RITA Consortium

FINAL EVALUATION REPORT

September 2017

RITA RURAL INFORMATION TECHNOLOGY ALLIANCE

Prepared by:

The Improve Group

Executive Summary

In 2013, the U.S. Department of Labor announced its third round of Trade Adjustment Assistance Community College and Career Training (TAACCCT) grants. The goal of these grants is to expand demand-driven skills training and strengthen employer partnerships. In theory, as individuals become more credentialed, they become more employable. Following the same train of thought, as these students gain skills and credentials, they become more valuable to employers and are likely to receive higher wages.

Pine Technical and Community College, Ridgewater College, Central Lakes College, and North Central Texas College make up the Rural Information Technology Alliance (RITA). TAACCCT granted a total of $18.3 million over four years for Information Technology (IT) education at these schools, which are based in Minnesota and Texas. This ranged from student support, such as intensive advisor coaching, to state-of-the-art infrastructure additions, such as new learning technology.

A third-party evaluator, The Improve Group, evaluated both grant implementation and student outcomes at RITA schools. In examining the implementation of the grants at each college, the evaluator determined the degree of fidelity to the original grant proposal and the level of quality of implementation. The evaluator examined capacity that was built within the consortium that would sustain beyond the grant period's end. In measuring the outcomes for students, the evaluator measured changes before and after grant implementation, including in:

- Academic program completion rates,
- Wages for incumbent workers, and
- Employment and job retention for students not employed at the time of enrollment.

The information in this report has two main purposes: to assist grant and college staff in decision-making concerning future grants of a similar nature, and to serve as a tool for reporting to the Department of Labor. It was prepared for the Employment and Training Administration (USDOL/ETA) to comply with the reporting- and record-keeping requirements of the grant.

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Setting the Context

Background

The RITA consortium includes four community colleges situated in unique settings. Each school partnered to form RITA with the goal of providing students with new opportunities in an advanced IT program. Pine Technical and Community College (PTCC) in Pine City, Minnesota, is the lead institution of RITA. Joining it are Ridgewater College in Willmar and Hutchinson, Minnesota; Central Lakes College (CLC) in Brainerd, Minnesota; and North Central Texas College (NCTC) in Corinth, Flower Mound, and Gainesville, Texas.

The RITA model involved four primary strategies: creating, integrating and expanding programs, supporting students, recruiting and retaining students, and engaging industries and partners. As the four schools operated in different contexts, these strategies looked different at each school.

Program creation, integration, and expansion involved curriculum and infrastructure changes to assist students in completing a program, finding a job, and securing higher wages. This included hiring new faculty, training instructors, adding new classes, and adapting curriculum to better serve today's industry needs. Changes to infrastructure included upgrades to technology, equipment, and software—such as adding IT labs.

Student support centered around those in the IT programs, including orienting potential students to the programs available. Education and Employment Advisors, or "EEAs," provided case management services that were central to this strategy. EEAs coached students on soft skills as well as aligning them with the right academic plans and keeping them on-track through program completion. Toward the end of their programs, students also received career preparation and coaching that routed them into long-term, industry-related employment.

Recruitment and retention strategies included marketing and outreach to attract students to these new and improved IT programs. These efforts specifically targeted certain groups including Trade Adjustment Assistance (TAA) workers, under-employed workers, veterans, and non-traditional students. Schools also used RITA resources to vastly update their online presence and social media marketing strategies.

Lastly, RITA schools increased engagement with industries and partners to align their curricula with employer standards and preferences. Each RITA college developed and deepened relationships with regional industries. Industry involvement influenced the development and adaptations seen in RITA programming and coursework. In some cases, these relationships also led to more opportunities for students, such as internships.

Within the consortium, RITA colleges worked together to implement shared strategies and activities, utilizing the consortium partners for strategizing and problem-solving. Additionally, each college adapted strategies for its unique context. Combined, RITA schools expected three student outcomes:

- That academic program completion rates would increase,
- That RITA students who were employed before their program (incumbent workers) would have higher wages afterward, and
- That students who were not employed at enrollment would have higher employment and retention.

To evaluate RITA student outcomes, The Improve Group used a quasi-experimental design featuring a matched comparison group analysis to examine expected outcomes.

Methodology

Design Summary

The Improve Group conducted a mixed-method evaluation, drawing from qualitative and quantitative methods, to assess RITA's outcomes and implementation processes. Quantitative methodology was implemented to assess program impact on student outcomes. Qualitative methodology was used to analyze the context that contributed to the outcomes, program implementation, capacity, and sustainability measures once the grant had ended.

Outcome Analysis Methodology

The outcome evaluation conducted for this study was based on a quasi-experimental design. The treatment group was made up of students participating in RITA programming, while a comparison group was selected from prior students in the same IT program. The groups were compared against each other to answer the following research questions.

Research Questions

The outcome evaluation component of this project was based on five main research questions, all focused on determining RITA impact on students. These questions framed the sample selection and analysis process.

1. What impact did RITA have on student completion rates?
2. What impact did Employment and Education Advisors (coaches or "EEAs") have on student completion rates?
3. What impact did RITA have on wages for incumbent workers in the IT program?
4. What impact did RITA have on students getting employed after leaving school?
5. What impact did RITA have on students being retained in a job after leaving school?

Defining and Selecting the Sample

Treatment Group

RITA was implemented as a set of integrated strategies and improvements to pre-existing IT departments at the community colleges. As such, random assignment was impractical. Individuals self-selected to enroll as a student into the IT program during the grant. As grant funding improved infrastructure, paid for EEA staff, and subsidized faculty, effectively improving all classes in the IT department, the definition of a treatment student was broad. A student was considered part of the treatment group if s/he took two or more IT classes *at any point* during the RITA implementation period. For many students, one IT class fulfills a non-IT degree requirement. However, taking two or more IT classes was more likely to indicate some interest in the subject area, whether or not the student decided to pursue it fully. Students were still counted in this sample if they started school prior to RITA grant funding, as long as they took two or more IT classes *during the RITA time period*.

Academic calendar for RITA colleges

	Start of IT classes being considered "treatment"	**End of IT classes being part of "treatment"**
NCTC	Spring 2014	Spring 2017
Minnesota State colleges	Fall 2014	Spring 2017

Using the base criteria for inclusion in the treatment group, students were seen as being divided even further into two separate groups: Sub-group 1, or those who received "student services" from EEAs/coaches, and Sub-group 2, or those who did not or were documented as not pursuing an IT program of study. As the comparison group drew from non-IT students to improve sample numbers, the latter sub-group was still included in analyses. The initial sample for the treatment groups is listed in the following chart.

Number of students who did and did not receive student services from EEAs/coaches, by RITA college

College	**Number of students who received student services**	**Number of students who did not receive student services**	**Total**
CLC	166	411	577
NCTC	683	0	683
PTCC	110	258	368
RC	152	115	267

Comparison Population

The comparison group was based on the sample principles as the treatment to minimize bias. Students from the treatment schools who took two or more IT classes at some point in the five years prior to the grant were recruited to participate. This set of criteria created an environment as similar as possible to the treatment group: individuals self-selected into enrollment, were IT students, and experienced the same school environment. This strategy certainly held some validity concerns, as is discussed in the Limitations section below.

The recruitment process for participation in the study involved contacting former students who met the aforementioned criteria. These individuals were explained the purpose of the study, were asked to grant permission to release their wage data, and were asked to participate in a 20-minute intake survey about their demographic characteristics. As an incentive, the sample was offered an entry into a raffle to win an iPad mini.

Using these strategies, only a small percentage of students opted in to the study. This group was used as the comparison in all employment- and wage-related analysis. The initial sample of students who met the required criteria, but who had not granted wage data releases, were all used in answering the research question regarding completion.

Due to the nature of community college, many students initially meeting the criteria for the comparison sample were moved to the treatment group after returning to school during the RITA time period to continue taking IT classes.

Data Sources

Analysis

The comparison and treatment groups were initially analyzed using cross tabulations, frequencies, and means testing. This view of the data demonstrated that there was significant missing demographic information for treatment and comparison students who had not completed an intake form. However, of those for whom data was available, statistical tests showed that the groups looked similar in multiple characteristics.

Nevertheless, due to inadequate intake data collection on more nuanced demographic characteristics of the sample, and a small sample size, basic school data was used to create a propensity score based on multiple imputation. The propensity score then became the principal covariate in the regression models for each of the research questions.

Completion rates were calculated by looking at whether a student completed any desired credential, and how many (out of those they declared). Credentials were disaggregated by type to see with what frequency students received an associate degree (approximately 60 credits), Certificate (approximately 19 credits), diploma (37 credits, at CLC only), or Certification (based on passing a test after an approximately three- to four-credit course). At Ridgewater College, diplomas and associate degrees were combined into one outcome variable as the numbers of credits needed to complete each were seen as comparable.

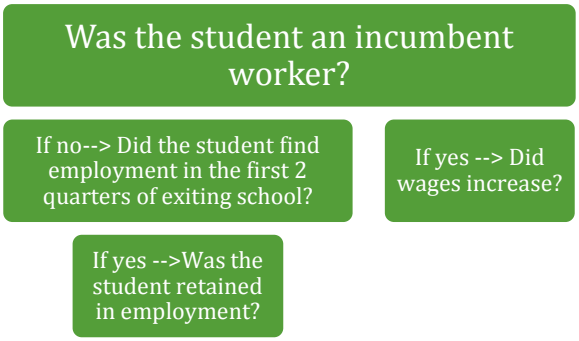
Employment and Education Advisor impact was intended to be measured by frequency of contacts per student. However, since analysis of the completion rates did not show positive impact on students, this analysis was not conducted.

Wage analysis was calculated only for students whose date of enrollment *into an IT program* overlapped with a quarter in which they received a wage. The wages in that quarter were then compared to any subsequent quarter to see if there was an increase.

Impact on employment was determined by taking any student who did not receive a wage in the quarter that they started their IT program, and calculating whether they received a wage in the quarter that they left school. Students did not need to have completed a credential to be calculated in this outcome, with the hypothesis being that any schooling likely helps students in finding a job. Finding employment after leaving school was also counted if the student received a wage in the quarter following the quarter of leaving school.

Of the students who were found to have employment within the first two quarters of exiting school, retention was determined based on whether the student had a wage in the fourth quarter following the quarter they left school.

The following chart visualizes the narrowing of the sample based on the research questions.



Propensity Score Matching

Missing data created challenges for conducting further analysis. Regression models will drop cases (students) if there is missing data in any of the covariates. As analysis was conducted by school and each research question further narrowed the potential sample, it was necessary to maximize statistical power. The team attempted to use full information maximum likelihood (FIML) but found that there was too much "missingness." Because FIML was not possible within R for binary outcome variables, and the results would be based on the same variables, the research team used multiple imputation.

Multiple imputation leverages the data of the sample's peers (students who do not have missing data) and uses that data to fill in missing variables. This allows for greater statistical power when conducting a regression.

The research team created five multiply imputed datasets. The team then regressed RITA participation (being in the treatment group or not) onto all possible covariates (demographics and school variables [e.g. GPA, credits earned, etc.]) and saved the propensity score. To create a simple and single propensity score, the researchers took the average across the multiply imputed data set.

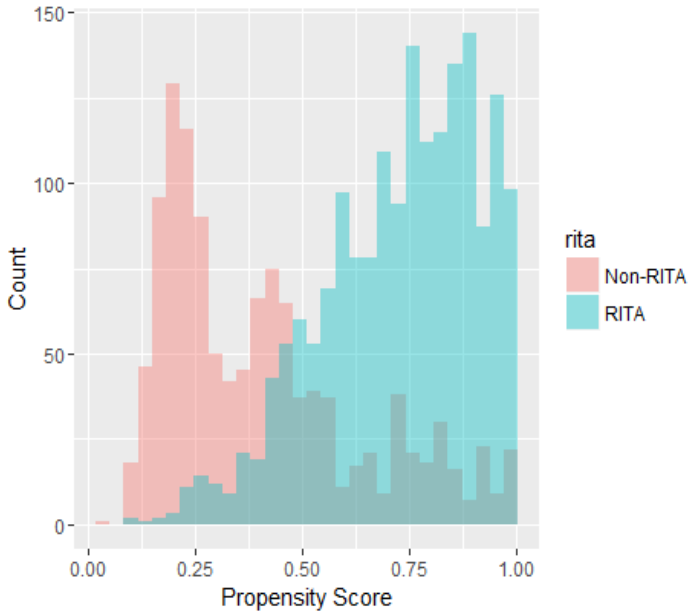
The propensity score variable represents the mean effect of these covariates across the multiply imputed data sets.

Propensity scores were estimated to try to account for potential confounding variables while simultaneously reducing the number of covariates in the longitudinal models. A propensity score is a score that quantifies the likelihood of a subject receiving a treatment as a function of factors that influence treatment participation[1] .The variables used to predict treatment assignment (i.e., RITA status) in the propensity score model were:

- Site Name
- Hispanic
- White
- Pell
- ADA
- Gender
- Education level
- TAA
- Felony
- Military
- Education Goal
- Program Enrolled
- Age at start of program

[1] Rosenbaum, P., & Rubin, D. (1984). Reducing Bias in Observational Studies Using Subclassification on the Propensity Score. Journal of the American Statistical Association, 79(387), 516-524. doi:10.2307/2288398

Propensity scores for RITA and non-RITA students



The graph above presents the estimated propensity scores plotted by RITA status (i.e., whether a student participated in RITA). This graph suggests that there was substantial overlap in propensity scores. This means that while RITA students had higher propensity scores relative to non-RITA students, there were non-RITA students with propensity scores similar to RITA students and vice versa.

Regression Models

Research Question 1: What impact did RITA have on student completion rates?

Once PSM scores were established, the researchers conducted multivariate logistic regressions on academic outcomes. Regressions of the outcomes were run for each school; the covariates in the model were limited to the propensity score and treatment status (whether a student was exposed to the RITA intervention; 0 = no, 1 = yes). The researchers ran another regression with the addition of a school covariate (where 0 = Central Lakes College, 1 = North Central Texas College, 2 = Pine Technical and Community College, and 3 = Ridgewater College) to assess the overall RITA effect across the partner schools.

The question guiding the first set of regression models was: To what extent has RITA improved student completion rates? This research question was explored by degree type. Specifically, the researchers explored the extent to which RITA affected completion of the following:

- Associate degrees (0= did not complete, 1= completed)
- Diplomas (0= did not complete, 1= completed)
- Certificates (0= did not complete, 1= completed)
- Any degree: either associate, diploma, or certificate (0= did not complete any, 1= completed any type)

In addition, the researchers explored to what extent persistence, defined as "being continually enrolled in the first three semesters since starting the program," was affected by participation in the RITA program. For example, if a student enrolled in school starting with fall 2012, then they would need to be enrolled in fall 2012, spring 2013, and fall 2013. This analysis was conducted as a proxy to understand if RITA program elements encouraged students to stay enrolled more consistently, an intermediate outcome that hypothetically could precede future credential completion. This analysis was not performed by degree type.

The research team filtered out students that enrolled in their college prior to 2007 to increase comparability across student experience (minimizing the number of students who would have had plenty of time to complete compared to students who had less time, e.g., the treatment). This resulted in the removal of 194 students across the schools in both the comparison and RITA groups.

To answer the research questions, completion or persistence was regressed on participation in RITA and the propensity score variable. Because completion and persistence are Bernoulli trials (e.g., completed/didn't completed or persisted/didn't persist), logistic regression models were used. The researchers initially hoped to fit a multi-state survival model to simultaneously model the probability of completion or dropping out conditional on RITA status. However, because of the nature of the data, it was not possible to utilize this model.

For each dependent variable, the sample only included students who had declared that particular credential. Thus, students who were not planning to complete a diploma would not be counted as a "0" or non-completer in the regression for diploma completion rates.

Research Question 2: What impact did Employment and Education Advisors have on student completion rates?

As will be elaborated in the findings, there were limited positive effects of RITA on the desired outcomes. Therefore, analysis to assess EEA/Coach impact on these outcomes was unnecessary.

Research Question 3: What impact did RITA have on wages for incumbent workers in the IT program?

For employment research questions, the researchers fit a longitudinal model to the income data over time. This model was fit to data on students who were employed at the start of their program. The covariates in the model included:

- Linear: Time as measured in six-month intervals from the program start date (where 0 = quarter in which student began their program, 1 = next six months after the student started their program, etc.)
- Age at program enrollment
- Propensity score
- The college in which the student was enrolled
- RITA status (whether a student was exposed to the RITA intervention; 0 = no, 1 = yes)

Research Questions 4 and 5: What impact did RITA have on students getting employed after leaving school? And, what impact did RITA have on students being retained in a job after leaving school?

To answer these questions, the researchers fit a longitudinal model to an employment indicator (0 if income is $0, 1 if income is greater than $0). The covariates in this model were the same as those mentioned above for income.

Implementation Analysis Methodology

Implementation science guided The Improve Group's approach to analysis. This approach examines how evidence-based programs are incorporated into practice. It seeks to understand the obstacles and drivers that influence successful implementation of effective programs or initiatives. It is important to evaluate implementation because the way an initiative is implemented influences its outcomes. The RITA Statement of Work documented the original conceptualization of the program, and therefore served as the basis of comparison for assessing the fidelity of implementation. The purpose of assessing fidelity is to help stakeholders understand any changes or adaptations made to a program during implementation.

Three frameworks guided the design of data collection tools: the Quality Implementation Tool[2], the Capacity Development Framework from the Centers for Disease Control and Prevention (CDC), and the strategies outlined in the RITA Statement of Work. These frameworks were utilized to explore three main questions:

1. To what degree of fidelity has the proposed RITA model been implemented?
2. How high is the quality of the RITA program's implementation?
3. What capacity is being built within the consortium toward sustainability of the model after the grant end?

Fidelity Methodology

The Improve Group measured the extent to which RITA implementation maintained fidelity to the proposed Statement of Work outlined in the grant proposal. At each data collection interval, the research team interviewed and surveyed RITA staff to identify actions being taken within each Statement of Work item, comparing these actions to proposal documentation. These items include:

1. Development of Grant Team
2. Design, Purchase, and Install Technology Infrastructure
3. Development of Programs
4. Market Informational Technology Program
5. Deploy RITA Programs and Support Students
6. Engage RITA Partners
7. Employ Student

[2] Meyers, D. C., Katz, J., Chien, V., Wandersman, A., Scaccia, J. P. and Wright, A. (2012), Practical Implementation Science: Developing and Piloting the Quality Implementation Tool. American Journal of Community Psychology, 50: 481–496. doi:10.1007/s10464-012-9521-y

8. Evaluate and Improve RITA Program

Quality Methodology

The Quality Implementation Framework is a way for practitioners and policymakers to determine whether implementation has been successful in achieving outcomes and promoting sustainability. The framework identifies 14 key elements or indicators for quality implementation (Meyers, Durlak, & Wandersman, 2012) and was developed through a synthesis of 25 implementation frameworks across multiple research and practice areas. The framework provides practical guidance for planning and/or executing implementation efforts by offering comprehensive implementation indicators. The framework divides the process of implementation into four temporal phases:

1. Initial considerations,
2. a structure for implementation,
3. ongoing structure for once implementation begins, and
4. improving future applications.

This study used QIF to go beyond documenting whether schools are following their plan, to assess in what ways schools have the active ingredients for successfully institutionalizing efforts beyond the grant period.

Capacity Methodology

The research team measured the extent to which capacity was being built within the consortium toward sustainability of the model after the grant. To do this, the team utilized the Capacity System Framework. The Capacity System Framework outlines eight areas of capacity:

1. System profile – the existing environment and relationships that the set of strategies operates in, and the key influences.
2. Leadership – strong, recognized, and stable leadership for strategies and established legitimacy with multiple constituencies.
3. Strategic planning – the development of strategic objectives and action plans to effectively implement strategies.
4. Information – the current state of measurement, analysis, and management of information (data) for knowledge-driven performance.
5. Community and constituency focus – the strategies involve, understand, and maintain accountability to the stakeholders.
6. Human resources – the organization, development, and support of the workforce surrounding the strategies.
7. System operations – the core operational processes that achieve results.
8. Results/Outcomes – what the program has achieved to date.

Data Collection Tools: 2015

During Summer 2015, The Improve Group, the third-party evaluator of RITA, gathered feedback and insights from RITA stakeholders through 47 interviews and 32 surveys. All interviewees were invited to participate in the survey, although some did not participate. A portion of the survey respondents were not invited to

interview, as they had only limited knowledge about the grant implementation process.

The Improve Group conducted site visits to all four college campuses and carried out many of the interviews in-person while on site. The on-site visits enhanced the ability to verify information, as evaluators could verify installation of equipment and meet staff. Interview questions were crafted to draw out accomplishments and areas for growth. By using a "solution-focused" interviewing method, The Improve Group could glean useful information and reduce positive response bias. For instance, when a participant rated something as a 10 out of 10, the evaluators would ask the informant, "What would be needed to reach an 11?" Applying this approach contributed to the validity of the evaluation.

Data Collection Tools: 2016

During Spring 2016, The Improve Group conducted interviews and focus groups with RITA stakeholders to hear their insights around the success and challenges of implementing RITA, changes in organizational capacity resulting from RITA, and sustaining the benefits of RITA after funding has ended. Interviewees held the following positions:

- Faculty
- Education and Employment Advisors (EEAs)/Coaches
- Grant managers
- Instructional designers
- Deans
- College leadership
- Grant leadership
- Grant staff

Grant managers assisted The Improve Group in determining which college staff to interview. In addition to interviewing RITA staff, The Improve Group held one focus group at each of three of the colleges and conducted interviews with two PTCC students. Altogether, 59 RITA stakeholders participated.

Throughout the interviewing process, The Improve Group asked interviewees to reflect on RITA's progress in implementing the Statement of Work and to compare current consortium and college capacity scores to previous scores. Interview questions were crafted to draw out accomplishments and areas for growth. By using the "solution-focused" interviewing method, The Improve Group could again glean useful information and reduce positive response bias.

Data Collection Tools: 2017

In spring 2017, grant managers participated in their final interviews with The Improve Group. During interviews, they reflected on the main areas of implementation at their college, recounted successes and challenges, and shared highlights from the past year. They also began to verbally sketch a visual depiction of the implementation model at their colleges.

In summer 2017, The Improve Group facilitated workshops at each of the colleges to present and gather context on outcome data, confirm key successes and challenges with a broader audience, and further develop the visual of the implementation model. Attendees included the grant manager, the consortium director, and, at some schools, other college staff.

Outcomes Analysis

The results of the outcome analysis were based on the multivariate regression models discussed in the methodology section above. In brief, the results show that participation in RITA often did not result in the desired outcomes. Additional analysis was conducted during September 2017 to include an additional quarter of wage and employment data. This analysis did not show statistically significant difference from previous analyses. Final analysis can be found in Appendix F.

The increase or decrease in odds of a RITA student completing their desired credential, by school

	Associate degree (n=809)	**Diploma** (n=37)	**Certificate** (n=130)	**Any degree** (n=944)
NCTC	↑	N/A	↔	↑
CLC	↓	↓	unknown	↓
PTCC	↓	N/A	unknown	↓
RC	↓		unknown	↓

Student outcome analysis sought to answer five specific research questions.

Did RITA students complete credentials at higher rates?

NCTC was the only school that saw improvements in the odds of completion for its students. In associate degrees and overall for any degree, RITA students from NCTC had statistically significantly higher odds of completing than the comparison group. For the Minnesota colleges, RITA students had significantly lower odds of completing credentials than the comparison group. This was the case for each of the applicable credential types (associate, diploma, certificate) as well as across any degree.

In the table, "unknown" indicates that the sample size was too small to make inferences. An "N/A" communicates that the credential was not offered at that school. Ridgewater College's diploma program required a large number of credits so it was counted as an associate degree in the analysis.

For a detailed table of the model estimates, see Appendix E.

To what extent was the dosage of an Education and Employment Advisor (EEA) or Coach impactful on completion?

Due to Minnesota RITA students not achieving improved completion outcomes, EEA visits were not analyzed for the effect of their impact on the outcome.

The NCTC coaching model was found to increase a student's probability of completing an associate degree by 26 percentage points. Similarly, for every additional contact a coach had with or on behalf of a student, the probability of completing any credential increased by 45 percentage points.

For students who are employed at enrollment into the IT program (incumbent workers), did they increase their wages at any time after enrollment?

When plotting the wage trajectories for RITA students versus non-RITA students (comparison) since enrollment, non-RITA students on average started with lower wages and ended with higher wages than their RITA counterparts after eight quarters.

However, when controlling for the propensity score and age, participating in RITA did not have a significant effect on wages over time. For all colleges, RITA and non-RITA students had similar trajectories in income over the four-year time frame beginning with the start of students' programs.

What was RITA's effect on finding employment upon exit from school?

Multivariate logit regression models demonstrate that RITA students were not statistically significantly different from their comparison peers with regards to getting hired within two quarters of exit from school, or in retaining their employment after that exit. These insignificant findings were mostly due to small sample size.

Linear regression models of employment over time between the treatment and comparison groups demonstrate that among all students (including incumbent workers), the employment rate increased for non-RITA students and remained fairly steady for RITA students from the time of their enrollment. These rates were not statistically significant, indicating that participating in RITA was not related to employment over time.

Implementation Analysis

This section outlines the findings related to implementation. The section is organized by the four main RITA implementation strategies: development of programs, student support, recruitment and retention, and engaging industry and partners.

Development of Programs

Fidelity

RITA created and nurtured a collegial culture and created the opportunity for faculty to convene, collaborate, and share best practices. Informants cited the spirit of collaboration RITA created among faculty for networking, creating programs, and sharing ideas. This led to increased collaboration across colleges, as well as among

faculty and EEAs within colleges. This culture of sharing assisted in sharing resources and developing new program innovations.

RITA created a culture of collaboration among faculty. One of the key forums for this was the August 2016 RITA faculty retreat, which was a highlight for faculty at schools across the consortium.

The RITA consortium developed and made additions and enhancements to programs in Cyber Security, Mobile Application Development, Networking, Computer Programming, CISCO, and Microsoft. Some students felt the diversity of courses made them more well-rounded for a job and that they gained more valuable experience with technology used in today's workplace.

The key course modifications the consortium contributed to were through e-learning, including putting additional courses online, reviewing courses with the Quality Matters rubric to enhance quality, and hybridizing courses. Consortium interviewees said these modifications allowed students to access information through a participatory, high-tech environment.

Interviewees identified strong leadership by the consortium director and grant managers, as well as consensus decision-making, as key strengths of the grant management structure. Grant managers said weekly web-based working group meetings with the consortium director provided an effective forum for consensus decision-making, a method that facilitated transparency and trust. These meetings and this decision-making style were also effective methods for everyone to keep abreast of what happened at each other's colleges. For example, it was through these meetings that the RITA leadership team could determine that Minnesota schools (in the Minnesota State Colleges and Universities System) needed to pursue a networking degree with a cyber security emphasis, while the Texas school (NCTC) could develop a complete cyber security degree.

The consortium director's effectiveness as a leader emerged as a common theme. Many interviewees spoke highly of his strategic thinking and relationship-building skills. They said these skills, along with his positive attitude and kindness, steered the organizational changes at the colleges.

Capacity

New and improved programs are one of the top ways RITA benefits will sustain, many agreed. Cyber Security and Mobile Application Development emerged as the two most successful new programs developed through RITA funding.

Enhanced technology infrastructure supports these new and improved programs and will continue to impact the IT student experience. A highlight of this is new virtualization hardware, which Ridgewater College began hosting and supporting for the four schools. As a result, RITA staff were able to leverage the short and long-term opportunities that this new infrastructure can bring to the college, its current and future students, and the local community.

RITA schools have also added new CISCO labs and testing centers. The updates of other labs at RITA schools have given students more hands-on learning experiences, and have provided peer-to-peer collaboration and learning experiences. This builds on a theme of RITA creating a culture of collaboration within and across colleges.

Pine Technical Community College's new Cyber Security Associate of Applied Science degree is a great example of sustained RITA benefit, employer engagement, and consortium collaboration. The school added the program in response to employer advisor input, and after its development at PTCC, the curriculum was also shared throughout the RITA cohort. As part of their coursework, cyber security students gained professional experience opportunities such as working with the school to assess its vulnerability to cyber hacks and providing recommendations based on the assessment.

RITA has also influenced colleges' approaches to strategic planning. Colleges are either considering different activities in their plans or adopting different approaches overall. The hiring of an internal RITA data coordinator has also allowed colleges to monitor data throughout the grant. Schools also implemented the Effort to Outcomes (ETO) data management system for tracking RITA students, which has improved tracking of new programs and students. Many said the greatest improvement in capacity was in data and information management and use.

Challenges, Barriers, and Issues that Remain

While the updates to and addition of technology to RITA schools is a major success, stakeholders voiced concern about the resources needed to maintain these labs and other resources. Due to the innovative nature of the IT field, technology infrastructure needs ongoing maintenance and consistent updates to stay current.

Online course delivery is another area with room for improvement. Some students expressed concern that certain courses cannot be taught successfully online, like those that required hands-on experience. Other students simply did not find online courses to be engaging.

At the beginning of the grant period, some faculty were resistant to course hybridization and teaching in online formats. Some were concerned about the effectiveness of online learning, while others felt they did not have the training and skills necessary to teach quality online or hybridized courses. To address this implementation challenge, the consortium invested in supporting faculty in this area by hiring staff responsible for ensuring quality e-learning content, and training faculty on best practices in teaching and learning. The effects of these efforts were not evaluated.

Faculty and consortium staff aspired to create a shared enrollment system that would allow students from any of the four colleges to easily enroll in courses across the four colleges. However, they found this was too challenging to implement during the four-year grant period, given institutional and system policies and norms.

Student Support

Fidelity

Education and Employment Advisors (EEAs), also called coaches, were a strength across schools. EEAs provide engaging, individualized support throughout a student's entire time at a RITA school. To start, EEAs worked to create marketing and recruitment strategies to connect with students when they indicate an interest in a RITA program. Once a student enrolled, EEAs helped in determining their program and how to register in the right courses. Along the way, EEAs served as intermediaries between faculty and students, monitoring academic progress and intervening when students showed signs of distress in a course. For the later end of students' academic period, EEAs posted job opportunities and provided one-on-one support through resume coaching, mock interviews, and the development of other soft skills needed for the job market. In sum, the coaches were more than advisors, giving students the extra attention and support they needed to stay on track and be accountable to themselves until program completion.

Ridgewater College coaches used an intrusive advising model with faculty partnerships to create strong feedback loops. This approach emphasizes individualized supports.

North Central Texas College coaches used the Inside Track model. This approach emphasizes consistency in support across students.

Capacity

Some forms of coaching will be sustained at RITA schools, although aspects of the coaching model are contingent on funding. For instance, all NCTC coaches are certified in InsideTrack, a wraparound coaching model "designed to improve enrollment, persistence, completion and career readiness." This model will be implemented school-wide. The intensive coaching models used at other schools may prevail to some degree, depending on funding. Some colleges trained other school staff on these models, with the intention that they be applied to other students.

Challenges, Barriers, and Issues that Remain

Some students desire more faculty interaction, hands-on support, and exam preparation. There are several factors that could contribute to students not taking certification exams, and some students reported feeling unprepared for the exam even after taking the preparation course. Also, faculty and EEAs struggle to build relationships with online students, who naturally visit campus less.

Despite a high level of support, RITA has not yet reached many of the anticipated student outcomes it aspired to achieve at the genesis of its grant award. Apart from some emerging positive findings with completion among NCTC students, RITA participants have not experienced improvements in their odds of completion, finding employment, or increasing their wages as compared to students in the four years prior to the grant. While disappointing, these results are not surprising nor are they substantially on the student support model. EEAs and coaches can help make connections between students and potential jobs, but they have little power

over wage improvement or hiring. Likewise, the methodology limitations and discussion sections highlight many of the variables potentially impacting the outcomes and dampening their potential achievement.

Recruitment and Retention

Fidelity

A stronger focus on marketing and outreach to potential students is raising awareness of RITA schools' IT offerings. The hiring of a RITA-wide Communications Coordinator laid a strong foundation for disseminating information to current and prospective students. This coordinator, who has a background in communications and higher education, added a focus on targeted social media to reach potential RITA students, and implemented methods for monitoring success of the social media campaign. This campaign has included videos, blog posts, Facebook pages, and a Twitter account. Web and social media advertisements are working—the RITA program ads had generated more than 22,000 visitors to RITA college IT webpages as of last year. Promotion often uses a program-specific strategy, which is both more likely to tailor to a student's specific interest, as well as raise the profile of RITA and a college's brand simultaneously.

Grant managers at each college have worked with the communications coordinator to make RITA information easy to find and easily navigable online. The coordinator also created responsive systems for students to submit requests for more information and then receive prompt, individualized responses. For each school, the coordinator created branded materials and a tailored RITA marketing plan.

Additionally, the new student outreach recruiting model is a strength of the RITA grant, and came as a result of both marketing and the EEAs' coaching. More proactive practices are increasing schools' ability to turn prospective students into enrollees. Improved student outreach includes a focus on underrepresented groups like women and minorities. Nowhere is this better displayed than at Ridgewater College and its culturally inclusive recruiting. Instead of relying on the traditional information sessions, wherein interested students must come to campus, the school is going out into the community to actively recruit among underrepresented groups.

Ridgewater College had a culturally inclusive approach to recruitment, meeting prospective students at cultural staples within the local community. Recruitment shifted to a focus on building long-term relationships versus transactional interactions. This focus on cultural inclusion earned Ridgewater College an equity and inclusion award from the Minnesota State Colleges and Universities System.

Capacity

RITA staff have piloted new approaches to recruitment and retention that have been adopted by other departments within the respective colleges. These new approaches will sustain. For instance, aspects of the RITA college websites were redesigned to emphasize IT programs, and some of these changes will extend beyond the end of the grant.

Challenges, Barriers, and Issues that Remain

Some colleges have felt resistance internally to adopting new approaches and technology for recruitment and retention. For instance, some EEAs found it challenging to develop the practice of entering data into the shared database. Other EEAs initially faced interpersonal challenges in collaborating with faculty on identifying students needing additional support.

While updated marketing practices are promising, stakeholders are concerned they won't have the funding to sustain them after the grant period is over. Some indicate that funding for communications and marketing is largely contingent on student enrollment numbers and subsequent tuition dollars.

Engaging Industries and Partners

Fidelity

Through engagement efforts, RITA colleges have strengthened new and existing relationships with partners in industry. A key way they do this is with employer advisory councils, which provide direct input on the creation of academic programs. Through communication with these councils, which consist of employees of locally based IT companies, colleges created programming that was directly aligned with immediate local industry needs. This also meant employers had a close understanding of what types of students they could expect from each school, creating pathways for students to gain professional internship experience.

North Central Texas College's advisory council integrates employers in designing and approving curricula. The council also provides periodic feedback on programming.

Capacity

During the RITA grant period, schools grew their capacity to engage with employers. Some of the advisory boards grew in membership and met more frequently. This engagement will continue at many of the schools. Many RITA stakeholders believe the advisory councils are an important feedback loop for ensuring that the courses and curricula respond to local industry demand.

Discussion

Student Support

Each college placed a heavy emphasis on increasing student support systems using the RITA grant funding, demonstrating the value of support services in student success. Different schools used different coaching styles. One, North Central Texas College, hired coaches and trained them all using the InsideTrack model. This model provides a cohesive structure to student support services and a structured methodology to work with students in a way that is demonstrated to lead to success. Other colleges, meanwhile, used intrusive advising to consistently contact students and monitor when they were falling behind. This sometimes involved close coordination with faculty. The different methods demonstrate the importance of fitting processes to local culture and context.

Multiple schools noted that a limitation to successful student support services lies within each student's individual drive and capacity to do well and successfully complete a degree. They also said collaboration between faculty, EEAs, RITA staff, and industry partners was a successful way to increase the likelihood of student success.

Consortium Collaboration

RITA consisted not only of four separate colleges, but also of a consortium across the schools for sharing ideas, problems, and solutions. On a large scale, this collaboration equipped each school's grant manager with a team of peers with which they could design, develop, and enhance RITA programming. This team was useful in resolving challenges and developing innovations. Faculty collaborated through retreats, the first of which served as a jumping-off point for continued collaboration. Faculty used these opportunities to exchange resources and ideas, which served to enhance programs and curriculum at each unique school.

Collaboration was also built into the design of courses for students' benefit. Infrastructure was purchased and courses were planned so that students could take courses at multiple colleges across the consortium. This afforded students the opportunity to earn degrees that aren't offered at their home or any nearby institutions, opening new opportunities for them.

The consortium grant director facilitated a cohesive and coordinated grant implementation throughout the four colleges, which created the space and environment for this collaboration. The data evaluation coordinator led the implementation and utilization of a cloud-based participant tracking and reporting tool that provided for uniform and streamlined data management across the consortium.

The colleges across the consortium all collected systematic data on their students through the Efforts to Outcomes software, allowing for annual outcome reporting and minimized data entry error.

Timing

The timing of the RITA funding (three years, or less, at some schools) posed several considerations and limitations for the evaluation and the program impact. Implementation Science dictates full implementation of a program is five years after the implementation start date, which suggests the full RITA impacts will not be seen until 2019 and beyond. That causes a limitation for data analysis, as only a limited number of students have interacted with RITA programs since the intervention was fully implemented. Technical programs like those funded through RITA take a significant amount of time to implement. Programs needed to be developed and approved through college, system, and/or state approval processes. Especially for schools in Minnesota, the approval process was unexpectedly cumbersome. Once approved, faculty and staff must be hired. All RITA programs were not fully implemented until fall 2015.

The expiration date of the grant had further implications for RITA itself. Because faculty and staff employed with grant funding knew the money was limited, they sought out post-RITA employment prior to the grant end to avoid a gap in employment.

Finally, the development of brand new academic programs informed by industries and partners and supported with innovative technologies—truly the best of what RITA had to offer—takes time. Students have only experienced the full result of this for a limited amount of time.

Faculty Development

Colleges faced stiff competition from the IT field when hiring faculty. The IT industry pays well compared to colleges, and some colleges also had salary caps in place. This also presented a challenge for retaining current staff. Some colleges chose to provide training and development to existing faculty, increasing their skill level and marketability outside of the college.

Sustained Impact

The most sustainable impacts of RITA are those that have been integrated into the full college setting, ensuring long-term success and impact. There are three main areas where RITA has been integrated into college operations.

These include the integration of:

- EEAs and student support practices, such as through NCTC's InsideTrack training,
- technology and infrastructure updates, such as through PTCC campus-wide infrastructure investments, and
- marketing and recruitment practices, such as through CLC's integration of marketing and recruitment for all college programs.

Limitations

Process Limitations

The length of the grant period was restrictive. Many of RITA's elements took months to be launched—due to the nature of the programming and external factors—so their true impact couldn't be measured at the point of the evaluation. For example, quantitative analysis was done before most RITA students at Central Lakes College had time to complete. Additionally, due to the length of the grant program itself, many students have not had time to complete their certification because they are part-time and because RITA hasn't been in place long enough.

Institutional processes were one reason programs took longer than planned to be approved and deployed. This included the lengthy program approval processes of the Minnesota State Colleges and Universities System, which affected the three RITA schools in Minnesota. Within some programs, this delay caused for the program to

only have existed for one academic year prior to completion of the RITA grant, causing for low completion rates.

Recruitment processes were updated to be more proactive in recruiting students to sign up for the program, as well as to recruit students who may not traditionally sign up for the program.

Additionally, recruiting and outreach to different types of students created comparability challenges, as schools recruited for students who may not want to be in IT programs, or gave credit for prior learning that hadn't been counted before.

Outcome Data Limitations

Limitations

Omitted Variable Bias

Although the researchers attempted to create sample conditions in which students' motivation to enroll in an IT program would remain constant, the reality of the past 10 years' impact on students is notable. The 2009-2014 time period (the comparison group) was marked by high unemployment, and a time when community members were more likely to enroll in school and have time to devote to completing a credential. In contrast, the RITA grant was implemented in the years following, 2014-2017, when unemployment had decreased and employers needed IT staff. This environment means that students are both less apt to enroll in school (they have a job) and are less apt to stay in school once they have enrolled (employers are less likely to require a degree to fill a vacancy). Within this context, non-completion of a credential would be highly correlated to the time period, which may have led to omitted variable bias negatively impacting RITA student outcomes.

Selection Bias

Comparison students may have been exposed to selection bias. Those who were willing to participate in the study were potentially those who had a positive experience in their program: someone who completed a credential, found employment, and/or received higher wages after leaving school. On the other hand, much of the successful recruitment efforts were conducted during business hours. This could imply that those who were available to participate are individuals with alternative work hours or who were unemployed. It is unclear to what degree self-selection influenced the results.

Small Sample Size

As was alluded to in the discussion of the methodology, the sample sizes available for the different analyses were small. Each analysis to answer the research question had to be split by school, then by treatment or comparison group, and then by whether the outcome variable applied to the student. Small samples limited the statistical power and the ability to detect an effect if it was small.

Program Duration

Not all treatment students were enrolled in school long enough to have received their desired degree. The RITA "treatment" effect is a combination of elements, with one primary piece being updated or new IT programs for students to enroll in.

Several IT programs at schools in the consortium were not approved for curriculum and enrollment until midway through the grant. This meant that some treatment students have not had enough time to complete their credential by the time this analysis was conducted. Likewise, even for treatment students who enrolled in an improved but existing IT program in the initial year of the grant, any part-time status would make completion of an associate degree (a 2-year program when done full time) virtually impossible. Moreover, this has even further impacts when attempting to analyze and compare employment outcomes for students. Only students who had exited or completed a credential could be analyzed for employment. Few students were therefore available for this analysis.

Additionally, technical schools and community colleges like those that make up RITA typically promote continuous learning, meaning students take semesters off and then come back. That makes determining whether someone completed or exited without completion difficult. Similarly, defining what counts as enrollment in IT is difficult. A student could take one IT class, take a semester off, and then come back and only focus on general courses.

Data Source

The data used to inform the employment and wage research questions were obtained from state employment departments. While states are federally required to collect quarterly wages of employees working in their state from employers, there are many limitations to this dataset. In brief, data is only collected on employees in that state. Thus, any students in the sample who worked outside of Minnesota or Texas were counted as "not-employed" in the research. Also, individuals who are self-employed are exempt from reporting their wages to the state. Unfortunately, the IT field is one that is often characterized by a high number of independent consultants. This further reduces the dataset of individuals who may be self-employed or making higher wages, and instead counts them as unemployed.

Implications for Policy and Practice

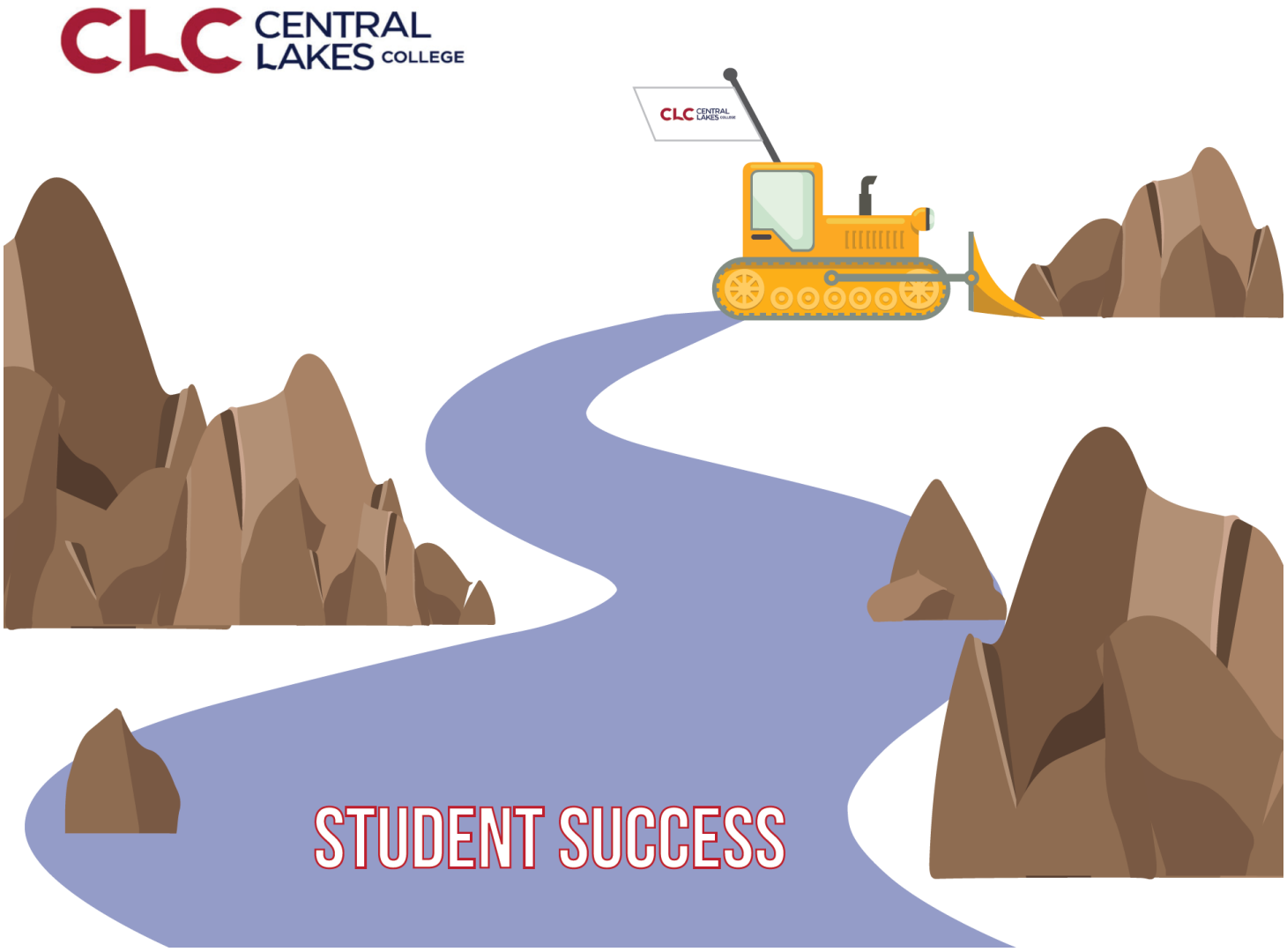
Due to the timing limitations outlined above, an extended implementation timeline could influence the outcomes of a program like RITA. With implementation science dictating five years for the full implementation, a program must allow at least this much time so that multiple cohorts of part-time students can experience grant enhancements. Hiring for new positions, acquiring new technology, and developing programs takes a long time and this influences outcomes.

Collaboration with local industry partners proved to be a key to student success. This took multiple forms. Through advisory boards, employers gave input on programming and courses to ensure it was relevant in today's workforce. This increased students' likelihood of success post-completion. The schools' increased engagement with industry also led to more opportunities for students than they had pre-RITA, like internships, tours of workplaces, and networking events.

Inviting more input and providing more transparency during the grant proposal process could increase support and cooperation for a new initiative from faculty and staff. When faculty and staff are not involved from the beginning, it may contribute to their resistance to change.

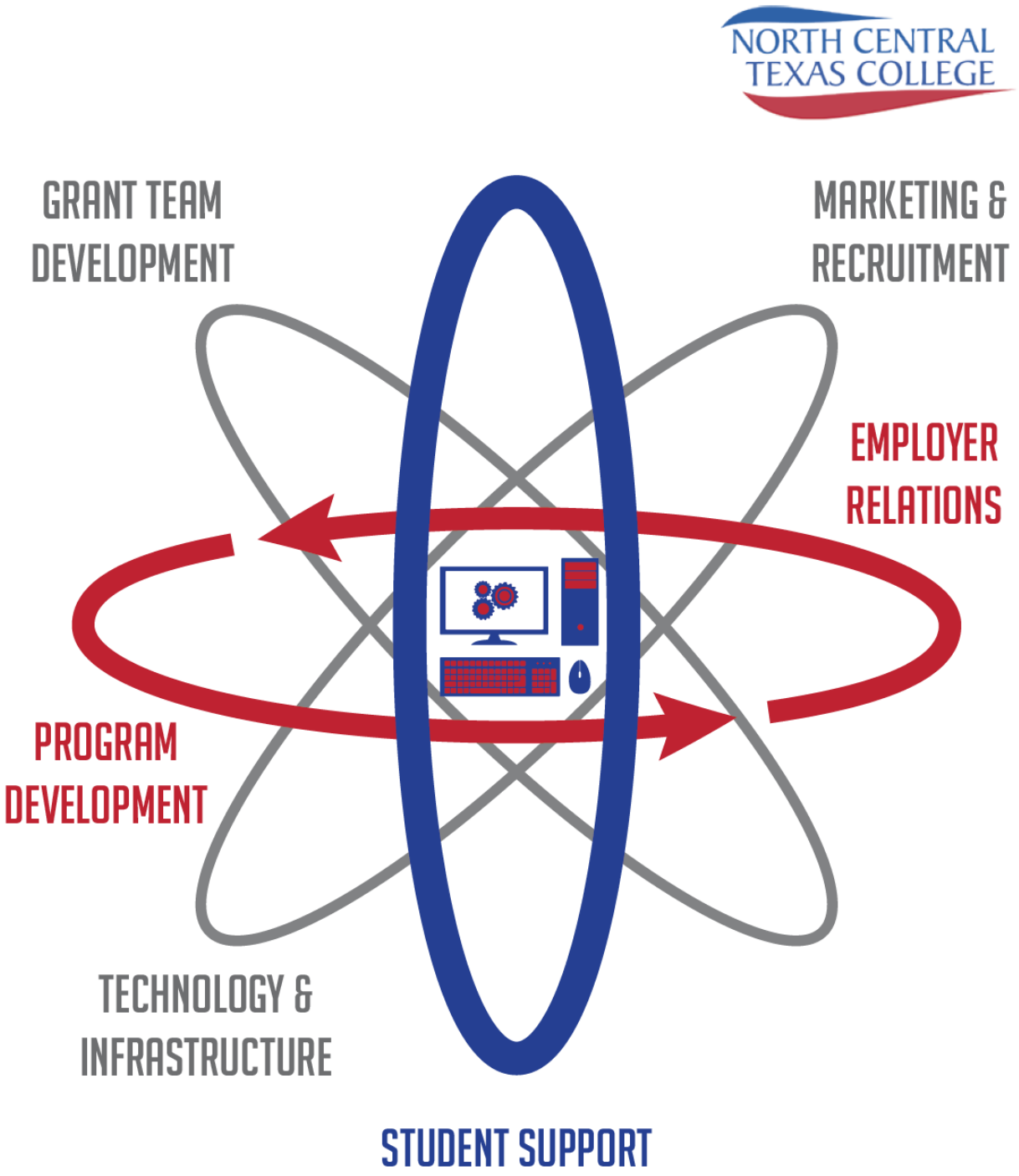
Appendix A: Central Lakes College Implementation Model

At CLC, RITA clears the way.



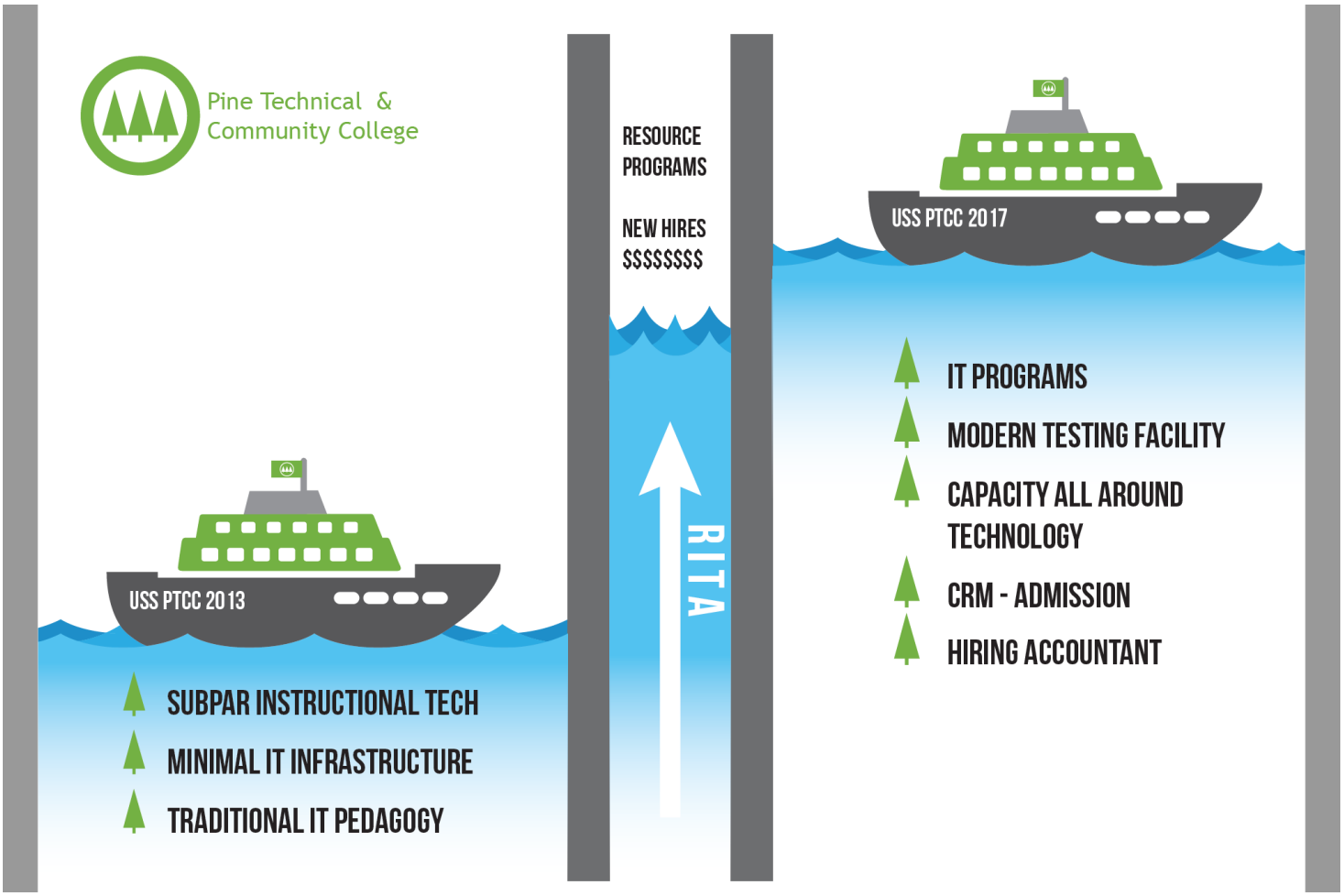
Appendix B: North Central Texas College Implementation Model

The student is the nucleus of the RITA atom at NCTC.



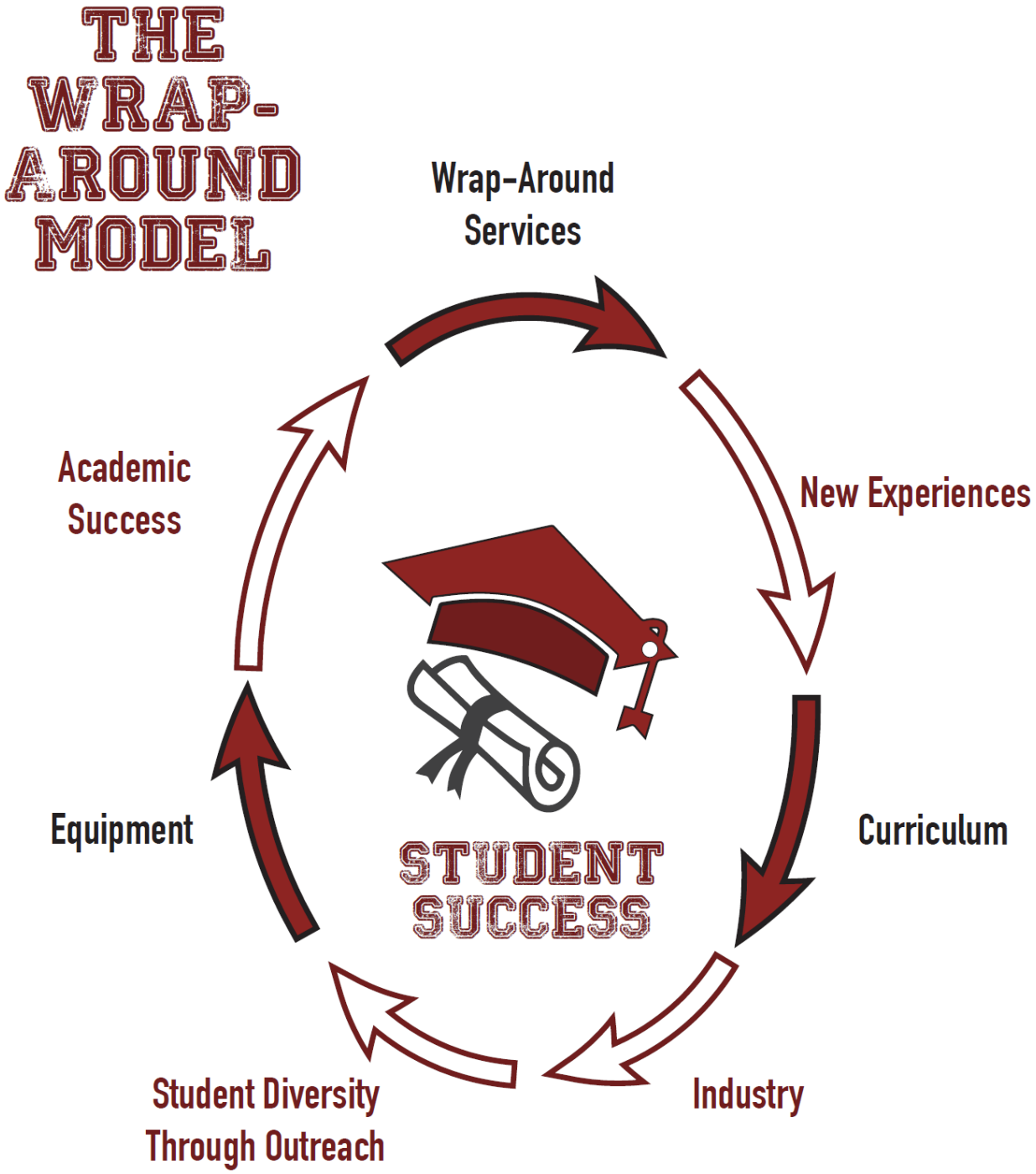
Appendix C: Pine Technical Community College Implementation Model

RITA floated all boats at PTCC.



Appendix D: Ridgewater College Implementation Model

The Wrap-Around Model



Appendix E: Detailed Statistical Models and Results

Results of Completion

Briefly, the results show the effect of RITA varied by school and wasn't always in the expected direction. Also, a certification analysis couldn't be performed because only one non-RITA student completed certification. Additionally, while the researchers considered the total number of completions by participant and examined both a Poisson and hurdle model to model this count, they did not include the findings in the report. Few students had more than one completed program; because of this they examined completion as binary only (i.e., completed or not completed).

Associate Degree

Table 1: Completion of Associate Degree by School

Site Name	Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
Central Lakes College	(Intercept)	1.913	0.464	4.118	0.000
Central Lakes College	rita1	-1.604	0.639	-2.511	0.012
Central Lakes College	propensity.score	-5.552	1.012	-5.487	0.000
North Central Texas College	(Intercept)	0.341	0.375	0.910	0.363
North Central Texas College	rita1	13.065	2.614	4.998	0.000
North Central Texas College	propensity.score	-14.816	3.092	-4.792	0.000
Pine Technical and Community College	(Intercept)	-0.559	0.561	-0.998	0.318
Pine Technical and Community College	rita1	-1.868	0.754	-2.477	0.013
Pine Technical and Community College	propensity.score	-0.111	1.203	-0.092	0.927
Ridgewater College	(Intercept)	4.115	0.590	6.979	0.000
Ridgewater College	rita1	1.225	0.549	2.231	0.026
Ridgewater College	propensity.score	-7.931	1.155	-6.870	0.000

Site Name	Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
Ridgewater College	propensity.score	-7.931	1.155	-6.870	0.000

Table 2: Completion of Associate Degree across Schools

Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
(Intercept)	0.464	0.265	1.747	0.081
rita1	0.455	0.291	1.564	0.118
propensity.score	-3.924	0.478	-8.200	0.000
North Central Texas College	-0.404	0.282	-1.432	0.152
Pine Technical and Community College	-0.243	0.327	-0.744	0.457
Ridgewater College	1.637	0.242	6.771	0.000

Diploma

Table 3: Completion of Diploma by School

Site Name	Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
Central Lakes College	(Intercept)	1.174	0.874	1.343	0.179
Central Lakes College	rita1	-1.783	0.841	-2.121	0.034
Central Lakes College	propensity.score	-1.822	1.359	-1.341	0.180
Ridgewater College	(Intercept)	3.563	1.370	2.600	0.009
Ridgewater College	rita1	-1.690	1.292	-1.308	0.191
Ridgewater College	propensity.score	-4.283	2.730	-1.569	0.117

Table 4: Completion of Diploma across Schools

Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
(Intercept)	1.728	0.717	2.409	0.016
rita1	-2.056	0.661	-3.112	0.002
propensity.score	-2.604	1.156	-2.251	0.024
Ridgewater College	0.948	0.582	1.629	0.10

Certificate

Table 5: Completion of Certificate by School

Site Name	Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
Central Lakes College	(Intercept)	13.298	8.781	1.514	0.130
Central Lakes College	rita1	-2.422	1.941	-1.248	0.212
Central Lakes College	propensity.score	-14.096	9.193	-1.533	0.125
North Central Texas College	(Intercept)	3.351	0.960	3.489	0.000
North Central Texas College	rita1	6.735	2.298	2.930	0.003
North Central Texas College	propensity.score	-9.352	3.104	-3.013	0.003

Table 6: Completion of Certificate across Schools

Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
(Intercept)	0.769	0.887	0.867	0.386
rita1	3.182	1.040	3.060	0.002
propensity.score	-5.007	1.481	-3.380	0.001
North Central Texas College	1.845	0.645	2.858	0.004
Pine Technical and Community College	-1.875	1.259	-1.489	0.136
Ridgewater College	-0.733	1.308	-0.560	0.575

Completion across All Associate, Certificate, and Diploma

Table 7: Completion of Any Program (Associate, Diploma, or Certificate) by School

Site Name	Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
Central Lakes College	(Intercept)	0.694	0.236	2.935	0.003
Central Lakes College	rita1	0.318	0.303	1.049	0.294
Central Lakes College	propensity.score	-3.565	0.524	-6.797	0.000
North Central Texas College	(Intercept)	0.834	0.129	6.460	0.000
North Central Texas College	rita1	14.972	1.354	11.057	0.000
North Central Texas College	propensity.score	-15.721	1.481	-10.617	0.000
Pine Technical and Community College	(Intercept)	-2.008	0.300	-6.686	0.000
Pine Technical and Community College	rita1	-1.016	0.406	-2.502	0.012
Pine Technical and Community College	propensity.score	0.561	0.673	0.833	0.405
Ridgewater College	(Intercept)	3.977	0.468	8.491	0.000
Ridgewater College	rita1	0.219	0.413	0.530	0.596
Ridgewater College	propensity.score	-6.534	0.864	-7.563	0.000

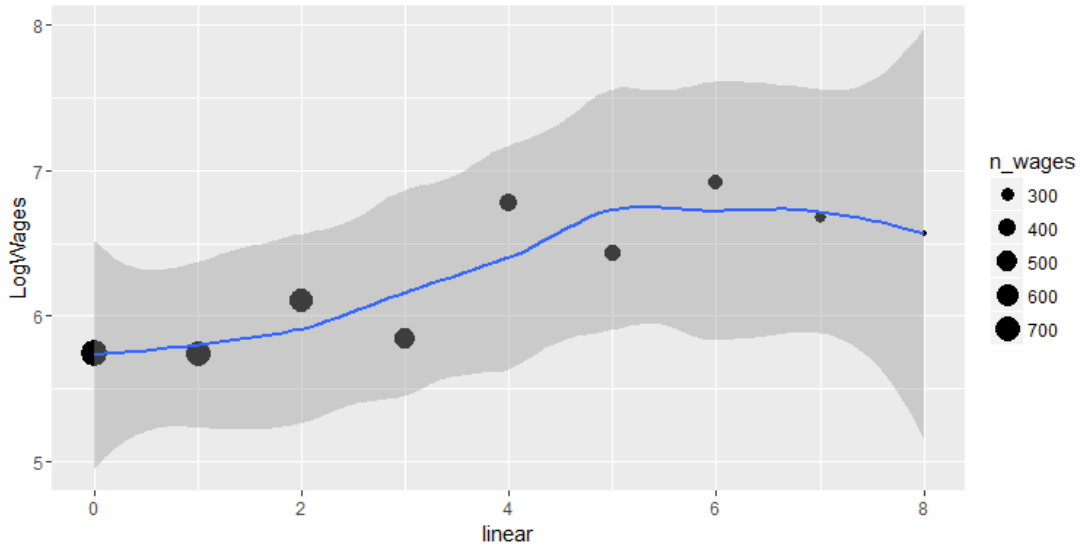
Table 8: Completion of Any Program (Associate, Diploma, or Certificate) across Schools

Parameter	Est. (log odds)	Std Error	Z-statistic	p-value
(Intercept)	-0.589	0.138	-4.270	0
rita1	0.879	0.186	4.721	0
propensity.score	-2.134	0.259	-8.255	0
North Central Texas College	0.821	0.135	6.090	0
Pine Technical and Community College	-0.936	0.175	-5.361	0
Ridgewater College	1.549	0.152	10.158	0

Results of Wages and Employment

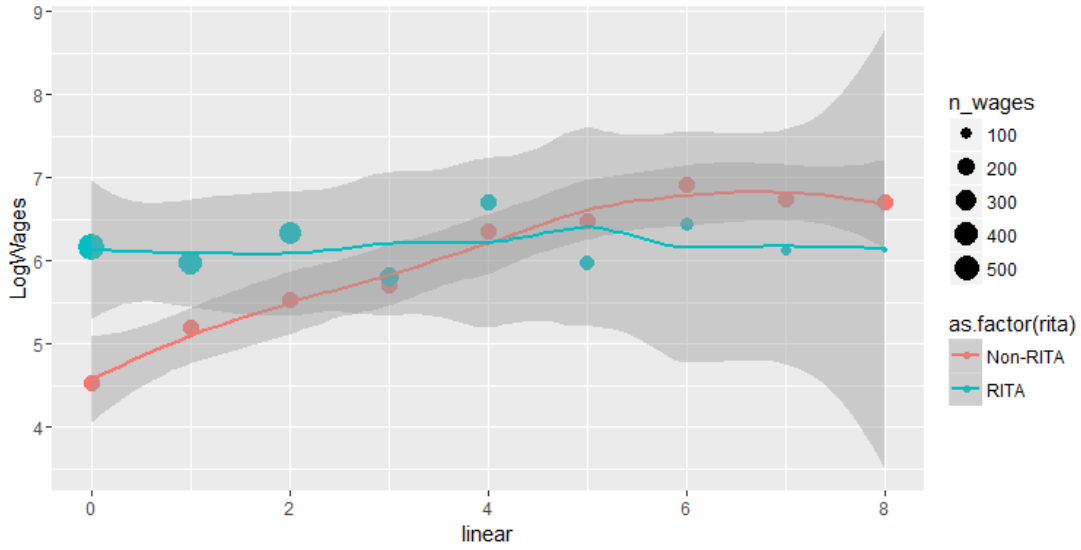
To understand how to better model the influence of RITA on income over time, the authors first plot natural log of income over time, and then over time by covariates (e.g. RITA status, site). The natural log transformation was used to normalize the distribution of residuals so that the assumption of normality of the residuals could be met. A value of $1 was added to each observation of income to guard against taking the natural log of zero.

Income



The graph above shows an increasing trend for the log of wages over time. On average, students tended to have lower wages when they started their program and then wage grew until around two years after the start of students' programs, at which point it became relatively flat. Plotting this trajectory by RITA status reveals an interesting difference in patterns between the two groups.

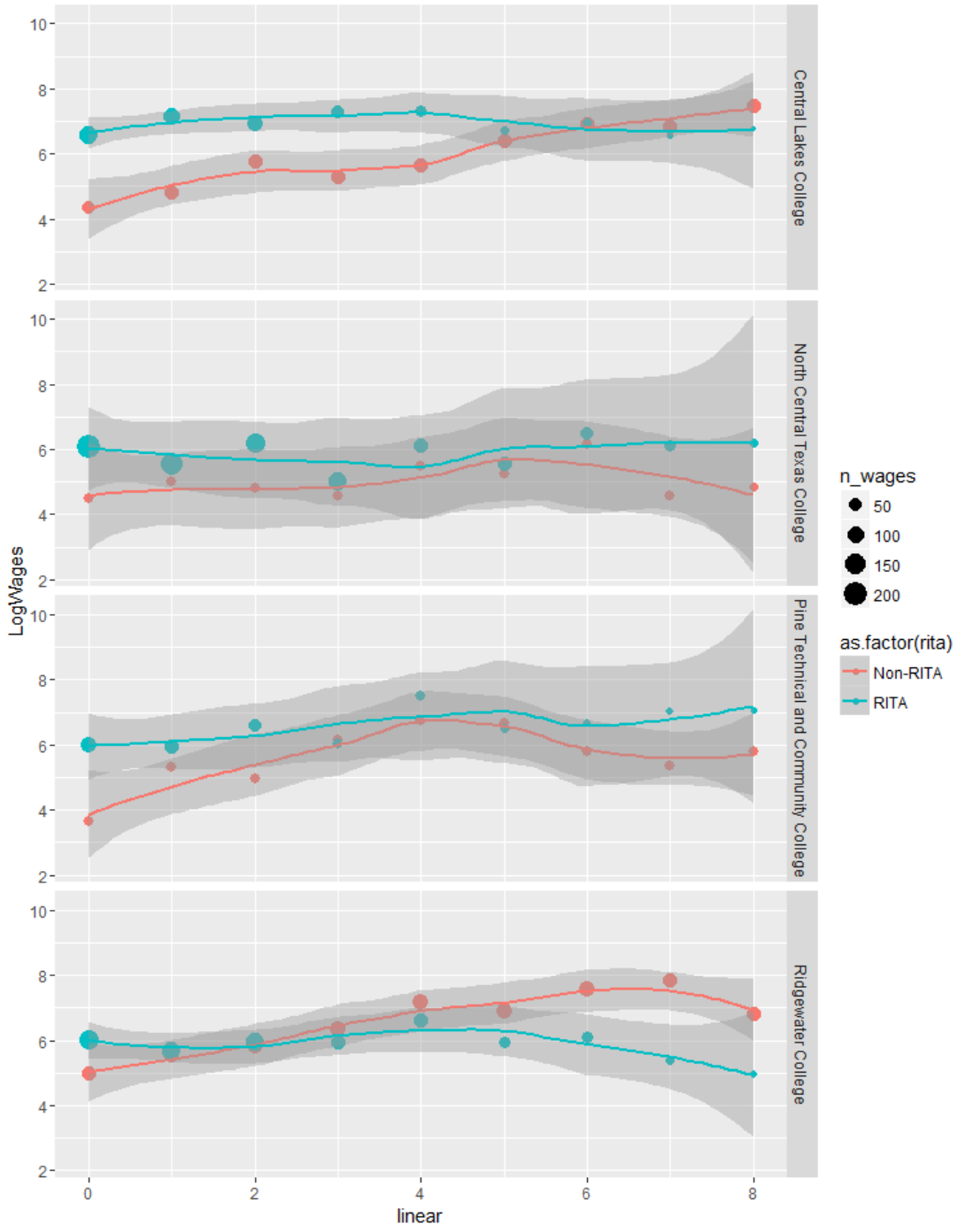
An important caveat to these data is that income data were obtained from only two sources, the State of Minnesota and the State of Texas. As a result, any income obtained by the students in this sample while they resided in different states is not reported. When income data were missing for students, the authors imputed a value of $0 for any 6-month intervals in which no income was observed for a student. The net effect of this is to assume lower wages and a lower employment rate.



The graph above presents the trajectories of the log-transformed income variable by RITA status. This graph suggests that RITA students had a flatter trajectory relative to their non-RITA counterparts. In contrast, non-RITA students started their program with a lower income, which increased up until about 3 years after they started their program, and then flattens.

There are a few factors that may shed light on why the graph looks the way it does. RITA status and the year in which students started their program are highly related. Specifically, most non-RITA students began their program before 2012 whereas most RITA students began their program after 2012. As a result, more non-RITA students (16 percent) began their program during the Great Recession from 2007 through 2009 whereas very few RITA students (2 percent) started their program during this time. Additionally, younger students, who began their program shortly after graduating high school, they are more likely to have lower wages when enrolling, as a function of their age. For this reason, it is important that the researchers attempt to control for the age of a student at the beginning of their program.

The graph below presents the trajectories of the average log-transformed income by RITA status and college.



The graphs for each college appear to be similar in that RITA students had relatively flatter trajectories compared to their non-RITA counterparts. Also, non-RITA students consistently began their programs with lower incomes. It should be noted that the employment and income data obtained for North Central Texas College students came from a different data source than the data obtained on students from the other sites. For Central Lakes, Pine Technical, and Ridgewater

Colleges, non-RITA students appear to have more positive growth trajectories relative to their RITA counterparts.

Inferential Results

To estimate the impact of RITA on the trajectory of income, the researchers began by fitting a longitudinal model to the log transformed income variable and comparing the model fit of different forms of that trajectory (i.e., linear, quadratic). Once a model for the mean trajectory was decided, the authors then fit a model to estimate the impact of RITA on that trajectory, while holding constant other covariates. The following table presents the results from the longitudinal models fit.

	Value	Std.Error	t-value	p-value
(Intercept)	7.230	0.560	13.030	0.000
Site.NameNorth Central Texas College	-0.010	0.630	-0.010	0.990
Site.NamePine Technical and Community College	0.670	0.700	0.960	0.340
Site.NameRidgewater College	0.445	0.484	0.921	0.358
age.centered	0.030	0.010	2.820	0.010
propensity.score	0.550	0.500	1.100	0.270
ritaRITA	0.870	0.430	2.010	0.050
linear	-0.017	0.211	-0.081	0.935
Site.NameNorth Central Texas College:ritaRITA	-0.260	0.690	-0.380	0.700
Site.NamePine Technical and Community College:ritaRITA	-0.990	0.790	-1.250	0.210
Site.NameRidgewater College:ritaRITA	-0.930	0.570	-1.640	0.100
Site.NameNorth Central Texas College:linear	-0.267	0.205	-1.299	0.194
Site.NamePine Technical and Community College:linear	-0.310	0.220	-1.400	0.160
Site.NameRidgewater College:linear	0.090	0.160	0.550	0.580
age.centered:linear	-0.010	0.000	-1.500	0.130
propensity.score:linear	-0.060	0.213	-0.284	0.776
ritaRITA:linear	-0.170	0.170	-0.990	0.320
Site.NameNorth Central Texas College:ritaRITA:linear	-0.280	0.250	-1.110	0.270
Site.NamePine Technical and Community College:ritaRITA:linear	0.490	0.300	1.630	0.100
Site.NameRidgewater College:ritaRITA:linear	-0.056	0.217	-0.259	0.796

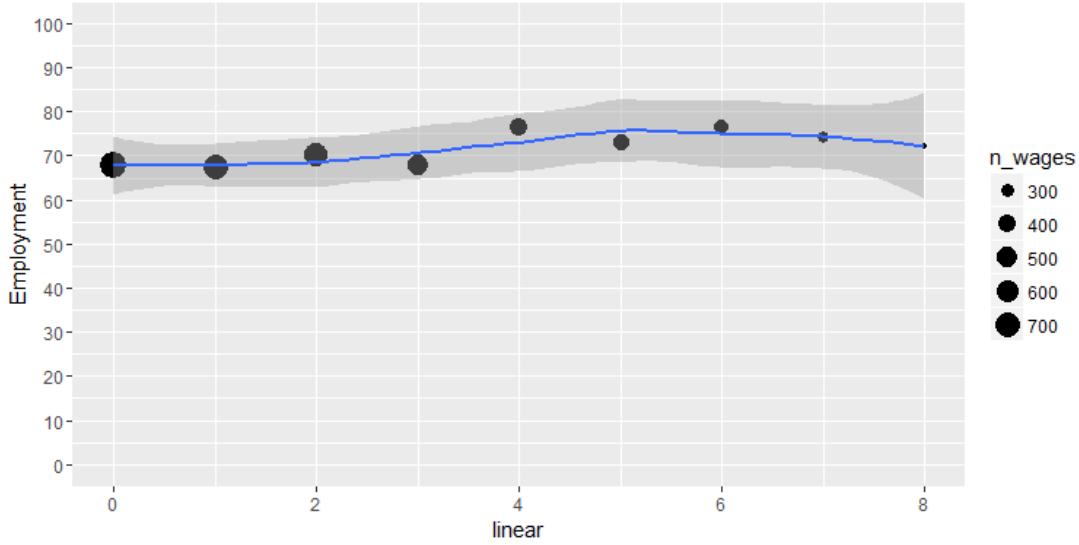
The table above provides the results of a linear growth model fit to the log-transformed income data over time. The results suggest that RITA was not a significant predictor of the intercept ($\beta =$

$0.33, p > 0.05$) or of the linear trend ($\beta = -0.11, p > 0.05$). Additionally, the results suggest that the effect of RITA on the intercept and linear trend was similar across the schools as indicated by the lack of statistically significant (at $\alpha = 0.05$) coefficients associated with the effects of "Site.Name." Collectively, these results suggest that RITA and non-RITA students had similar trajectories in income over the 4-year time frame beginning with the start of students' programs. Additionally, these trajectories were similar across the participating colleges. Students who were older than average when they began their programs did tend to start with higher incomes ($\beta = 0.03, p < 0.01$).

Employment

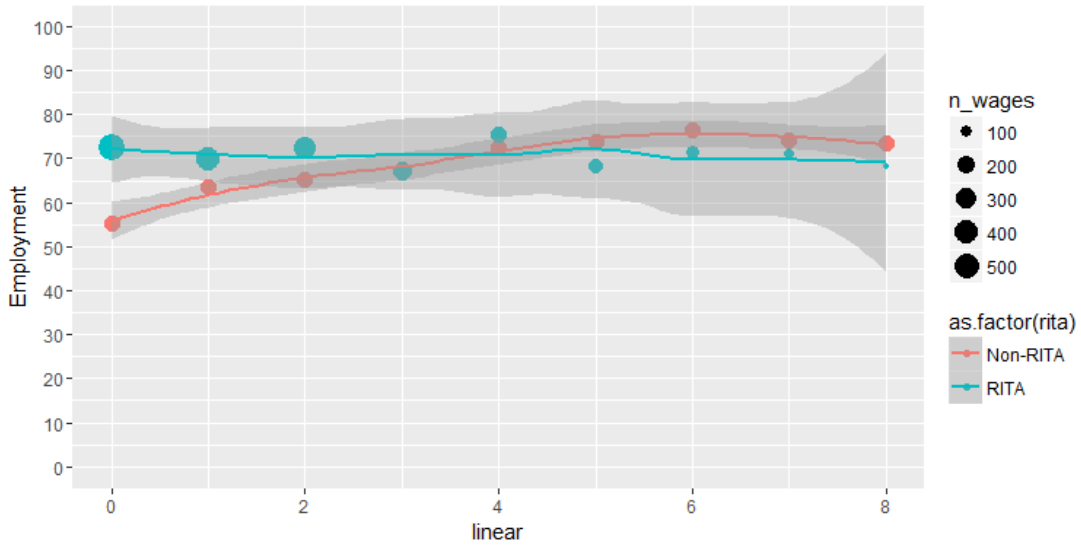
In order to estimate the influence of RITA on employment over time, the authors first plot employment over time, and then employment over time by covariates (e.g. RITA status, site). Employment was defined as having income within a given six month interval (i.e. income greater than $0 = 1, income equal to $0 = 0).

The following graph illustrates the employment rate of students over time.



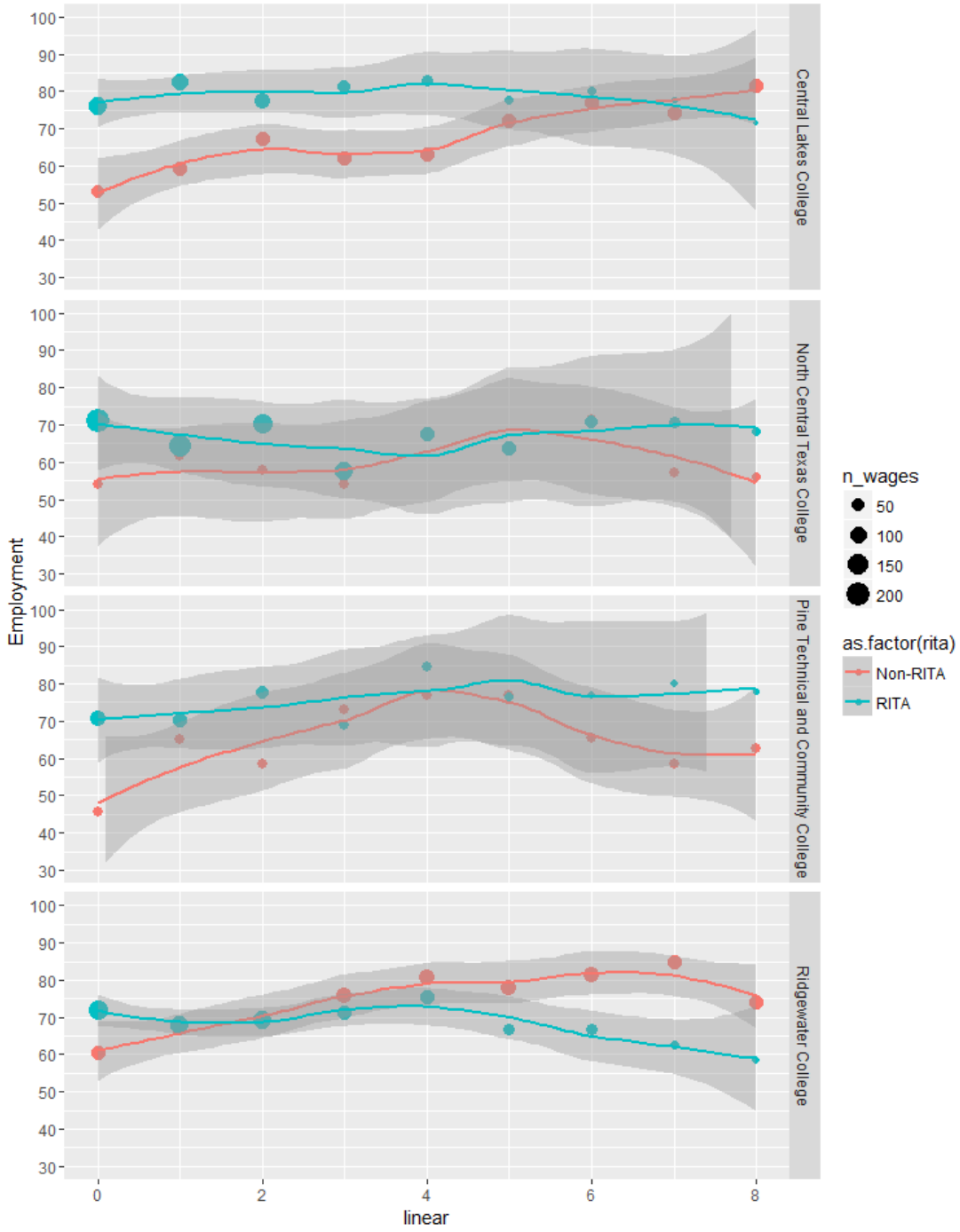
The graph above suggests that on average, the employment rate of students was about 68 percent at the start of their programs and increased over time to about 72 percent 4 years later. As with the previous income results, an important caveat to these data is that whenever income was unobserved for a student within a six-month interval, the authors assumed a value of $0 (and therefore a status of "unemployed"). The net effect of this is to assume lower wages and a lower employment rate even if a student may have obtained employment in a different state.

The authors then examined the trajectory of employment by RITA status.



The graph above shows a higher employment rate for RITA students at the start of their programs (about 72 percent) relative to non-RITA students (about 55 percent). This gap closes a bit over time with both groups having an employment rate of about 70 percent and 74 percent respectively, 4 years after starting their program.

In order to better understand the pattern of employment across schools, another graph depicting the employment rate over time by RITA status and college was generated.



The graphs above suggest that on average RITA students consistently started their programs with higher employment rates compared to non-RITA students. For two schools, Central Lakes College and Ridgewater College, this pattern reverses over time with non-RITA students having higher employment rates compared to RITA students after about 4 years.

Inferential Results

In order to estimate the impact of RITA on the trajectory of employment, the authors fit a longitudinal model to the employment status data. The following table presents the results from this model.

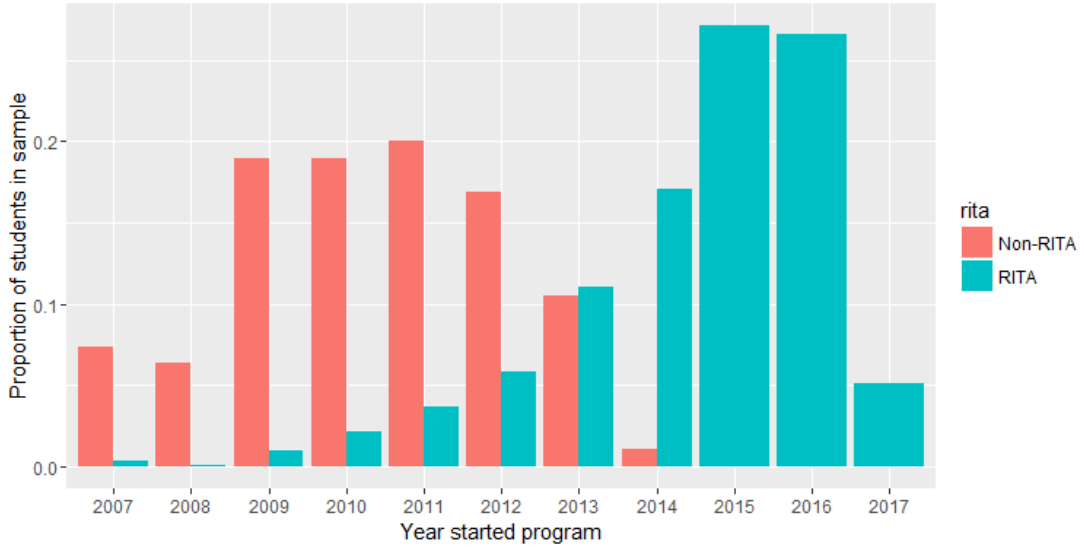
	Estimate	Std.err	Pr(>|W|)
(Intercept)	0.02	0.43	0.96
Site.NameNorth Central Texas College	0.26	0.45	0.57
Site.NamePine Technical and Community College	-0.08	0.49	0.87
Site.NameRidgewater College	0.46	0.38	0.23
age.centered	-0.03	0.01	0.00
propensity.score	0.15	0.39	0.71
ritaRITA	1.13	0.34	0.00
linear	0.21	0.11	0.05
Site.NameNorth Central Texas College:ritaRITA	-0.69	0.51	0.18
Site.NamePine Technical and Community College:ritaRITA	-0.25	0.58	0.67
Site.NameRidgewater College:ritaRITA	-0.82	0.45	0.07
Site.NameNorth Central Texas College:linear	-0.21	0.08	0.01
Site.NamePine Technical and Community College:linear	-0.10	0.09	0.27
Site.NameRidgewater College:linear	-0.04	0.08	0.62
age.centered:linear	0.00	0.00	0.86
propensity.score:linear	-0.07	0.11	0.53
ritaRITA:linear	-0.11	0.10	0.24
Site.NameNorth Central Texas College:ritaRITA:linear	0.00	0.12	0.99
Site.NamePine Technical and Community College:ritaRITA:linear	0.22	0.15	0.15
Site.NameRidgewater College:ritaRITA:linear	-0.02	0.12	0.84

The results for employment above suggest that RITA was a significant predictor of the intercept ($\beta = 0.67, p = 0.01$), but not of the linear ($\beta = -0.04, p > 0.05$) trend. This suggests that while RITA students tended to have higher rates of employment when they began their programs, the trend in employment over time was similar between RITA and non-RITA students. Additionally, the impact of RITA (or lack thereof) on employment was largely similar between Central Lakes College and the other colleges in the sample as indicated by the lack of statistically significant (at $\alpha = 0.05$) coefficients associated with the effects of "Site.Name". Collectively these results suggest that RITA status was not related to employment over time.

Discussion

The results of these analyses should be interpreted with caution. A key limitation of this study is the fact that students who participated in RITA lacked a quality control group against which results could be compared. As noted earlier, non-RITA students were largely sampled from previous cohorts of students. As a result, a higher proportion of non-RITA students began in a program around the peak of the U.S. economic recession relative to RITA students. This fact can be seen in the graph below. Also, income data were only available from two states and a lack of income data for a student was assumed to mean the student had $0 for income during that time period. This is likely an underestimate of income and employment rate. While the time period covering college enrollment is likely to be accurate, time points that depart from that enrollment are probably less accurate.

The use of an experimental design would help to obtain better estimates of the impact of RITA on income and employment.

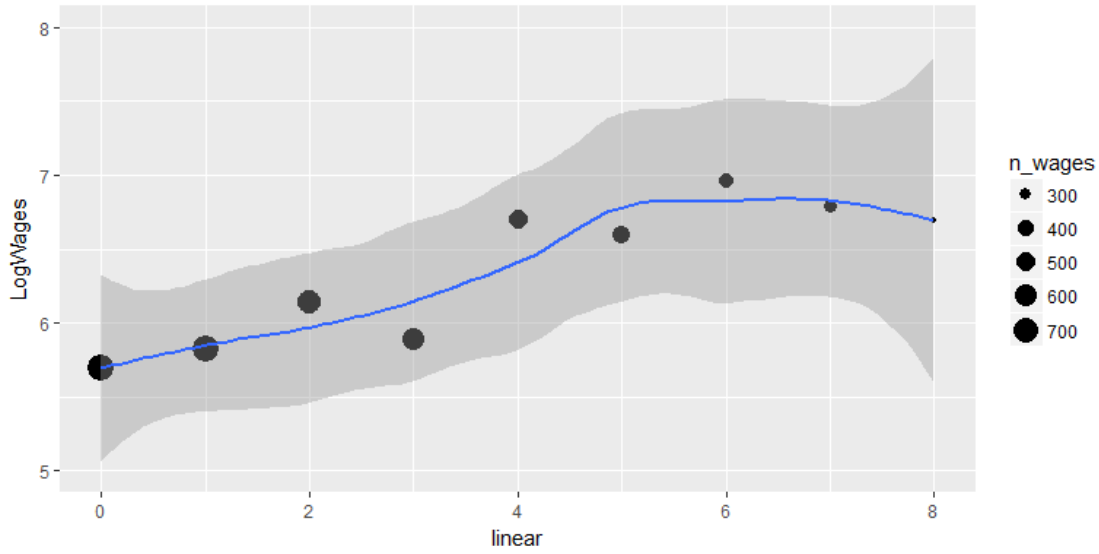


Appendix F. Final Analysis

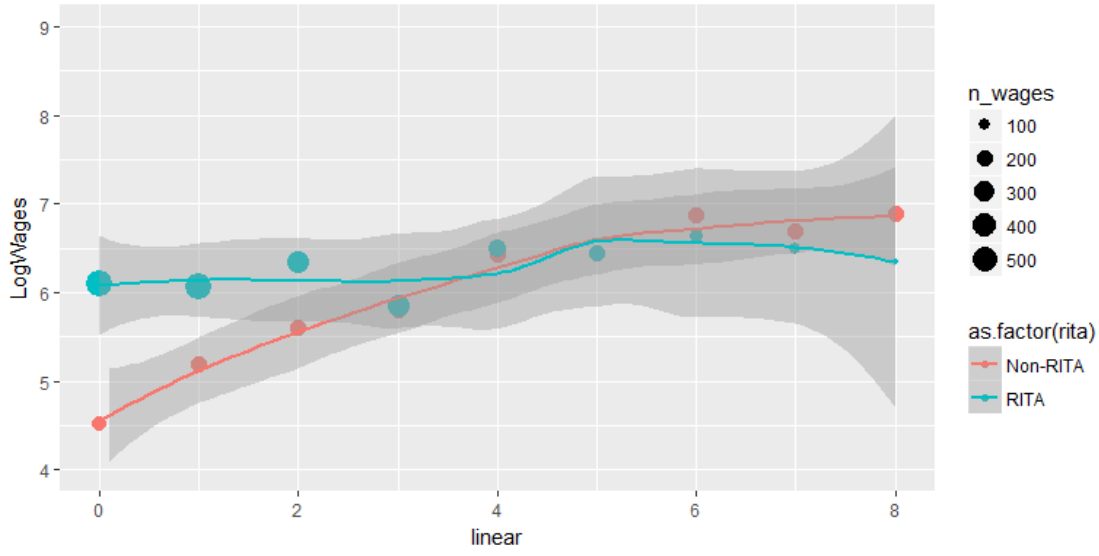
The following charts provide analysis of income and employment with an additional quarter of wage data (Quarter 2, 2017) before the final report to DOL was due November 15, 2017. In summary, the data did not change significantly from what was presented in Appendix E.

Income

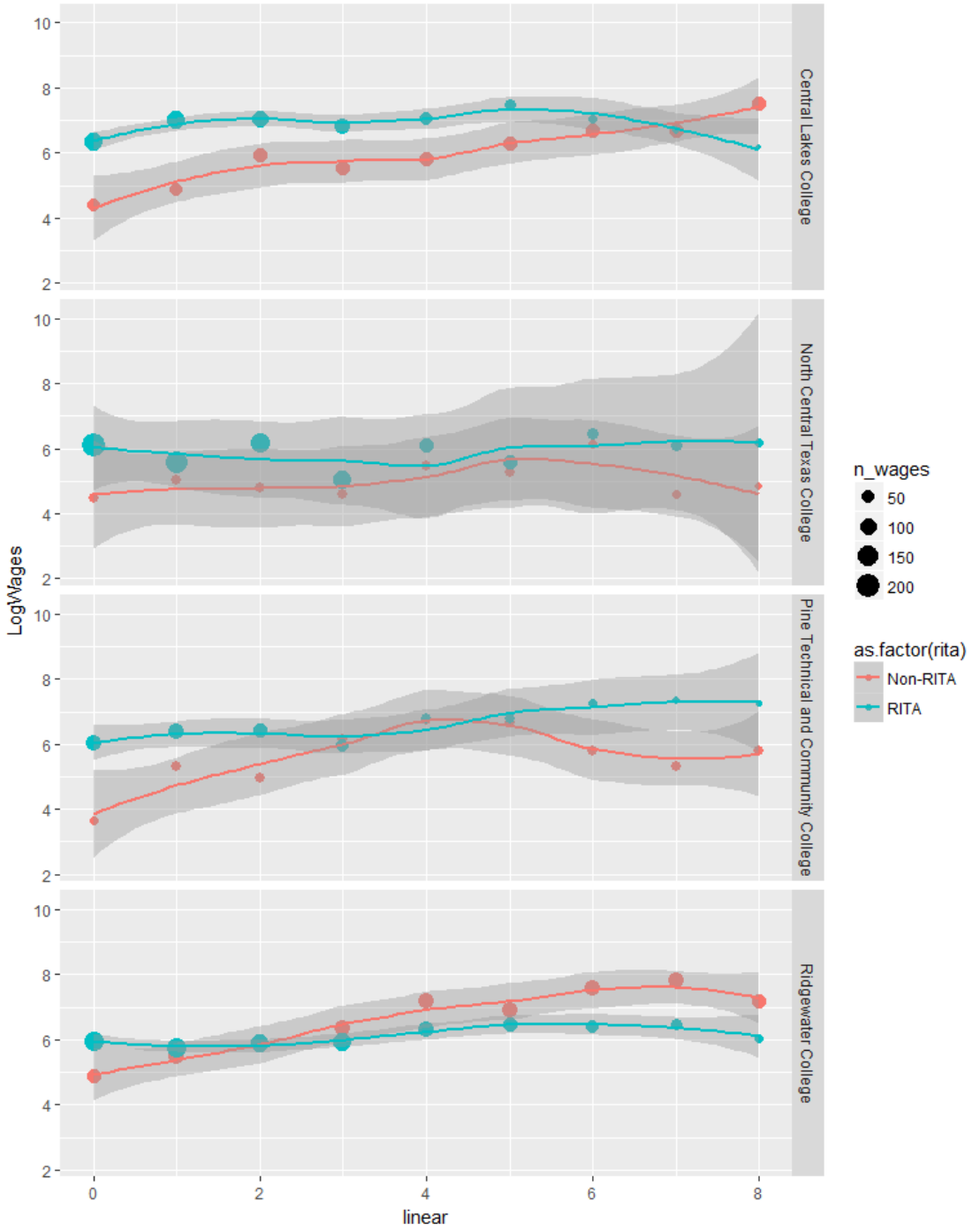
The graph below shows an increasing trend for the log of wages over time.



The graph below shows an increasing trend for the log of wages over time.



The graph below presents the trajectories of the average log-transformed income by RITA status and college.



Inferential results

The following table presents the results from the longitudinal models fit.

	Value	Std.Error	t-value	p-value

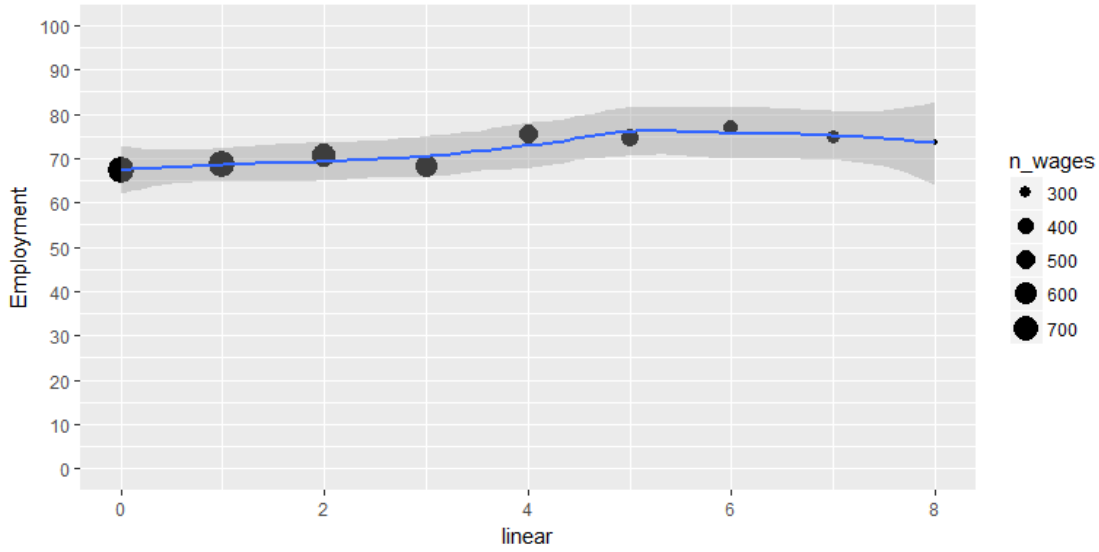
(Intercept)	7.200	0.560	12.770	0.000
Site.NameNorth Central Texas College	-0.040	0.650	-0.060	0.950
Site.NamePine Technical and Community College	0.580	0.720	0.810	0.420
Site.NameRidgewater College	0.400	0.501	0.799	0.425
age.centered	0.030	0.010	2.560	0.010
propensity.score	0.670	0.500	1.340	0.180
ritaRITA	0.730	0.450	1.640	0.100
linear	-0.023	0.213	-0.109	0.913
Site.NameNorth Central Texas College:ritaRITA	-0.130	0.710	-0.180	0.860
Site.NamePine Technical and Community College:ritaRITA	-0.850	0.800	-1.060	0.290
Site.NameRidgewater College:ritaRITA	-0.880	0.580	-1.530	0.130
Site.NameNorth Central Texas College:linear	-0.290	0.216	-1.344	0.179
Site.NamePine Technical and Community College:linear	-0.310	0.230	-1.350	0.180
Site.NameRidgewater College:linear	0.080	0.160	0.480	0.630
age.centered:linear	0.000	0.000	-1.030	0.300
propensity.score:linear	-0.026	0.210	-0.123	0.902
ritaRITA:linear	-0.140	0.160	-0.850	0.400
Site.NameNorth Central Texas College:ritaRITA:linear	-0.330	0.260	-1.310	0.190
Site.NamePine Technical and Community College:ritaRITA:linear	0.360	0.290	1.240	0.220
Site.NameRidgewater College:ritaRITA:linear	-0.096	0.209	-0.458	0.647

The table above provides the results of a linear growth model fit to the log-transformed income data over time. The results suggest that RITA was a significant predictor of the intercept ($\beta = 0.73, p = 0.10$) but not of the linear trend ($\beta = -0.14, p > 0.05$). Additionally, the results suggest that the effect of RITA on the intercept and linear trend was similar across the schools as indicated by the lack of statistically significant (at $\alpha = 0.05$) coefficients associated with the interaction terms that contain the words "Site.Name" and "RITA" together. Collectively, these results suggest that while RITA students began their programs with higher incomes, both groups had similar trajectories in income over the four-year time frame. Additionally, these trajectories were similar across the participating colleges. Students who were older than average when they began their

programs did tend to start with higher incomes ($\beta = 0.03, p = 0.01$) after controlling for other covariates.

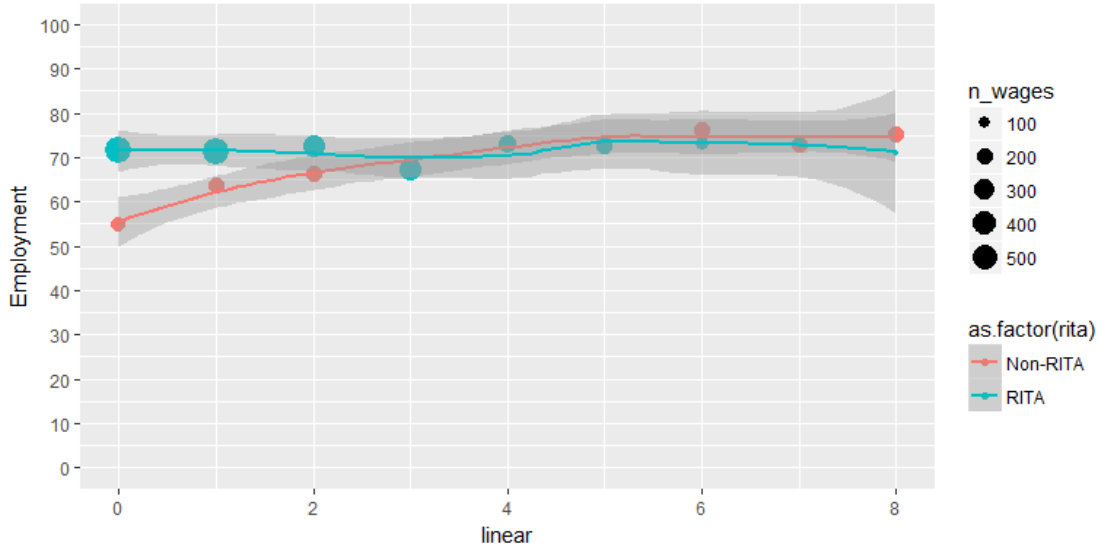
Employment

The following graph illustrates the employment rate of students over time.



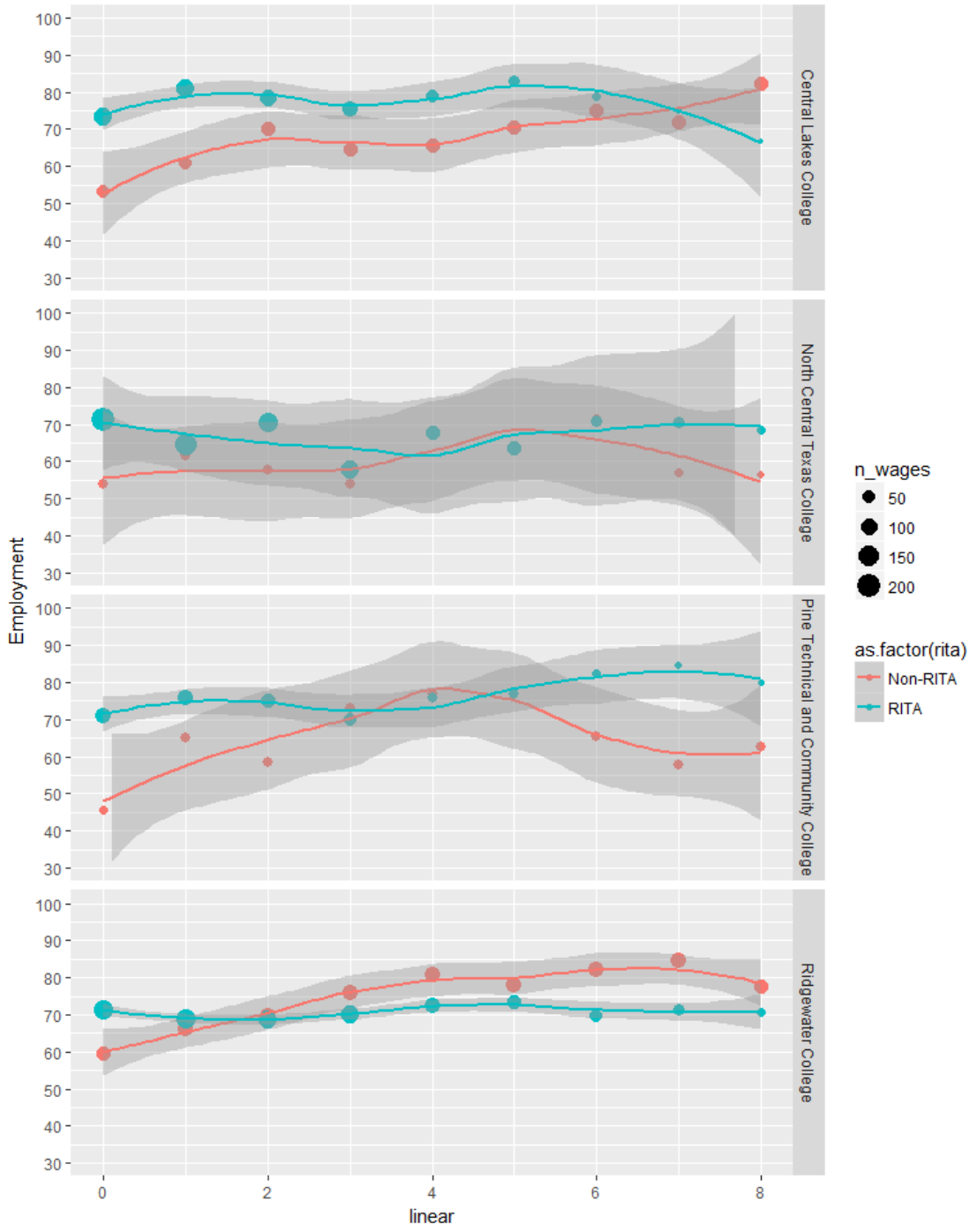
The graph above suggests that on average, the employment rate of students was about 68% at the start of their programs and increased over time to about 74% four years later. This is unchanged from prior analysis.

The authors then examined the trajectory of employment by RITA status.



The graph above shows a higher employment rate for RITA students at the start of their programs (about 72%) relative to non-RITA students (about 55%). This gap closes a bit over time with both groups having an employment rate of about 72% and 75% respectively, four years after starting their program.

In order to better understand the pattern of employment across schools, another graph depicting the employment rate over time by RITA status and college was generated.



The graphs above suggest that on average RITA students consistently started their programs with higher employment rates compared to non-RITA students. For two schools, Central Lakes College and Ridgewater College, this pattern reverses over time with non-RITA students having higher employment rates compared to RITA students after about four years.

Inferential results

In order to estimate the impact of RITA on the trajectory of employment, the authors fit a longitudinal model to the employment status data. The following table presents the results from this model.

	Estimate	Std.err	Pr(>|W|)
(Intercept)	0.16	0.44	0.72
Site.NameNorth Central Texas College	0.16	0.46	0.73
Site.NamePine Technical and Community College	-0.17	0.49	0.73
Site.NameRidgewater College	0.31	0.38	0.42
age.centered	-0.03	0.01	0.00
propensity.score	0.09	0.39	0.82
ritaRITA	0.92	0.34	0.01
linear	0.19	0.10	0.07
Site.NameNorth Central Texas College:ritaRITA	-0.47	0.52	0.36
Site.NamePine Technical and Community College:ritaRITA	0.01	0.58	0.99
Site.NameRidgewater College:ritaRITA	-0.62	0.45	0.17
Site.NameNorth Central Texas College:linear	-0.20	0.08	0.02
Site.NamePine Technical and Community College:linear	-0.09	0.09	0.31
Site.NameRidgewater College:linear	-0.01	0.08	0.91
age.centered:linear	0.00	0.00	0.83
propensity.score:linear	-0.04	0.10	0.66
ritaRITA:linear	-0.10	0.09	0.25
Site.NameNorth Central Texas College:ritaRITA:linear	-0.02	0.11	0.84
Site.NamePine Technical and Community College:ritaRITA:linear	0.13	0.13	0.33
Site.NameRidgewater College:ritaRITA:linear	-0.03	0.11	0.77

The results for employment above suggest that RITA was a significant predictor of the intercept ($\beta = 0.92, p < 0.01$), but not of the linear ($\beta = -0.09, p > 0.05$) trend. This suggests that while RITA students tended to have higher rates of employment when they began their programs, the trend in employment over time was similar between RITA and non-RITA students. Additionally, the impact of RITA (or lack thereof) on employment was largely similar between Central Lakes College and the other colleges in the sample as indicated by the lack of statistically significant (at $\alpha = 0.05$) coefficients associated with the interaction terms that contain the words "Site.Name" and "RITA" together. Non-RITA students at North Central Texas did exhibit a slower growth rate in employment over time relative to Central Lakes College ($\beta = -0.20, p = 0.02$)