trend (i.e., OBF impacts) that occurred in Years 1, 2, and 3 after the implementation of OBF, respectively. Note that this model estimates the impact of OBF as the change in the log odds of achieving the outcome in a given post-OBF year, which is not easily-interpretable for a lay audience. Thus, we converted all log odds to predicted probabilities (in percent) using mean values of all covariates.

In addition to estimating the impact of OBF for the overall full-time sample, we also examined whether the estimated OBF effect varies across two specific student populations: economically disadvantaged student groups, as defined by Pell eligibility, and underrepresented minority (black and Hispanic) students. We conducted these subgroup analyses by segmenting the above regression equation between Pell and non-Pell groups or between underrepresented minority (URM) and non-URM groups. In these analyses, the differential impact of OBF was evaluated between two student subgroups by examining the significance of interaction terms between a student subgroup dummy (e.g., a dummy indicator for Pell and non-Pell students) and the three post-OBF dummies.

A full set of parameter estimates are reported in Tables 7D, 8D, and 9D below. Not all three treatment variables were used in every regression because some outcomes were on a time frame that precluded more recent cohorts from analysis. For example, attaining a bachelor's degree within four years was only possible for the 2011 cohort, thus only one post-OBF dummy was used in that regression. We should also note that a few students may be used in one analysis but not in another due to missing data on the outcomes of interest.

## Model Limitations

An interrupted time series analysis with no control group is susceptible to threats to internal validity caused by history. For example, there may have been another program related to college completion

implemented in Tennessee at the same time as OBF, which could lead us to overestimate the positive effects of OBF.

Our analysis is also susceptible to omitted variable bias. For example, our logit regression model did not control for institutional level covariates because we could not assign each student to a single institution. Many students moved from their starting institution to another within the Tennessee's public university system over time.

A key component of an interrupted time series analysis is having an accurate pre-OBF trend line. To this end, a longer pre-OBF period is always desired. Due to data constraints, however, we must base our pre-OBF trend line on only five pre-OBF periods (cohorts 2006 through 2010). For one outcome – “crossing the finish line” – we must base our pre-OBF trend line on only three pre-OBF periods. As such, there is the possibility that our pre-OBF trend line does not provide a valid counterfactual.

## Data Limitations

A small portion of observations had missing data on their ACT score, age, and major. For these observations, missing values were imputed. Some students had missing data related to their Pell eligibility status. Because we conducted subgroup analyses for Pell and non-Pell students, students with missing Pell eligibility data were dropped. We initially intended to analyze post-graduation job placement for the two-year sector, but were unable to do so due to the quality of the data.

## Full Parameter Estimates

**Table 7D. Full-Time, Four-Year Sector Students**

	Bachelor's Degree Within 4 Years	Accumulated 24 Credits in First Year	Accumulated 48 Credits in First Two Years	Accumulated 72 Credits in First Three Years	"Crossing the Finish Line"
Time	0.0297*** (0.00642)	0.000702 (0.00564)	-0.00179 (0.00553)	-0.00242 (0.00550)	0.0244 (0.0164)
Post Year 1	0.125*** (0.0278)	0.0433 (0.0247)	0.0193 (0.0242)	0.0162 (0.0241)	0.00661 (0.0413)
Post Year 2	- -	0.0256 (0.0287)	0.0522 (0.0282)	0.0462 (0.0280)	0.0904 (0.0549)
Post Year 3	- -	0.116*** (0.0334)	0.123*** (0.0327)	- -	0.185** (0.0698)
Pell Eligible	-0.588*** (0.0193)	-0.438*** (0.0133)	-0.514*** (0.0131)	-0.562*** (0.0140)	-0.367*** (0.0219)
Adult	-1.174*** (0.0959)	-0.680*** (0.0406)	-0.901*** (0.0449)	-0.975*** (0.0504)	-0.591*** (0.109)
ACT Score	0.137*** (0.00221)	0.132*** (0.00179)	0.141*** (0.00175)	0.135*** (0.00184)	0.0879*** (0.00252)
Hispanic	-0.319*** (0.0641)	-0.0283 (0.0414)	-0.0462 (0.0408)	-0.0857 (0.0449)	-0.285*** (0.0723)
Black	-0.373*** (0.0277)	-0.0822*** (0.0172)	-0.0976*** (0.0172)	-0.131*** (0.0186)	-0.355*** (0.0309)
Other Race	-0.0597 (0.0345)	0.0253 (0.0248)	0.0475 (0.0244)	0.0289 (0.0260)	-0.0657 (0.0390)
Female	0.691*** (0.0170)	0.427*** (0.0126)	0.445*** (0.0124)	0.445*** (0.0132)	0.559*** (0.0191)
Professional Major	-0.0117 (0.0179)	0.0440** (0.0138)	0.0521*** (0.0135)	0.0892*** (0.0144)	-0.0621** (0.0203)
STEM Major	-0.157*** (0.0238)	-0.124*** (0.0179)	-0.126*** (0.0176)	-0.122*** (0.0188)	-0.104*** (0.0271)
Constant	-4.613*** (0.0609)	-2.437*** (0.0476)	-2.936*** (0.0468)	-2.926*** (0.0491)	-2.677*** (0.0746)
Observations	94,377	127,115	127,235	110,295	52,380

Standard errors in parentheses

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

**Table 8D. Full-Time, Two-Year Sector Students**

	Associate Degree Within 2 Years	Associate Degree Within 3 Years	Certificate Within 2 Years	Accumulated 12 Credits in First Semester	Accumulated 24 Credits in First 2 Semesters	Accumulated 36 Credits in First 3 Semesters	Transferred Within 3 Years
Time	-0.00743 (0.0167)	-0.0147 (0.0115)	0.0578 (0.0400)	-0.0188* (0.00803)	-0.0238** (0.00853)	-0.0136 (0.00922)	-0.0300** (0.0115)
Post Year 1	-0.183** (0.0699)	-0.0613 (0.0470)	1.683*** (0.129)	0.0797* (0.0317)	0.0363 (0.0340)	-0.0716 (0.0371)	-0.00597 (0.0470)
Post Year 2	0.0220 (0.0807)	0.137* (0.0550)	1.553*** (0.165)	0.113** (0.0381)	0.0390 (0.0407)	-0.00349 (0.0442)	0.0661 (0.0557)
Post Year 3	0.107 (0.0939)	- -	1.320*** (0.202)	0.182*** (0.0451)	0.131** (0.0479)	0.0575 (0.0519)	- -
Pell Eligible	-0.673*** (0.0375)	-0.504*** (0.0273)	-0.489*** (0.0495)	-0.433*** (0.0176)	-0.475*** (0.0184)	-0.456*** (0.0199)	-0.527*** (0.0273)
Adult	-0.0695 (0.0642)	0.00212 (0.0436)	0.229*** (0.0676)	0.105*** (0.0245)	0.109*** (0.0269)	-0.0314 (0.0306)	-0.884*** (0.0597)
ACT Score	0.170*** (0.00476)	0.115*** (0.00357)	0.101*** (0.00638)	0.0754*** (0.00234)	0.0882*** (0.00248)	0.104*** (0.00269)	0.113*** (0.00360)
Hispanic	-0.0773 (0.130)	-0.141 (0.0964)	0.0594 (0.151)	0.0308 (0.0531)	-0.0349 (0.0577)	-0.0174 (0.0634)	0.202* (0.0887)
Black	-0.827*** (0.0915)	-0.933*** (0.0576)	-0.787*** (0.0985)	-0.583*** (0.0241)	-0.701*** (0.0298)	-0.760*** (0.0357)	-0.188*** (0.0473)
Other Race	-0.103 (0.0764)	-0.0535 (0.0547)	-0.404*** (0.105)	-0.0343 (0.0332)	-0.00562 (0.0354)	-0.0290 (0.0389)	0.0893 (0.0540)
Female	0.482*** (0.0372)	0.452*** (0.0276)	0.0934 (0.0495)	0.416*** (0.0168)	0.364*** (0.0181)	0.322*** (0.0198)	0.0295 (0.0265)
Professional Major	-0.691*** (0.0461)	-0.526*** (0.0315)	0.393*** (0.0510)	-0.0979*** (0.0177)	-0.247*** (0.0193)	-0.354*** (0.0216)	-0.907*** (0.0344)
STEM Major	0.361*** (0.0756)	0.466*** (0.0553)	1.160*** (0.0809)	0.146*** (0.0378)	0.232*** (0.0401)	0.264*** (0.0429)	-1.043*** (0.0811)
Constant	-5.978*** (0.119)	-3.904*** (0.0864)	-6.839*** (0.199)	-1.212*** (0.0561)	-2.134*** (0.0597)	-2.819*** (0.0651)	-3.414*** (0.0855)
Observations	69,956	58,125	69,953	68,175	68,035	67,854	58,127

Standard errors in parentheses

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

**Table 9D. Part-Time, Two-Year Sector Students**

	Associate Degree Within 3 Years	Associate Degree Within 4 Years	Certificate Within 2 Years	Accumulated 12 Credits in First Year	Accumulated 24 Credits in First 2 Years	Accumulated 36 Credits in First 3 Years	Transferred Within 3 Years
Time	0.118* (0.0519)	0.0734 (0.0376)	0.0252 (0.112)	0.0458* (0.0199)	0.0476* (0.0217)	0.0464* (0.0235)	0.0697 (0.0536)
Post Year 1	-0.565** (0.191)	-0.417** (0.139)	1.011** (0.366)	-0.227** (0.0724)	-0.240** (0.0792)	-0.323*** (0.0864)	-0.634** (0.207)
Post Year 2	-0.559* (0.224)	- (-)	0.328 (0.477)	-0.399*** (0.0875)	-0.383*** (0.0956)	-0.474*** (0.104)	-0.579* (0.236)
Post Year 3	- (-)	- (-)	0.803 (0.566)	-0.519*** (0.105)	-0.491*** (0.115)	- (-)	- (-)
Pell Eligible	-0.590*** (0.112)	-0.396*** (0.0948)	-0.428** (0.161)	-0.191*** (0.0402)	-0.232*** (0.0440)	-0.220*** (0.0537)	-0.389** (0.123)
Adult	0.323** (0.110)	0.279** (0.0920)	0.507*** (0.153)	0.546*** (0.0359)	0.512*** (0.0398)	0.448*** (0.0492)	-0.577*** (0.133)
ACT Score	0.0781*** (0.0142)	0.0637*** (0.0119)	0.0418* (0.0203)	0.0152** (0.00489)	0.0224*** (0.00539)	0.0271*** (0.00662)	0.0552*** (0.0153)
Hispanic	-0.194 (0.345)	-0.0533 (0.293)	-0.0292 (0.423)	0.222* (0.100)	0.181 (0.109)	0.257 (0.138)	0.0238 (0.348)
Black	-0.998*** (0.190)	-0.862*** (0.152)	-1.309*** (0.259)	-0.525*** (0.0453)	-0.552*** (0.0522)	-0.494*** (0.0664)	0.0584 (0.156)
Other Race	-0.501 (0.261)	-0.307 (0.199)	-0.516 (0.347)	0.136* (0.0694)	0.211** (0.0746)	0.250** (0.0923)	0.331 (0.212)
Female	0.297* (0.117)	0.290** (0.0979)	-0.111 (0.158)	0.372*** (0.0375)	0.296*** (0.0418)	0.269*** (0.0520)	-0.117 (0.117)
Professional Major	0.104 (0.111)	0.103 (0.0944)	0.980*** (0.165)	-0.0674 (0.0364)	-0.145*** (0.0406)	-0.161** (0.0507)	-0.818*** (0.138)
STEM Major	0.000303 (0.252)	0.261 (0.191)	0.893** (0.289)	0.164* (0.0760)	0.151 (0.0830)	0.182 (0.103)	-0.999** (0.329)
Constant	-5.065*** (0.360)	-4.034*** (0.288)	-6.097*** (0.587)	-1.199*** (0.124)	-1.717*** (0.136)	-2.083*** (0.162)	-3.948*** (0.374)
Observations	13,011	8,996	17,042	16,326	16,268	12,389	13,014

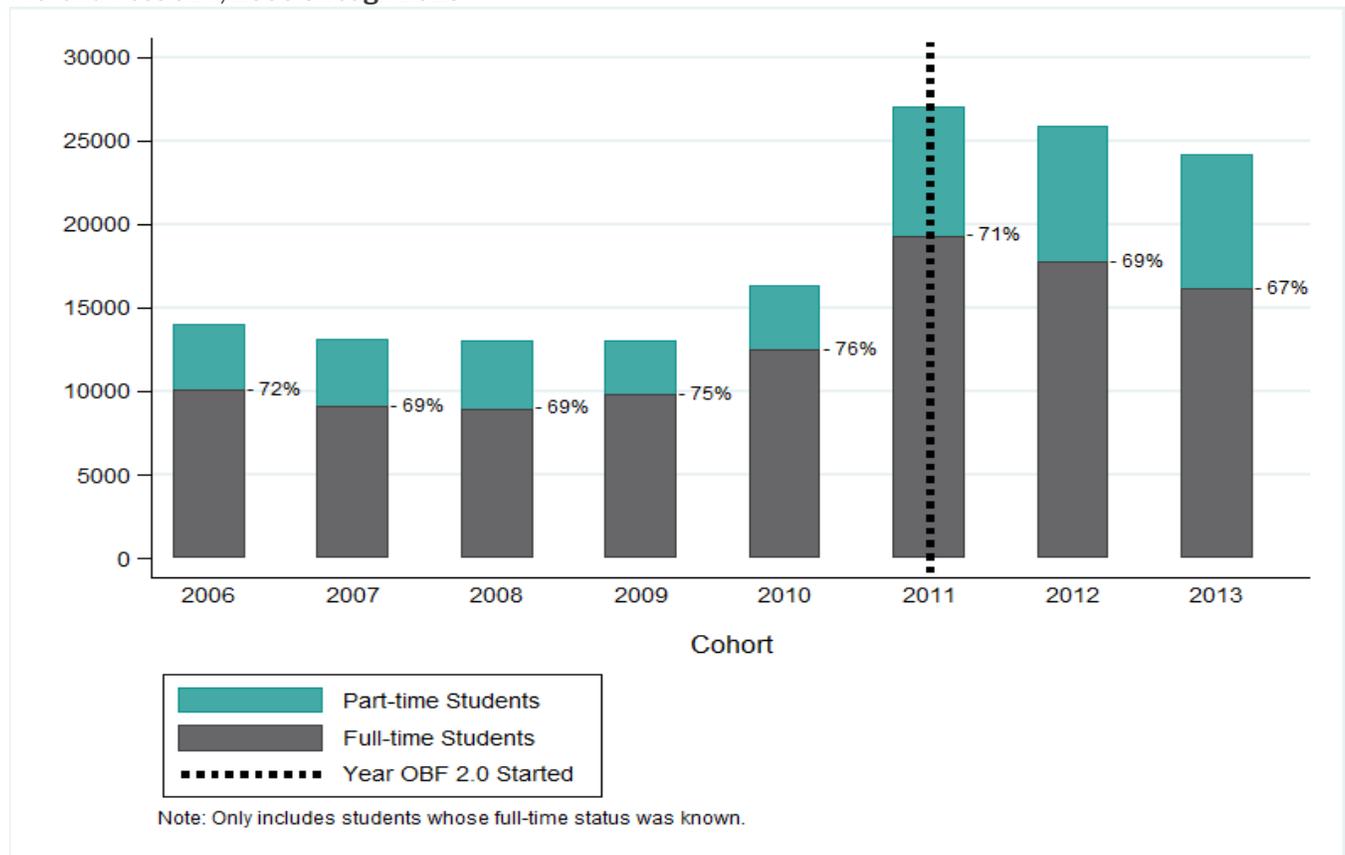
Standard errors in parentheses  
 \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

## Appendix E. Trends for Cohort Enrollment and Key Student Outcomes at Tennessee's Community Colleges

### A. Overall Cohort Enrollment Trends of First-Time Undergraduate Students at Tennessee's Community Colleges

Figure 1E displays enrollment trends for Tennessee's community colleges from academic year 2005-06 to 2012-13.

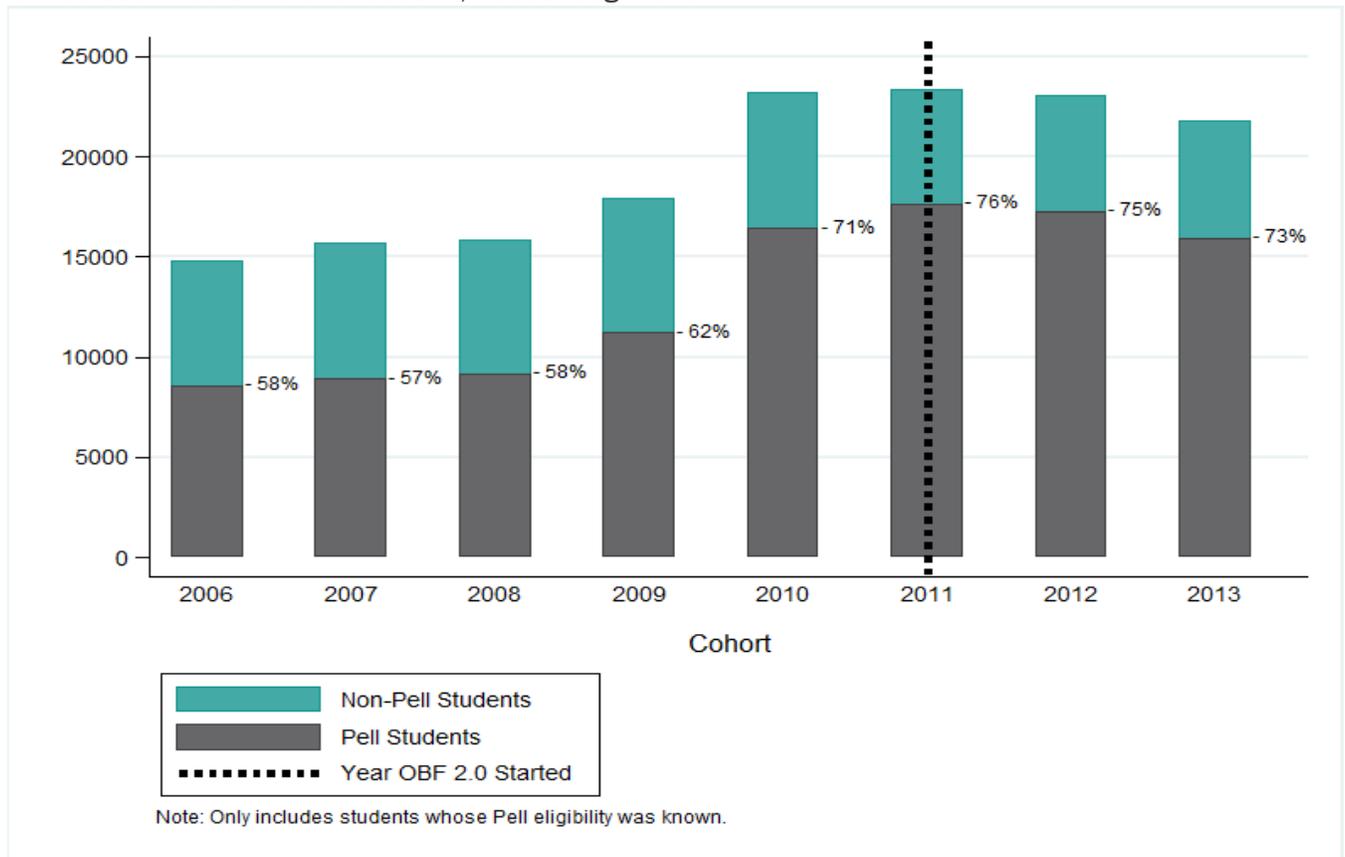
**Figure 1E. Undergraduate Cohort Enrollment of First-Time Students at Tennessee's Community Colleges in Years Pre- and Post-OBF, 2006 through 2013**



#### iii. Enrollment Trends of Pell-Eligible Students

Figure 2E displays cohort enrollment trends of first-time undergraduate students who were Pell eligible at any time during their first two years of community college.

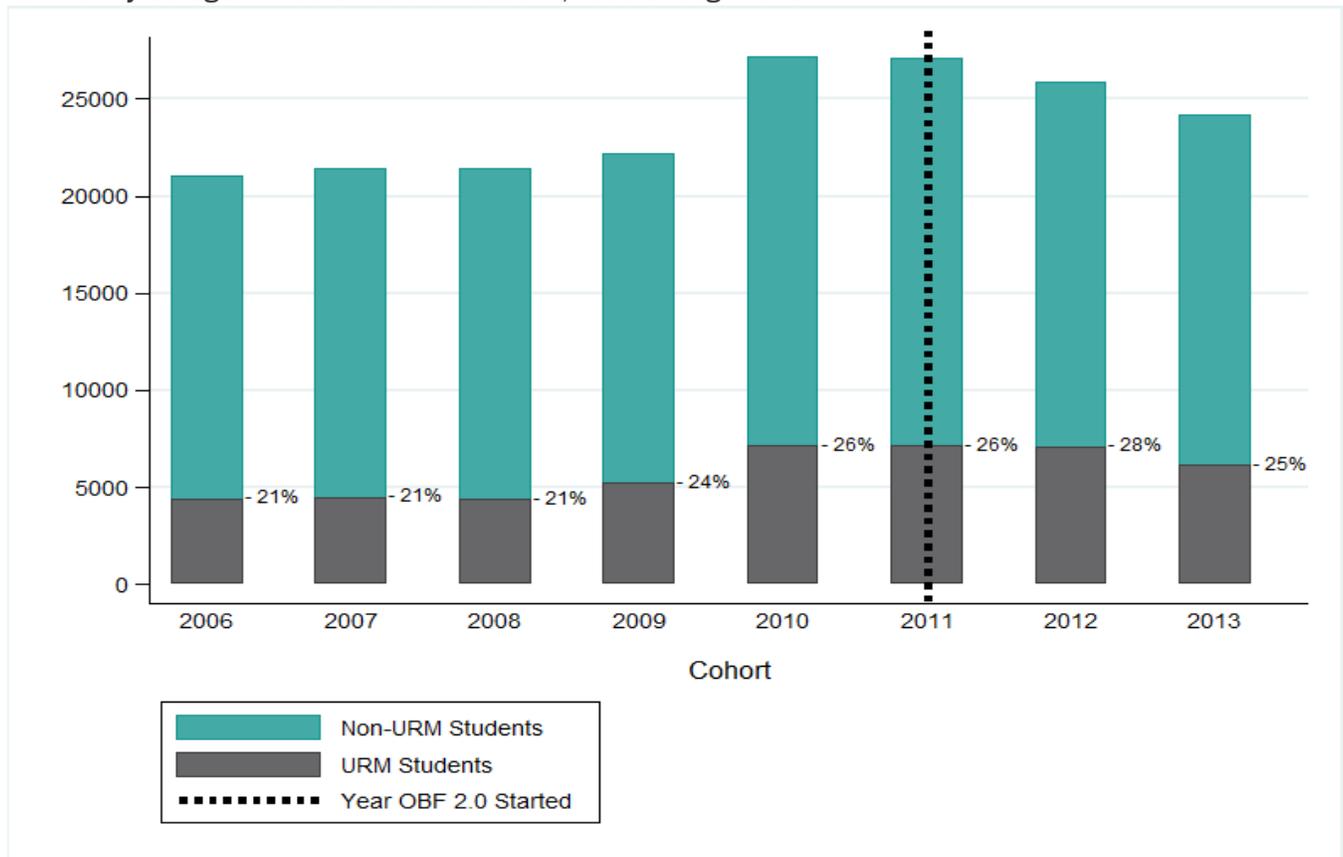
**Figure 2E. Trends in Undergraduate Cohort Enrollment of First-Time Pell-Eligible Students at Tennessee’s Public Universities in Years Pre- and Post-OBF, 2006 through 2013**



iv. Enrollment Trends of Underrepresented Minority Students

Figure 3E displays cohort enrollment trends of first-time undergraduate students in Tennessee’s community colleges who are black or Hispanic.

**Figure 3E. Trends in Undergraduate Enrollment of First-Time Underrepresented Minority Students at Tennessee’s Community Colleges in Years Pre- and Post-OBF, 2006 through 2013**



### Trends in Key Outcomes for Tennessee’s Community Colleges

In this section, we present descriptive data tracking changes in the years pre- and post-OBF implementation in terms of both total number and percentage for:

1. First-time, full-time students who complete an associate degree within two years;
2. First time, full-time students who complete an associate degree within three years;
3. First time, full-time students who earn a certificate within two years;
4. First time, full-time students who accumulate 12 credits within their first semester;
5. First time, full-time students who accumulate 24 credits within their first year;
6. First time, full-time students who accumulate 36 credits within their first three semesters; and
7. First time, full-time students who transfer within three years.

i. Attaining an Associate Degree

Figure 4E displays overall changes in both the total number and the percentage of students who attain an associate degree within two years pre- and post-implementation of outcomes-based funding.

**Figure 4E. Number and Percentage of First-Time, Full-Time Students Receiving an Associate Degree within Two Years in Years Pre- and Post- OBF, 2006 through 2013.**

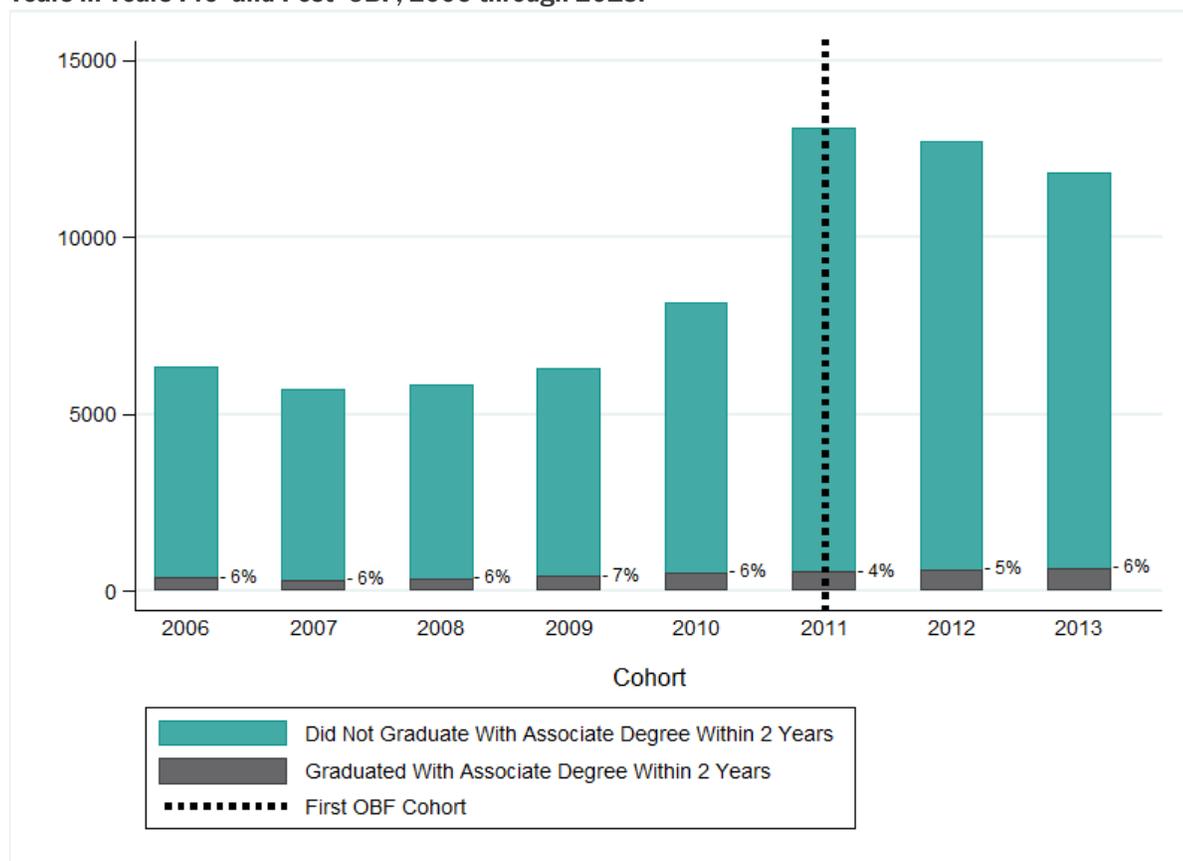
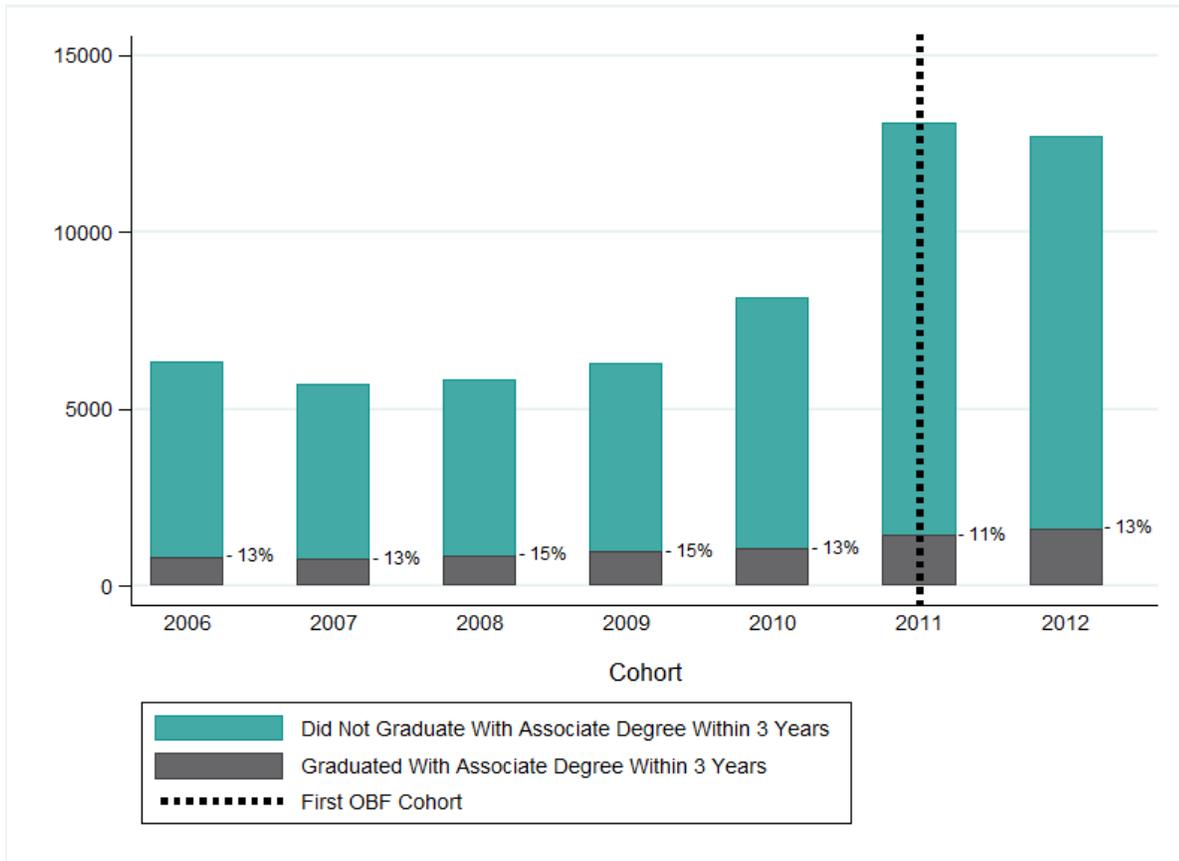


Figure 5E displays overall changes in both the total number and the percentage of students who attain an associate degree within three years pre- and post-implementation of outcomes-based funding.

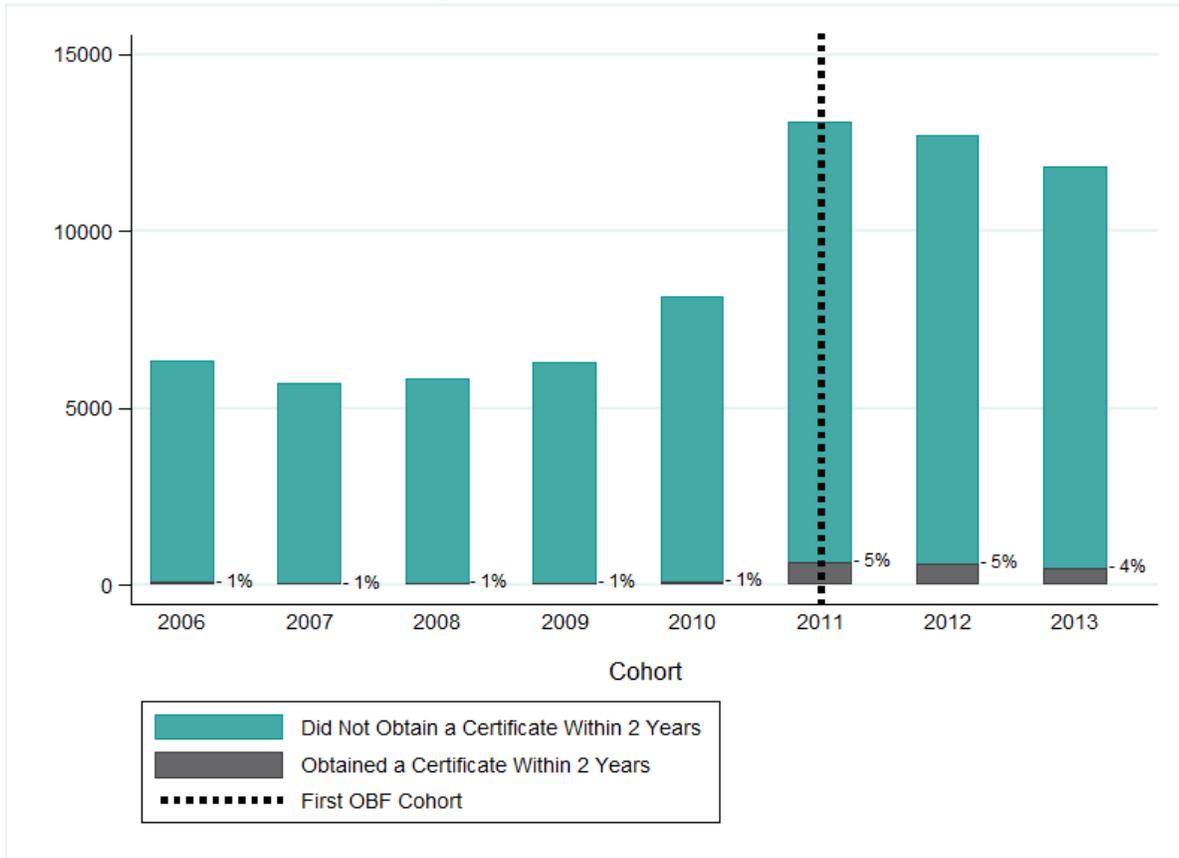
**Figure 5E. Number and Percentage of First-Time, Full-Time Students Receiving an Associate Degree within Three Years in Years Pre- and Post- OBF, 2006 through 2012.**



ii. Earning a Certificate

Figure 6E displays overall changes in both the total number and the percentage of students who attain a certificate within two years pre- and post-implementation of outcomes-based funding.

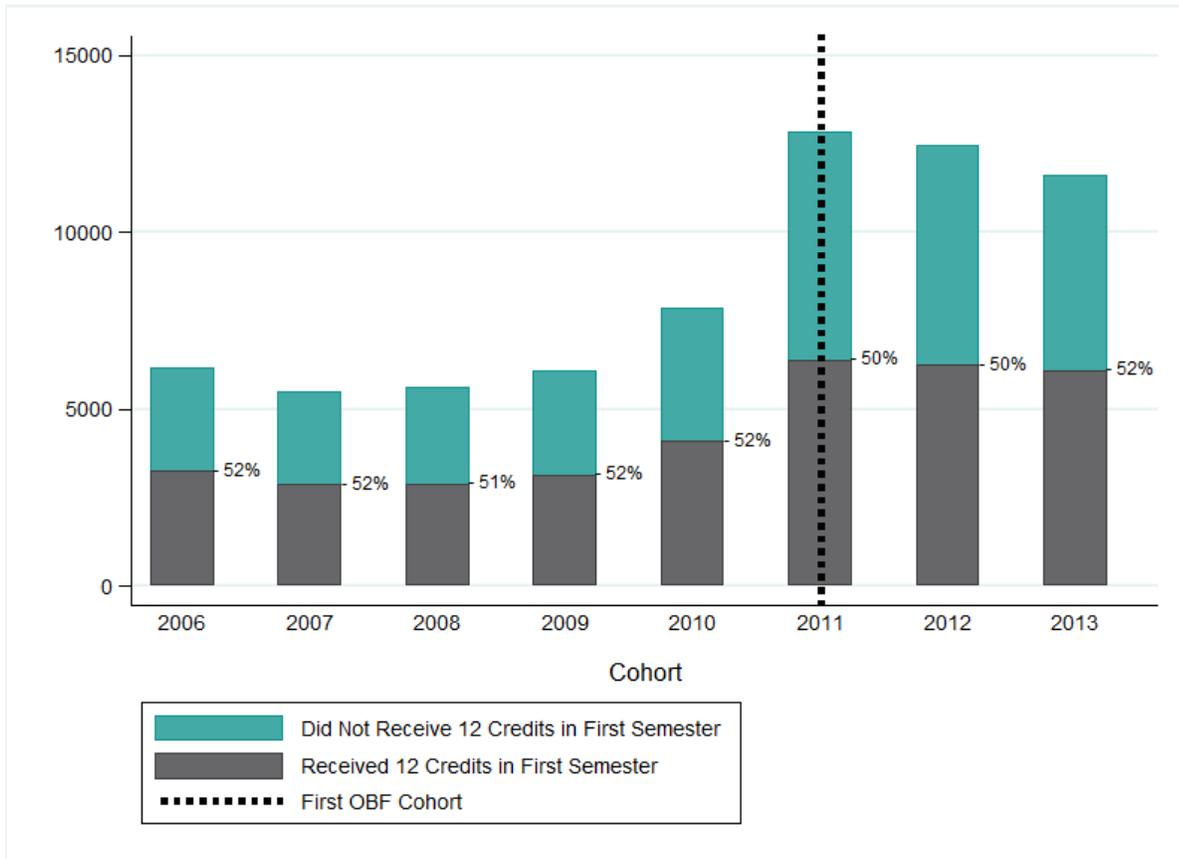
**Figure 6E. Number and Percentage of First-Time, Full-Time Students Receiving a Certificate within Two Years in Years Pre- and Post- OBF, 2006 through 2013.**



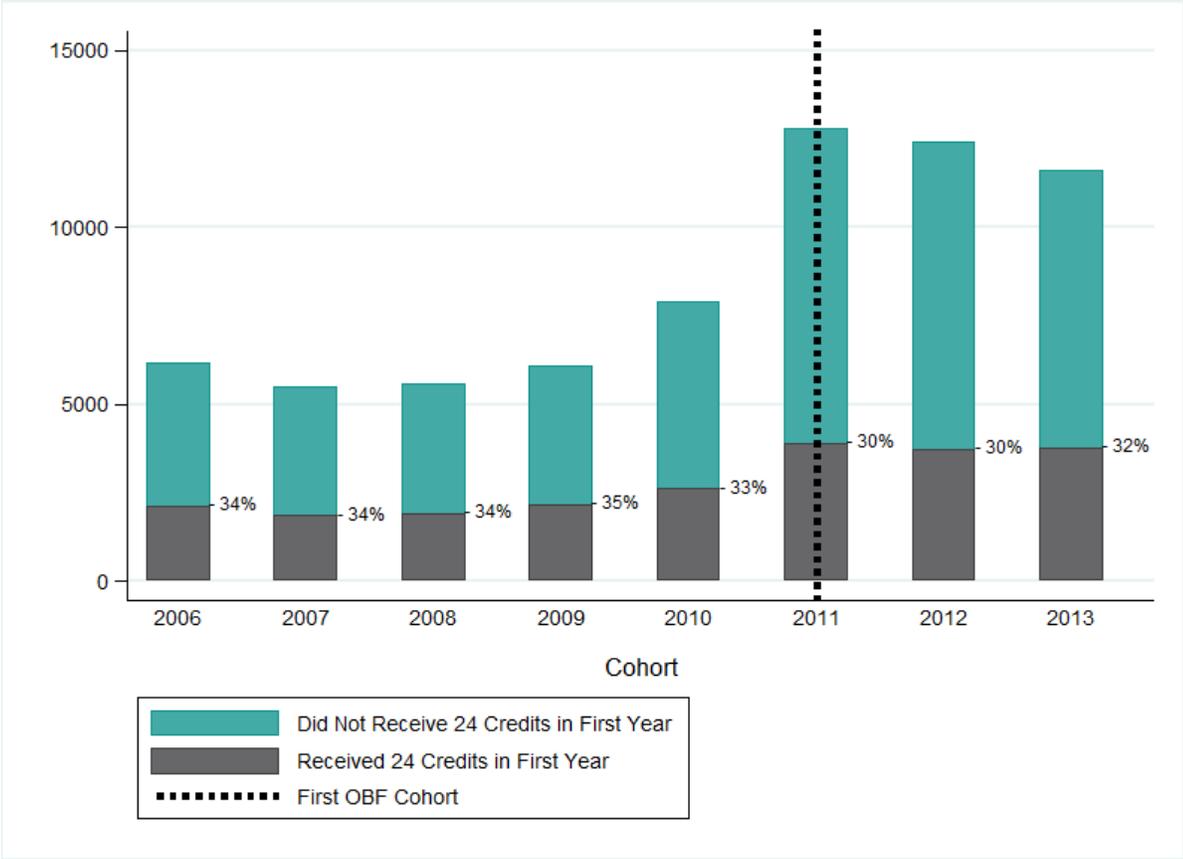
iii. Accumulating 12, 24, and 36 Credits

The following figures display overall changes pre- and post-implementation of outcomes-based funding in both the total number and the percentage of students who meet credit milestones – 12 credits within the first semester, 24 credits within the first year, and 36 credits within the first three semesters.

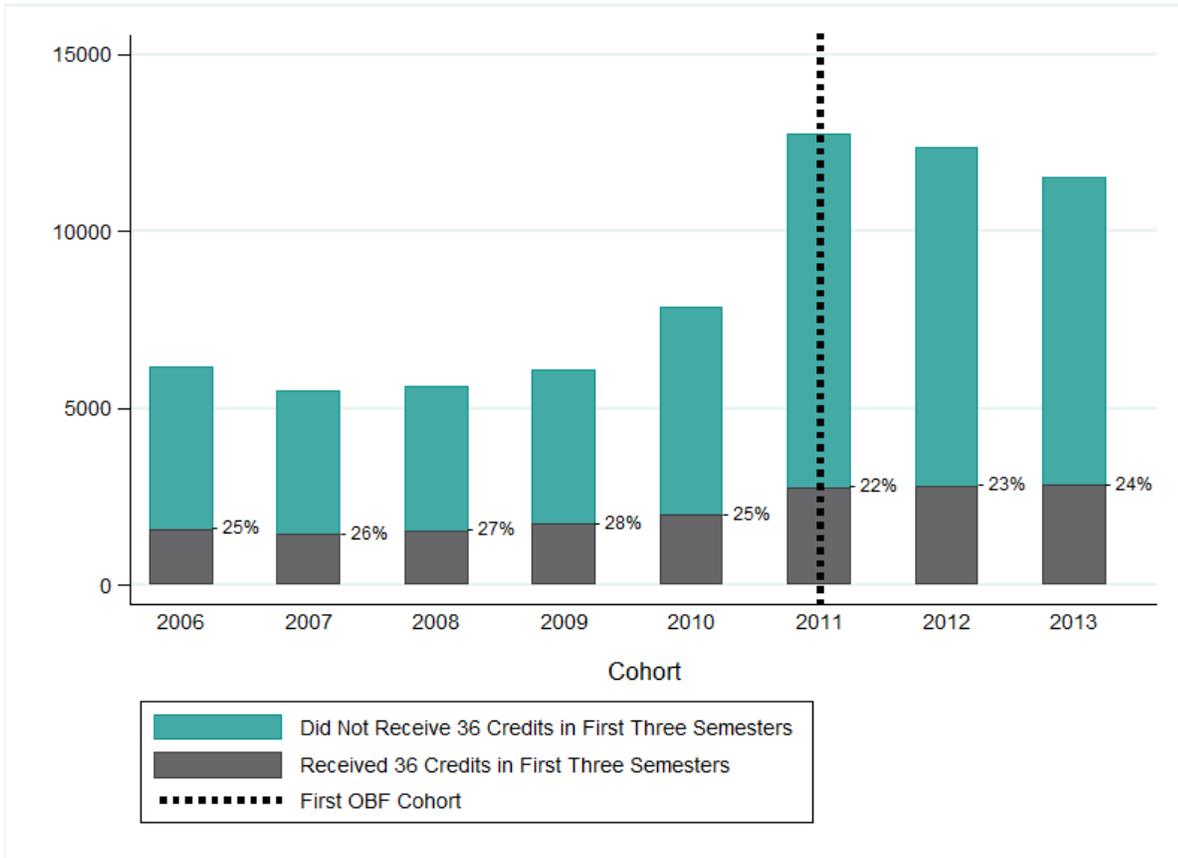
**Figure 7E. Number and Percentage of First-Time, Full-Time Students Accumulating 12 Credits in First Semester in Years Pre- and Post- OBF, 2006 through 2013**



**Figure 8E. Number and Percentage of First-Time, Full-Time Students Accumulating 24 Credits in First Year Semesters in Years Pre- and Post- OBF Implementation, 2006 through 2013.**



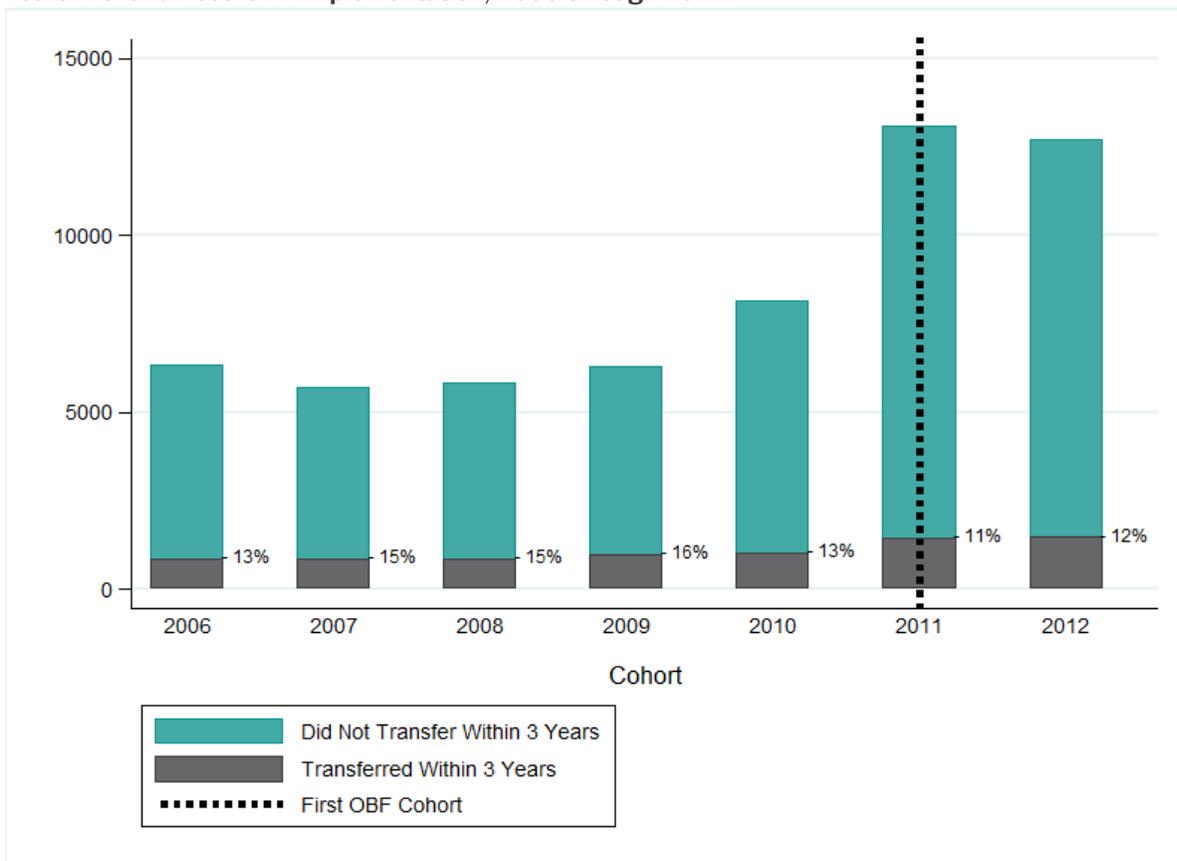
**Figure 9E. Number and Percentage of First-Time, Full-Time Students Accumulating 36 Credits in First Three Semesters in Years Pre- and Post- OBF Implementation, 2006 through 2013.**



iv. Transferring

Figure 10E displays overall changes in both the total number and the percentage of students who transfer within three years pre- and post-implementation of outcomes-based funding.

**Figure 10E. Number and Percentage of First-Time, Full-Time Undergraduates Transferring within Three Years in Years Pre- and Post- OBF Implementation, 2006 through 2012.**

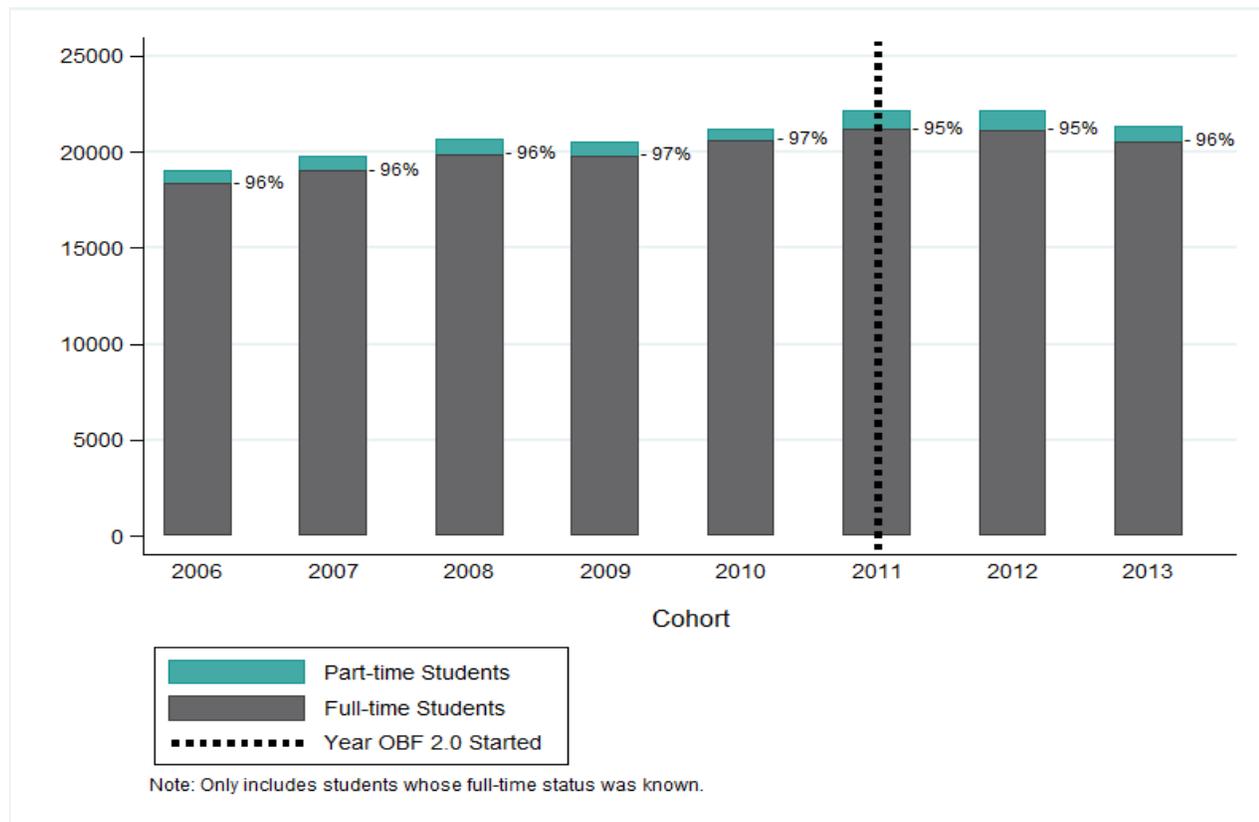


## Appendix F. Trends for Enrollment and Key Student Outcomes at Tennessee's Universities

### Overall Enrollment Trends of First-Time Undergraduate Students at Tennessee's Public Universities

Figure 1F displays enrollment trends for Tennessee's public universities from academic year 2005-06 to 2013-14. Here, we defined a student's cohort as the academic year in which the student first enrolled. For example, students who entered in the 2005-06 academic year are referred to as the 2006 cohort.

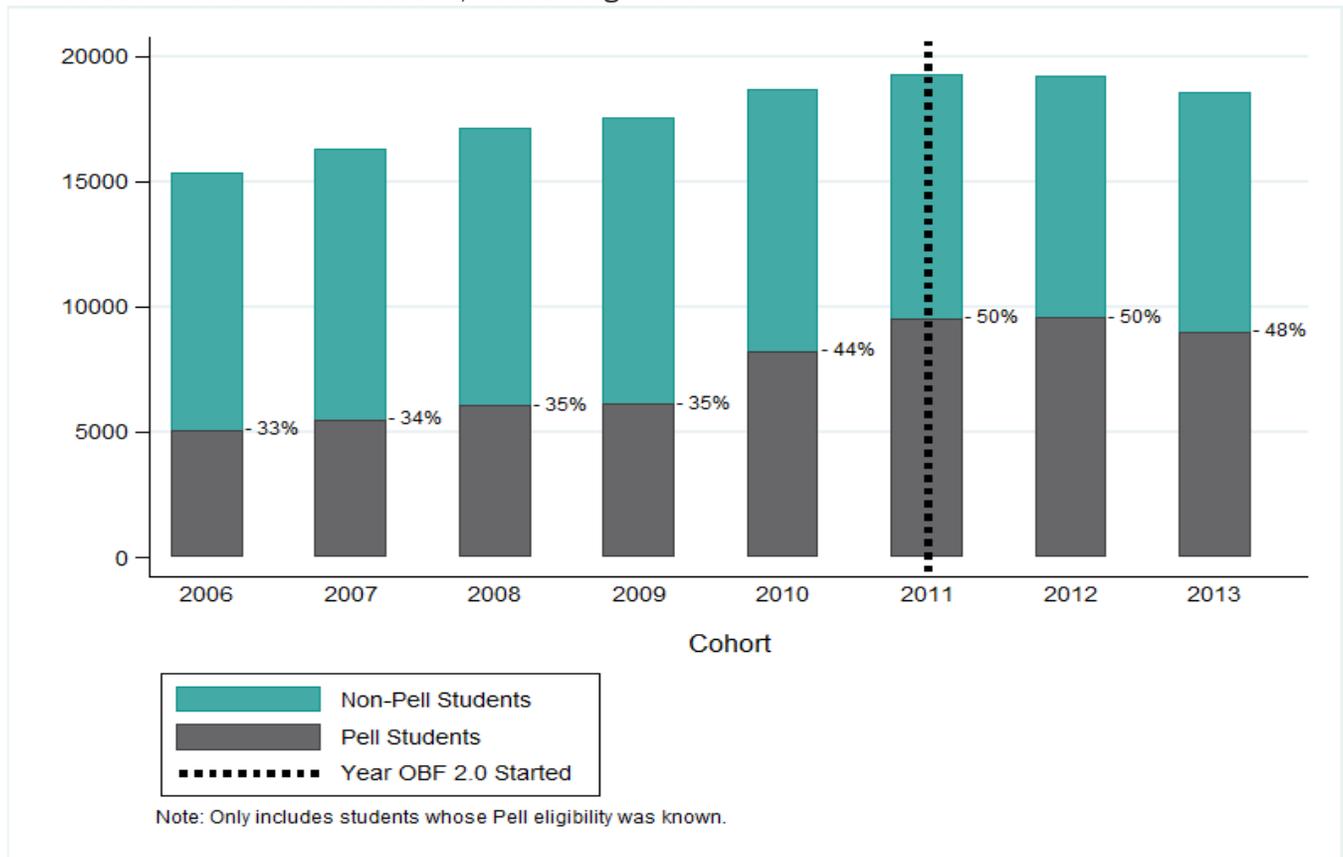
**Figure 1F. Undergraduate Enrollment of First-Time Students at Tennessee's Public Universities in Years Pre- and Post-OBF, 2006 through 2013**



### Enrollment Trends of Pell-Eligible Students

Figure 2F displays enrollment trends of first-time undergraduate students who were Pell eligible while enrolled at a Tennessee public university. While Tennessee's OBF formula awards institutions for serving students who were Pell eligible at any time during their college career, due to available years of data, our analysis examines at students who were Pell eligible at any time during their first two years of their college career.

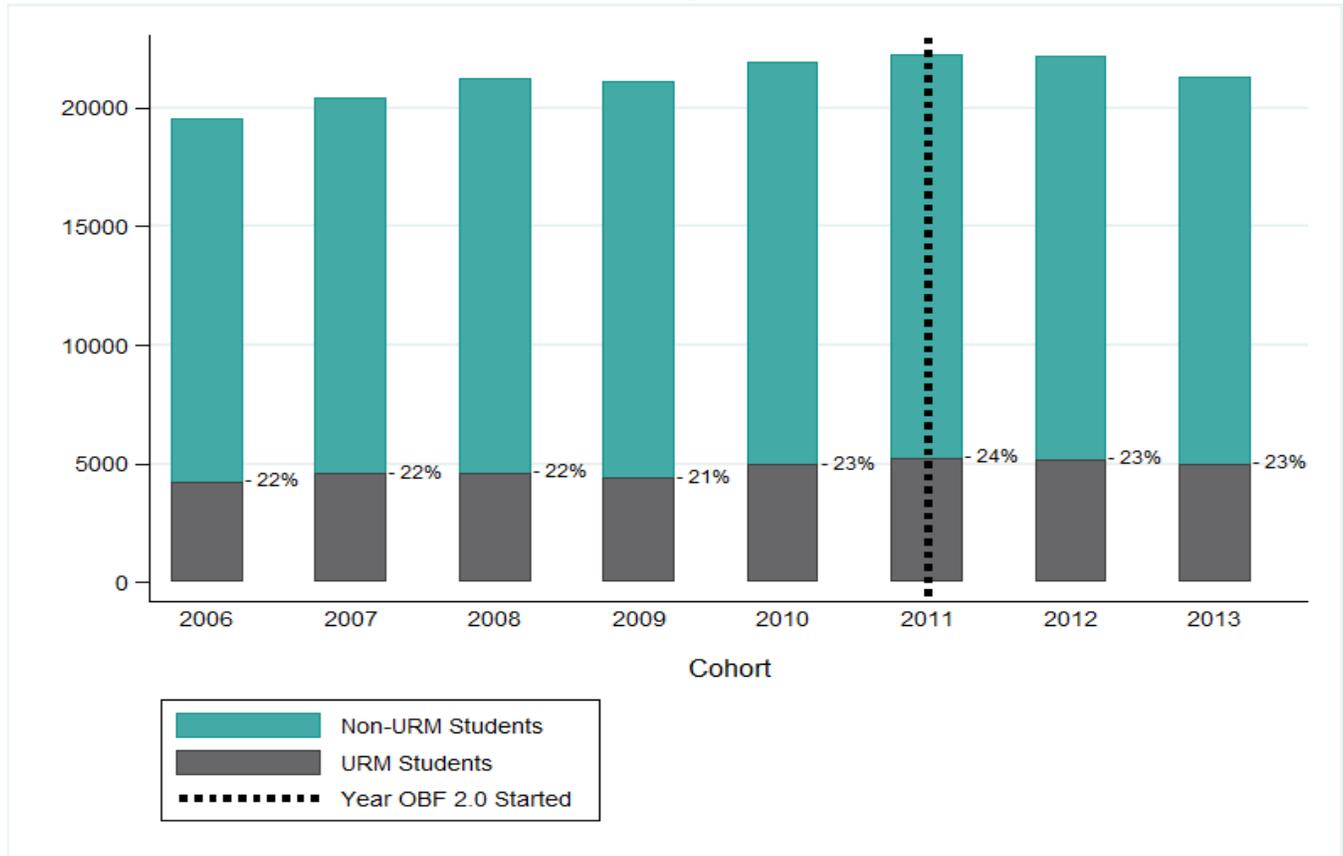
**Figure 2F. Trends in Undergraduate Enrollment of First-Time Pell-Eligible Students at Tennessee’s Public Universities in Years Pre- and Post-OBF, 2006 through 2013**



### Enrollment Trends of Underrepresented Minority Students

We also examined enrollment trends for underrepresented minority students. Figure 3F displays enrollment trends of first-time undergraduate students who are black or Hispanic. Both the number and percent of underrepresented minority students did not change significantly over the 10 years of data examined.

**Figure 3F. Trends in Undergraduate Enrollment of First-Time Underrepresented Minority Students at Tennessee’s Public Universities in Years Pre- and Post-OBF, 2006 through 2013**



### Achievement Trends in Key Outcomes for Tennessee’s Public Universities

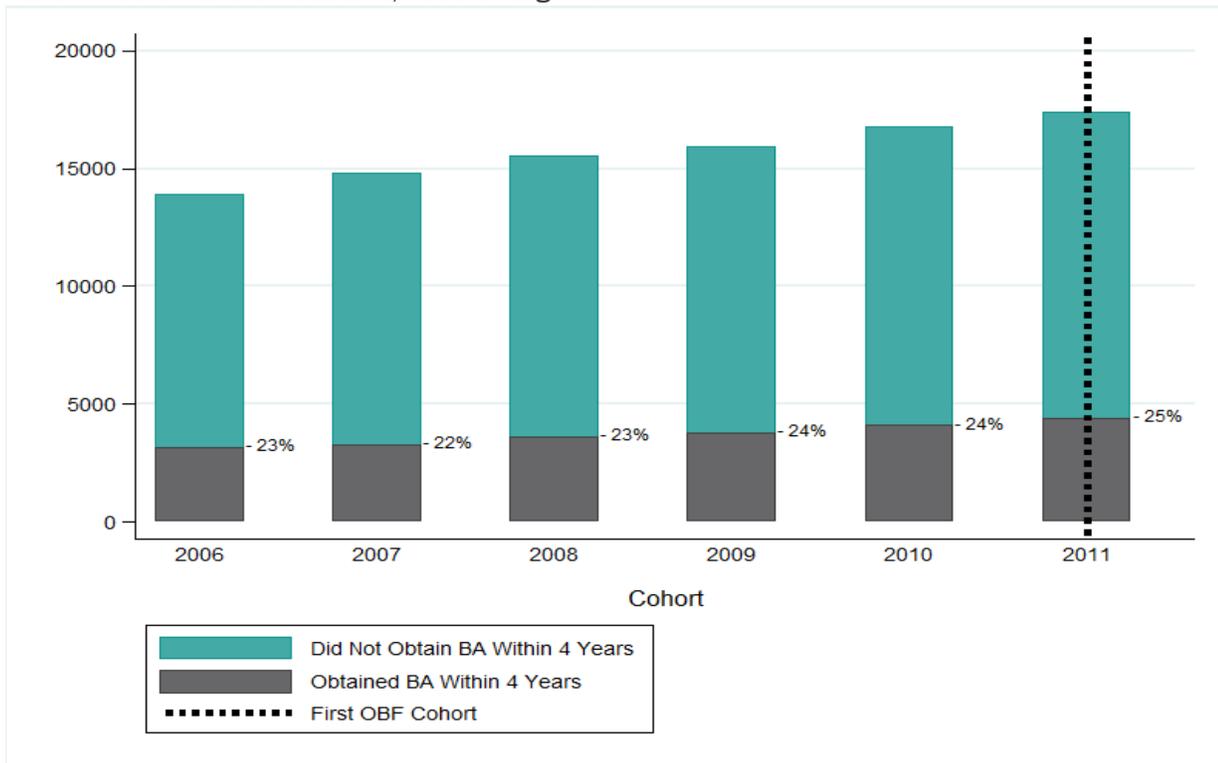
In this section, we present descriptive data tracking changes in the years pre- and post-OBF implementation in terms of both total number and percentage for fall term entries who are:

1. First-time, full-time students who complete a bachelor’s degree within four years;
2. First time, full-time students who earn 24 credits within their first year;
3. First time, full-time students who earn 48 credits within their first two years;
4. First time, full-time students who earn 72 credits within their first three years; and
5. First time, full-time students who entered their third year on track to graduate (with 48 credits) and graduated within four years.

#### Attaining a Bachelor’s Degree

Figure 4F displays overall changes in both the total number and the percentage of students who attain a bachelor’s degree within four years pre- and post-implementation of outcomes-based funding.

**Figure 4F. Number and Percentage of First-Time, Full-Time Students Receiving a Bachelor’s Degree within Four Years in Years Pre- and Post- OBF, 2006 through 2011.**



i. Accumulating 24, 48, and 72 Credits

Figures 5F, 6F, and 7F display overall changes pre- and post-implementation of outcomes-based funding in both the total number and the percentage of students who met credit hour milestones—24 credits within the first year, 48 credits within the first two years, and 72 credits within the first three years.

**Figure 5F. Number and Percentage of First-Time, Full-Time Students Earning 24 Credits within the First Year in Years Pre- and Post- OBF, 2006 through 2013.**

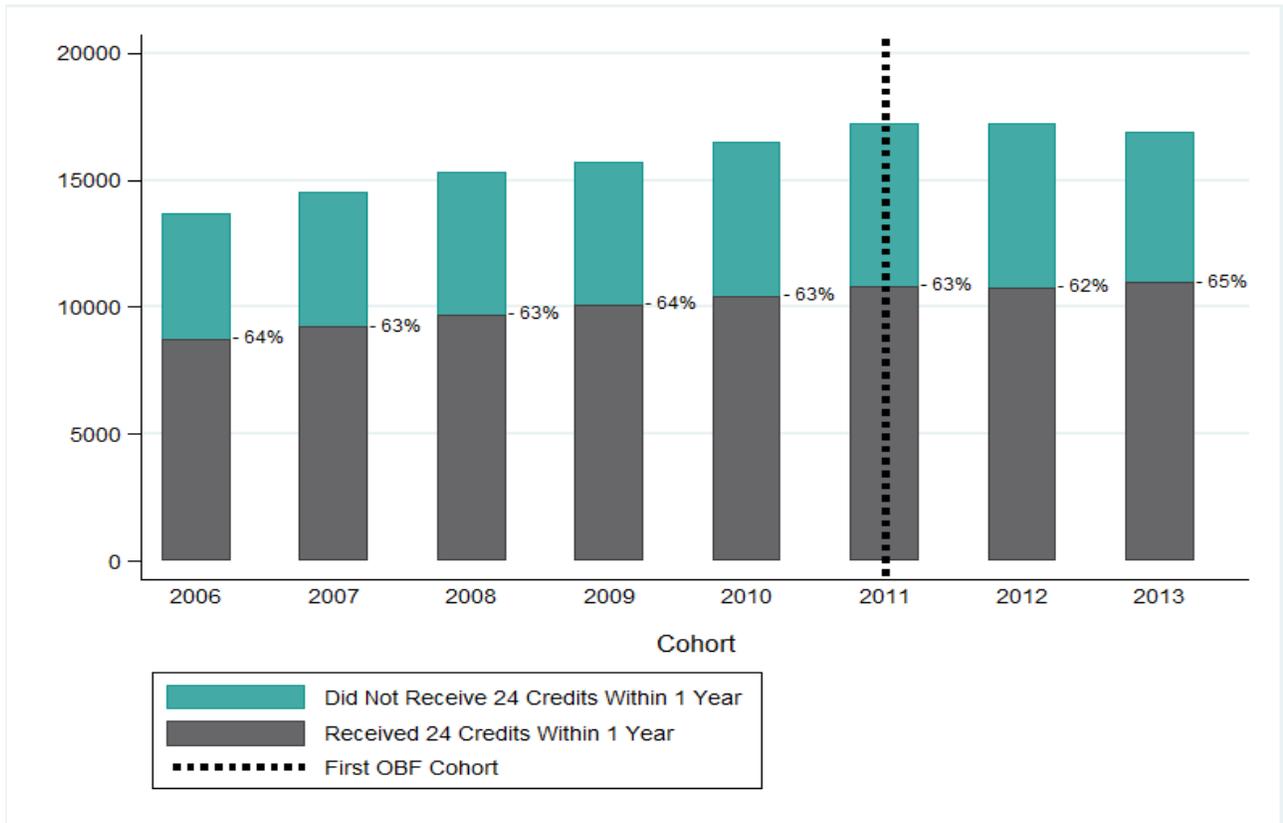


Figure 6F displays overall changes in both the total number and the percentage of students who accumulate 48 credits within the first two years pre- and post-OBF implementation.

**Figure 6F. Number and Percentage of First-Time, Full-Time Students Earning 48 Credits within the First Two Years in Years Pre- and Post- OBF Implementation, 2006 through 2013.**

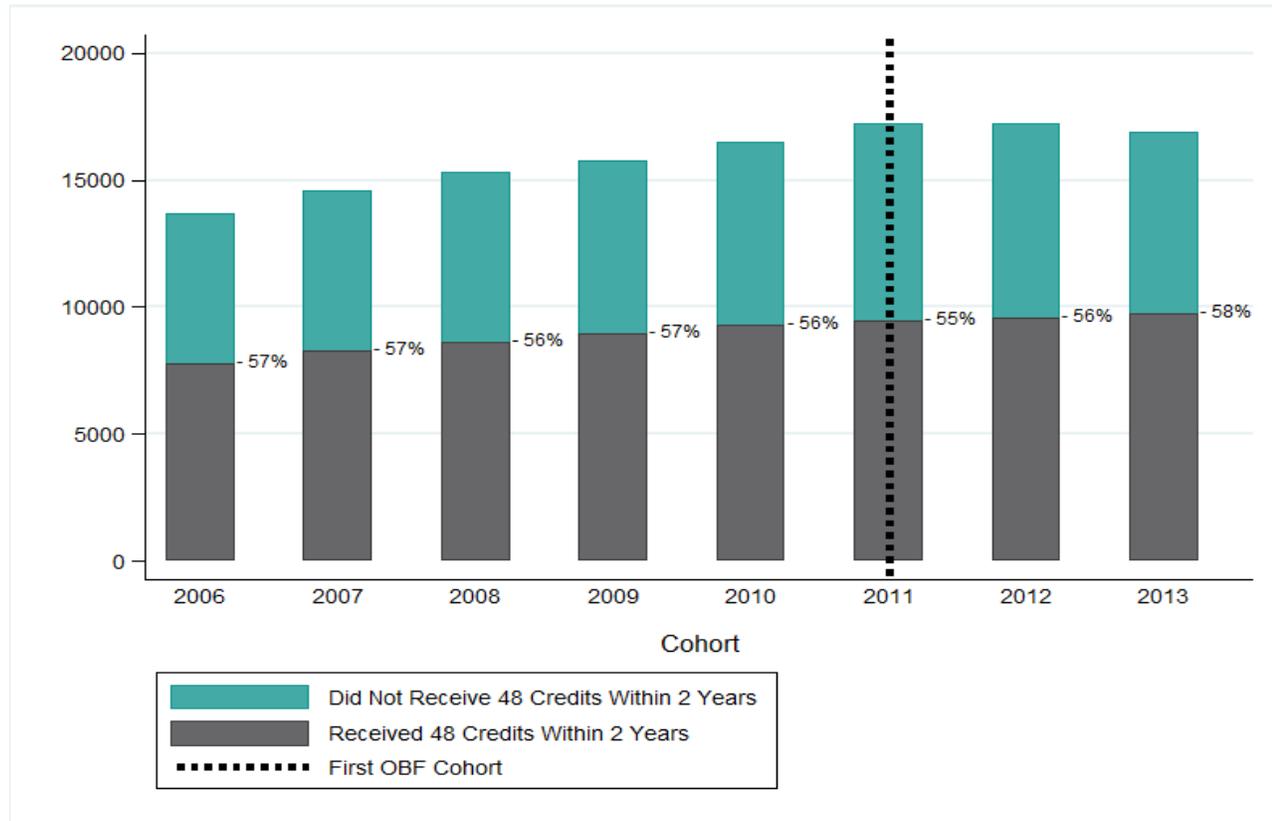
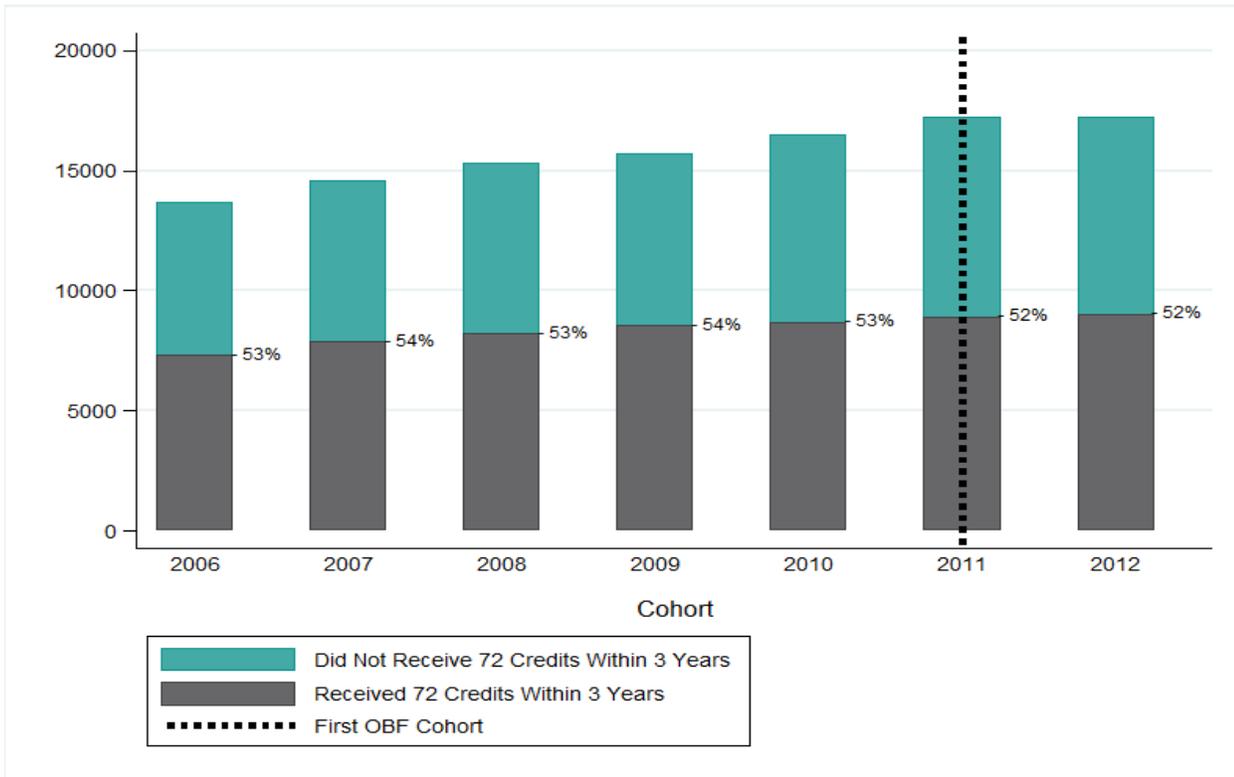


Figure 7F displays overall changes in both the total number and the percentage of students who accumulate 72 credits within the first three years pre- and post-OBF implementation.

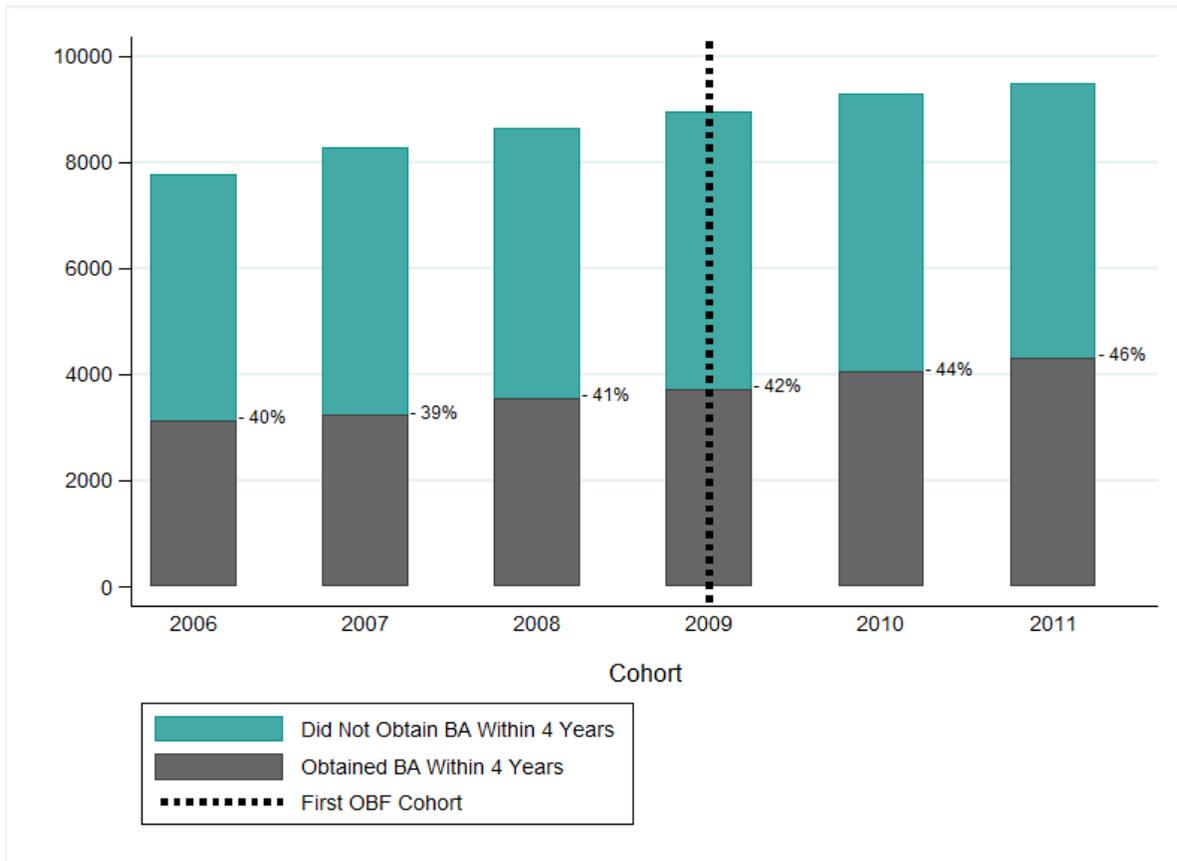
**Figure 7F. Number and Percentage of First-Time, Full-Time Students Earning 72 Credits within the First Three Years in Years Pre- and Post- OBF Implementation, 2006 through 2012.**



ii. Crossing the Finish Line: Students Entering Junior Year On-Time and Graduating within Four Years

Figure 8F displays overall changes in both the total number and the percentage of students who entered their junior year on-time and graduated within four years, a concept termed “crossing the finish line.” In examining this trend, we are interested in how students advance during their last two years of study. Therefore, we mark the first OBF cohort at 2009 since those students would be in their third year in 2011, the year OBF was implemented in Tennessee.

**Figure 8F. Number and Percentage of First-Time, Full-Time Students Successfully “Crossing the Finish Line” (receiving a Bachelor’s Degree on time, conditional on entering the third year of study on time) in Years Pre- and Post- OBF, 2006 through 2011.**



## Appendix G. Are the Positive Effects of Outcomes-Based Funding Widespread among Institutions?

### Trends in Key Student Outcomes among Institutions

As Tennessee's OBF policy is intended to affect all public universities and community colleges, it was important to examine whether the positive effects detailed above were unique to only a few institutions or spread across many. Within the brief, we present tables estimating the effect of outcomes-based funding on bachelor's degree completions for all public universities in Tennessee and the effect of outcomes-based funding on associate degree and certificate completions for all community colleges. The following figures show the trends in each outcome across eight years of available data.

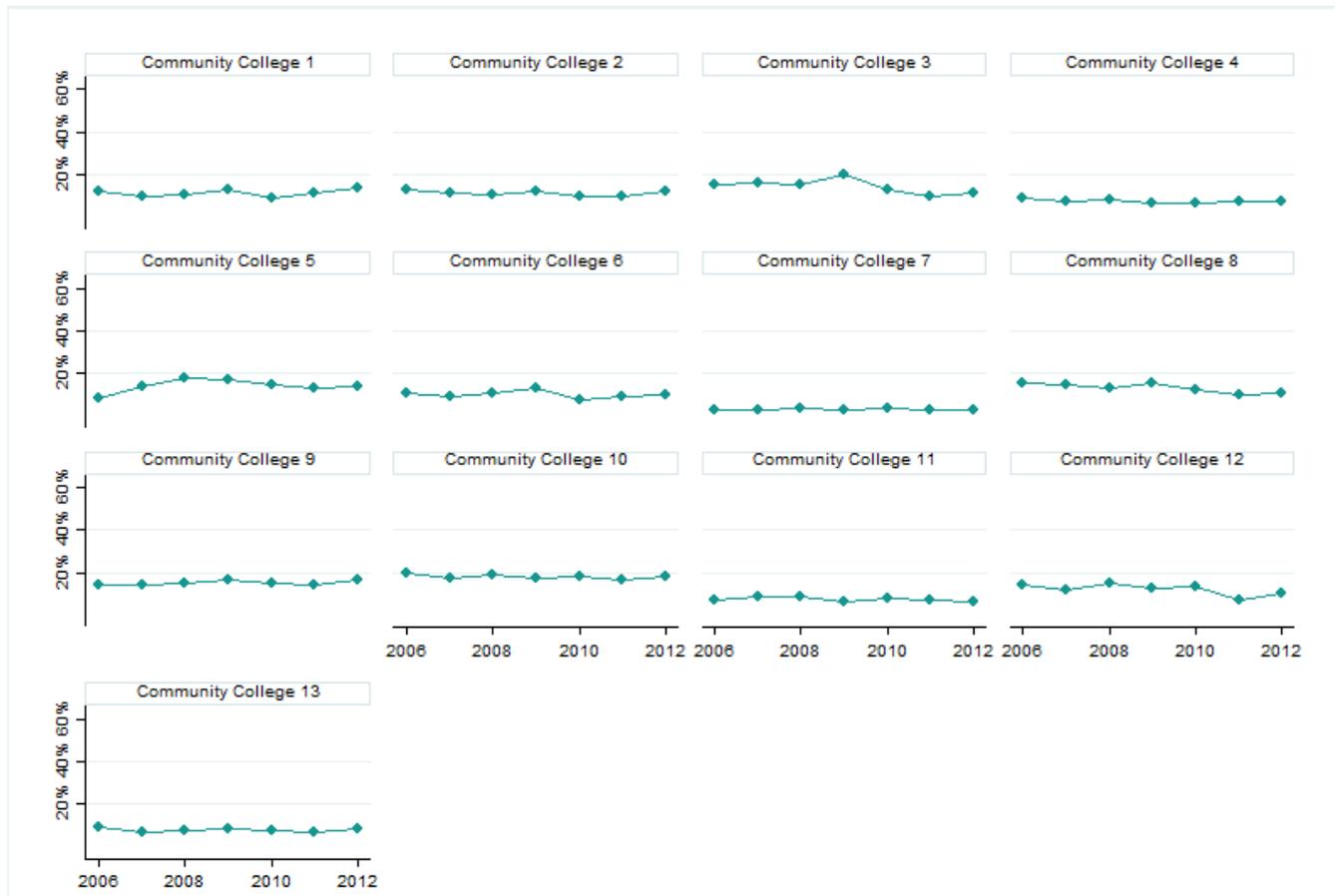
Figure 1G illustrates the trend in bachelor's degree completions across Tennessee's nine public, four-year institutions, which include six research universities and three comprehensive universities.

**Figure 1G. Trends in the Four-Year Bachelor's Attainment Rate at Universities in Tennessee**



Figure 2G illustrates the trend in associate degree completions across Tennessee's 13 community colleges.

**Figure 2G. Trends in the Three-Year Associate Degree Attainment Rate at Community Colleges in Tennessee**



Lastly, Figure 3G illustrates the trend in certificate completions across Tennessee’s community colleges. Only 10 community colleges are presented below, as data on certificates was not available for three of Tennessee’s community colleges.

**Figure 3G. Trends in the Two-Year Certificate Attainment Rate at Community Colleges in Tennessee**



### Impact of Outcomes-Based Funding on Key Student Outcomes among Institutions

Using a quasi-experimental technique called Interrupted Time Series, we estimated the effect of outcomes-based funding on key student outcomes across institutions. The impact of OBF in Tennessee was examined on bachelor’s degree completions for all public universities and on associate degree and certificate completions for all community colleges. A more detailed overview of the analyses for all available graduation cohorts is provided below.

Table 1G examines the relationship between implementation of OBF and bachelor’s degree completions for each of Tennessee’s nine public universities, which include six research universities and three comprehensive universities.

**Table 1G. Estimating the Effect of Outcomes-Based Funding on Bachelor’s Degree Completions within Four Years**

INSTITUTIONS	INSTITUTION TYPE	SIZE	2011	SUMMARY
University of Tennessee – Knoxville	Research Universities	20,218	-0.8	No significant findings
Middle Tennessee State University		18,258	0.6	No significant findings
University of Memphis		10,643	3.8**	+ Impact
Tennessee Technological University		8,907	2.1	No significant findings
East Tennessee State University		8,646	3.1*	+ Impact
Tennessee State University		4,541	1.8	No significant findings
University of Tennessee – Chattanooga	Comprehensive Universities	10,124	3.1*	+ Impact
University of Tennessee – Martin		6,596	4.6**	+ Impact
Austin Peay State University		6,443	1.3	No significant findings

Numbers represent the effect of OBF on the probability of attaining a Bachelor’s degree within four years.

Each institution has a different number of students. As such, comparing statistical significance between institutions is not that meaningful.

Table 2G shows the results examining the relationship between implementation of OBF and associate degree completions for each of Tennessee’s 13 community colleges.

**Table 2G. Estimating the Effect of Outcomes-Based Funding on Associate Degree Completions within Three Years**

INSTITUTIONS	POST-OBF COHORTS			SUMMARY
	N	2011	2012	
Pellissippi State Community College (Largest Enrollment)	6660	2.8*	5.5**	+ Impact
Volunteer State Community College	6482	1.3	5.2***	+ Impact
Walters State Community College	5385	-5.1	-2.7**	- Impact
Chattanooga State Community College	5360	0.5	1.3	No significant findings
Northeast State Community College	4981	-2.1	-4.3	No significant findings
Jackson State Community College	4755	1.2	3.4*	+ Impact
Southwest Tennessee Community College	4523	0.7	1.4	No significant findings
Columbia State Community College	3586	-2.7	-1.3	No significant findings
Roane State Community College	3575	-4.4	-2.3	No significant findings
Motlow State Community College	3433	-2.9	-1.1	No significant findings
Nashville State Community College	3396	1.4	1.6	No significant findings
Cleveland State Community College	3221	-4.8*	-1.7	- Impact
Dyersburg State Community College (Smallest Enrollment)	2643	-1.1	1.5	No significant findings

Numbers represent the effect of OBF on the probability of attaining an associate degree within three years.

Each institution has a different number of students. As such, comparing statistical significance between institutions is not that meaningful.

Table 3G shows examines the relationship between implementation of OBF and certificate completions for 10 of Tennessee’s community colleges.

**Table 3G. Estimating the Effect of Outcomes-Based Funding on Certificate Completions within Two Years**

INSTITUTIONS	POST-OBF COHORTS			SUMMARY	
	N	2011	2012		2013
<b>Pellissippi State Community College (Largest Enrollment)</b>	Not available				
<b>Volunteer State Community College</b>	7530	4.7***	2.7*	0.5	+ Impact
<b>Walters State Community College</b>	6602	3.1***	5.0***	5.7**	+ Impact
<b>Chattanooga State Community College</b>	6141	-0.7	0.7	-1.1	No significant findings
<b>Northeast State Community College</b>	5976	0.6**	0.3*	0.8***	+ Impact
<b>Jackson State Community College</b>	5488	1.0*	1.2*	3.4**	+ Impact
<b>Southwest Tennessee Community College</b>	5701	0.5	0.4	0.6	No significant findings
<b>Columbia State Community College</b>	4364	2.4*	2.3	2.2	+ Impact
<b>Roane State Community College</b>	4449	0.4	0.3	0.4	No significant findings
<b>Motlow State Community College</b>	Not available				
<b>Nashville State Community College</b>	4114	5.1***	3.1**	5.0**	+ Impact
<b>Cleveland State Community College</b>	3808	3.6**	5.4***	5.3**	+ Impact
<b>Dyersburg State Community College (Smallest Enrollment)</b>	Not available				

Numbers represent the effect of OBF on the probability of attaining a certificate within two years. Each institution has a different number of students. As such, comparing statistical significance between institutions is not that meaningful.

## Appendix H. Deeper Dive into Quantitative Findings

### What Effect Did the “Partial Dosage” Cohorts Have on Our Results?

Partial dosage refers to individuals who received less than the full portion of “treatment” in an experiment. In this context, it refers to students who entered Tennessee’s higher education system before OBF was implemented, but continued their studies after it had been implemented.

We hypothesize that the presence of students who received partial dosage would cause us to *underestimate* the impact of OBF. If OBF has a positive impact on students’ outcomes, then students who received partial dosage will be more likely to graduate than students who received no dosage. Thus, comparing full dosage cohorts to partial dosage cohorts (as we do) likely results in an underestimation of the impact of OBF.

We can test our theory by moving our date of OBF implementation prior to the partial dosage cohorts and seeing how the effects for the post-OBF cohorts change. If our theory is correct, we would expect the positive effects of OBF on the post-OBF cohorts to become larger. Below, we conduct such an analysis for our three primary positive findings: bachelor’s degree attainment within four years, associate degree attainment within three years, and certificate attainment within two years.

**Table 1H. The Effect of OBF on Bachelor’s Degree Attainment within Four Years When 2009 and 2010 Are considered Pre-treatment Cohorts as Compared to When They Are Considered Post-Treatment Cohorts**

	Primary Model	2010 as post-	2009 and 2010 as post-
2009 Cohort			0.00591 (0.0366)
2010 Cohort		0.0448 (0.0310)	0.0508 (0.0487)
2011 Cohort	0.125*** (0.0278)	0.162*** (0.0379)	0.170*** (0.0619)

Note: Coefficients are from a logit regression.

**Table 2H The Effect of OBF on Associate Degree Attainment within Three Years for Full-time Students When 2009 and 2010 Are Considered Pre-Treatment Cohorts as Compared to When They Are Considered Post-Treatment Cohorts**

	Primary Model	2010 as post-	2009 and 2010 as post-
2009 Cohort			0.0551 (0.0692)
2010 Cohort		-0.262*** (0.0571)	-0.205** (0.0917)
2011 Cohort	-0.0613 (0.0470)	-0.287*** (0.0677)	-0.213* (0.115)
2012 Cohort	0.137** (0.0550)	-0.145* (0.0822)	-0.0532 (0.141)

Note: Coefficients are from a logit regression.

**Table 3H. The Effect of OBF on Certificate Attainment within Two Years When 2010 Is Considered a Pre-Treatment Cohort as Compared to When It Is Considered a Post-Treatment Cohort**

	<i>Primary Model</i>	<i>2010 as post-</i>
<i>2010 Cohort</i>		0.722*** (0.205)
<i>2011 Cohort</i>	1.683*** (0.129)	2.388*** (0.244)
<i>2012 Cohort</i>	1.553*** (0.165)	2.433*** (0.304)
<i>2013 Cohort</i>	1.320*** (0.202)	2.376*** (0.366)

Note: Coefficients are from a logit regression

Our hypothesis that partial dosage cohorts result in underestimation of the effect of OBF holds for the bachelor’s attainment and certificate attainment analysis, but does not for the associate attainment analysis. This falsification is a result of the 2010 cohort, a partial dosage cohort, actually having a lower probability of attaining an associate degree within three years than the cohorts that received no dosage (see section C below for further analysis of this phenomenon). As such, our findings related to associate degree attainment within three years should perhaps be interpreted with more caution than our findings related to bachelor’s attainment within four years and certificate attainment within two years.

### Could Shifts in Covariate Trends Have Affected Our Results?

An abrupt shift in a covariate trend following the treatment can pose issues for an interrupted time series analysis that does not have a control group. Statistical control is not perfect, and it can be difficult to disentangle the effect of the treatment from an abrupt, contemporaneous shift in a covariate trend.

Using an interrupted time series analysis, we found that four of our covariates in the four-year sector and nine in the two-year sector did indeed significantly deviate from their pre-OBF trend lines after OBF was implemented. It is important, however, to understand *how* such a deviation would affect our results. For example, the proportion of students who were Pell eligible increased following OBF, but being Pell eligible has a negative relationship with the likelihood of graduating; thus, any error resulting from this shift would make our results *more negative*. The other three covariates that shifted in the four-year sector following OBF produce a similar effect: if they did affect our results, the direction of that effect was negative. To be clear, this indicates that our positive findings on bachelor’s attainment cannot be called into question based on post-OBF shifts in covariate trends.

**Table 3H. The Effect that Shifts in Covariates in the Bachelor’s Degree Attainment Analysis Following OBF May Have Had on Our Results**

<b>Covariate</b>	<b>Change following OBF</b>	<b>Relationship with attainment rate</b>	<b>Effect on results</b>
<b>Pell</b>	+	-	-
<b>African-American</b>	+	-	-
<b>Other Race</b>	+	-	-
<b>ACT Score</b>	-	+	-

The story in the two-year sector is more complicated. In both the associate degree and certificate analyses, three of our covariates—Other Race, Adult, and STEM Major—shifted in contradictory directions post-OBF. Of the other six covariates, two shifted in a direction that could have produced positive bias and four shifted in a direction that could have produced negative bias. Overall, this indicates that it is unlikely that abrupt shifts in covariate trends affected our findings related to associate degree or certificate attainment; however, we cannot entirely rule it out.

**Table 4H. The Effect that Shifts in Covariates in the Associate Degree Attainment Analysis Following OBF May Have Had on Our Results**

Covariate	Change following OBF	Relationship with attainment rate	Effect on results
Pell	+	-	-
African-American	+	-	-
Hispanic	-	-	+
Other Race	Mixed	-	Mixed
Female	+	+	+
Adult	Mixed	+	Mixed
ACT Score	-	+	-
Professional Major	+	-	-
STEM Major	Mixed	+	Mixed

**Table 5H. The Effect that Shifts in Covariates in the Certificate Attainment Analysis Following OBF May Have Had on Our Results**

Covariate	Change following OBF	Relationship with attainment rate	Effect on results
Pell	+	-	-
African-American	+	-	-
Hispanic	-	+	-
Other Race	Mixed	-	Mixed
Female	+	+	+
Adult	Mixed	+	Mixed
ACT Score	-	+	-
Professional Major	+	+	+
STEM Major	Mixed	+	Mixed

## How Reliable Is Our Pre-OBF Trend Line?

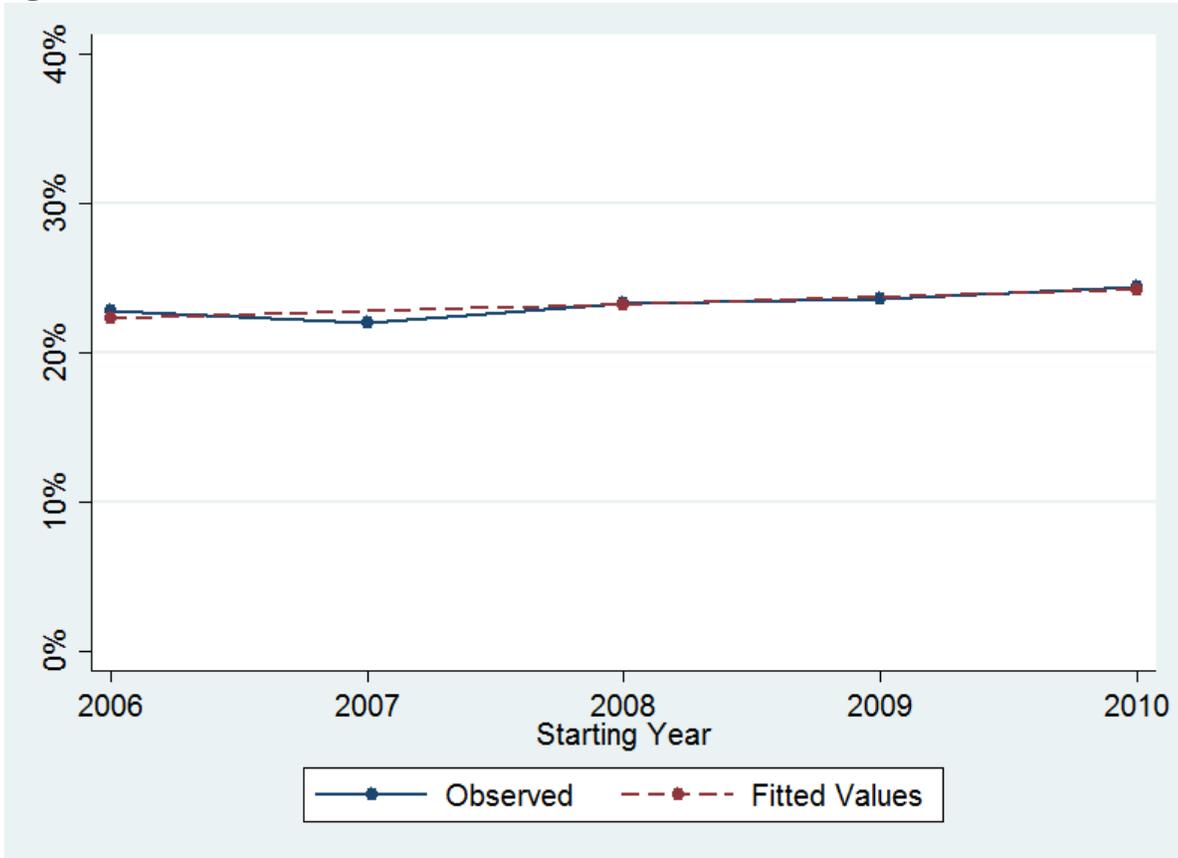
Estimating a reliable pre-OBF time trend is integral to properly implementing an interrupted time series analysis. Our estimates of OBF's impact are entirely dependent upon the pre-OBF trend line accurately revealing an underlying time trend that would have continued in absence of the implementation of OBF. If, for example, one of our pre-OBF years is a large outlier, our estimation of the pre-OBF trend may be unreliable.

In Table 6H, we show the observed bachelor's attainment within four years rate for each of the pre-OBF cohorts, which are the numbers upon which our trend line is based. Other than a slight dip in 2007, the pre-OBF bachelor's attainment rate shows a consistently positive trend. Notably, the final three pre-OBF cohorts almost perfectly align with the best fit line. As such, we believe that our pre-OBF trend line accurately reflects a positive trend in graduation rates in Tennessee prior to the implementation of OBF.

**Table 6H. The Observed Bachelor's Attainment Rate for Each Pre-OBF 2.0 Cohort**

	BA Attainment Rate
2006	22.82
2007	22.05
2008	23.29
2009	23.64
2010	24.43

**Figure 1H. Observed Bachelor's Attainment Rates for the Pre-OBF Cohorts with a Linear Best Fit Line**

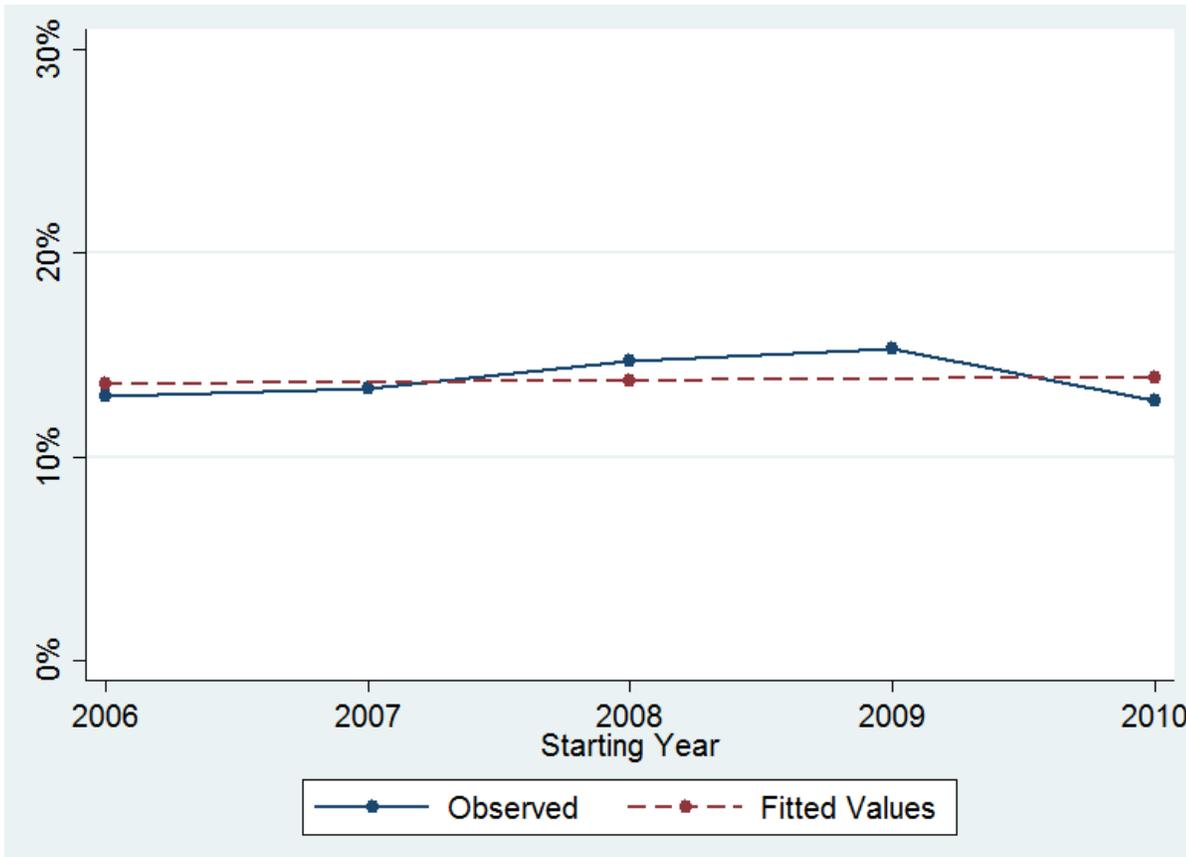


In Table 7H, we show the observed rate of associate degree attainment within three years for full-time students, which are the numbers upon which our trend line is based. In Figure 2H, we show the observed attainment rates along with a linear fit line. Figure 2H shows that our pre-OBF trend line for the analysis of associate attainment within three years may be questionable. Our estimated trend line is nearly flat, but this is largely because of the large dip for the 2010 cohort. Prior to that dip, the rate of attaining an associate degree within three years increased for three years in a row. This finding is related to our finding on partial dosage cohorts and, similarly, indicates that our results related to associate degree attainment within three years should be interpreted with caution.

**Table 7H. The Observed Associate Degree Attainment (within three years) Rate for Each Pre-OBF 2.0 Cohort**

	AA Attainment Rate
2006	13.00
2007	13.34
2008	14.69
2009	15.32
2010	12.76

**Figure 2H. Observed Associate Degree Attainment (within three years) Rates for the Pre-OBF Cohorts with a Linear Best Fit Line**

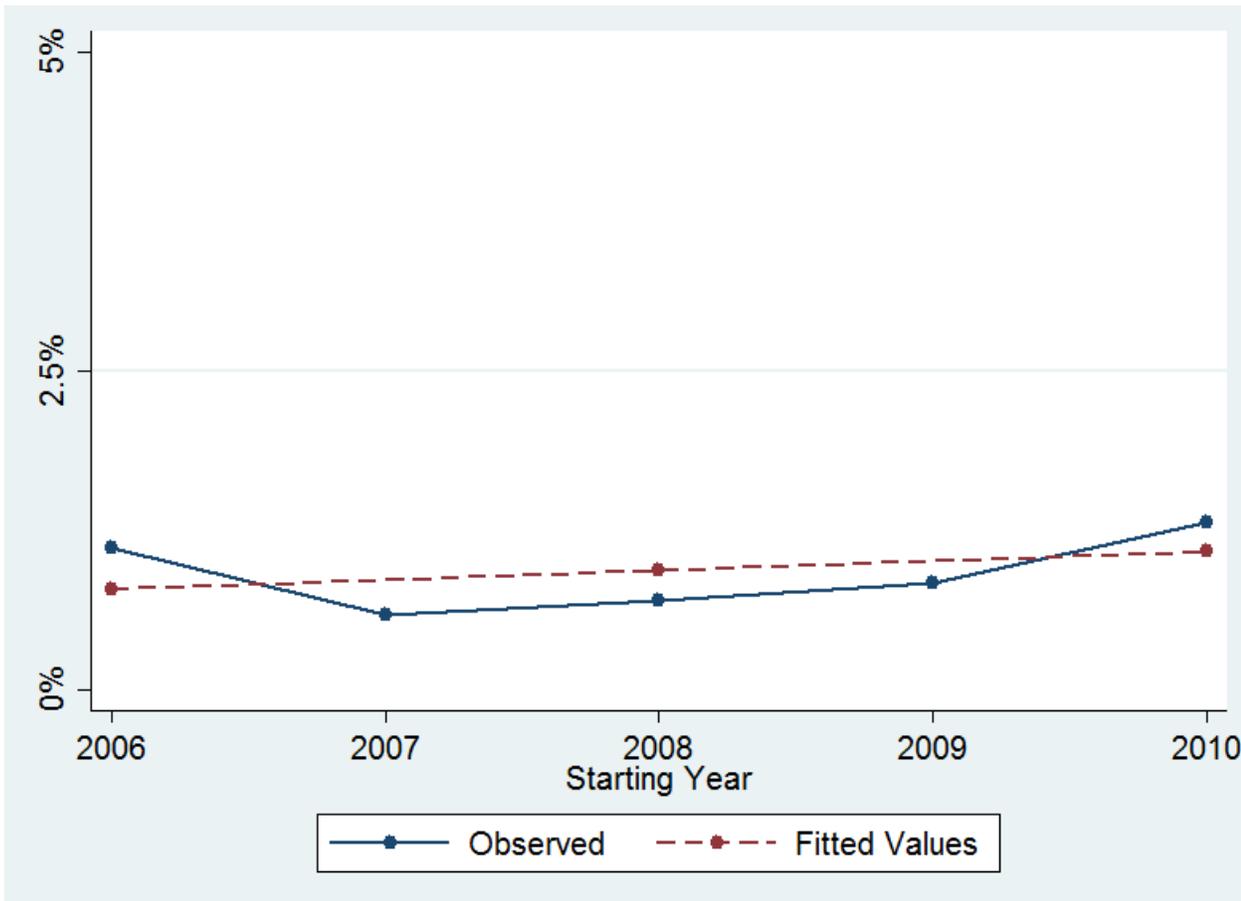


In Table 8H, we show the observed rate of attaining a certificate within two years for full-time students for each of the pre-OBF cohorts. In Figure 3H, we show the observed attainment rates along with a linear best fit line. It should be noted that the scale of the Y-axis in Figure 3H is much smaller than that in Figure 1H and Figure 2H; thus, any disparity between the best fit line and the observed attainment rate will appear exaggerated. Overall, our pre-OBF time trend, which is slightly positive, looks reliable. From 2007–2010, there was a consistent positive trend in the certificate attainment rate. While one might be concerned about the jump for the 2010 cohort, it should be noted that this cohort was one that received partial dosage.

**Table 8H. The Observed Certificate Attainment (within two years) Rate for Each Pre-OBF 2.0 Cohort**

	Certificate Attainment Rate
2006	01.12
2007	00.60
2008	00.71
2009	00.84
2010	01.31

**Figure 3H. Observed Certificate Attainment (within two years) Rates for the Pre-OBF Cohorts with a Linear Best Fit Line**



### Did OBF Widen the Attainment Gap?

In many cases, we find statistically significant results for our overall population, but not for underserved populations, i.e. Pell-eligible students or black and Hispanic students. As such, one might be concerned that OBF in Tennessee has exacerbated gaps in educational attainment by improving student outcomes for more advantaged students, while having little impact on disadvantaged students.

We rigorously tested whether or not differences in OBF effects between subgroups were statistically significant with a fully interacted interrupted time series model, specified by:

$$\text{logit}(\pi_{it}) = \beta_0 + \beta_1 \text{Time}_{it} + \beta_2 \text{POST1\_OBF}_{it} + \beta_3 \text{POST2\_OBF}_{it} + \beta_4 \text{POST3\_OBF}_{it} + \sum_{k=1}^K \beta_{k+4} X_{kit} + \beta_1 \text{Time}_{it} * \text{Pell}_{it} + \beta_2 \text{POST1\_OBF}_{it} * \text{Pell}_{it} + \beta_3 \text{POST2\_OBF}_{it} * \text{Pell}_{it} + \beta_4 \text{POST3\_OBF}_{it} * \text{Pell}_{it} + \sum_{k=1}^K \beta_{k+4} X_{kit} * \text{Pell}_{it} + \varepsilon_{it},$$

where:

$\pi_{it}$  = probability of achieving a given binary outcome,  $\Pr(Y_{it} = 1)$ , given the values of all explanatory variables. And,  $\text{logit}(\pi_{it}) = \log\left(\frac{\pi_{it}}{1-\pi_{it}}\right)$ .

$Y_{it}$  = One of the binary outcome measures listed above for student  $i$  in year  $t$  (e.g., 1 if a full-time student completed a BA degree and 0 otherwise.)

$\text{Time}_t$  = A continuous variable indicating year  $t$  from the start of the observation period (year 2006)

$\text{POST1\_OBF}_{it}$ ,  $\text{POST2\_OBF}_{it}$  &  $\text{POST3\_OBF}_{it}$

= Dummy variables indicating 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> year after the implementation of OBF, respectively

$X_{kit}$  = A vector of student-level covariates including gender, Pell eligibility in their first two years, race/ethnicity, age, gender, ACT score, and major.

$\text{Time} * \text{Pell}_t$  = An interaction between Pell eligibility and a continuous variable indicating year  $t$  from the start of the observation period (year 2006)

$\text{POST1\_OBF} * \text{Pell}_{it}$ ,  $\text{POST2\_OBF} * \text{Pell}_{it}$  &  $\text{POST3\_OBF} * \text{Pell}_{it}$

= Interactions between Pell eligibility and dummy variables indicating 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> year after the implementation of OBF, respectively

$X * \text{Pell}_{kit}$  = A vector of interactions between Pell eligibility and student-level covariates including gender, Pell eligibility in their first two years, race/ethnicity, age, gender, ACT score, and major.

$\varepsilon_{it}$  = Random errors

The same model specified above was also conducted with underrepresented minority (black and Hispanic) students in place of Pell-eligible students. Students who identified as multiple races or were of an unknown race were not included in that model.

Across all of our analyses for both sectors, there were 80 coefficients of interest. We find 7 instances in which the effect of OBF on the more advantaged group was statistically significant and larger than the effect on the disadvantaged group. We also find 2 instances in which the reverse is true—the effect was statistically significant and larger on the disadvantaged group. Table 9H, below, displays our findings, with positive signs indicating that the attainment gap grew, negative signs indicating that the attainment gap shrank, and null symbols indicating that there was no statistically significant change in the attainment gap.

In this study, we reject the null hypothesis at a p-value less than .05. As such, 5% of the time we will detect a statistically significant result that is purely due to chance. That means that, of our 80 coefficients of interest, we would expect four of them to be statistically significant, yet meaningless. As such, finding that 7 of 80 coefficients point in one direction, while 2 point in the opposite direction, is not an especially strong finding. That is to say: The quantitative evidence that OBF has caused the attainment gap to grow is fairly weak. More research into the issue of equity in OBF will, however, be necessary to provide a definitive answer on the issue.

**Table 9H. Summary of Analyses of Growth in the Attainment Gap**

	Pell Students	Black/Hispanic Students
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			Post y1	Post y2	Post y3	Post y1	Post y2	Post y3
Four-year sector	Full-time students	Bachelor's degree within four years	θ			θ		
		Accumulated 24 credits within one year	θ	+	θ	θ	θ	θ
		Accumulated 48 credits within two years	θ	+	θ	θ	θ	θ
		Accumulated 72 credits within three years	θ	+		θ	θ	
Two-year sector	Full-time students	Associate degree within two years	θ	θ	θ	θ	θ	θ
		Associate degree within three years	-	θ		θ	θ	
		Certificate within two years	θ	θ	θ	θ	θ	θ
		Accumulated 12 credits within one semester	θ	θ	θ	θ	θ	θ
		Accumulated 24 credits within one year	θ	+	+	θ	θ	θ
		Accumulated 36 credits within three semesters	θ	θ	θ	θ	θ	θ
	Part-time students	Associate degree within three years	θ	θ		θ	θ	
		Associate degree within four years	θ			-		
		Certificate within two years	+	θ	θ	θ	θ	θ
		Accumulated 12 credits within one year	θ	θ	θ	θ	θ	+
		Accumulated 24 credits within two years	θ	θ	θ	θ	θ	θ
		Accumulated 36 credits within three years	θ	θ		θ	θ	

+ Attainment gap grew

- Attainment gap shrank

θ No statistically significant change