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# Giving Credit Where Credit Is Due: Causal Impacts of Reverse Transfer Associate Degrees on Education and Labor Market Outcomes

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Reverse transfer associate degrees are credentials retroactively awarded to current bachelor's degree seekers that combine current four-year credits with credits previously earned at a community college. Providing students with an associate degree may not only increase motivation and persistence en route to completing a bachelor's but may also provide important labor market benefits by way of increased marketability and earnings potential. Despite the proliferation of reverse transfer policies across at least 15 states to date, there is no causal evidence documenting their effect on students' outcomes. Leveraging administrative data from Tennessee matched with records on its statewide reverse transfer program and a difference-in-differences design, we find reverse transfer degrees generally have little impact on students' short- and intermediate-term academic and labor market outcomes. Our results point to suggestive yet small positive gains in GPA and short-term employment for recipients, but these estimates accompany no impacts on bachelor's degree attainment and estimates that confidently reject any meaningful impacts on recipients' earnings. Our findings contrast those of existing descriptive works on reverse transfer that reported large benefits for students, due in part to our methodological improvements and more robust data. These findings should guide policymakers considering the adoption, design, and ongoing operation of reverse transfer programs.

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**Abstract**
Reverse transfer associate degrees are credentials retroactively awarded to current bachelor's degree seekers that combine current four-year credits with credits previously earned at a community college. Providing students with an associate degree may not only increase motivation and persistence *en route* to completing a bachelor's but may also provide important labor market benefits by way of increased marketability and earnings potential. Despite the proliferation of reverse transfer policies across at least 15 states to date, there is no causal evidence documenting their effect on students' outcomes. Leveraging administrative data from Tennessee matched with records on its statewide reverse transfer program and a difference-in-differences design, we find reverse transfer degrees generally have little impact on students' short- and intermediate-term academic and labor market outcomes. Our results point to suggestive yet small positive gains in GPA and short-term employment for recipients, but these estimates accompany no impacts on bachelor's degree attainment and estimates that confidently reject any meaningful impacts on recipients' earnings. Our findings contrast those of existing descriptive works on reverse transfer that reported large benefits for students, due in part to our methodological improvements and more robust data. These findings should guide policymakers considering the adoption, design, and ongoing operation of reverse transfer programs.

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## Introduction

Earning a bachelor's degree is associated with, on average, improved labor market outcomes and a host of positive benefits for individuals and society (Ma et al., 2019). Rather than beginning at a four-year institution, however, many students, parents, and college counselors believe that first entering a two-year institution (or community college) and then transferring to a four-year institution is a viable and cost-effective pathway. Indeed, the vast majority of entering community college students report intending to ultimately earn a bachelor's degree or higher (Jenkins & Fink, 2016). Of all students in the Beginning Postsecondary Students: 2012/2017 sample that first enrolled at a public, two-year institution, 77.6% reported expecting to do so. Despite these aspirations, only 30.8% of the most-recently tracked national cohort of students (who began college in 2014) ultimately transferred to a four-year institution, and, among those who transferred, less than half (47.4%) ultimately earned a bachelor's degree within six years (Shapiro et al., 2021). This is particularly problematic given that the majority (58.1%) of those transfer students left their community college without having first earned a certificate or associate degree (Shapiro et al., 2021). That is, only 41.9% of students in the entering 2014 community college cohort transferred to a four-year institution with a credential in hand. This places students in an "all or nothing" position: Unless they persist and attain a bachelor's degree, they will have invested substantial resources to acquire credits across two- and four-year colleges that ultimately do not yield any credential (Bragg et al., 2011, p. 3). To date, at least 15 states have worked to reduce this incidence by promoting the award of "reverse transfer" associate degrees (Anderson, 2015).

Reverse transfer policies enable associate degrees to be awarded to current transfer students by combining credits from their previous community college and current four-year institution. In practice, these policies "reverse transfer" credits earned from a four-year institution and add them to a student's prior community college transcript, allowing students to cross the typical 60-credit hour threshold required to earn an associate degree. By leveraging those prior community college credits that did not yet yield a certificate or associate degree, reverse transfer policies may not only shield students from that "all or nothing" position by reducing the likelihood they depart college without any credential but may also provide other positive benefits, including motivation *en route* to completing a bachelor's degree and immediate labor market benefits by way of increased employment and earnings.

National support for reverse transfer policies began with the 2012 Credit When It's Due initiative, where six foundations joined to fund the development and implementation of reverse transfer policies in 15 states (Taylor et al., 2017). Taylor (2016) provides a comprehensive and descriptive review of the introduction and design of these first reverse transfer programs. From 2014-2016, these states awarded nearly 16,000 reverse transfer associate degrees, and another six states proposed legislation related to reverse transfer during that time. As relatively simple, administrative interventions, reverse transfer policies may be particularly attractive to states as ways to increase educational attainment and labor market outcomes while reducing the incidence of students joining the some 36 million Americans with some college credits but no degree (Shapiro et al., 2019). Yet despite their popularity and commonsense design, few studies have examined students' outcomes under reverse transfer policies, with none yielding credibly causal impacts.

Among the few existing works on reverse transfer to date, two published works have specifically explored impacts on students' academic and labor market outcomes. Taylor and Giani (2019) reported impressively large and positive impacts of reverse transfer associate degrees on students' bachelor's degree completion rates, including estimates up to an 11% increase in attainment for students in Minnesota who received these awards and a 32% increase for similar students in Hawaii. Additionally, Giani et al. (2021) estimated a 10% increase in bachelor's degree completion for reverse transfer associate degree awardees in Texas but found no impacts on students' employment or earnings. While these works represent the primary body of quantitative work on reverse transfer associate degrees to date, each is sharply limited by (a) reliance on descriptive or correlational techniques, including logistic regression and propensity score matching; (b) comparisons of students who positively selected into each respective state's reverse transfer program to those who did not; and (c) an inability to distinguish between traditional associate degree awards and those awarded through the reverse-transfer process of interest (or to observe reverse transfer degree receipt at all). This reality leaves wide gaps in our empirical understanding of the impacts of reverse transfer polices and a dearth of credible evidence to guide policymakers considering their adoption, design, and ongoing operation.

In this study, we leverage rich administrative data on the universe of public and select private college students in a separate reverse transfer state (Tennessee) to estimate causal impacts of reverse transfer associate degrees on students' short- and intermediate-term academic and labor market outcomes, including baccalaureate attainment, labor market participation, and earnings, as well as on academic outcomes yet to be explored in this literature: students' GPA, college credits attempted, and credits earned. In addition to these new outcomes, our data allow us to overcome many threats to internal validity present in prior works by providing us with the ability to observe (a) students who opted-in to the state's reverse transfer program, providing strong control over concerns of endogeneity by comparing opt-in awardees to opt-in students who did not receive an award, and (b) actual receipt of reverse transfer associate degrees, in addition to robust information on students' term-by-term academic outcomes. With these data, we estimate the first causal impacts of reverse transfer associate degrees by leveraging a difference-in-differences design to compare outcome changes for students (or cohorts) before and after receipt of a reverse transfer associate degree to groups of similar students (or cohorts) over time. Our empirical strategy and varied specifications yield complementary and consistent estimates of the average treatment effect for those who actually received a reverse transfer associate degree, as well as intent-to-treat (ITT) impacts for cohorts of students we expect would be eligible given program rules.

In contrast to prior works, our results suggest receipt or eligibility for a reverse transfer associate degree has little if any impact on students' short- or intermediate-term academic outcomes. We find receipt of a reverse transfer associate degree yields a small but persistent 0.04-point increase in subsequent semesters' GPAs but otherwise no impacts on semester credits attempted or earned. Similarly, for ultimate bachelor's degree attainment, our ITT analysis suggests no changes in eligible cohorts' baccalaureate completion outcomes. For labor market outcomes, we find some evidence of a modest 3-4 percentage point increase in likelihood a student is ever employed once he/she is no longer enrolled in school, but we find no robust impacts on students' earnings. Our findings allow us to reject returns to a reverse transfer degree that are larger than 5% for our population of transfer students. Furthermore, prior studies have

estimated larger returns to associate degrees for women compared to men, which is attributable to women disproportionately earning degrees in health fields (Jepsen et al., 2014; Liu et al., 2014; Stevens et al., 2018). In our sample, 99% of reverse transfer associate degrees awarded are liberal arts and sciences / liberal studies degrees, so we are additionally able to estimate whether there are heterogeneous returns to an associate degree by gender after controlling for type of degree awarded. We find no positive returns to a reverse transfer degree for men or women.

In addition to representing the only causal evidence on reverse transfer award impacts on a host of students' short- and intermediate-term academic outcomes, our results on students' labor market participation and earnings also constitute new evidence on the sheepskin effects of associate degrees. Most previous studies that estimated returns to associate degrees using worker fixed effects models (Jepsen et al., 2014; Liu et al., 2014; Stevens et al., 2019) or quasi-experimental enrollment variation for specific degree programs like nursing (Grosz, 2020) estimated the combined effect of returns to credits and returns to a credential. Our setting uniquely allows us to separate out the effect of the credential itself because the students who opted-in to the reverse transfer program but were not awarded a reverse transfer degree are observably similar on many dimensions to those who were awarded the degree. In particular, they have comparable GPAs and met the same credit requirements. The fact that earnings for these groups are comparable 1-5 years after the reverse transfer decision is made indicates that there is no sheepskin effect from an associate degree in our population and time period of study.

Despite these minimal impacts, our findings do not suggest that reverse transfer programs are bad policies. In fact, they fundamentally represent a payment of credit when credit is indeed due given that students have already indeed earned these degrees. Furthermore, our findings should allay the expressed concerns of policymakers and institutional leaders who feared that awarding students associate degrees *en route* to a bachelor's degree could have diversionary effects and instead motivate a substitution of schooling with work. Rather, policymakers should carefully consider the costs and benefits of these and similar policies and work to consider ways that reverse transfer could yield meaningful impacts for students.

The remainder of the paper is organized as follows. First, we discuss the introduction and operation of the Tennessee Reverse Transfer program, one of the earliest reverse transfer policies in the nation, which, from fall 2015 through spring 2020, conducted nearly 15,000 degree audits of opt-in students that yielded nearly 4,100 reverse transfer degrees. We then further discuss prior works on reverse transfer in other states, describe the conceptual pathways through which a reverse transfer associate degree might influence students' short- and intermediate-term academic and labor market outcomes, and explicitly identify our research questions. Next, we describe our data and empirical strategies, followed by a presentation of our results. We conclude with a discussion of these findings and their implications for public policy.

## Tennessee Reverse Transfer Program

In 2012, Tennessee's governor signed legislation adopting the Tennessee Reverse Transfer program, which authorized collaboration between the state's public college systems—and any not-for-profit private institutions who chose to participate—to create a statewide reverse transfer associate degree program. From 2012-2014, a Reverse Transfer Taskforce worked to

establish program details, determine award requirements, and execute associated credit transfer agreements between participating institutions, which includes all 13 public community colleges, all nine public universities, and eight private institutions. This work also included the development of the Reverse Transfer System (RTS), a software system that facilitates the program by capturing students' decisions to opt-in or opt-out of the program, collecting students' transcript information, conducting degree audits on students' records to determine award eligibility against program rules, awarding reverse transfer associate degrees, and fulfilling statewide reporting requirements. RTS is administratively housed with the University of Tennessee system. Much of the state's work on reverse transfer was supported in part by a $400,000 grant from Lumina Foundation through the Credit When It's Due initiative and in part by a $300,000 public appropriation from the state legislature in 2014 (Taylor et al., 2017). As of the state's 2022-23 fiscal year budget, the Tennessee Higher Education Commission (THEC) has requested $360,000 in recurring state appropriations to operate reverse transfer (THEC, 2021a).

Like many reverse transfer policies, the Tennessee Reverse Transfer program requires students to meet specific GPA and credit hour requirements to earn an associate degree. To be awarded a reverse transfer degree, students must have (a) earned a minimum of 60 combined college credits, (b) earned a minimum of 15 credits from a community college (i.e., 25% of an associate degree to fulfill residency requirements of the institutions' regional accreditor), (c) have at least a 2.0 cumulative GPA at their former community college, and (d) meet the degree requirements for at least one of 50 Tennessee Transfer Pathways associate degree programs.[1] These requirements are verified with a semi-automated "degree audit," where RTS identifies potentially eligible students from the universe of all community college transfer students based on their current enrollment and prior academic records, and then community college registrars make final awards given a review of students' two- and four-year transcripts.[2]

To maintain compliance with the Family Educational Rights and Privacy Act (FERPA), many reverse transfer programs require students to proactively opt-in to their processes, allowing educational records and credits to be transferred among two- and four-year institutions. Potentially eligible students automatically identified by RTS receive proactive email communications and reminders from their current registrar that are tri-branded by the Tennessee Reverse Transfer program, their former community college, and their current four-year institution. These emails indicate students' potential eligibility for an associate degree, include information on the reverse transfer program, provide students with information on their rights under FERPA alongside links to opt in or out of the program, and include contact information for questions. From fall 2015 through spring 2020, nearly 65,000 students received an opportunity to

[1] These requirements are similar to those in other states (Blackwell, 2018). For more information on Tennessee Transfer Pathways, see https://www.tntransferpathway.org/.

[2] To be deemed eligible to opt-in to reverse transfer and receive a degree audit via RTS, students must (a) be a transfer student from a public community college currently enrolled at a participating public or private four-year institution, (b) have at least a 2.0 cumulative GPA at their former community college, (c) have successfully transferred at least 12 credits from their previous community college to their current four-year institution (i.e., counting toward the 15-hour award requirement), and (d) have not already earned an associate or bachelor's degree.

opt-in; approximately 23% (nearly 15,000) did so and received a degree audit.[3] Roughly one third of all degree audits result in the award of a reverse transfer associate degree.

The Tennessee Reverse Transfer degree audit process begins with each fall and spring semester (in January or August, respectively), and opt-in students are informed of the disposition of their audit by the end of the same semester (in May or December, respectively), with degrees conferred in that same month. The first reverse transfer associate degrees were awarded in 2015, and the state has subsequently awarded over 5,200 degrees through reverse transfer (Tennessee Reverse Transfer, 2022).[4]

**Prior Work on Reverse Transfer**

Despite the relatively rapid diffusion of reverse transfer policies across states, few studies have empirically examined their relationship with students' attitudes and outcomes. The majority of this work has been qualitative in nature, where existing scholarship leverages case study designs, focus groups, or policy inventories to understand how programs operate, how students perceive their state's program or the value of an associate degree awarded through reverse transfer, and challenges experienced by students or states under reverse transfer policies (e.g., Friedel & Wilson, 2015; Geyer, 2016; Merten, 2017; Robinson, 2015; Rockey et al., 2021; Wilson, 2015).

Among those qualitative works to date is Cortez-Lopez and Taylor (2020), where focus group students reported that earning an associate degree through reverse transfer provided feelings of "personal accomplishment" and "momentum" toward completing a bachelor's degree, alongside now having a "back-up plan or insurance" in case they did not persist (p. 68-69). These students also reported "employer recognition" of associate degrees but cited the potential weakness of a "general" associate degree—those most commonly awarded through reverse transfer (e.g., Associate of Arts)—to yield positive benefits in the labor market as opposed to a "vocational" or "occupational" degree (e.g., Associate of Science in Nursing or Engineering; Cortez-Lopez & Taylor, 2020, p. 70). Furthermore, some students even suggested that reverse transfer degrees may have diversionary or negative effects on baccalaureate attainment, making students "content" with at least some credential and incentivizing them to withdraw from their bachelor's degree program, substituting work for enrollment (p. 71). This potential of reverse transfer to negatively influence students' baccalaureate attainment rates has been cited as a concern among policymakers and staff at partner four-year institutions (Taylor et al., 2017; Taylor & Giani, 2019), underscoring the need for rigorous evidence on the impact of reverse transfer associate degrees.

To our knowledge, only four studies have sought to quantitatively connect the award of or eligibility for a reverse transfer associate degree to students' academic outcomes, with one additionally examining potential influence on students' labor market outcomes. The two studies closest to our current investigation are Taylor and Giani (2019) and Giani et al. (2021). Taylor

[3] 2% of students opted-out of the program, and 75% did not respond, thus also opting out. Appendix Figure A.1 displays the email students received inviting them to opt-in to the program. Once students opt-in, they are always opted-in unless they subsequently and actively opt-out.

[4] For more information on the Tennessee Reverse Transfer program, see https://tnreversetransfer.org/.

and Giani (2019) studied persistence and bachelor's degree attainment rates using microdata on students in two reverse transfer states: Hawai`i and Minnesota. The authors used a series of logistic regressions with an indicator for receipt of a reverse transfer associate degree to descriptively compare outcomes for award recipients to several counterfactual groups. For bachelor's degree completion, however, the authors produced inconsistent estimates across a variety of specifications, ranging from a 9% *decline* in Minnesota to an 11% increase for students in the same state. Estimates for students in Hawai`i ranged from a 16-32% increase in bachelor's degree attainment. The authors attributed these differences to each state's design and implementation of its reverse transfer policy and to the composition of the study's multiple comparison groups, ultimately calling on future work to explore causal impacts of reverse transfer and to consider additional intended and unintended consequences.

In the second study, Giani et al. (2021) applied propensity score matching to microdata in Texas to explore differences in students' baccalaureate attainment and labor market outcomes. The authors compared outcomes for students who they predicted would be eligible for reverse transfer and earned an associate degree to (a) students who they predicted would be eligible for reverse transfer but never earned an associate degree and (b) students who earned an associate degree prior to transfer. The key limitations here are that Giani et al. (2021) cannot observe whether a student actually received an associate degree through the state's reverse transfer program (versus any associate degree), limiting their ability to accurately assign exposure to the treatment of interest, and their inability to observe whether a student opted-in or out of the state's reverse transfer program, introducing concerns of endogeneity. The authors found that students predicted to receive reverse transfer were 7.2-7.7 percentage points (or 10%) more likely to earn a bachelor's degree than other "eligible" students and 5.3 points more likely to earn a bachelor's degree than students who earned an associate degree prior to transfer. The authors found no association between the predicted receipt of reverse transfer and students' labor market outcomes (which were only observed for the study's last panel year), including no relationship to whether a student was employed in any (or all) quarters or their total earnings. Given the study's limitations, the authors urged caution in their interpretations and additionally called for future research on reverse transfer.

The final two quantitative studies to our knowledge include unpublished doctoral dissertations examining reverse transfer at a single community college in Iowa and for students at private universities in Tennessee. First, Hull (2018) used propensity score matching to examine bachelor's degree completion rates between transfer students who completed an associate degree before transferring to a four-year institution and reverse-transfer eligible students who had previously earned at least 60 credits at a community college (i.e., enough for an associate degree) prior to transfer. Hull (2018) found that reverse transfer-eligible students at one Iowa community college were 5.7% *less* likely to earn a bachelor's degree than peers who had previously completed an associate degree. Second, across a sample of students currently enrolled at private universities in Tennessee, Atkinson and Ashford (2020) compared mean bachelor's degree completion rates between reverse transfer opt-in students who ultimately did and did not earn a reverse transfer associate degree. The authors found no descriptive or statistical difference in completion rates between reverse-transfer-awarded and reverse-transfer-eligible students.

In all, there remains a dearth of rigorous and causal evidence on the impacts of reverse transfer associate degrees on students' academic and labor market outcomes. Studies within the current body of literature point to suggestive benefits alongside equally suggestive drawbacks or null associations, but these studies are limited in their ability to draw such connections given a reliance on descriptive techniques, endogenous treatment assignment, and a combined inability to distinguish a reverse transfer associate degree from any other associate degree. Despite these inconclusive works, there are clear conceptual channels through which reverse transfer associate degrees may causally impact students' academic and labor market outcomes that beg further exploration into these degrees.

## Conceptual Foundations for Reverse Transfer

On the academic front, theories of *achievement motivation* and *self-efficacy* suggest "individuals interpret the results of their performance attainments… which in turn inform and alter their subsequent performances" (Blaug, 1985; Fyans, 1980; Pajares, 1996, p. 544). In the case of reverse transfer, students retroactively awarded an associate degree while continuing to pursue a bachelor's degree may derive additional motivation to increase their immediate academic performance (i.e., GPA and credits earned) or develop a stronger commitment to ultimately complete a bachelor's degree (i.e., attempting more credits or attaining the degree; Filippin & Paccagnella, 2012). Furthermore, the award of an official academic credential not only rewards progress toward students' ultimate educational goal but may also help students realize higher self-efficacy given positive signals of their skills and abilities (Bandura, 1997; Zimmerman, 1995). Indeed, these sentiments have been captured by students' reports of "personal accomplishment" and "momentum" following receipt of a reverse transfer associate degree (Cortez-Lopez & Taylor, 2020, p. 68), suggesting the award of a reverse transfer associate degree may positively impact students' short- and intermediate-term academic outcomes. Conceptually, however, it is also possible that a reverse transfer associate degree may instead reduce students' ultimately bachelor's degree completion by substituting the immediate award of an associate degree for a future bachelor's degree, allowing students to feel "content" and subsequently stop out (Cortez-Lopez & Taylor, 2020, p. 71). Such a possibility has been cited as a concern among policymakers and staff at four-year institutions (Taylor et al., 2017; Taylor & Giani, 2019).

For employment and earnings outcomes, we draw from theories of *human capital* and *job-market signaling* which collectively suggest that holding an associate degree not only signals higher levels of students' ability but that these abilities can also transfer benefits to an employer through a worker's skills, providing students with greater employment and earnings prospects (Becker, 1964; Spence, 1973). Indeed, there is consistent evidence that associate degrees carry a high wage premium over high school diplomas, and the incidence of unemployment among associate degree holders remains lower than those without any college credential (Carnevale et al., 2020; Deming et al., 2016; Ost et al., 2018). These employment premiums for reverse transfer students could be realized in the short-term while still enrolled (i.e., immediately after earning the retroactive degree) or in the intermediate term upon graduation (or stop out) from their four-year institution. Any such premium could prove to be particularly important for those transfer students who are awarded a reverse transfer associate degree but who stop out before ultimately completing a bachelor's degree. However, given concerns cited by prior reverse

transfer students suggesting that a "general" associate degree (like those awarded through reverse transfer) may yield less labor market benefits than a "vocational" or "occupational" degree (Cortez-Lopez & Taylor, 2020, p. 70). Indeed, prior works have shown that technical associate degrees have stronger effects on students' employment and wages (Carruthers & Sanford, 2018; Grosz, 2020; Stevens et al., 2019). Thus, any potential impacts of reverse transfer on students' employment and earnings may be moderated or reduced given the type of credential awarded.

In all, there are clear conceptual foundations upon which we hypothesize that the receipt or eligibility for a reverse transfer associate degree may influence students' subsequent academic and labor market outcomes, though these impacts may represent intended, unintended, or mixed effects—some of which have been suggested by existing descriptive works. Equipped with rich administrative data from one reverse transfer state and a causal-inference design, our study fills gaps left by prior works and seeks to provide clear, policy-relevant estimates of the impacts of reverse transfer associate degrees on a host of students' short- and intermediate-term academic and labor market outcomes.

## Research Questions

Building on these conceptual foundations and extending prior works on reverse transfer, our study asks if eligibility or receipt of a reverse transfer associate degree impacts (a) recipients' academic term or semester GPA, college credits attempted, or credits earned; (b) eligible cohorts' ultimate bachelor's degree attainment rates; and (c) recipients' labor market outcomes, including any workforce participation and, if employed, recipients' earnings. Answers to these questions will not only produce the first causal estimates of the impact of reverse transfer associate degrees but also stand to inform states currently operating reverse transfer policies and may additionally guide considerations for future state adopters. Furthermore, such evidence may also help states better (re)design, market, and target reverse transfer opportunities for students.

## Data

Data for our study are generated by matching student-unit records from two administrative sources: the P20 Connect Tennessee Longitudinal Data System (P20) and the state's reverse transfer system (RTS) described above. P20 tracks the universe of public K-12 students through any public or private postsecondary enrollments in the state and into the state workforce. P20 records index students at the individual-semester-institution level, and we observe these records from academic year 2010-11 through 2020-21. Thus, P20 allows us to identify our primary academic outcomes of interest, including (a) students' GPA, credits attempted, and credits earned in any semester and at any institution, as well as cumulative values of each over time, and (b) any postsecondary credentials, including bachelor's degrees, earned in any semester at any institution. P20 also leverages unemployment insurance (UI) records to capture any in-state workforce participation, including individuals' quarterly earnings. In addition to these outcomes, P20 allows us to observe a host of fixed student-level characteristics, including students' gender, race, year of birth, residency status, and admissions test scores (i.e., ACT and SAT), as well as time-variant student characteristics, including term-by-term enrollment status and intensity, and major. These enrollment and award records cover nearly 1.4

million unique students across our study's 11-year window, capturing approximately 671,000 students each year.

As noted, RTS captures the universe of public community college students transferring to in-state public or private four-year institutions and identifies whether students are eligible for a reverse transfer degree audit based on their cumulative community college credits, GPA, and any prior associate or bachelor's degrees. After students are notified of their eligibility for an audit, RTS then captures students' decisions to opt in or out of reverse transfer prior to a formal review of their transcript and any official transfer of credit, allowing us to observe which students positively selected into reverse transfer and which students were and were not subsequently awarded a reverse transfer associate degree. Students' decisions to opt-in to reverse transfer represent the endogenous treatment assignment that has in part limited the internal validity of prior works like Giani et al. (2021). Rather than similarly comparing outcomes for students who opted-in to those who opted-out, given that students who are motivated or able to take-up a resource may systematically vary from those who do not or cannot (Cellini, 2008), we can instead leverage RTS to restrict our analytic sample to only students who opted-in to reverse transfer. This reduces concerns of selection on unobservables and ensures we are comparing outcomes for students across the reverse transfer *award* margin, rather than the opt-in margin. Over 9,200 unique students opted-in to the reverse transfer process from fall 2015 through spring 2020, and over 3,000 were ultimately awarded a degree.

*Outcomes and Samples*

For our first research question exploring impacts of reverse transfer degrees on recipients' semester GPA, college credits attempted, and credits earned, we first identify the sample of students awarded a reverse transfer associate degree ($n$=3,025) and their records from five terms prior to their degree audit to three terms after the audit. This window not only allows us to observe a wide pre- and post-audit academic history for each student but also provides superior data coverage. Given that these are transfer students, moving back beyond at least two and a half years prior to the degree audit (which captures *before* many of these students ever enrolled at a community college) or beyond at least a year and a half past the audit (which captures *after* many of these students graduated or stopped out of a university) dramatically reduces our sample size for this term-by-term analysis. Furthermore, because students can receive a degree audit in multiple semesters—that is, if a student is eligible for an audit but does not receive a degree, they are re-audited in subsequent semesters—we focus only on students' last audit cycle (and decision) and the outcomes relative to that cycle. Students' last observable audit cycle is the cycle in which they would ultimately be awarded a reverse transfer associate degree or not.[5]

[5] Our results remain unchanged when defining students' first audit as the first year of treatment. However, focusing on students' first audit cycle can generate misassigned treatment and control groups. For example, a student could be denied a reverse transfer degree upon their first audit (e.g., they are missing a major-specific course) but subsequently awarded a degree upon their second audit (e.g., after completing the course). Tracking this student as a "control" following the first audit would introduce a reverse transfer associate degree to this "control" in a subsequent term. We believe focusing on students' first audit cycle should only be justified if there are concerns that (a) students must repeatedly (endogenously) opt-in to reverse transfer in each semester or (b) students can endogenously manipulate their prior community college credits, GPA, or course taking, but these are not plausible in our setting. First, students need only opt-in a single time, and, if they are not awarded a degree, do not proactively

Next, we identify these same term outcomes across the same window for students in two primary comparison groups: (a) all other students who opted-in to the reverse transfer process but ultimately did not receive a reverse transfer associate degree ($n$=6,169) and (b) students who opted-in to reverse transfer *and* who we predict should receive a reverse transfer associate degree based on GPA, credits, and prior awards but who ultimately did not earn a reverse transfer degree due to other program rules unobservable to us (e.g., failing to fulfill major-specific coursework; $n$=5,030).[6] These groups not only ensure that we compare outcomes for reverse transfer students to those of their similarly-motivated, opt-in peers but also to peers who met similar GPA and credit-hour benchmarks. Table 1 reports descriptive statistics for our reverse transfer awardees and these counterfactual samples for the semester immediately prior to their last audit semester. As shown, our treatment group and both control groups are comparable by level on our outcomes of interest and demographic covariates but have small differences in enrollment intensity, student status, test scores, and credit hours.

Our second research question concerns bachelor's degree attainment outcomes. Here, we are interested in across-cohort changes in baccalaureate attainment for would-be reverse transfer students before and after the state began its reverse transfer program in fall 2015. For this analysis, we construct "transfer cohorts" for each fall semester from fall 2011 through fall 2018.[7] A student is placed in a transfer cohort if they (a) were enrolled in a university in the fall semester, (b) were enrolled in a community college in the prior spring or fall semester, (c) had not yet earned an associate or bachelor's degree, and (d) had no subsequent community college enrollments. This mimics students' behavior in the Tennessee reverse transfer process. Within each fall's transfer cohort, we then identify which students would be eligible for a reverse transfer associate degree based in part on their cumulative community college GPA ($\geq$ 2.0) and credits earned ($\geq$ 15) at the time of transfer to similarly mimic the Tennessee reverse transfer process. This provides us with cohorts of transfer students who are reverse-transfer-degree-eligible (i.e., treatment) and reverse-transfer-degree-ineligible (i.e., control) for each academic year before and after the state's fall 2015 introduction of its reverse transfer policy, when

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opt-out, and do not earn another associate or bachelor's degree, they are automatically re-audited in subsequent semesters. Second, if students are not awarded a degree, they are only informed if they were ineligible on the credit or GPA margin or if they "do not meet the requirements for a degree" (i.e., via coursework; see Appendix Figure A.2 for an example of this decision letter). Examples of these emails are provided here: https://tnreversetransfer.org/resources-for-administrators/rts-resources/. To manipulate this decision, students would need to (a) re-enroll in a community college to increase their cumulative GPA and/or credits in a subsequent semester and then re-transfer to a four-year institution in a following semester to qualify (which such behavior would equally qualify them for an associate degree from the two-year institution directly, eliminating the need to re-transfer and thus dropping them from our sample of four-year students either because they were previously awarded a non-reverse-transfer associate degree or because they never re-enrolled at a four-year institution) or (b) complete unidentified course(s) at their four-year institution to meet the requirements for one of the 50 Tennessee Transfer Pathways majors. Again, though we believe examining outcomes relative to students' last audit cycle is most appropriate, our results remain unchanged when we focus on students' first audit.

[6] Our data do not include detailed transcript records, thus we cannot model whether a student meets specific degree requirements, such as taking a particular course sequence or fulfilling a general education requirement. These determinations are made by individual institutions' registrars upon an official review of students' two- and four-year transcripts. We do, however, observe term-by-term GPA and credit hours, the program's primary eligibility criteria.

[7] Here, our window is restricted to 2011 through 2018 allowing us to observe (a) students' prior (i.e., 2010) enrollment records to identify if students had some prior community college enrollments (i.e., whether they transferred or not) and (b) observe if students ever earned a bachelor's degree through 2020-21 (i.e., two years after transferring in 2018).

reverse-transfer-degree-eligible students would begin receiving associate degrees. We then observe whether students in each cohort ultimately earned a bachelor's degree through the 2020-21 academic year. Table 2 shows descriptive statistics on bachelor's degree completion rates and a set of covariates for students in the fall 2014 cohort (reverse-transfer-award eligible $n$=3,124 and ineligible $n$=3,151), the year immediately prior to the start of the Tennessee Reverse Transfer program.

Finally, for our analysis of students' workforce outcomes, we use the P20 data that covers employment and earnings in Q1 (January-March) of 2010 through Q4 (October-December) of 2020. Academic enrollment information is reported by semester whereas earnings are reported by quarter. We map earnings in Q3 (July-September) and Q4 (October-November) to the fall semester and earnings in Q1 (January-March) and Q2 (April-June) to the spring semester. For example, a student with earnings in Q3 of 2010 is coded as working during the 2010-11 school year—as is a student with earnings in Q2 of 2011. We match these employment records (if any) to our sample students' academic records. We drop any employment records where a student was younger than 18 or older than 60 at the time earnings were reported.[8] We also restrict our records to the population of all students who opted-in to the reverse transfer audit and met the baseline eligibility requirements of having a community college GPA of 2.0 or above and at least 15 community college credits ($n$=6,652). Finally, because employment and earnings can vary by whether and where students are enrolled while working, we classify each school year-student observation as a school year where the student was either enrolled in a four-year institution, enrolled in a community college, or not enrolled at all. We drop any data corresponding to school years where a student was either enrolled at both a two-year and four-year institution in the same academic term or enrolled at a two-year institution for part of the academic year and enrolled at a four-year institution the other part of the academic year. Reverse transfer degree award outcomes are again based on the student's last reverse transfer audit record if they have more than one. We limit our time window to five school years before this reverse transfer audit to five school years after and drop any school year observations corresponding to students enrolled in community colleges post-reverse transfer audit ($n$=6,647).[9]

For our primary outcomes of interest—any employment, quarters of employment, and earnings—we code a student as employed during the academic year if they have any positive earnings during Q3, Q4, Q1, or Q2 that align with that respective school year. Similarly, we define quarters employed as the number of quarters (out of four) that the student had any positive earnings. For earnings, we compute ln(yearly earnings) based on total earnings a student earned during the respective year over those four quarters. This variable is missing for any students reporting $0 of earnings, so regressions using this outcome are based on academic years where the student was working and earning some positive wages. Yearly earnings are CPI adjusted to 2020 dollars and do include students who have $0 of earnings. Table 3 reports descriptive statistics for labor market outcomes and covariates for reverse transfer degree awardees and opt-in (but non-awarded) peers who also met the program's GPA and credit-hour thresholds for the academic year immediately prior to their respective reverse transfer audit.

## Empirical Strategy

[8] Age is calculated based on year of birth reported in the admissions file information.
[9] There are very few instances where students return to a community college after a reverse transfer audit.

As alluded to earlier, we leverage a difference-in-differences design to estimate causal impacts of reverse transfer associate degrees on students' short- and intermediate-term academic and labor market outcomes. However, a clever reader has already asked why we do not instead exploit exogenous variation in degree receipt induced by the program's GPA and credit hour thresholds with a regression discontinuity (RD) design. While it appears the program design would be well suited to an RD, implementation is complicated in this setting. First, due to unobservable program rules (i.e., fulfilling major-specific coursework), any RD implemented would leverage a fuzzy design. Even beyond using students' GPA and credit hours as instruments for reverse transfer receipt (which would likely violate the exclusion restriction for a bachelor's degree attainment outcome), given these unobservable assignment mechanisms, we only achieve modest-at-best first-stage estimates at the observable GPA and credit-hour margins of 24.6 and 1.3 percentage points, respectively. Second, given that obtaining a community college GPA of 2.0 or above and earning at least 15 hours prior to transfer are relatively low bars, there are less than 300 observations below each threshold, grossly underpowering the RD.[10]

Given the limitations of an RD analysis, we instead leverage a difference-in-differences design (DD) that still yields causal estimates under assumptions that are satisfied in our sample. DD designs exploit variation between units across a policy adoption window. In our setting, we leverage a DD estimator to compare changes in academic and labor market outcomes for reverse transfer associate degree awardees (or eligible cohorts) before and after the degree was awarded (or before and after the policy was adopted) to changes in outcomes for peers in the control groups described above. To target the average treatment effect of receipt of a reverse transfer associate degree (or the intent-to-treat parameter for students eligible for such an award), we adopt variations of a DD design within the context of each question given the outcome of interest and our available data—exploiting within-student variation across terms in one case and exploiting cross-cohort variation over academic years in another.

*Identification for academic term GPA, college credits attempted, and credits earned*

Our first set of analyses explore within-student variation in semester GPA, college credits attempted, and credits earned by comparing term-by-term changes in these outcomes for students awarded a reverse transfer degree (before and after the award) to students who were not awarded a reverse transfer degree, including (a) all other opt-in students and (b) the "expected" reverse-transfer awardees described above. Under this strategy, we estimate

$$(1) \qquad y_{it} = \delta_0 + \delta_1 RT_{it} + \sum_{t=-5}^{3} \theta_t I_t + \mathbf{X}'_{it}\beta + \alpha_i + \phi_t + \epsilon_{it} ,$$

where $y$ is the outcome of interest for student $i$ in year-term $t$. $RT$ is our regressor of interest, which takes the value of 1 when student $i$ is awarded a reverse transfer associate degree in year-term $t$ (and in all subsequent year-terms); $RT$ is 0 otherwise. $I$ are relative-term fixed effects, or indicators for year-terms relative to a student's reverse transfer audit, ranging from five terms prior to three terms after. These allow us to ensure we compare outcomes for reverse transfer

[10] An analysis at the GPA margin with a minimum detectable effect size of even a relatively large change of 10 percentage points in students' baccalaureate attainment (similar to prior descriptive works on reverse transfer) under a fuzzy RD design, local-linear specifications, and 1.0 GPA bandwidth is powered at only 0.239.

recipients and non-recipients within the same term relative to their respective audit. **X** captures observable time-variant student characteristics, including year-term reported major, enrollment status, and enrollment intensity, which are accompanied by student fixed effects ($\alpha$) that control time-invariant features of students and allow us to leverage within-student variation in the outcomes of interest. We also incorporate year-term ($\phi$) fixed effects to control any shocks received by all students in a given semester.

In Equation (1), $\delta_1$ is our parameter of interest, or the causal impact of receiving a reverse transfer associate degree. This coefficient captures the average change in $y$ for students who received a reverse transfer associate degree relative to non-recipient comparisons, net of any level differences in $y$ between the groups prior to the respective year-term of their degree audit.

*Identification for cohort bachelor's degree attainment*

For our analysis of reverse transfer associate degree impacts on baccalaureate attainment, we focus on cross-cohort changes in outcomes by exploiting the temporal introduction of the state's reverse transfer policy. As described in Data above, we follow the program's cumulative community college GPA, credit hours, and no-prior-degree eligibility criteria and compare bachelor's degree attainment outcomes for (a) should-be award eligible transfer students to (b) should-be award ineligible transfer students across the 2015 policy adoption window. Under this strategy, we estimate

$$(2) \qquad y_{ic} = \gamma_0 + \gamma_1 RT_{ic} + \varphi Eligible_i + \mathbf{X}_i'\beta + \mu_c + u_{ic} \ ,$$

where $y$ captures the ultimate baccalaureate degree attainment outcome for student $i$ in transfer cohort $c$. $RT$ is still our regressor of interest, which identifies "treatment" students (i.e., those eligible for a reverse transfer degree at the time of transfer) in the 2015 transfer cohort and later cohorts (e.g., post-treatment years). $Eligible$ then separates treatment (i.e., eligible) and control (i.e., ineligible) students across all cohorts to then net out level differences between groups prior to the first treatment year. Because we only observe students once as part of a given cohort, we can augment the **X** from Equation (1) with factors that were absorbed by student fixed effects. Here, we include students' major, enrollment status, enrollment intensity, and cumulative community college GPA and credits earned at the time of transfer, as well as students' admission test score, gender, race, birth year, and residency status. These rich covariates also allow us to control for compositional changes in cohorts over time. Our estimation also includes cohort ($\mu$) fixed effects to restrict comparisons between eligible and ineligible students within a given cohort year.

While we can observe eligible and ineligible students during the program's operation, our inability to do so for earlier cohorts requires us to predict eligibility using program rules. Thus, $\gamma_1$ in Equation (2) yields the intent-to-treat estimate of the effect of eligibility for a reverse transfer associate degree on students' baccalaureate attainment outcome.

*Identification for yearly employment and wages*

To investigate the effects of reverse transfer degree receipt on labor market outcomes, we leverage our constructed student-academic year level panel dataset covering 2010 to 2020 that contains academic enrollment information as well as UI earnings and employment information. Recall, we map earnings and employment in Q3 and Q4 to the fall semester and earnings in Q1 and Q2 to the spring semester. Using this student school-year data, we estimate the effects of reverse transfer degree receipt on employment (defined as ever having positive earnings), employment intensity (defined as the number of quarters with positive earnings), ln(yearly earnings), and total yearly earnings in CPI-adjusted 2020 dollars. We allow the effects of a reverse transfer award to vary by whether the student is enrolled in a four-year university. Formally, we estimate

$$(3) \quad y_{ist} = \sigma_0 + \sigma_1 RT_{it} \times EnrolledUniv_{ist} + \sigma_2 RT_{it} \times NotEnrolled_{ist} + \sum_{t=-5}^{5} \theta_t I_{st} + \mathbf{X}'_{ist}\beta + \alpha_i + \phi_{st} + \varepsilon_{ist} ,$$

where $y$ captures labor market outcome for student $i$ with enrollment status $s$ in academic year $t$. Recall that a student's status is either enrolled in a four-year institution during the academic year, enrolled in a community college during the academic year, or not enrolled in any institution during the academic year. $RT \times EnrolledUniv$ takes the value of 1 when student $i$ has a reverse transfer associate degree in school year $t$ and is also enrolled in a four-year institution. $RT \times NotEnrolled$ takes the value of 1 when student $i$ has a reverse transfer associate degree in school year $t$ and is not enrolled at any institution during that school year. $I$ are relative school-year by enrollment status fixed effects. For comparability of event studies across our analyses, we use data from five school years prior to the reverse transfer audit to five school years after. These fixed effects allow us to ensure we compare outcomes for reverse transfer recipients and non-recipients within the same school year and enrollment status group relative to their respective audit. **X** again captures observable time-variant student characteristics. We interact the following variables with the student's enrollment status: fixed effects for the number of terms the student was enrolled, fixed effects for age, an indicator for full-time and/or part-time enrollment during the school year, and indicators for whether the student was classified as a first-time freshman, returning student, readmitted student, or first-time enrollee. We also include student fixed effects ($\alpha$) that control time-invariant features of students and allow us to leverage within-student variation in the outcomes of interest and school year by enrollment status ($\phi$) fixed effects to control any shocks received by all students (or workers) in each enrollment status group in a given academic year.

For this labor market analysis, we again observe actual reverse transfer degree receipt and restrict our sample to only students who opted-in to reverse transfer and met the GPA and community college credits eligibility requirements. This allows us to compare outcomes for reverse transfer awardees to similar non-awardees and again yields an estimate for the average treatment effect on the treated rather than an ITT estimate.

For each DD model, we estimate heteroskedastic-robust standard errors clustered at the student level.

*Assumptions*

The primary assumption underlying any DD analysis is that of parallel trends: that treatment and control groups followed similar outcome paths prior to the time of treatment. If significant outcome deviations existed *prior* to the post-treatment between the treatment and control groups, then the control group used is not a suitable counterfactual, and any significant outcome deviations observed *after* treatment should not be attributed to the effect of the treatment alone. To test for the presence of significant pre-treatment trends in our samples, we implement a series of event studies that interact a reverse transfer associate degree treatment (or eligibility) indicator with year (or term or cohort) dummies across the study window, omitting the time point immediately prior to the reverse transfer audit/award cycle as the baseline period. This allows us to explicitly test for treatment effects—differences between students in our treatment and control groups—in each panel year relative to the baseline period. These specifications, corresponding to Equations 1-3 respectively, are given by

$$(4) \quad y_{it} = \pi_0 + \pi_{1t} \sum_{t=-5}^{3} (RT_{it} \times \phi_t) + \sum_{t=-5}^{3} \theta_t I_t + \mathbf{X}'_{it}\beta + \alpha_i + \phi_t + \epsilon_{it} \,,$$

$$(5) \quad y_{ic} = \gamma_0 + \gamma_{1c} \sum_{c=2011}^{2018} (Eligible_i \times \mu_c) + \mathbf{X}'_i\beta + \mu_c + u_{ic} \text{ , and}$$

$$(6) \quad y_{ist} = \delta_0 + \delta_{1t} \sum_{t=-5}^{-1} (RT_{it} \times \phi_t) + \delta_{2t} \sum_{t=0}^{5} (RT_{it} \times EnrolledUniv_{ist} \times \phi_t) + \delta_{2t} \sum_{t=0}^{5} (RT_{it} \times NotEnrolled_{ist} \times \phi_t) + \sum_{t=-5}^{5} \theta_t I_t + \mathbf{X}'_{it}\beta + \alpha_i + \phi_{st} + \varepsilon_{ist} \,.$$

If our underlying assumptions are met, we should not detect significant effects across the pre-treatment periods on our coefficients of interest (i.e., $\pi_1$, $\gamma_1$, and $\delta_1$). Figures 1-3 plot point estimates from these regressions alongside 95% confidence intervals for each outcome of interest. As expected, we do not detect significant time-series differences in outcomes for reverse transfer associate degree awardees (or eligible cohorts) and their non-awardee (or ineligible) peers in any comparison group prior to their reverse transfer audit cycle or the start of the Tennessee Reverse Transfer program. This provides confidence in our DD design, allowing us to attribute significant deviations in the post-treatment period to the receipt of (or eligibility for) reverse transfer associate degrees.

Our event study plots are also instructive when considering possible impacts of reverse transfer on students' academic and labor market outcomes. For term GPA, plots in Figure 1 suggest small descriptive increases in GPA of 0.4-0.8 points for reverse transfer associate degree awardees in the term of their award and for three terms following but no impact on recipients' college credits attempted or credits earned. Similarly, for bachelor's degree completion (Figure 2), our event study points to possible (imprecisely estimated) reductions in baccalaureate attainment rates of nearly 2.0-2.4 percentage points in the second and third year following program adoption alongside an imprecise 5.5-point increase for transfer cohorts four years after the policy began. This figure, however, also suggests a generally downward trend in B.A. attainment differences between our expected-eligible and expected-ineligible groups, with a significant difference among the 2011 transfer cohort. The continuation of this trend after the policy's 2015 adoption thus does not qualitatively suggest any impact of reverse transfer. Finally, for labor market outcomes of interest (Figure 3), plots suggest a 3-4 percentage point increase in the likelihood a student is ever employed once they have left school and an increase in total quarters employed but no change in the likelihood of being employed while enrolled.

Figure 3 shows no obvious effect of reverse transfer receipt on log yearly earnings or average yearly earnings.

An additional assumption of a valid DD design is that there are no contemporaneous treatments occurring across the pre-to-post-treatment window. That is, there should be no other policy changes occurring that could similarly explain outcome changes, blurring what is attributable to the effect of a reverse transfer associate degree and what is attributable to another treatment. Our academic term and labor market outcome analyses leverage within-student variation across a relative-term treatment window (i.e., audit cycle) for each student. To violate this assumption in our setting, a contemporaneous treatment would need to be delivered to these students during or after their specific degree audit term. Furthermore, any such intervention would need to apply to our relatively narrow sample of students (i.e., transfer students who met the initial criteria for a reverse transfer associate degree and then opted-in to the reverse transfer process) compared to common policy changes that target other groups of students. Following discussions with Tennessee Reverse Transfer program administrators and policy leaders in the state, we are unaware of other policy changes occurring during these reverse transfer cycles that could influence these students' outcomes.

One possible violation of this assumption impacts our second set of analyses (alone) exploring changes in cohorts' baccalaureate degree attainment outcomes. Recall that we estimate impacts here by comparing outcomes for eligible and ineligible students in distinct transfer cohorts before and after the establishment of the Tennessee Reverse Transfer program. In 2015, the state also began operating Tennessee Promise, a tuition-free program for community college students. Tennessee Promise has been shown to increase community college enrollments, predominantly among Black and Hispanic students, students with higher average ACT scores, and students with higher high school GPAs (Nguyen, 2020; THEC, 2021b). Ongoing works also show that higher-achieving students in Knox Achieves, the predecessor to the statewide Tennessee Promise program, were, on average, less likely to complete a bachelor's degree (likely given their undermatching at a community college) but that lower-achieving, Black, and Hispanic students were more likely to complete two- and four-year degrees (Carruthers et al., 2020). Given these facts, the introduction of Tennessee Promise could bias our ITT estimates if (a) Promise significantly altered the composition of our cohorts over time and/or (b) Promise influenced our cohorts' bachelor's degree attainment rates. Unfortunately, P20 data do not identify Tennessee Promise students, though we believe any possible threats to our analysis brought about by the introduction of Tennessee Promise are minimal in our setting for three primary reasons.

First, given that Tennessee Promise began in fall 2015, the first possible transfer cohort that could include these students would be fall 2016, providing us with at least one reverse-transfer-eligible cohort (2015) that could not include any Promise students and one additional cohort (2016) that likely includes few if any Promise students, where students would have to have transferred to a university within one year after starting community college as a Promise student. To leverage these Promise-free cohorts, we conduct a sensitivity analysis for our primary specifications where we limit our post-period window to only include the 2015 and the 2015/2016 transfer cohorts. Results are shown in part by the event study in Figure 2 and fully in Appendix Table B.1. In Table B.1, our results point to potential reductions in transfer cohorts'

baccalaureate attainment outcomes of 2-4 percentage points, though these estimates are relatively imprecise, and our event study (Figure 2) does not suggest a meaningful change in secular tends for B.A. attainment outcomes across the policy-adoption window (i.e., the 2015 and 2016 cohort point estimates follow a generally downward sloping trend that existed prior to the adoption of reverse transfer in Tennessee). In all, these estimates suggest that our findings are robust to altered specifications that eliminate or reduce potential confounding from the introduction of Tennessee Promise.

Second, given that Tennessee Promise only provides grants for tuition and fees at community colleges, Promise students rarely ever transfer to universities, even following two years of study. THEC (2020) reported that only 24.7% of the first (2015) cohort of Promise students had ever transferred to a university by 2020, five years later. These transfer rates were lower for students in the second (2016) and third (2017) entering cohorts (only 22.1% and 17.4% of students transferred to a university by 2021, respectively; THEC, 2021b), suggesting that, even if Promise students were captured within our fall transfer cohorts, their relative proportion should be small.

Third, and finally, Promise students would need to meet eligibility criteria to be included in our analytic cohorts, including having not yet earned any degree. Given that Tennessee Promise pays up to the full cost of tuition and mandatory fees for two years (or five semesters), it would be irrational for a Promise student to transfer to a university prior to accumulating enough credits to yield a certificate or associate degree. Indeed, 50.3% of Promise students in the first (2015) cohort ultimately attained a certificate or associate degree (THEC, 2021b). In all, even if Promise students (a) transferred to universities, (b) qualified for inclusion in our cohorts, and (c) significantly impacted the demographic composition of the transfer cohorts in 2016 and later, we include a rich set of covariates in Equation (2) to help control for such changes in cohorts' compositions over time.

## Results

Results from our primary DD analyses are presented in Table 4 (impacts on term GPA, college credits attempted, and credits earned), Table 5 (cohort bachelor's degree attainment), and Table 6 (labor market participation and earnings).

### *Results on academic term GPA, college credits attempted, and credits earned*

For students' short-term academic outcomes, our evidence suggests that receipt of a reverse transfer associate degree may yield a small positive impact on students' term (or semester) GPA. Across our comparison groups comparing award recipients to all other opt-in peers and a subset who we predict should have received an award, estimates suggest the award of a reverse transfer degree increases students' GPA by a modest 0.04 points. Our event study estimates shown in Figure 1 suggest this increase is realized first in the semester in which students receive the associate degree and is then relatively stable within each semester for at least three subsequent terms. Despite this impact, we find no evidence to suggest students increase college credit hours attempted in subsequent semesters or earn more credits in subsequent semesters following receipt of a reverse transfer associate degree. The 95% confidence interval

around these estimates allow us to confidently reject any changes in credits attempted or earned of $\pm$0.20 credit hours or greater for either outcome.

*Results on cohort bachelor's degree attainment*

Results for our intent-to-treat analysis estimating impacts of eligibility for a reverse transfer associate degree on eligible cohorts' baccalaureate attainment outcomes are presented in Table 5. Consistent with our event study parameters, we find no impact of eligibility for a reverse transfer degree on students' ultimate bachelor's degree attainment outcomes through the study window. We estimate a relatively precise null that can reject any possible impacts as small as 1-2 percentage points and can confidently reject the large impacts observed in prior descriptive works like Taylor and Giani (2019)—at least for our sample of students in Tennessee. These intent-to-treat estimates suggest there was virtually no change in the ultimate bachelor's degree completion rates among transfer students who were (or would be) and were not (or would not be) eligible for a reverse transfer associate degree at the time of transfer from a community college following the program's introduction. While we are confident in these generally null findings, we again note the presence of a downward sloping trend in bachelor's degree outcomes shown in Figure 2. Even with this limitation, virtually no change in this outcome trajectory following the policy's adoption again suggests that the introduction of reverse transfer had little impact on bachelor's degree completion for eligible students in our sample.

*Results on yearly employment and wages*

Panel A of Table 6 presents the estimated impacts of a reverse transfer degree award on labor market outcomes for all students in the analytic sample (i.e., those who opted-in to the reverse transfer audit and met the GPA and credits eligibility criteria). Starting with the school years when students are still enrolled at a university, we find no evidence that the award of a reverse transfer associate degree increases the probability of employment or total quarters employed. There is some evidence that the award of a reverse transfer degree may decrease total yearly earnings, but the effect (-$630) is quite small in magnitude. For similar students in our sample not awarded reverse transfer, average yearly earnings are roughly $14,200 per year. By contrast, there is an increase in the probability of employment for (former) students who are no longer enrolled of 3.4 percentage points. There is also imprecise evidence that the award of a reverse transfer associate degree may increase their total number of quarters employed. We find no significant impacts on ln(yearly earnings) or CPI-adjusted yearly earnings for students in these years. The 95% confidence interval for the effect of the reverse transfer degree award on ln(yearly earnings) rules out increases in earnings larger than 4.5% for students fully in the labor force.

Because prior studies estimating returns to associate degrees have uncovered larger returns for women compared to men (Bahr et al., 2015; Jepsen et al., 2014; Minaya and Scott-Clayton, 2022), Panels B and C of Table 6 re-estimate Equation 3 separately for samples of female students and male students. We find a marginally significant increase in employment of 4.1 percentage points for men and 2.8 percentage points for women. For earnings, no estimates are statistically significant, and our confidence intervals are relatively wide for these subgroups, though these possible changes are a small fraction of the earnings premia found in prior works

(e.g., 27-32%; Bahr et al., 2015). Overall, our labor market findings provide rigorous evidence to support prior descriptive findings by Giani et al. (2021) suggesting relatively little impacts of reverse transfer degrees on students' labor market outcomes with the possible exception of employment probabilities once students have left their universities.

## Discussion

Despite a belief that students can successfully start college at a two-year institution, transfer to a university, and subsequently complete a bachelor's degree, less than half of these transfer students ultimately earn a bachelor's degree, and the remainder who had not yet completed an associate degree leave college with no credential at all (Jenkins & Fink, 2016; Shapiro et al., 2021). Reverse transfer degrees are a relatively new and innovative state-level policy seeking to reduce the likelihood students are in this "all or nothing" position. That is, unless they persist and attain a bachelor's degree, they will have invested substantial resources to acquire credits across two- and four-year colleges that ultimately do not yield any credential (Bragg et al., 2011, p. 3). By retroactively awarding an associate degree to transfer students from a combination of credits from their previous community college and current four-year institution, students may not only be shielded from this "all or nothing" scenario but may enjoy other positive benefits, including increased motivation *en route* to completing a bachelor's degree and immediate labor market benefits by way of increased employment and earnings. This possibility had led at least 15 states to award reverse transfer associate degrees.

Even with the proliferation of reverse transfer policies, few studies have examined students' outcomes under reverse transfer policies, with none yielding credibly causal impacts. Among the studies to date, findings have suggested widely mixed impacts on students' bachelor's degree completion and suggest no impacts on students' labor market outcomes (Taylor & Giani, 2019; Giani et al., 2021). However, each of these prior works was each was sharply limited by a reliance on descriptive techniques, students' endogenous selection into reverse transfer, and the inability to separate impacts of reverse transfer degrees from traditionally awarded associate degrees. This leaves wide gaps in our understanding of the impacts of reverse transfer polices and a dearth of credible evidence to guide policymakers. In this study, we leverage administrative data from Tennessee to generate the first causal estimates of reverse transfer associate degree impacts on these same outcomes—bachelor's degree completion, employment, and earnings—in addition to outcomes yet to be explored in this literature: students' GPA, college credits attempted, and credits earned. Our data also allow us to overcome prior studies' threats to internal validity by providing us with the ability to isolate reverse transfer program opt-in students and to observe actual reverse transfer awards.

Our results robustly suggest that neither receipt nor eligibility for a reverse transfer associate degree has any meaningful impact on students' short- or intermediate-term academic or labor market outcomes. We find that the award yields a modest 0.04-point increase in students' GPA in subsequent semesters but does not influence their college credits attempted or credits earned, where we find precisely estimated null impacts. We also find no true impacts on eligible cohorts' ultimate bachelor's degree attainment across our study window and confidently reject the 10-30% increases observed by prior works for reverse transfer students in other states (Taylor & Giani, 2019; Giani et al., 2021). For students' labor market outcomes, our estimates suggest

that reverse transfer award recipients may experience a small increase in likelihood they are ever employed following the award once they have left their university, but this effect does not result in significantly higher earnings. Our estimates can confidently rule out increases in wages larger than 4.5% measured in our window of up to five school years after the award for students in the labor market. These estimates support the prior null impacts observed by Giani et al. (2021) for reverse transfer students in Texas.

Although our data do not allow us to assess labor market impacts more than five years after degree receipt, prior studies have found that when sub-Baccalaureate credentials deliver a labor market return, these tend to accrue relatively quickly. For instance, among the population of those who receive an associate degree but do not continue their education at a four-year institution, Minaya and Scott-Clayton (2022) find that average quarterly earnings for those with an associate degree start increasing around seven quarters after first entry. Bettinger and Soliz (2016) only have about three years of data after students graduate but still find statistically significant impacts of an associate degree for women's earnings. Similarly, Jepsen, Troske, and Coomes (2014) also find positive returns during time window that extends up to 4.5 years post-entry. If reverse transfer degrees did increase earnings for students, we would expect to see at least some effect in our time window.

*Why do reverse transfer associate degrees not "work?"*

On the academic front, reverse transfer policies typically apply to a unique subset of students, including (a) those who have already surpassed the odds of successfully transferring from a community college to a university, (b) those who have surpassed academic GPA and credit-hour thresholds, and (c) those that have proactively opted-in to a reverse transfer program. These students are likely already motivated to compete a bachelor's degree, and, as observed in prior works, the provision an associate degree may simply be seen as a "backup plan or insurance" rather than "momentum" toward completing an additional credential (Cortez-Lopez & Taylor, 2020, p. 68-69). It is possible the modest increases in subsequent semester GPAs among recipients reflect achievement motivation behaviors or increases in students' self-efficacy having earned their first postsecondary credential. On the credit front, however, there is likely a ceiling on any possible impacts on credits attempted (or earned) given that approximately 80% of students in our sample had some employment during an academic year and the average pre-reverse-transfer credit hours attempted among our population was already nearly 10.5 hours per semester. However, there is still room for improvement on student GPAs given that baseline means in our analytic sample are just above 2.90. Finally, it is equally likely that the liberal arts and sciences / liberal studies degrees awarded, which represent 99% of the awards we observe in the Tennessee Reverse Transfer program, is again not enough to propel students' academics, particularly given the likelihood that such an award would not align with a students' intended career field or current four-year major.

It is important to highlight that the fact we do not identify any true *negative* impacts on cohort baccalaureate attainment rates for reverse transfer eligible students should be interpreted in a positive light. The potential of reverse transfer to negatively influence students' baccalaureate attainment rates has been cited as a concern among policymakers and staff at partner four-year institutions (Taylor et al., 2017; Taylor & Giani, 2019), though our findings

suggest that this diversionary effect—or a potential for students to feel "content" with at least some credential and subsequently dropout—is highly unlikely (Cortez-Lopez & Taylor, 2020, p. 71). Furthermore, our findings of virtually no impacts on students' employment and wages additionally suggest such an occurrence where students would substitute work for school could be irrational.

On the labor market front, previous studies that applied worker fixed effects models to state administrative datasets ultimately found large positive returns to associate degrees, but we find no labor market return to a reverse transfer degree. The most obvious explanation for this difference is the type of associate degree awarded. As noted, 99% of the reverse transfer degrees awarded through the reverse transfer program in Tennessee are liberal arts degrees, a more general type of degree that prior work suggests may have a more limited return. Bahr et al. (2015) estimated returns using data from community college students in Michigan and found that, conditional on working, an associate degree increased earnings for women by 32% and for men by 27%. However, their main estimates obscure significant heterogeneity by field. Positive returns to associate degrees are driven overwhelmingly by awards in nursing and other health fields, especially for women, and other technical fields, including IT, computer science, and engineering (Bahr et al., 2015). In accordance with our reverse transfer results, they find no statistically significant return for associate degrees in liberal arts for men or women, and their 95% confidence intervals rule out increases greater than 7% and 6% respectively.

It is also worth noting that Bahr et al. (2015) and most other studies estimating returns to associate degrees typically estimate the combined effect of both required credits and the official credential. By contrast, because our control group consists of students who are observationally similar to reverse transfer degree awardees and, in particular, have met the program's minimum GPA and credit thresholds, our estimates are largely isolating only the credential itself or the signaling effect of the associate degree rather than the additional contribution of credit accumulation and associated human capital. Especially in the case of a liberal arts associate degree, such signaling that could increase employment and wages is likely to be limited. In all, this type of degree instead suggests that students have completed general education courses but does not confer a specific occupational certification or indicate that a student has technical skills for a particular occupation. Such limitations are detected by the students themselves, where reverse transfer students across three different states noted the potential weakness of a "general" associate degree compared to a "vocational" or "occupational" degree (e.g., Associate of Science in Nursing or Engineering) when discussing their perceived value of such a degree (Cortez-Lopez & Taylor, 2020, p. 70). Moreover, the students eligible for reverse transfer are those who have already successfully transferred to a four-year institution and maintained enrolled. It is possible that their current enrollment at a four-year institution may provide essentially the same information about their academic abilities to a potential employer as having an associate degree in hand.

### *Implications for Policy*

Despite the minimal at best impacts of reverse transfer associate degrees, our findings should not be construed to suggest that these policies are not worth investment or consideration. These policies confer credentials upon students that have been *earned* through students' credit

accumulation and academic performance (i.e., GPA) and funded through both student (e.g., tuition and fees, foregone wages) and institutional resources (e.g., instruction, student support services). In this light—on an *equity* rather than *economic* front—reverse transfer associate degree programs represent a payment of credit when credit is indeed due. Such recognition for credit may also extend to institutions, such as in Tennessee, where community colleges and universities alike "earn" additional funds through the state's outcomes-based funding formula for each additional reverse transfer degree awarded (THEC, 2021c). Furthermore, our findings of no negative impacts of these policies should assuage the noted concerns of policymakers and institutional leaders alike regarding students' ultimate bachelor's degree attainment prospects. In all, reverse transfer policies are relatively simple administrative interventions that hold the potential to support both students and institutions. Such policies could be particularly attractive for states or systems with modest abilities to support student success. Policymakers should thus consider the costs and benefits of these and similar policies given any expected payoffs and, considering our findings, carefully reflect on ways in which reverse transfer programs can be designed to yield meaningful impacts on students' academic and labor market outcomes.

Two possible improvements to reverse transfer programs include widening the policy's eligibility criterion and working to identify ways that students could qualify for a more applied or technical credential that is likely to yield positive labor market returns. First, reverse transfer policies in Tennessee and other states are relatively narrowly applied, and students are easily disqualified. While our analysis is able to compare recipients to similar non-recipients, considering the GPA and credit hour thresholds alone, we predict that 7,927 students are eligible for a reverse transfer associate degree on these margins—nearly 5,000 more than were actually awarded across our study period—if it were not for them being disqualified for a variety of other reasons, including having sufficient credits but the "wrong" credits (e.g., not having completed a specific course sequence or general education requirement). We are also unsure whether these additional eligibility criteria are readily known to students. While we find generally limited impacts of these reverse transfer associate degrees, any possible benefits could be important for students who would otherwise qualify. Second, while it is likely that so many liberal arts and sciences / liberal studies degrees are awarded through reverse transfer *because* students fail to meet specific course degree requirements for more specialized degrees, states and institutions should work to identify ways (or alter program criteria) for students to qualify for these credentials that prior works suggest do have positive impacts on employment and wages (Bahr et al., 2015; Carruthers & Sanford, 2018; Grosz, 2020; Stevens et al., 2019).

### *Conclusion*

Our findings represent the strongest and most comprehensive evidence to date on the impacts of reverse transfer associate degrees on an array of students' short- and intermediate-term academic and labor market outcomes. Here, we not only fill an existing gap given a dearth of credible evidence on these policies across existing literature, but our results also provide new quasi-experimental evidence on the sheepskin effects of liberal arts associate degrees. Our findings that neither receipt nor eligibility for a reverse transfer associate degree positively (or negatively) impacts students' outcomes contrast those of prior works, strongly underscoring the importance of study replication, extension, and re-evaluation—particularly when the advent of better data and more sophisticated tools can meaningfully alter the knowledge base on a given

topic (e.g., Gurantz & Odle, 2022). While our results do not suggest that reverse transfer policies should be abandoned or secluded from consideration, our results do suggest that policymakers should consider the costs and potential benefits of these policies and work to identify ways that reverse transfer could yield meaningful impacts for students if such credentials are truly intended to propel persistence through baccalaureate attainment and yield positive impacts on employment and earnings. The current design and operation of reverse transfer associate degree programs are unlikely to meet these goals without additional intervention.

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**Table 1.** *Descriptive statistics for term analysis on GPA and credits.*

| | Treatment: Awarded Reverse Transfer | | Control: All Other Reverse Transfer Opt-In Students | | | Control: Expected Reverse Transfer Awardees | | |
|---|---|---|---|---|---|---|---|---|
| | *Mean* | *SD* | *Mean* | *SD* | *p* | *Mean* | *SD* | *p* |
| *Outcomes* | | | | | | | | |
| Term GPA | 2.93 | 0.91 | 2.90 | 1.01 | 0.323 | 2.92 | 1.00 | 0.748 |
| Term Credit Hours Attempted | 11.32 | 4.33 | 10.60 | 4.68 | <0.001 | 10.66 | 4.71 | <0.001 |
| Term Credit Hours Earned | 10.47 | 4.50 | 9.58 | 4.81 | <0.001 | 9.68 | 4.82 | <0.001 |
| *Characteristics* | | | | | | | | |
| Admission Test Score (ACT/Equivalent) | 20.67 | 3.40 | 21.10 | 3.63 | <0.001 | 21.11 | 3.63 | <0.001 |
| Gender (Female) | 0.57 | 0.50 | 0.56 | 0.50 | 0.589 | 0.55 | 0.50 | 0.236 |
| Age | 24.99 | 6.80 | 26.11 | 8.11 | <0.001 | 25.23 | 7.28 | 0.201 |
| Residency (In-State) | 0.97 | 0.16 | 0.97 | 0.17 | 0.256 | 0.97 | 0.17 | 0.230 |
| Intensity (Full-Time) | 0.65 | 0.48 | 0.56 | 0.50 | <0.001 | 0.57 | 0.50 | <0.001 |
| Student Status: First-Time at Institution | 0.32 | 0.47 | 0.16 | 0.37 | <0.001 | 0.17 | 0.37 | <0.001 |
| Student Status: Readmitted at Institution | 0.06 | 0.24 | 0.07 | 0.25 | 0.174 | 0.06 | 0.24 | 0.851 |
| Student Status: Returning at Institution | 0.62 | 0.49 | 0.77 | 0.42 | <0.001 | 0.77 | 0.42 | <0.001 |
| Race: African American | 0.17 | 0.37 | 0.20 | 0.40 | 0.001 | 0.18 | 0.38 | 0.151 |
| Race: Am. Indian/AK Native | 0.00 | 0.05 | 0.00 | 0.07 | 0.098 | 0.01 | 0.07 | 0.081 |
| Race: Asian/Pacific Islander | 0.03 | 0.16 | 0.02 | 0.15 | 0.566 | 0.02 | 0.15 | 0.634 |
| Race: Multiple | 0.02 | 0.13 | 0.02 | 0.12 | 0.438 | 0.02 | 0.13 | 0.604 |
| Race: Other/Unknown | 0.07 | 0.26 | 0.07 | 0.25 | 0.296 | 0.07 | 0.25 | 0.640 |
| Race: White | 0.72 | 0.45 | 0.69 | 0.46 | 0.057 | 0.71 | 0.46 | 0.406 |
| Unique N | 3,025 | | 6,169 | | | 5,030 | | |

Notes: Table reports descriptive statistics and standard deviations for students who received a reverse transfer associate degree and two comparison groups: all other Tennessee Reverse Transfer program opt-in students and those who were expected to be awarded a reverse transfer associate degree given cumulative community college credits and GPA. Data are for students' term immediately prior to their last reverse transfer degree audit. *p* value is on t-test of mean difference between reverse transfer students and the respective control group.

**Table 2.** *Descriptive statistics for cohort analysis on bachelor's degree attainment.*

| | Treatment: Reverse Transfer Award Eligible | | Control: Reverse Transfer Award Ineligible | | |
|---|---|---|---|---|---|
| | *Mean* | *SD* | *Mean* | *SD* | *p* |
| *Outcome* | | | | | |
| Bachelor's Degree Attainment | 0.79 | 0.40 | 0.71 | 0.45 | <0.001 |
| *Characteristics* | | | | | |
| Community College GPA | 3.20 | 0.61 | 2.81 | 1.24 | <0.001 |
| Community College Credits | 46.22 | 27.24 | 9.51 | 12.32 | <0.001 |
| Admission Test Score (ACT/Equivalent) | 22.47 | 3.87 | 22.87 | 3.92 | <0.001 |
| Gender (Female) | 0.59 | 0.49 | 0.56 | 0.50 | 0.016 |
| Age | 24.29 | 6.24 | 21.06 | 3.92 | <0.001 |
| Residency (In-State) | 0.95 | 0.22 | 0.98 | 0.16 | <0.001 |
| Intensity (Full-Time) | 0.83 | 0.38 | 0.93 | 0.26 | <0.001 |
| Student Status: First-Time at Institution | 0.02 | 0.15 | 0.05 | 0.21 | <0.001 |
| Student Status: Not Specified/Unknown | 0.00 | 0.06 | 0.00 | 0.04 | 0.191 |
| Student Status: Readmitted at Institution | 0.02 | 0.12 | 0.01 | 0.12 | 0.884 |
| Student Status: Returning at Institution | 0.96 | 0.20 | 0.94 | 0.24 | 0.000 |
| Race: African American | 0.17 | 0.37 | 0.18 | 0.38 | 0.216 |
| Race: Am. Indian/AK Native | 0.00 | 0.05 | 0.00 | 0.05 | 0.985 |
| Race: Asian/Pacific Islander | 0.03 | 0.18 | 0.02 | 0.14 | 0.001 |
| Race: Multiple | 0.01 | 0.11 | 0.02 | 0.15 | 0.003 |
| Race: Other/Unknown | 0.06 | 0.24 | 0.06 | 0.23 | 0.462 |
| Race: White | 0.72 | 0.45 | 0.72 | 0.45 | 0.791 |
| Unique N | 3,124 | | 3,151 | | |

Notes: Table reports descriptive statistics and standard deviations for students predicted to be eligible and ineligible for a reverse transfer associate degree award upon transfer based upon students' community college GPA and credits. Data are for 2014 transfer cohort, the year immediately prior to the start of the Tennessee Reverse Transfer program. *p* value is on t-test of differences between group means.

**Table 3.** *Descriptive statistics for academic year analysis on employment and wages.*

| | Treatment: Awarded Reverse Transfer | | Control: All Other Reverse Transfer Opt-In Students | | |
|---|---|---|---|---|---|
| | *Mean* | *SD* | *Mean* | *SD* | *p* |
| *Outcomes* | | | | | |
| Ever Employed | 0.80 | 0.40 | 0.79 | 0.41 | 0.562 |
| Quarters Employed | 2.73 | 1.63 | 2.66 | 1.64 | 0.098 |
| Yearly Earnings (ln) | 9.02 | 1.21 | 9.05 | 1.29 | 0.334 |
| Yearly Earnings (2020 $) | 11,752 | 14,472 | 13,420 | 20,078 | <0.001 |
| *Characteristics* | | | | | |
| Community College GPA | 3.09 | 0.50 | 3.09 | 0.55 | 0.688 |
| Community College Credits | 59.80 | 17.52 | 49.83 | 21.48 | <0.001 |
| Age | 23.94 | 6.25 | 25.60 | 7.72 | <0.001 |
| Gender (Female) | 0.59 | 0.49 | 0.56 | 0.50 | 0.016 |
| Qtrs. Enrolled in Univ. | 2.13 | 0.78 | 1.97 | 0.95 | <0.001 |
| Ever Enrolled Full-Time | 0.81 | 0.39 | 0.72 | 0.45 | <0.001 |
| Ever Enrolled Part-Time | 0.47 | 0.50 | 0.47 | 0.50 | 0.849 |
| First-Time at Univ. | 0.38 | 0.49 | 0.33 | 0.47 | <0.001 |
| First-Time Freshman at Univ. | 0.01 | 0.10 | 0.02 | 0.13 | 0.003 |
| Returning Student at Univ. | 0.88 | 0.32 | 0.80 | 0.40 | <0.001 |
| Readmitted Student at Univ. | 0.10 | 0.30 | 0.10 | 0.31 | 0.319 |
| Unique N | 2,607 | | 4,028 | | |

Notes: Table reports descriptive statistics and standard deviations for students who received a reverse transfer associate degree and all other Tennessee Reverse Transfer program opt-in students. Data are for students' academic year immediately prior to their last reverse transfer degree audit year. *p* value is on t-test of mean difference between reverse transfer students and control group peers.

**Table 4.** *Difference-in-difference estimated impacts of reverse transfer associate degree receipt on term GPA and credits, by counterfactual group.*

| | GPA | | Credits Earned | | Credits Attempted | |
|---|---|---|---|---|---|---|
| | *Opt-In* | *Expected* | *Opt-In* | *Expected* | *Opt-In* | *Expected* |
| Awarded Reverse Transfer Degree | 0.038* (0.018) | 0.046* (0.019) | 0.047 (0.065) | 0.033 (0.067) | -0.045 (0.044) | -0.068 (0.046) |
| Baseline | 2.85 | 2.86 | 10.00 | 10.10 | 11.20 | 11.30 |
| Observations | 50,679 | 45,479 | 50,679 | 45,479 | 50,679 | 45,479 |
| Adjusted $R^2$ | 0.401 | 0.395 | 0.650 | 0.649 | 0.778 | 0.776 |

Notes: + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Table reports coefficients and robust standard errors (in parentheses) clustered at the student level. Outcomes are within term/semester. "Opt-In" comparison group includes all other Tennessee Reverse Transfer program opt-in students. "Expected" comparison includes all students who were expected to be awarded a reverse transfer associate degree given cumulative community college credits and GPA. Models include student, audit-relative term, academic year-term, and major fixed effects plus covariate controls: registration status, enrollment intensity, and, for GPA, term credit hours attempted. Baseline are outcome means for respective control group across post-audit period.

**Table 5.** *Difference-in-difference estimated impacts of reverse transfer award eligibility on bachelor's degree attainment.*

| | Bachelor's Degree Attainment |
|---|---|
| Eligible for Reverse Transfer Degree | -0.009 |
| | (0.008) |
| Baseline | 0.558 |
| Observations | 47,630 |
| Adjusted $R^2$ | 0.255 |

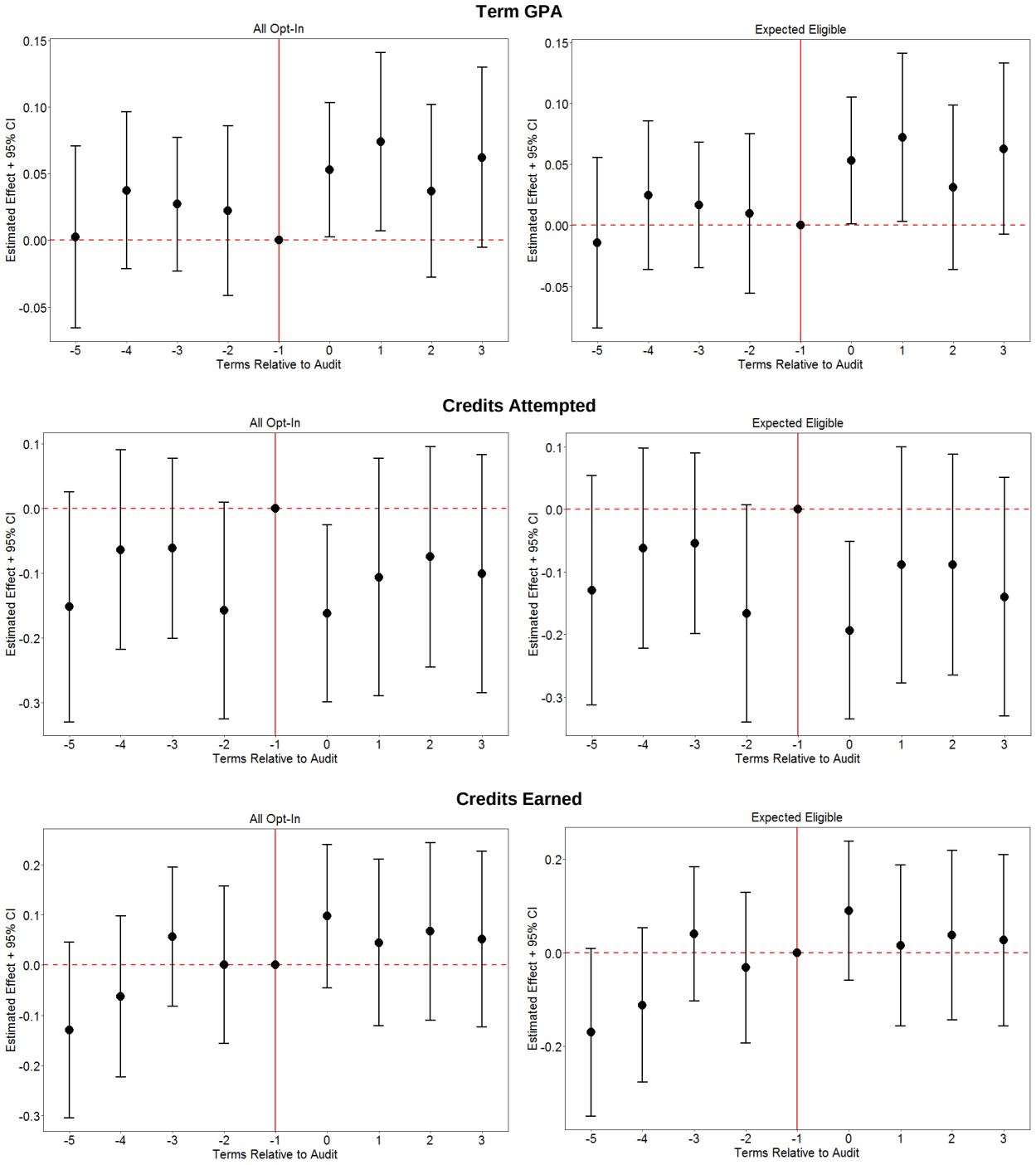
Notes: + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Table reports coefficients and robust standard errors (in parentheses) clustered at the student level. Outcome is ever completing a bachelor's degree. Eligibility for a reverse transfer degree is estimated using students' cumulative community college GPA and credits at the time of transfer. Model includes year, age, and major fixed effects plus covariate controls: admission test score, gender, race, residency status, registration status, enrollment intensity, community college GPA, and community college credits. Baseline is outcome mean for control group (students predicted to be ineligible for a reverse transfer award upon transfer) across post-audit period.

**Table 6.** *Difference-in-difference estimated impacts of reverse transfer associate degree receipt on academic year analysis on employment and wages, including heterogeneity by gender.*

| | Ever Employed | Quarters Employed | Yearly Earnings (log) | Yearly Earnings (2020 Dollars) |
|---|---|---|---|---|
| *Panel A: All Students* | | | | |
| Awarded Reverse Transfer- | 0.005 | -0.018 | -0.022 | -628* |
| Enrolled at University | (0.010) | (0.036) | (0.030) | (313) |
| Awarded Reverse Transfer- | 0.034* | 0.084+ | -0.029 | -121 |
| Not Enrolled | (0.013) | (0.049) | (0.037) | (560) |
| Control Mean: Enrolled | 0.784 | 2.447 | 9.179 | 14,156 |
| Control Mean: Not Enrolled | 0.758 | 2.346 | 9.890 | 23,161 |
| N | 50,317 | 50,317 | 39,077 | 50,317 |
| Number of Students | 6,647 | 6,647 | 6,647 | 6,647 |
| *Panel B: Female Students* | | | | |
| Awarded Reverse Transfer- | 0.005 | -0.018 | 0.004 | -588 |
| Enrolled at University | (0.012) | (0.047) | (0.039) | (374) |
| Awarded Reverse Transfer- | 0.028+ | 0.080 | 0.018 | 308 |
| Not Enrolled | (0.016) | (0.062) | (0.050) | (662) |
| Control Mean: Enrolled | 0.803 | 2.547 | 9.163 | 14,074 |
| Control Mean: Not Enrolled | 0.782 | 2.423 | 9.807 | 21,753 |
| N | 28,624 | 28,624 | 22,703 | 28,624 |
| Number of Students | 3,804 | 3,804 | 3,654 | 3,804 |
| *Panel C: Male Students* | | | | |
| Awarded Reverse Transfer- | 0.005 | -0.009 | -0.049 | -565 |
| Enrolled at University | (0.015) | (0.056) | (0.047) | (515) |
| Awarded Reverse Transfer- | 0.041+ | 0.096 | -0.088 | -334 |
| Not Enrolled | (0.021) | (0.078) | (0.055) | (948) |
| Control Mean: Enrolled | 0.761 | 2.328 | 9.198 | 14,256 |
| Control Mean: Not Enrolled | 0.727 | 2.243 | 10.010 | 25,051 |
| N | 21,693 | 21,696 | 16,374 | 21,696 |
| Number of Students | 2,843 | 2,843 | 2,705 | 2,843 |

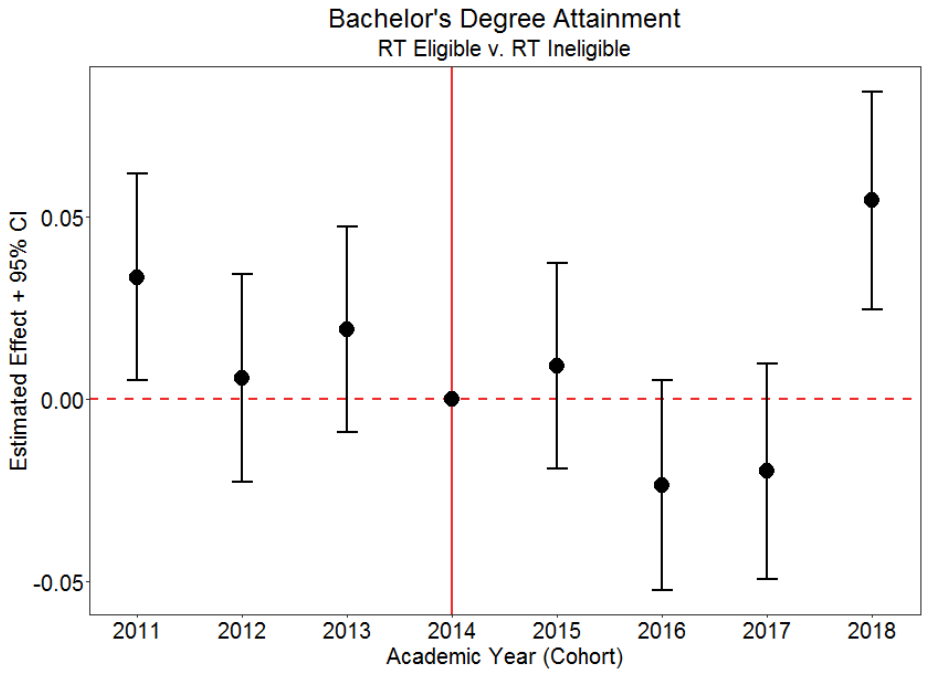
Notes: + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Table reports coefficients and robust standard errors (in parentheses) clustered at the student level. Outcomes are: ever employed in academic year, number of quarters employed, ln(yearly earnings) for earnings >$0, and yearly earnings in 2020 dollars. All models include student, school year by enrollment status, audit-relative year by enrollment status, terms enrolled by enrollment status, age by enrollment status, ever enrolled part-time by enrollment status, ever enrolled full-time by enrollment status, and indicators for whether student is classified as a first-time freshman, returning student, readmitted student, and first time enrollee by enrollment status fixed effects. Control mean is the outcome for students not awarded reverse transfer in the post-audit time period given by enrollment status.

**Figure 1.** *Event study figures for term GPA and credits, by counterfactual group.*



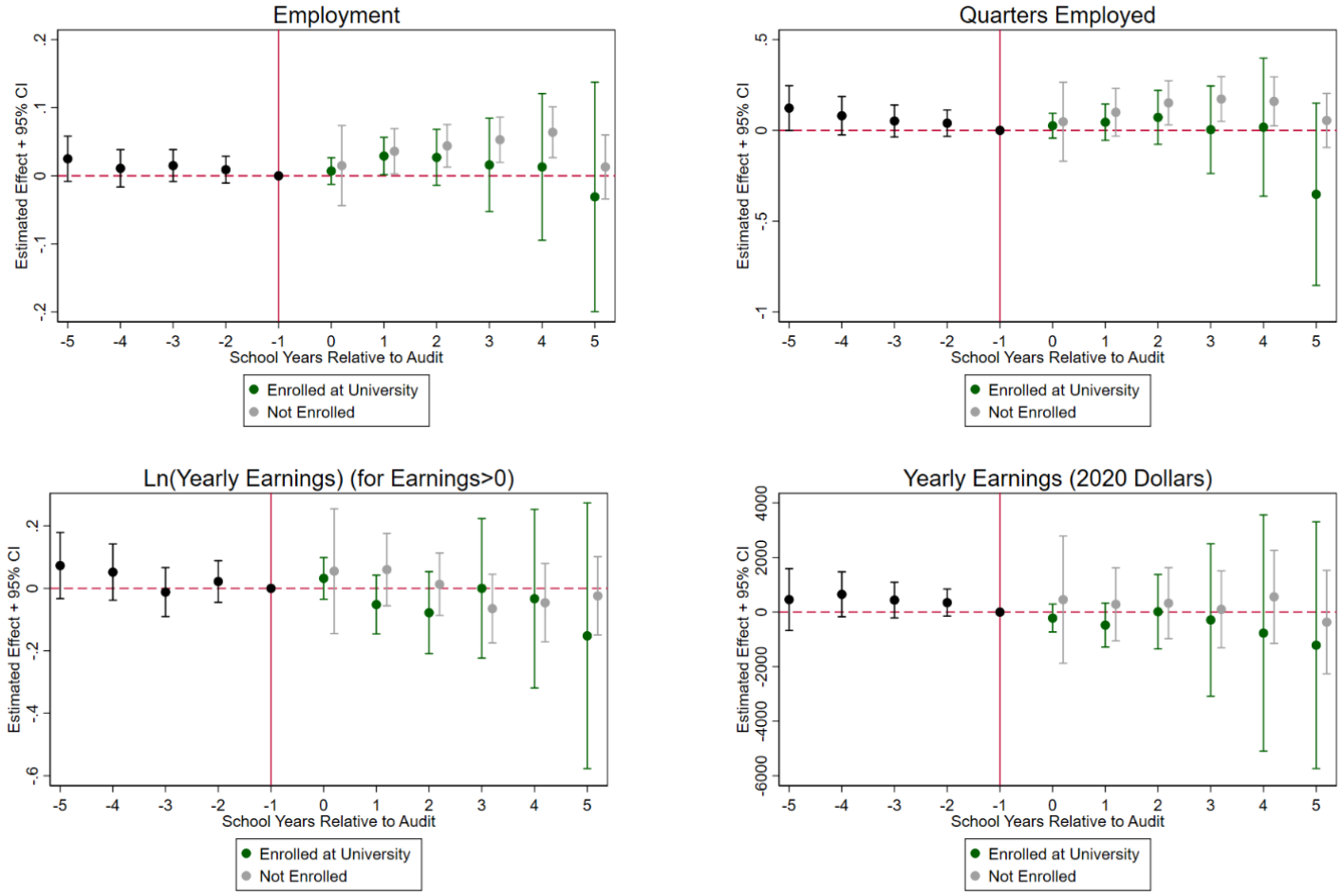

Notes: Figures plot event-study estimates from equation 4 alongside 95% confidence intervals comparing term outcomes for reverse transfer recipients to two counterfactual groups. "All Opt-In" comparison group includes all other Tennessee Reverse Transfer program opt-in students. "Expected Eligible" comparison includes all students who were expected to be awarded a reverse transfer associate degree given cumulative community college credits and GPA. Models include student, audit-relative term, academic year-term, and major fixed effects plus covariate controls: registration status, enrollment intensity, and, for GPA, term credit hours attempted.

**Figure 2.** *Event study figure for cohort bachelor's degree attainment.*




Notes: Figure plots event-study estimates from equation 5 alongside 95% confidence intervals comparing reverse transfer eligible and ineligible students in transfer cohorts before and after the policy's 2015 introduction. Eligibility for a reverse transfer degree is estimated using students' cumulative community college GPA and credits at the time of transfer. Model includes year, age, and major fixed effects plus covariate controls: admission test score, gender, race, residency status, registration status, enrollment intensity, community college GPA, and community college credits.

**Figure 3.** *Event study figures for academic year employment and wages.*

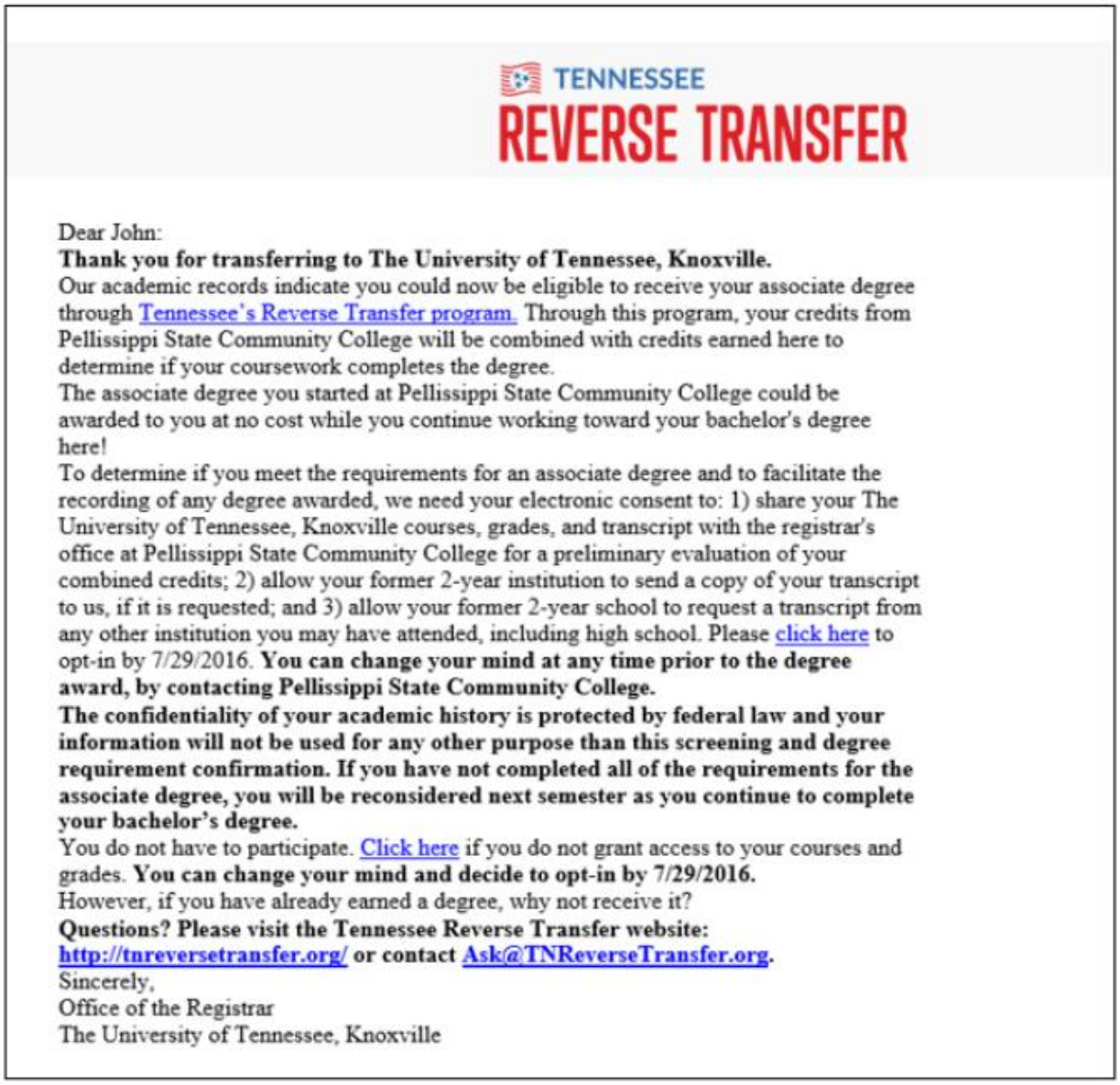



Notes: Figures plot event-study estimates from equation 6 alongside 95% confidence intervals comparing yearly workforce outcomes for reverse transfer recipients (by enrollment status) to expected recipients based upon program rules. All models include student, school year by enrollment status, audit-relative year by enrollment status, terms enrolled by enrollment status, age by enrollment status, ever enrolled part-time by enrollment status, ever enrolled full-time by enrollment status, and indicators for whether student is classified as a first-time freshman, returning student, readmitted student, and first time enrollee by enrollment status fixed effects.

# APPENDIX A: Student Email Correspondence

Appendix Figure A.1

## Invitation to Opt-in

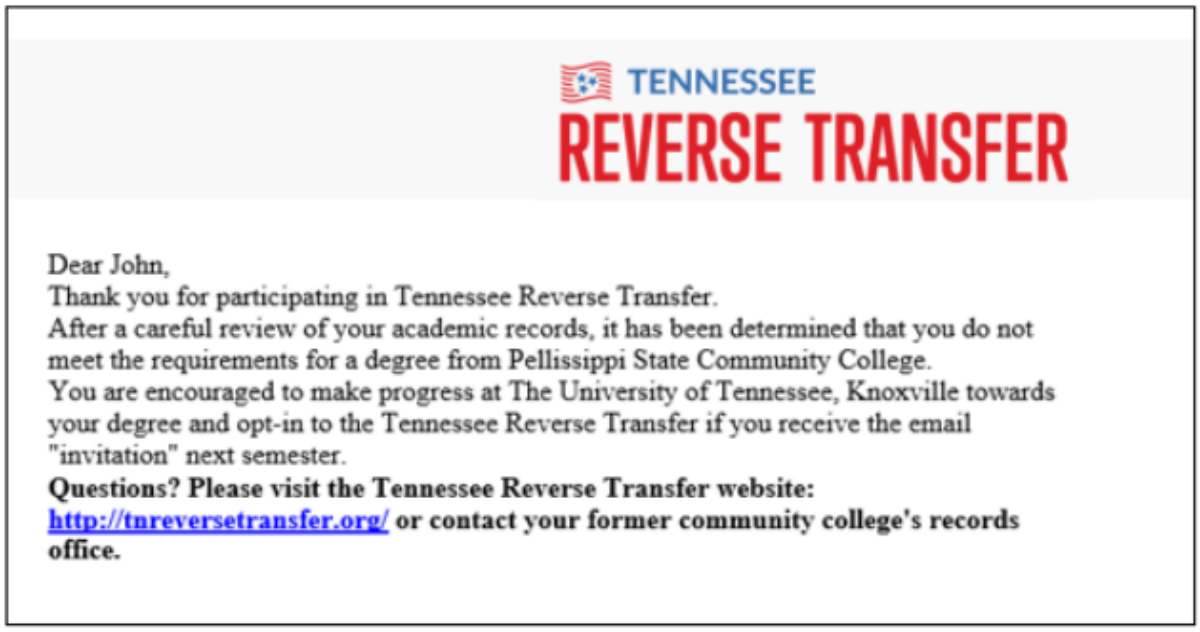


TENNESSEE
REVERSE TRANSFER

Dear John:
**Thank you for transferring to The University of Tennessee, Knoxville.**
Our academic records indicate you could now be eligible to receive your associate degree through Tennessee's Reverse Transfer program. Through this program, your credits from Pellissippi State Community College will be combined with credits earned here to determine if your coursework completes the degree.
The associate degree you started at Pellissippi State Community College could be awarded to you at no cost while you continue working toward your bachelor's degree here!
To determine if you meet the requirements for an associate degree and to facilitate the recording of any degree awarded, we need your electronic consent to: 1) share your The University of Tennessee, Knoxville courses, grades, and transcript with the registrar's office at Pellissippi State Community College for a preliminary evaluation of your combined credits; 2) allow your former 2-year institution to send a copy of your transcript to us, if it is requested; and 3) allow your former 2-year school to request a transcript from any other institution you may have attended, including high school. Please click here to opt-in by 7/29/2016. **You can change your mind at any time prior to the degree award, by contacting Pellissippi State Community College.**
**The confidentiality of your academic history is protected by federal law and your information will not be used for any other purpose than this screening and degree requirement confirmation. If you have not completed all of the requirements for the associate degree, you will be reconsidered next semester as you continue to complete your bachelor's degree.**
You do not have to participate. Click here if you do not grant access to your courses and grades. **You can change your mind and decide to opt-in by 7/29/2016.**
However, if you have already earned a degree, why not receive it?
**Questions? Please visit the Tennessee Reverse Transfer website: http://tnreversetransfer.org/ or contact Ask@TNReverseTransfer.org.**
Sincerely,
Office of the Registrar
The University of Tennessee, Knoxville

Appendix Figure A.2

## No Degree Awarded



TENNESSEE
REVERSE TRANSFER

Dear John,
Thank you for participating in Tennessee Reverse Transfer.
After a careful review of your academic records, it has been determined that you do not meet the requirements for a degree from Pellissippi State Community College.
You are encouraged to make progress at The University of Tennessee, Knoxville towards your degree and opt-in to the Tennessee Reverse Transfer if you receive the email "invitation" next semester.
**Questions? Please visit the Tennessee Reverse Transfer website: http://tnreversetransfer.org/ or contact your former community college's records office.**

# APPENDIX B: Sensitivity Test

**Table B.1.** *Difference-in-difference estimated impacts of reverse transfer award eligibility on bachelor's degree attainment; shortened post-periods given introduction of Tennessee Promise.*

| | Bachelor's Degree Attainment |
|---|---|
| **Post: 2015 Only** | |
| Eligible for Reverse Transfer Degree | -0.027* |
| | (0.012) |
| Baseline | 0.694 |
| Observations | 29,403 |
| Adjusted $R^2$ | 0.182 |
| **Post: 2015 and 2016** | |
| Eligible for Reverse Transfer Degree | -0.036*** |
| | (0.009) |
| Baseline | 0.683 |
| Observations | 35,250 |
| Adjusted $R^2$ | 0.184 |

Notes: + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Table reports coefficients and robust standard errors (in parentheses) clustered at the student level. Outcome is ever completing a bachelor's degree. Eligibility for a reverse transfer degree is estimated using students' cumulative community college GPA and credits at the time of transfer. Model includes year, age, and major fixed effects plus covariate controls: admission test score, gender, race, residency status, registration status, enrollment intensity, community college GPA, and community college credits. Baseline is outcome mean for control group (students predicted to be ineligible for a reverse transfer award upon transfer) across post-audit period. Post-policy-adoption window is shortened to 2015 and 2015/16 (respectively) to remove potential interaction of Tennessee Promise with Reverse Transfer program impacts.