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ZACHARY J. HYDER

The University of Tennessee, Knoxville

GRESHAM D. COLLOM

University of Minnesota, Twin Cities

J. PATRICK BIDDIX

The University of Tennessee, Knoxville

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A Difference-in-Difference Examination of Tennessee Promise's Influence on Community College Enrollment by Student Adjusted Gross Income

ZACHARY J. HYDER¹, GRESHAM D. COLLOM², & J. PATRICK BIDDIX¹

¹The University of Tennessee, Knoxville & ²University of Minnesota, Twin Cities

Abstract

We utilize a difference-in-difference design to examine the effect of adopting a statewide promise program on the enrollment of community college students across socio-economic status. Limited by a small sample size for treated units, we find inferential evidence that the adoption of a state-wide, last-dollar promise program for community colleges with no merit-based or need-based criteria raised the enrollment of in-state first-time-in-college, full-time students in their first year of college from families that earned between \$0 and \$75,000 in adjusted gross income. Effect sizes were largest for students from the lowest SES group (\$0 to \$30,000) approximately 168 additional students enrolled per 2-year institution per year following Tennessee Promise program adoption. Findings controlled for year-to-year variations in unemployment and state price parities. We discuss benefits and concerns regarding scholarships such as the Tennessee Promise that increase enrollment for lower-income students but do not affect the amount of financial aid included in their award packages in practice.

Keywords: Free college, promise programs, difference-in-difference, socioeconomic status, college affordability

Dedication

Pat Somers had diverse scholarly interests. Her expertise in financial aid influenced my decision to attend the University of Missouri – St. Louis in hopes of working with her. Throughout my time in the program, her classes, our conversations, and collaborations with her, I discovered her expansive interests spanning methodology, history, activism, free speech, institutional research, and international higher education. Pat always had intriguing ideas and inspired us with her remarkable capacity to view complex problems as opportunities.

I often tell students and colleagues that learning from Pat's enthusiasm was both a gift and challenge. Her wide-ranging interests and ability to nurture curiosity with methodological expertise greatly enriched our learning experiences. The gift lies in our growth as scholars. The challenge is that many of us were drawn to explore diverse topics rather than establishing a singular scholarly focus. In today's faculty marketplace and tenure processes, that is less desirable. But we are better scholars for it, and I am grateful to her for modelling this approach.

This paper connects multiple themes that held significance for Pat. It represents a quantitative exploration of financial aid policies and practices. Research on promise programs would have been a natural progression of her work. She also championed the community college mission. It also addresses access to higher education, a topic of great importance to Pat.

Most significantly, this paper is a collaborative effort that includes former and current students. Pat served as my dissertation chair, and I chaired Gresham's dissertation, which makes her his "grand



chair.” She would have truly enjoyed collaborating with Zac, who shares many of her interests and demonstrates her enthusiasm and intellectual ability. While she was unable to directly contribute to the paper, her connection to this subject and to our growth as scholars are evident.

– J. Patrick Biddix

Introduction

States have a vested interest in maintaining a skilled workforce – benefits to states include attracting employers to the regions within the state, developing a higher earning tax base, and providing a path to upward social mobility for residents (Berger & Fisher, 2013; Chetty et al., 2017; Ma et al., 2019). However, the cost of postsecondary education is a barrier to accessing higher education and obtaining an award (Somers, 1996). Average annual tuition and fee costs at public, 2-year colleges grew by approximately 15.3 percent or \$500 in 2021-2022 constant dollars between the 2011-2012 and 2021-2022 academic years (National Center for Education Statistics [NCES], 2023). Rising costs coincide with concerning trends in access and graduation; socio-economic gaps in access and obtainment have widened over time with lower income students being most affected by the barrier of cost (Cofer & Somers, 2001; Page & Scott-Clayton, 2016). Currently, the predicted share of jobs requiring a high school diploma or less will shrink from a 32 percent share to 28 percent of jobs by 2030 (Carnevale et al., 2021). This highlights the problem motivating this study: if states cannot increase enrollment and graduation from postsecondary education, the resulting shortage in formally educated workers may create negative economic forces that states and their citizens will have to weather.

If higher income students are those who are more likely to enroll and graduate from college than their lower-income peers (Chetty et al., 2020), then states could focus on policy levers that increase postsecondary participation for lower income students to maximize potential postsecondary participation. In 2014 Tennessee was the first state to introduce a statewide tuition-and-fee free community/technical college promise program which served its first students in the fall of 2015. This policy tool was situated by Tennessee’s then governor to simultaneously address postsecondary affordability and scale the states skilled labor force to meet the demand of employers interested in relocating to Tennessee (Collom, 2021; Hyder & Driscoll, 2023; Hyder et al., 2023). Through this policy adoption, state leadership hoped to create a stronger college going culture in Tennessee.

The purpose of this manuscript is to investigate the relationship between the adoption of state-wide, tuition-and-fee free community/technical college and enrollment across socio-economic groups. We utilized a difference-in-difference framework to analyze Integrated Postsecondary Education Data System’s (IPEDS) first-time-in-college, first-year enrollment data for in-state students who were awarded any Title IV Federal financial aid by income level. Using this data, we studied the influence of adopting the Tennessee Promise on enrollment by income group as compared to 2-year public institutions in states with no state-wide tuition-and-fee-free community/technical college. To our knowledge we are the first to utilize IPEDS enrollment counts by socio-economic category in this type of design or to investigate effects of adopting tuition-free community college. Limited by a staggered adoption process for the Tennessee Promise, we examine the influence of tuition/fee free college adoption on a smaller sub-set of 5 Tennessee community colleges. Our research



question asks: *Are there differences in effect size regarding the influence of Tennessee Promise adoption on students by socio-economic status?*

As the first state-wide promise program, scholars have previously studied Tennessee Promise's effect on community college enrollment. These analyses have focused on examining the program's effect across covariates such as race and gender but not as closely on socio-economic status. Researchers know that socio-economic status is heavily linked to issues of racial and gender inequity (Chetty et al., 2020), so the lack of research on promise programs and socio-economic status in this area represents a gap in our understanding of how these programs affect students.

Review of Literature

Income is a variable of interest in examining college enrollment because socio-economic status is correlated with college attendance and selection. For example, the highest two quintiles of socio-economic status enrolled in postsecondary education at rates between 77 and 89 percent while students from the lowest two quintiles only enrolled at rates between 51 and 58 percent (Reber & Smith, 2023). Because lower shares of lower socioeconomic students enroll in postsecondary education, this population represents the largest share of people that could potentially generate the additional graduates desired by state governments for economic development. Thus, it is important to examine whether workforce development programs such as Tennessee Promise have differential effect sizes by income group. In this literature review, we provide a brief introduction relevant past research for promise programs broadly and then Tennessee Promise specifically.

Review of Promise Program Literature

Although the Tennessee Promise is a workforce development policy, the lever through which it affects students is financial aid. Thus, research on Tennessee Promise and its effects on students are closely related to other literature on financial aid. As individuals are exposed to additional aid and costs of attendance are lowered, student enrollment, program completion, and post-graduation outcomes such as earnings increase (Deming & Dynarski, 2010; Dynarski & Scott-Clayton, 2013; Dynarski et al., 2023; Long, 2008; Page & Scott-Clayton, 2016). Within this body of research, studies on place-based scholarships or promise programs as a form of financial aid have demonstrated positive effects on postsecondary enrollment with program features such as award amounts influencing program effects (Dynarski et al., 2023; Swanson et al., 2020).

Studies on the earliest promise programs such as the Kalamazoo Promise established that these programs affect the postsecondary enrollment choices of students (Daughtery & Gonzalez, 2016; Gonzalez et al., 2011; Swanson et al., 2020). One study found that the announcement of the Kalamazoo Promise led to a 9 percent increase in the probability of students from Kalamazoo earning any postsecondary credits (Bartik & Lachowska, 2012). Another early study found that the effects of promise programs on where students choose to enroll were stronger among students from families earning less than \$50,000 in annual income (Andrews et al., 2010).

However, promise programs represent a diverse collection of place-based scholarships, with a great deal in variety such as how funds are dispersed to students (e.g., first-dollar vs. last-dollar), where funds may be utilized, the intensity of early awareness operations for the program, and how large the



scholarship's service area is (Perna & Leigh, 2018). Here, we highlight two major differences between the Tennessee Promise and this early research on programs such as the Kalamazoo Promise. First, the Tennessee Promise only covers the costs of tuition and fees for sub-baccalaureate programs in Tennessee whereas students in other programs may be able to enroll in private and/or 4-year institutions. Second, is that the Tennessee Promise is configured as a last-dollar scholarship. This means that students' other aid such as Pell grants or merit aid are applied to students' balances before Tennessee Promise funds are dispersed.

Review of Tennessee Promise Literature

This has resulted in 43.6 and 46.0 percent of students from the first and second cohorts receiving zero dollars in promise funds as their tuition and fee costs are covered by their Pell grant or other scholarships (Tennessee Board of Regents, 2018; 2019). While this report has not been released in recent years, the proportion of Tennessee Promise students eligible for a full Pell grant award (EFC of \$0) has remained consistent between 28 and 30 percent of each cohort since launch with likely a similar number of students in recent cohorts that received \$0 in Tennessee Promise funds (Tennessee Higher Education Commission, 2023).

Regarding Tennessee Promise specifically, relevant research includes studies on both this program and a predecessor program, KnoxAchieves. Started six years before the Tennessee Promise in 2009, KnoxAchieves served high school graduates in Knox County, Tennessee by providing college coaching and financial aid support. Researchers found KnoxAchieves increased the enrollment of county high school graduates in the area's community college by 3.1 to 4.9 percentage points (Carruthers & Fox, 2016). Using program and district records for free and reduced lunch price program participation, the researchers were able to conduct an analysis that considered socio-economic status and concluded that the program had stronger effects for students that had participated in the free and reduced lunch program as compared to students that did not participate in this program (Carruthers & Fox, 2016).

However, researchers also share that the effects of KnoxAchieves may not only be due to the treatment of receiving more financial aid but also due to supplemental college advising and coaching services embedded in the program (Carruthers & Fox, 2016). This focus on college advising/coaching may have helped to spread awareness of student eligibility for not just the program's aid but also other need-based aid which may have increased effect sizes among its lower-income students.

Two previous studies have utilized difference-in-difference to examine the effect of the adoption of Tennessee Promise on community college enrollment for the entire state. In both studies, researchers considered race/ethnicity as covariates for analysis. These studies both found a positive effect on community college enrollment with both showing significant increases in Black enrollment (House & Dell, 2020; Nguyen, 2020). Only one of the two showed significant increases for Hispanic enrollment (Nguyen, 2020).

Of note is that the House and Dell (2020) study included a descriptive analysis considering socio-economic status. In this enrollment focused study, researchers conducted a descriptive analysis of Pell grant eligibility, adjusted gross income (AGI), and estimated family contribution (EFC).



Findings of this analysis found that the percent of Pell eligible students fell from 71.4% to 55.7%, average AGI rose from \$41,658.22 to \$66,439.88, and average EFC rose from 5,909.04 to 12,515.47 between 2013 and 2017 (House & Dell, 2020). These aligns with earlier findings from KnoxAchieves: increased enrollment following the adoption of free community college results in part due to students substituting away from more expensive 4-year institutions to the tuition/fee free 2-year institutions (Carruthers & Fox, 2016).

Our study builds upon these earlier attempts to consider socio-economic status across a more detailed categorical variable than previously done in estimating the effect of the adoption of free community college programs. The study on KnoxAchieves utilized free-and-reduced-lunch participation as a proxy for financial need in a propensity score analysis and found that KnoxAchieves students participating in free-and-reduced-lunch programs enrolled in community college at a rate of 1.2 percentage points more than their non-free-and-reduced-lunch eligible peers following adoption of the Tennessee Promise (Carruthers & Fox, 2016).

However, eligibility for free-and-reduced-lunch is an important albeit broad indicator of socio-economic status. The free-and-reduced-lunch eligibility threshold in the KnoxAchieves sample was \$44,123 for a family of four and the median income in Tennessee at that time was \$48,500 in 2016 constant dollars (Carruthers & Fox, 2020). While many students may be eligible for this program and benefit from its financial support, not all students experience the same degree of need within the free and reduced lunch program. For example, in 2012 over half of public-school children qualified for free-and-reduced-lunch, but only 22 percent were designated as living in poverty (Snyder & Musu-Gillette, 2015). Our study builds upon these two examples that consider socio-economic status by examining multiple income categories rather than a broad binary indicator of socio-economic status.

Method

Because an initial analysis of descriptive trends supported evidence of a parallel trends assumption, we identified difference-in-difference (DID) as an appropriate method for analysis. We utilized a DID design to examine the introduction of the Tennessee Promise (treatment) during and following the 2015-2016 academic year (post-treatment period). As a control for state-level economic forces that could influence enrollment, we included unemployment and regional price parities in our regression model as covariates. We also removed sub-state level promise programs. Doing this allowed us to account for the staggered adoption of the Tennessee Promise within the treatment group and institutions that may utilize local promise programs from our comparison group. Due to the potential for observations to have zero students enrolled within income categories, we are not able to use a log conversion to put findings into percent changes. Therefore, we report findings by increased number of students rather than percent change. Finally, we conducted a placebo test using non-treated states as a treated unit as a robustness check on our results. We used Stata version 18 for all data analysis in this project.

Data

We collected publicly available data from the IPEDS (National Center for Education Statistics, 2023), state unemployment rates from the US Bureau of Labor Statistics for each July prior to the



start of the fall term, and regional price parities. Regional price parities are measures of the purchasing power of a dollar provided by the US Bureau of Economic Analysis in each state for each year. We constructed a panel data set of enrollment headcounts by Adjusted Gross Income category at institutions spanning 10 academic years starting in 2010-2011 through 2019-2020. This established our sample time for pre- and post-treatment periods of five years each respectively.

After limiting our sample to public, two-year institutions in the United States that offer an associate degree ($n=837$) to the institutions in the 17 states without a promise program ($n=275$) and institutions in Tennessee ($n=13$) our initial sample of institutions was $n=288$. After removing sub-state-level promise programs and Tennessee institutions that were early adopters of a tuition free college model, our final comparison group was $n=200$ and final treatment group was $n=5$. Removal of these institutional, system, and regional level promise programs reduced the number of states represented in our sample to 14 states. Our outcomes of interest in this study were enrollment headcounts within five AGI categories ($\$0-30,000$, $\$30,001-48,000$, $\$48,001-75,000$, $\$75,000-110,000$, and $\$110,000$ or higher). In Table 1, we report enrolled students (treatment and comparison group means) per year and income category. While this IPEDS variable only captured the enrollment of first-time, full-time students, it is an acceptable measure for our purposes because students are only eligible for Tennessee Promise if the students were first-time-in-college students who are full-time and attending college during the fall semester following high school graduation (House & Dell, 2020). In Figure 1, we provide visualizations of the average enrollment for the treatment and comparison groups at each income level and Wald test results used to assess the validity of our pre-treatment parallel trends assumption. Examining the visualizations for parallel pre-treatment trends using and Wald test results (Wald, 1943), we posit that the parallel pre-treatment trends assumption holds for all groups except students from families with reported AGI over \$110,000.

Results for our parallel trends analysis and the use of IPEDS student AGI data does limit our analysis to first-year, full-time, first-time-in-college in-state students with family AGI less than \$110,000 and to an aggregate count of those students. However, for our purposes these restrictions are acceptable. Only full-time, first-time-in-college in-state students can receive the Tennessee Promise scholarship, so the restriction of our sample to this group is beneficial in that only eligible students are included in this headcount in both our treatment and comparison groups. Additionally, the low student enrollment headcounts for students with over \$110,000 in reported AGI are not conducive to DID analysis – note how headcounts for this group intersect in Figure 1. Figure 1 is separated across three pages for accessibility reasons using figures 1a through 1c. This is because the headcounts for this group vary by small margins and result in the year-to-year fluctuations where small variations in enrollment violate a parallel pretreatment trends assumption.

Difference-In-Difference

Researchers have regularly employed difference-in-difference design for quasi-experimental projects studying promise programs and other financial aid programs (Dynarski et al., 2023; Swanson, 2020). We examined community colleges as the treated-unit across a 10-year period to analyze how adoption of the state-wide Tennessee Promise influenced enrollment rates across income-groups as compared to states without a state-wide promise program. We utilized the following regression formula to accomplish this:



$$y = \beta_0 + \beta_1 T_i + \beta_2 Post_t + \beta_3 (T_i * Post_t) + c_{it} + e_{it},$$

In this regression, we utilized Tennessee's community colleges following promise program adoption in 2015 as the treatment group (T) and the 14 states without a statewide promise program as the comparison group (C). The pre-treatment ($T_0 = 0$ or $C_0 = 0$) period runs from the 2010-11 academic year through the 2014-2015 academic year. The post-treatment period ($T_1 = 1$ or $C_1 = 1$), runs from the 2015-2016 academic year to the 2019-2020 academic year. Together these periods, treatment condition, and their interaction can be presented with binary coefficients for treatment (T_i), period ($Post_t$), and interaction ($T_i * Post_t$) respectively. The interaction effect between treatment and period represents the difference-in-difference parameter.

Controlling for fixed effects in both pre-treatment and post-treatment observations is also important to account for variation between years, represented by c_i . To increase the inferential power of this quasi-experimental design, we constructed a regression model including covariates in this analysis that are reflective of the state's economic health which could motivate college enrollment, represented by X_i . This is reflected in the regression formula below.

$$y = \beta_0 + \beta_1 T_i + \beta_2 Post_t + \beta_3 (T_i * Post_t) + X_i + c_{it} + e_{it},$$

Due to the inclusion of additional covariates that account for the influence of the economy on the effects of Tennessee Promise adoption, we utilized regression formula (2) to provide the findings presented in this manuscript.



Table 1

Mean FTIC, Full-time, First-year Student Enrollment Receiving Any Title IV Funds for Treatment and Comparison Groups by Year and Income (Treatment Adoption Year Bolded)

Group	Year	Income Group					
		\$0 to \$30,000	\$30,001 to \$48,000	\$48,001 to \$75,000	\$75,001 to \$110,000	\$110,001 or higher	All Incomes
Treatment Group (Tennessee)	2010 - 2011	580.4	165.4	90.8	18.6	3.8	859.0
	2011 - 2012	583.4	135.4	84.8	20.0	5.6	829.2
	2012 - 2013	470.8	146.8	79.0	24.4	7.2	728.2
	2013 - 2014	457.4	143.0	94.6	22.4	6.8	724.2
	2014 - 2015	438.2	148.0	86.4	22.2	6.4	701.2
	2015 - 2016	609.8	234.6	136.4	18.8	3.0	1002.6
	2016 - 2017	533.8	221.8	129.2	12.2	1.6	898.6
	2017 - 2018	633.4	222.8	128.6	16.0	1.6	1002.4
	2018 - 2019	607.4	207.0	144.0	15.4	0.2	974.0
	2019 - 2020	554.0	192.4	139.4	17.4	0.8	904.0
Comparison Group	2010 - 2011	300.0	82.7	55.6	26.5	11.1	475.8
	2011 - 2012	303.5	76.2	53.7	25.6	11.7	470.7
	2012 - 2013	272.7	73.2	51.0	25.8	12.6	435.4
	2013 - 2014	263.7	72.3	51.7	27.2	15.0	429.9
	2014 - 2015	251.4	63.8	47.9	25.9	15.5	404.5
	2015 - 2016	212.1	64.6	49.1	27.2	17.5	370.5
	2016 - 2017	198.8	66.8	49.6	26.7	18.5	360.4
	2017 - 2018	207.8	66.4	46.5	26.4	18.5	365.7
	2018 - 2019	199.6	65.1	48.1	26.2	19.2	358.2
	2019 - 2020	193.3	65.7	50.5	27.6	21.4	358.5

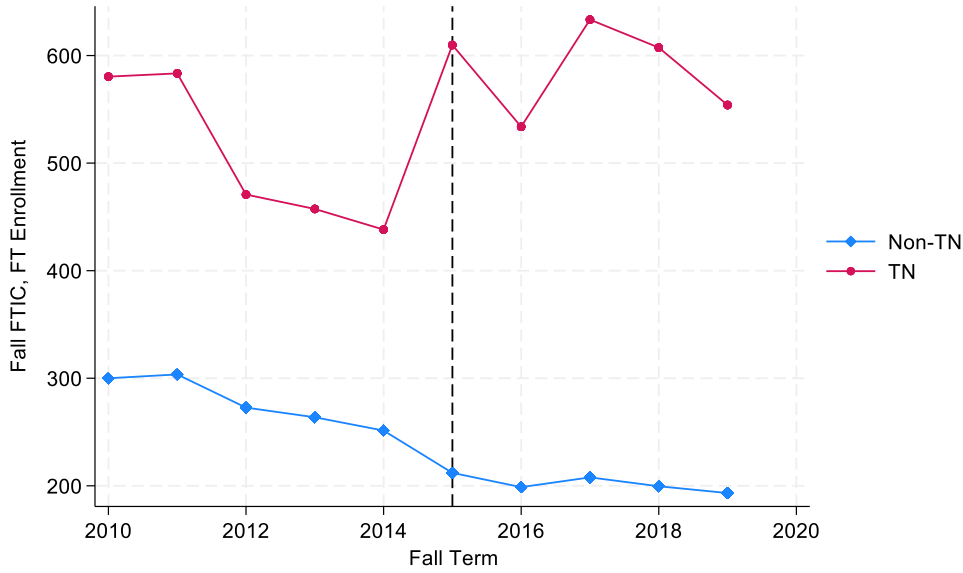


Figure 1a

Visualization of Parallel Trends Visualization for Sample

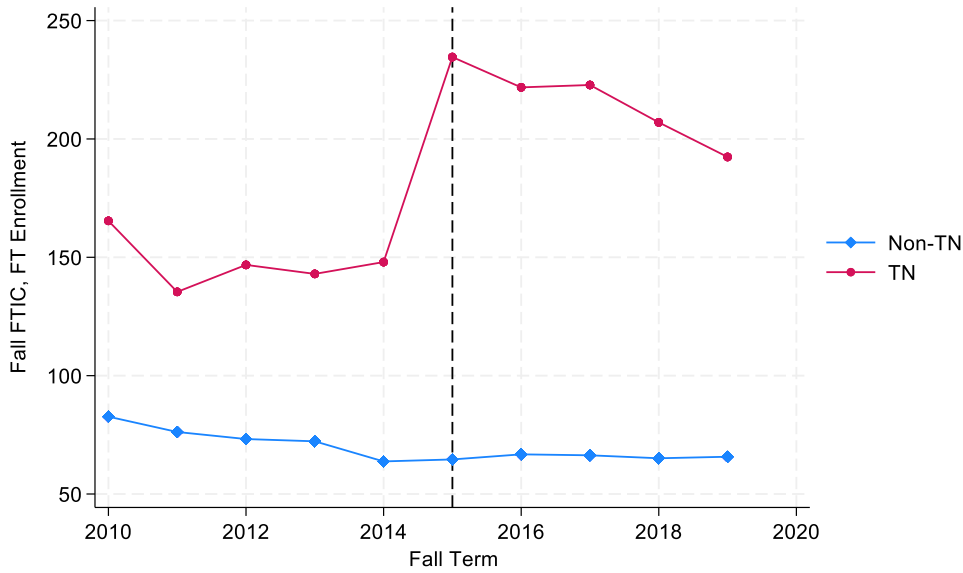
\$0 - \$30,000

Wald Test: (Prob >F = 0.0006***)



\$30,001 - \$48,000

Wald Test: (Prob >F = 0.0201*)



Note. Wald Test results for test of parallel trends assumption in parentheses = * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (Wald, 1943).

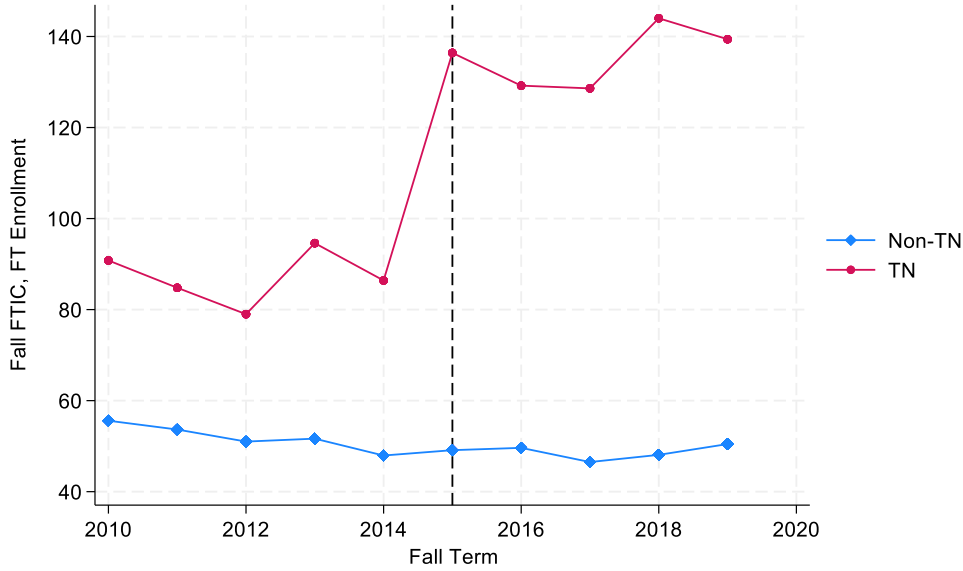


Figure 1b

Visualization of Parallel Trends Visualization for Sample

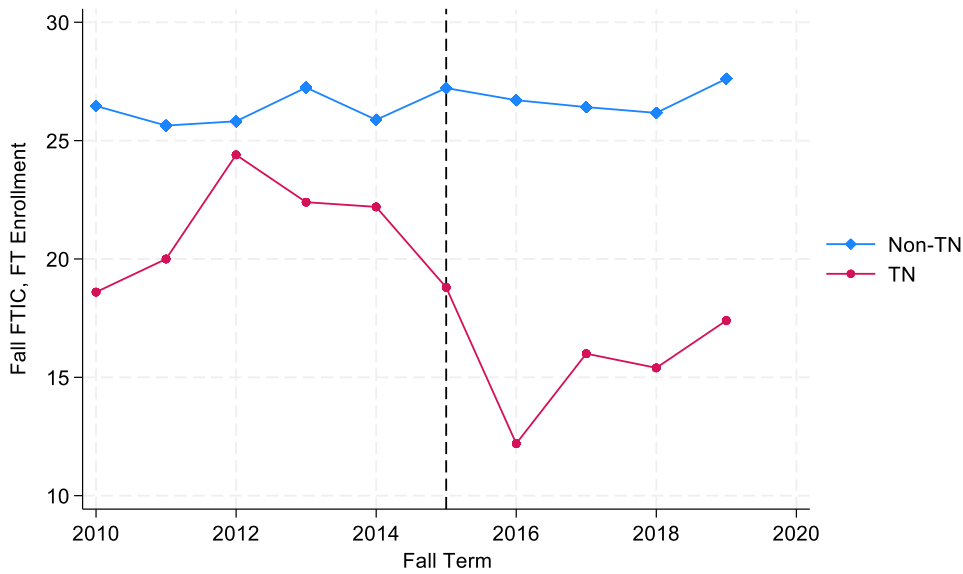
\$48,001 - \$75,000

Wald Test: (Prob >F = 0.0157*)



\$75,001 - \$110,000

Wald Test: (Prob >F = 0.0449*)



Note. Wald Test results for test of parallel trends assumption in parentheses
 = * $p < 0.05$ ** $p < 0.01$, *** $p < 0.001$

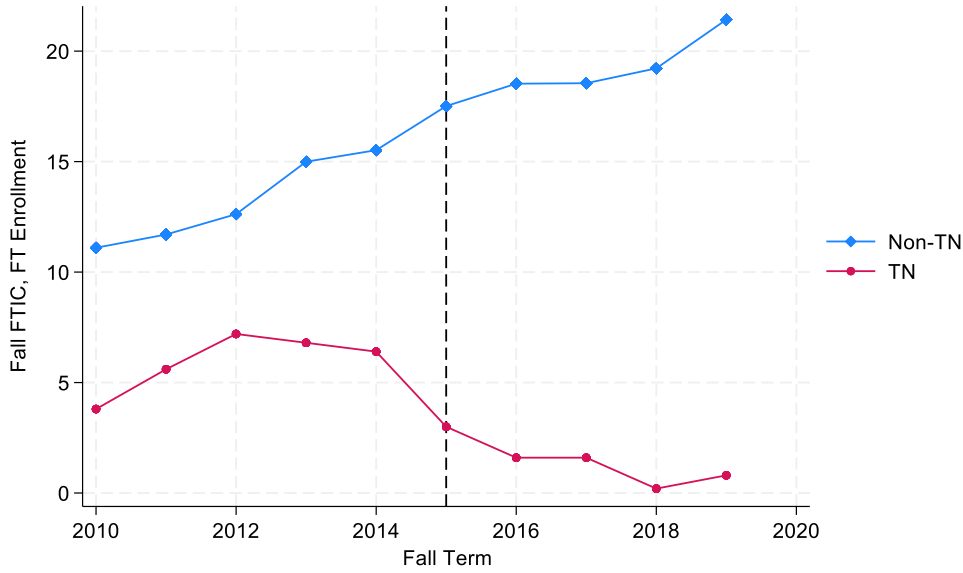


Figure 1c

Visualization of Parallel Trends Visualization for Sample

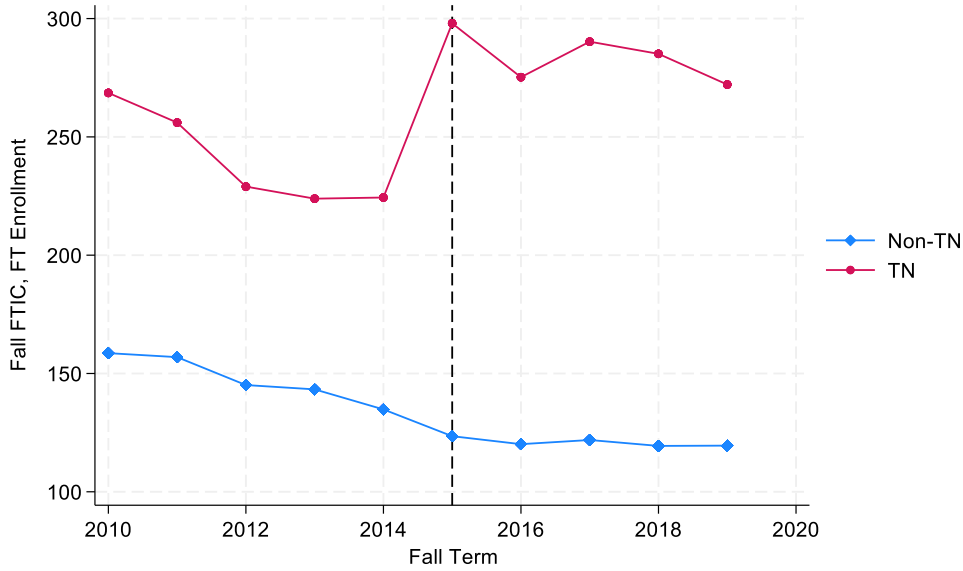
\$110,000 & Higher

Wald Test: (Prob >F = 0.5194)



All Incomes

(Prob >F = 0.0206*)



Note. Wald Test results for test of parallel trends assumption in parentheses

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



Results

Normally, DID models exploit a quasi-experimental design to estimate an interaction effect $\beta(T_i * Post_t)$ representing causal effect of treatment. However, this study's limited treatment group size and use of institutional-level data rather than the treatment-level data of the students themselves reduces this project's conclusive power. Despite this loss of statistical power, this analysis is still needed as a purposeful initial attempt to investigate the relationship between promise program adoption and postsecondary outcomes across IPEDS's enrollment by socio-economic category.

Regression results are provided in Table 2 for regression formula (2) by income group. We only provide data for the categories that met the parallel trends assumption in our tables hereon in, excluding students with reported AGI higher than \$110,000. Comparing enrollment at community colleges in Tennessee, estimates show that enrollment significantly increased for all groups where our parallel trends assumption was met. We find an increase in enrollment for students from families with AGIs between \$0 - \$3,000, \$30,000 - \$48,000, and \$48,000 - \$75,000, at $p < 0.001$ by approximately 291 students per year and institution or approximately 1,457 more students per year for five Tennessee community colleges affected by the adoption of Tennessee Promise within the TBR system. This estimate for increased enrollment falls between 15.4 to 15.5 percent of the full-time, first-time-in-college students of the five treated TBR institutions for each year since program adoption throughout our sample. For the aggregate all-incomes group, enrollment did increase in Tennessee following promise program adoption by an average of about 275 students per institution or 1,377 first-time-in-college, full-time first-year students across the five treated institutions. The effect size of students from families with AGI between \$0 and \$30,000 is approximately 59.3 percent of the effect size for all students which is reflective of the reality that community colleges serve as an affordable, open-access option for higher education and thus enroll a high number of students from socio-economically disadvantaged backgrounds.

Table 2

Difference-in-Difference Estimate for Effect of Tennessee Promise

	Income Group				
	\$0 to \$30,000	\$30,001 to \$48,000	\$48,001 to \$75,000	\$75,001 to \$110,000	All Incomes
Interaction (Promise)	163.7*** (12.42)	76.05*** (1.411)	51.74*** (2.22)	-6.122*** (1.39)	275.5*** (11.69)
Unemployment	6.285 (6.242)	-0.685 (1.221)	-0.566 (1.451)	-0.385 (0.945)	5.086 (7.899)
Price Parities	-3.784 (3.417)	-1.471* (0.64)	-1.4 (0.883)	-0.874 (0.765)	-7.711 (4.66)
<i>n</i>	205	205	205	205	205
<i>R</i> ²	0.23	0.11	0.08	0.01	0.18

Note. Standard errors in parentheses

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



Robustness Check Strategy

During our robustness check, we found dissimilar results to our correctly specified model. Here, regression formula (2) is also utilized to provide the results found in our robustness check using a placebo test strategy. We conducted a placebo test using a randomized draw of treated units created through a series of 500 permuted simulations using the *ritest* Stata command for placebo tests as described by Heß (2017). We present the Randomization inference (RI) based p -values as $p=c/n$ with standard errors. We denote $p=c/n$ as a pooled ratio of the count of simulations that produced dissimilar T-test statistic results when compared to the correctly specified model to the number of simulations ran (500). A seed was used in the random treatment assignment process to insure replicability for this robustness check process. For each of our income groups, we received nonsignificant $p=c/n$ results. All income levels produced insignificant results for this robustness check, and we can assume that our results are not sensitive to changes in which institutions within specific states are the treated group.

Table 3

Robustness Check Results Utilizing State Other Than TN as a Treated Unit

	Income Group				
	\$0 to \$30,000	\$30,001 to \$48,000	\$48,001 to \$75,000	\$75,001 to \$110,000	All Incomes
$p=c/n$	0.4720 (0.0223)	0.4680 (0.0223)	0.5180 (0.0223)	0.4740 (0.0223)	0.4680 (0.0223)

Note. Standard errors in parentheses. No values were significant at $p < .05$.

Limitations

Our study takes advantage of publicly available, institutional-level data and as a result loses significant statistical power due to using institutional rather than student-level data as the treated-unit in our design. While our quasi-experimental design does provide us enough statistical power to present inferential findings, we also acknowledge that there is more work to be done in examining the effect of financial aid program such as the Tennessee Promise across various socio-economic groups. For example, because of our lack of student level data we cannot observe variations in intensity of enrollment or examine the effect size per dollar spent on students by examining financial aid packages. We also cannot present our findings as casual due to our small, treated sample size of $n=5$ despite using DID design which typically allows for the estimation of casual effects. Additionally, we share that our study does not control for potential confounding variables concerning Tennessee’s public or private four-year universities. While it is unlikely that changes in admissions policies or practices of in-state universities affected community college enrollment, we do acknowledge this exclusion from our study here as a limitation. Finally, our findings are only reflective of last-dollar promise scholarships with no need or merit criteria which cover the costs of required tuition and fees at 2-year institutions because we only utilize the Tennessee Promise as our criteria to establish treatment in our study.



Discussion

Research on college promise programs offers optimistic findings regarding increasing access to postsecondary education for all individuals (House & Dell, 2020; Nguyen, 2020). Further, some evidence suggests increased use of promise program offerings among students from lower socio-economic backgrounds who stand to benefit the most from social mobility offered by a college degree (Carruthers & Fox, 2016). Our study supports previous research on college promise programs by providing novel empirical evidence with an added caveat, the amount of influence these programs have on students can vary across socio-economic status.

Implications

Based on our analysis, adoption of a state-wide, last-dollar promise program for community colleges (Tennessee Promise) increased enrollment significantly for students from families that earned between \$0 and \$75,000 in adjusted gross income. When considering all new enrollments, students from families with an AGI between \$0 - \$30,000 represented nearly 59% of the overall observed effect size. In other words, our findings revealed the Tennessee Promise may have increased enrollment the most among the student group with the most to gain from a college degree (i.e., students from low-income backgrounds). While this study yielded inferential results and does not establish causality, our analysis supports that the policy may be effectively broadening access to college for the students, and families, with the most need.

Increase Supports for Low-Income Students

With growing evidence supporting an increase in *access* for low-income students related to promise programs, we recommend policymakers focus on creating policy to support student persistence and graduation, primarily for low-income students with the greatest financial need. Critics of promise programs often point to the last-dollar funding model and the implications for equity of scholarship distribution (Collom et al., 2021; Jones et al., 2020). In a last-dollar program like Tennessee's, federal Pell Grants are applied to tuition and fees prior to promise program funding. Since the Pell Grant typically covers most of tuition and fees at community and technical colleges, very little promise program funding is used to support low-income students. Instead, last-dollar promise programs without income criteria run the risk of subsidizing middle- and upper-income students (Jones & Berger, 2020). Despite criticisms of last-dollar models, it remains unlikely that existing promise programs will adopt a first-dollar model (Bell, 2020). Policymakers implementing promise programs continue to use last-dollar models for a multitude of reasons, including both its cost-effectiveness when compared to first-dollar models (Perna & Leigh, 2018), and perceived fairness in providing tuition and fee free college to everyone, regardless of income (Bell, 2020).

We instead suggest policymakers consider expanding on the support available to students beyond tuition and fees. As of this writing, the Tennessee Promise includes a mentoring program and community service obligation. Yet, minimal evidence exists suggesting either requirement yields beneficial outcomes for students. Instead, we suggest state policymakers consider expanding programs such as the tnAchieves COMPLETE Grants program statewide. The COMPLETE Grants program provides application-based rewards intended to cover costs other than tuition and fees, including transportation, groceries, computers, supplies, rent/utilities, textbooks, and class-



specific fees (tnAchieves, n.d.). The Tennessee Higher Education Commission also highlighted the need for increased financial support for low-income students in their 2023 annual report, stating,

“The cost to enroll and remain enrolled in higher education extends beyond tuition and mandatory fees. Lower-income students who receive Federal Pell grants and Tennessee Student Assistance Award (TSAA) dollars typically receive little, if any, scholarship money directly from Tennessee Promise, which is a consequence the program’s last-dollar structure. TSAA and Completion Grants present two opportunities for the state to make postsecondary education more affordable for the state’s lowest income families” (p. 9).

(Re)Focus on Workforce Outcomes

Given the Tennessee Promise’s stated purpose of improving Tennessee’s workforce and economy, a greater focus on the policy’s impact on workforce outcomes is essential. Policymakers implemented the Tennessee Promise largely to improve the state’s economy by increasing the number of individuals in the state with a postsecondary credential, with the hope that a more educated population may incentivize employers to remain in or relocate to the state. Yet, workforce outcomes are noticeably absent from both existing research and state communications focused on the Tennessee Promise. For example, in their 2023 annual report the Tennessee Higher Education Commission stated over 41,000 students who received the Tennessee Promise “have earned a credential since the program began” (2023, p. 8). However, the report provides no data on student employment following obtaining their credential and briefly mentions the workforce in the report’s conclusion (Tennessee Higher Education Commission, 2023). Our findings add to the growing body of literature showing an increase in access for low-income individuals. However, enrolling in college is the first of many steps students must take to benefit from a college degree. We recommend a broad (re)focus on workforce outcomes by both researchers and policymakers to better understand, and improve, how promise programs and state institutions support students on their path to a high-quality degree and career.

Zachary J. Hyder is a doctoral candidate at the University of Tennessee, Knoxville. Zac studies higher education affordability and student success. His research focuses on the intersection of educational law, economics, and policy.

Gresham Collom is an assistant professor at the University of Minnesota, Twin Cities. Gresham studies educational policy and its impact on marginalized groups. His current work specifically focuses on Indigenous people and communities and how policy impacts access and success in higher education.

J. Patrick Biddix is the Jimmy and Ileen Cheek endowed professor of higher education at the University of Tennessee, Knoxville. Patrick is a former advisee and longtime collaborator of Dr. Somers. He attributes his eclectic research focus to her mentorship and encouragement.



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