

TEACHER EFFECTIVENESS IN ADULT EDUCATION

The Relationship Between Teacher Characteristics and Students' Transitions Into Postsecondary Education



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Executive Summary

To provide descriptive information about the characteristics of teachers in adult education and to explore whether those characteristics are associated with (1) student achievement, (2) transitioning into postsecondary education, and (3) labor market outcomes in adult education, the Office of Career, Technical, and Adult Education (OCTAE) contracted with American Institutes for Research (AIR) to produce a series of research briefs. The first brief provides research on the characteristics of adult education teachers, and the second brief examines the relationships between teacher characteristics and student achievement. This third brief studies the relationships between teacher characteristics and student transitioning into postsecondary education. The fourth brief focuses on communicating common issues with administrative data and provides recommendations from a research and evaluation perspective.

The analyses reported here are based on student-level data obtained from one state governed by the community college system with a large urban population. Results from this study allow us to better understand adult education teachers and the adult student population, and can provide evidence for discussions about policies and programs available to promote the transition of adult students into postsecondary education.

Analytic Data and Methods

To assess whether adult education teacher characteristics are correlated with students transitioning into postsecondary education, this study focused on the following areas:

- Teacher demographic characteristics, including gender, race/ethnicity, and employment status (part-time or full-time teacher)
- Teacher educational attainment
- Teacher professional development (number of hours participated in teacher professional development)
- Teacher experience, specifically total number of years in adult education

The findings presented in this brief are based on student-level data for the 2008–09, 2009–10, and 2010–11 program years obtained from the adult education data system of one state. The sample included approximately 102,000 to 104,000 students in each of three cohorts from adult basic education (ABE), adult secondary education (ASE), and English as a second language (ESL) programs, and nearly 3,000 adult education teachers for each cohort.

Readers are cautioned that the sample is not representative of all adult education teachers and students, and that the results do not imply a causal relationship between teacher characteristics and student transitions. However, the existing research examining adult education teachers and student performance is limited; therefore, the findings provide a first look at the relationship between key characteristics of adult education teachers and their students' transitions to postsecondary education.

Highlights: What We Have Learned So Far

The percentage of 2008–09 students who entered postsecondary education in the state examined ranged from 1% among a subset of ESL students to 30% among ASE High students, reflecting the purpose of adult education at those levels. The probability that students would enter postsecondary education also varied by several teacher characteristics based on a set of regression analyses. However, the relationships found between teacher characteristics and postsecondary education entry were at times counterintuitive, inconsistent across the samples included in the analyses, and/or too small to be substantively meaningful.

Specifically, when using the full sample (i.e., collapsing across cohorts and students' educational functioning level [EFL]), having a female teacher compared to a male teacher, a Hispanic teacher compared to a White teacher, a part-time teacher compared to a full-time teacher, or a teacher who participated in more professional development hours was associated with a lower probability of students' transitioning to postsecondary education. Having an African American teacher, however, was associated with an increased probability of transitioning into postsecondary education compared to having a White teacher. The relationships, although statistically significant, were not always large enough to be substantively meaningful (e.g., hours of professional development) and were not consistent across students with different EFLs (e.g., gender and race/ethnicity). In fact, among students most likely to transition to postsecondary education—ASE High—there were *no* relationships found between teacher characteristics and students' odds of transitioning to postsecondary education. Readers should also note that the results are based on data from only one state. Therefore, the findings may not be generalized to other states. Tables ES-1 and ES-2 on the following pages summarize the findings.

Table ES-1. Percentage of Students Who Entered Postsecondary Education by Cohort and Student EFL

Student EFL	Cohort	Entered postsecondary education	Student EFL	Cohort	Entered postsecondary education
ABE Beginning Literacy	2008–2009	8%	ESL Beginning Literacy	2008–2009	2%
	2009–2010	13%		2009–2010	3%
	2010–2011	13%		2010–2011	2%
ABE Beginning Basic Education	2008–2009	8%	ESL Low Beginning	2008–2009	1%
	2009–2010	10%		2009–2010	2%
	2010–2011	13%		2010–2011	1%
ABE Intermediate Low	2008–2009	11%	ESL High Beginning	2008–2009	1%
	2009–2010	12%		2009–2010	4%
	2010–2011	15%		2010–2011	3%
ABE Intermediate High	2008–2009	16%	ESL Intermediate Low	2008–2009	2%
	2009–2010	17%		2009–2010	4%
	2010–2011	18%		2010–2011	4%
ASE Low	2008–2009	23%	ESL Intermediate High	2008–2009	3%
	2009–2010	23%		2009–2010	6%
	2010–2011	23%		2010–2011	6%
ASE High	2008–2009	30%	ESL Advanced	2008–2009	10%
	2009–2010	29%		2009–2010	9%
	2010–2011	29%		2010–2011	8%

Table ES-2. Summary of Findings on Key Teacher Characteristics Used in Predicting the Probability That a Student Will Transition to Postsecondary Education by EFL^a

	Full sample	ABE Beginning Literacy	ABE Beginning Basic Education	ABE Intermediate Low	ABE Intermediate High	ASE Low	ASE High	ESL Advanced
Female teacher	Lower probability					Higher probability		
African American	Higher probability	Higher probability						
Hispanic	Lower probability	Higher probability						Lower probability
Part-time teacher	Lower probability							
Highest degree: GED				Lower probability				
Highest degree: associate's				Lower probability				
Highest degree: bachelor's				Lower probability				
Highest degree: master's				Lower probability				
Highest degree: PhD				Lower probability				
Highest degree: other								
Number of PD hours	Lower probability		Lower probability	Lower probability	Lower probability	Lower probability		
Years of adult education experience			Lower probability		Lower probability			

Note. The findings are based on a random effects logit regression model, using data from program years 2009, 2010, and 2011. Blank cells indicate that the odds ratio for that teacher characteristic was not significant.

^aFindings are not presented for EFLs with less than 10% of students who transitioned to postsecondary education, based on the 2009 cohort.

I. Introduction

A recent study released by the National Center for Higher Education Management Systems reports that the United States risks losing its edge in global economic competitiveness because new American workers do not have the same level of educational preparation as many of their international counterparts. It concludes that the United States cannot remain internationally competitive without providing better education to older adults who have either dropped out of high school or completed high school but did not go to college (Jones & Kelley, 2007).

In 2002, the U.S. Department of Labor announced that most of the fastest-growing jobs in the country will require workers to have postsecondary educational preparation (Alamprese, 2005). However, data from the 2005 U.S. Census indicate that large numbers of working-age adults (ages 18-64) continue to have attained only low levels of education. The Census reports that more than 25 million adults in the United States—or 14% of working-age adults—have not completed high school or the equivalent; among those with less than a high school diploma, approximately 35% dropped out before ninth grade. In addition, 8.3 million individuals with a high school diploma or less speak English poorly or not at all.

One of the roles of the U.S. adult education system is to increase the number of nontraditional learners who transition to postsecondary education. In program year (PY) 2011–12, federally funded adult education providers served more than two million eligible adults who lacked basic literacy and/or English language skills (National Reporting System, 2013). Among these adults, only one in four with less than a high school education at entry go on to participate in further education or training, including credit-bearing postsecondary education (Strawn, 2007). However, among the learners who indicated that postsecondary education enrollment was their *goal* for participating in adult education, a substantial percentage—56 percent—later enrolled in postsecondary education or training in PY 2011–12 (Office of Career, Technical, and Adult Education, 2013), up from 20% in PY2003–04.

A report from the Council for Adult and Experiential Learning (CAEL) underscores the importance of the adult education system in meeting the educational and workforce needs in our states and nation, and in improving postsecondary education attainment rates (CAEL, 2008). Unlike transition services for high school graduates, which are better established, the transformation of adult education programs to include transition services for adults is an emerging area of concern for the field of adult education (Office of Vocational and Adult Education, 2004). While a few studies examined various models of college transition programs in adult education (e.g., Zafft, Kallenbach, & Spohn, 2006), little information is available on the role of teacher characteristics—including professional qualifications—in transitioning adult students into postsecondary education.

To provide descriptive information about the characteristics of teachers in adult education and to explore whether those characteristics are associated with (1) student achievement, (2) transitioning into postsecondary education, and (3) labor market outcomes in adult education, the Office of Career, Technical, and Adult Education (OCTAE) contracted with American Institutes of Research (AIR) to produce a series of research briefs. The first brief provides research on the characteristics of adult education teachers and the second brief examines the relationships between teacher characteristics and student achievement. This third brief studies the relationships

between teacher characteristics and student transitioning into postsecondary education. Brief four focuses on communicating common issues with administrative data and provides recommendations from a research and evaluation perspective.

The analyses reported here are based on student-level data obtained from one state governed by the community college system with a large urban population. Results of this study allow us to better understand adult education teachers and the adult student population and can provide evidence for discussions about policies and programs available to promote the transition of adult students into postsecondary education.

II. Data

For this study, student-level data for the 2008–09, 2009–10, and 2010–11 program years were obtained from one state. The student-level data included information on teachers (Table 1), an indicator that a student transitioned into postsecondary education, student demographics, student EFL, program size, program type, and program performance, as measured by the percentage of students in the program who completed an EFL during the program year.

Our main interest was in estimating the relationships between a set of teacher characteristics and adult students' transitions into postsecondary education. For this purpose, we first needed to match teachers with their students. As discussed in detail in Appendix A, coteaching is common in the state that provided the data. To solve this problem, we selected a primary teacher for each student on the basis of that student's attendance hours with each teacher. The downside of this matching method is that we may have introduced bias into our estimation by assuming that student gains could be attributed only to the primary teacher. If a student benefited from a secondary teacher, our estimates would be biased upward because we attributed the gains to the primary teacher.

To carry out the proposed regression analysis (discussed in detail in the Methods section), we requested a longitudinal data set from the state that contained multiple observations for the same student across 3 years and multiple observations for the same teacher. The purpose of using a longitudinal data set was to control for potential unobservable time-invariant teacher (e.g., teaching ability, skill) and program (e.g., policies that do not change over time) characteristics that might have affected student access to postsecondary education when estimating the effects on observable teacher characteristics.

Our total sample size of students in ABE, ASE, and ESL programs was approximately 102,000 to 104,000 students and nearly 3,000 adult education teachers for each of the 3 program years. In Table 1, we present all available teacher, student, and program variables by year. Readers should note that although teacher professional development can be a key predictor in student achievement in K–12 education, in adult education we do not have ideal measures of the quality and the quantity of PD participation. In our study, we used the number of hours of PD participation in the program year as a proxy. One should be cautious when drawing conclusions based on the PD data available because a measure of this type does not represent the quality of PD provided in each local program, and it is unlikely that the content of the PD was focused on helping students transition to postsecondary education. In addition, it does not capture the full periodicity of teachers' participation in PD.

Table 1. Sample Size and the Availability of Teacher, Student, and Agency Variables by Program Year

	2008–09	2009–10	2010–11
Number of teachers	2,939	2,927	2,767
Number of observations (student level)	103,326	104,071	102,469
Teacher variables			
Gender	√	√	√
Race	√	√	√
Educational attainment	√	√	√
Part-time/full-time	√	√	√
Total years of adult education experience	√	√	√
Total professional development hours	√	√	√
Adult education department (ABE, ASE, ESL, etc.)	√	√	√
Student variables			
Age	√	√	√
Race	√	√	√
Attendance hours	√	√	√
Educational attainment	√	√	√
Employment status	√	√	√
Number of instructors	√	√	√
English is second language	√	√	√
Pre-assessment NRS level	√	√	√
Agency variables			
Agency/program size	√	√	√
Agency/program type	√	√	√
Agency/program performance	√	√	√

Descriptive Findings

Our main outcome variable is an indicator of whether the student entered postsecondary education or not. Because students who are placed in different educational functioning levels (EFLs) have different probabilities of entering postsecondary education, it is necessary to examine outcomes by EFL. In addition, students may enter postsecondary education immediately or any time after they exit the adult education system. However, we only tracked students 3 years after their exiting the adult education system. Overall, as shown in Table 2, around 10% of adult students in the participating state entered postsecondary education.

Table 2. Percentage of Students Who Entered Postsecondary Education by Cohort

Year	2008–09	2009–10	2010–11
Entered postsecondary education	9%	10%	10%
Number of observations	103,326	104,071	102,469

Table 3 presents the percentage of students entering postsecondary education by student EFLs. According to these results, about 30% of PY 2009 students in ASE High entered postsecondary education, followed by 23% of students in ASE Low and 16% of students in ABE Intermediate High. Students in other levels were much less likely to enter postsecondary education, reflecting the fact that students in different EFLs likely possess different prior educational backgrounds and goals.

Because adult students may not enter into postsecondary education until years after they exit the adult education system, we also examined student cohorts' outcomes by the year that students entered postsecondary education. For students in the 2008–09 cohort, about 39% of those who entered postsecondary education did so immediately after they exited the adult education program, and the percentage decreased each subsequent year (Table 4). Similarly, for students in the 2010–11 cohort, more than 50% of students who entered postsecondary education did so immediately after they exited the adult education program, while another 27% did so in the second year after exit.

This pattern was consistent when we looked at the percentage of students entering postsecondary education each year of entry by student cohort and EFL, as seen in Table 5. Students were more likely to enter postsecondary education the year they exited the adult education system than any other year, regardless of entering level.

Table 3. Percentage of Students Who Entered Postsecondary Education by Cohort and Student EFL

Student EFL	Cohort	Entered postsecondary education	Student EFL	Cohort	Entered postsecondary education
ABE Beginning Literacy	2008–2009	8%	ESL Beginning Literacy	2008–09	2%
	2009–2010	13%		2009–10	3%
	2010–2011	13%		2010–11	2%
ABE Beginning Basic Education	2008–2009	8%	ESL Low Beginning	2008–09	1%
	2009–2010	10%		2009–10	2%
	2010–2011	13%		2010–11	1%
ABE Intermediate Low	2008–2009	11%	ESL High Beginning	2008–09	1%
	2009–2010	12%		2009–10	4%
	2010–2011	15%		2010–11	3%
ABE Intermediate High	2008–2009	16%	ESL Intermediate Low	2008–09	2%
	2009–2010	17%		2009–10	4%
	2010–2011	18%		2010–11	4%
ASE Low	2008–2009	23%	ESL Intermediate High	2008–09	3%
	2009–2010	23%		2009–10	6%
	2010–2011	23%		2010–11	6%
ASE High	2008–2009	30%	ESL Advanced	2008–09	10%
	2009–2010	29%		2009–10	9%
	2010–2011	29%		2010–11	8%

Table 4. Percentage Distribution of Students Who Entered Postsecondary Education by Cohort and Year Entered Postsecondary Education

Year entered postsecondary education	PY/cohort			Total number of students entered postsecondary education
	2008–09	2009–10	2010–11	
2008	39%	0%	0%	3,481
2009	27%	53%	0%	7,705
2010	15%	24%	55%	9,354
2011	11%	12%	27%	5,010
2012	9%	11%	18%	3,662
Total	8,948	10,094	10,170	29,212

Table 5. Percentage of Students Who Entered Postsecondary Education by Student EFL, Cohort, and Year Entered Postsecondary Education

PY/cohort 2008–09						
Percentage of cohort who entered postsecondary education each year						
Student EFL	2008	2009	2010	2011	2012	Total number of students in cohort
ABE Beginning Literacy	3%	3%	1%	1%	1%	1,103
ABE Beginning Basic Education	4%	1%	1%	1%	1%	3,239
ABE Intermediate Low	5%	2%	2%	1%	1%	8,584
ABE Intermediate High	5%	4%	3%	2%	2%	11,749
ASE Low	7%	7%	4%	3%	2%	6,724
ASE High	11%	9%	5%	3%	2%	6,423
ESL Beginning Literacy	1%	0%	0%	0%	0%	7,831
ESL Low Beginning	0%	0%	0%	0%	0%	8,443
ESL High Beginning	1%	0%	0%	0%	0%	11,261
ESL Intermediate Low	1%	0%	0%	0%	0%	10,282
ESL Intermediate High	2%	1%	0%	0%	0%	14,412
ESL Advanced	5%	3%	1%	1%	1%	13,275
Total	3%	2%	1%	1%	1%	103,326

PY/cohort 2009–2010						
Percentage of cohort who entered postsecondary education each year						
Student EFL	2009	2010	2011	2012	Total number of students in cohort	
ABE Beginning Literacy	7%	4%	1%	1%	1,034	
ABE Beginning Basic Education	6%	2%	1%	1%	3,137	
ABE Intermediate Low	6%	3%	2%	2%	9,445	
ABE Intermediate High	8%	4%	3%	2%	12,660	
ASE Low	9%	7%	4%	3%	7,328	
ASE High	12%	10%	4%	3%	6,827	
ESL Beginning Literacy	3%	0%	0%	0%	9,800	
ESL Low Beginning	2%	0%	0%	0%	21,265	
ESL High Beginning	3%	0%	0%	0%	9,013	
ESL Intermediate Low	3%	1%	0%	0%	5,996	
ESL Intermediate High	5%	1%	0%	0%	10,101	
ESL Advanced	7%	2%	1%	1%	7,465	
Total	5%	2%	1%	1%	104,071	

PY/cohort 2010–11				
Percentage of cohort who entered postsecondary education each year				
Student EFL	2010	2011	2012	Total number of students in cohort
ABE Beginning Literacy	8%	3%	1%	922
ABE Beginning Basic Education	9%	3%	2%	3,044
ABE Intermediate Low	9%	3%	2%	9,592
ABE Intermediate High	10%	5%	3%	13,369
ASE Low	11%	7%	5%	7,608
ASE High	14%	9%	5%	6,824
ESL Beginning Literacy	1%	0%	0%	8,215
ESL Low Beginning	1%	0%	0%	19,876
ESL High Beginning	2%	1%	0%	9,412
ESL Intermediate Low	2%	1%	1%	6,100
ESL Intermediate High	3%	1%	1%	10,279
ESL Advanced	5%	2%	1%	7,228
Total	5%	3%	2%	102,469

Teacher Variables

In Table 6, we present summary statistics for the key teacher variables used in our regression models based on data from 2010–11. More than 65% of teachers were White, about 13% were African American, and about 11% were Hispanic. Most teachers held either a bachelor's (45 percent) or a master's (46 percent) degree as their highest level of education, and 2% of teachers held doctoral degrees. More than 90% of teachers were part-time, and the average number of years of adult education experience was 13 years. Teacher participation in professional development ranged widely across programs within the state. We used the number of hours to quantify participation in PD. On average, adult teachers participated in 9 hours of PD in 2010–11.

Table 6. Key Teacher Input Variables in 2010–11

Variable	Number of observations	Percentage or mean	Standard deviation	Minimum	Maximum
Teacher: White	2,767	67.0%	47.0%	0	1
Teacher: African American	2,767	12.5%	33.0%	0	1
Teacher: Hispanic	2,767	10.7%	30.9%	0	1
Teacher: Asian	2,767	3.3%	17.8%	0	1
Teacher: Other race	2,767	6.4%	24.5%	0	1
Female teacher	2,767	73.8%	44.0%	0	1
Male teacher	2,767	26.2%	44.0%	0	1
Teacher education: GED	2,767	0.3%	5.0%	0	1
Teacher education: high school	2,767	0.4%	6.6%	0	1
Teacher education: associate's degree	2,767	0.7%	8.5%	0	1

Variable	Number of observations	Percentage or mean	Standard deviation	Minimum	Maximum
Teacher education: bachelor's degree	2,767	45.0%	49.8%	0	1
Teacher education: master's degree	2,767	46.4%	49.9%	0	1
Teacher education: doctoral degree	2,767	2.4%	15.3%	0	1
Highest degree: Other	2,767	4.8%	21.3%	0	1
Part-time teacher	2,767	91.7%	27.6%	0	1
Full-time teacher	2,767	8.3%	27.6%	0	1
Years of adult education experience	2,767	12.8	11.2	0	60
Number of PD hours	2,767	9.1	9.4	0	179

Student Variables

We included student demographic variables, attendance hours, employment status, special needs, and student EFL in our regression models to control for their possible role in students' transitions to college. Table 7 presents summary statistics on those variables for the 2010–11 cohort.

Enrolled students in this cohort were, on average, 33 years old. More than 50% of 2010–11 students were Hispanic, and nearly 20% were African American. The average attendance hours ranged widely, with an average of 99 hours. More than 45% of students were unemployed while about 41% were employed. A small percentage of adult students in the 2010–11 cohort were labeled as disabled, while the disability status of the majority of students was unknown.

Students placed into different EFLs might also have different probabilities of transitioning to postsecondary education because of their prior educational backgrounds. For example, adult education providers may focus on transitioning ASE High students to postsecondary education. We tested this possibility by conducting separate analyses by student EFL. Among the 2010–11 cohort, nearly 60% of adult students were in various ESL levels, around 14% were placed in ASE levels, and the remainder were in ABE levels.

Table 7. Key Student Input Variables in PY 2010–11^a

Variable	Number of observations	Percentage or mean	Standard deviation	Minimum	Maximum
Student age	102,469	33.4	12.6	15	80
Student: attendance hours	102,469	99.3	95.1	12	1,410
Student: White	102,469	21.3%	40.9%	0	1
Student: African American	102,469	18.6%	38.9%	0	1
Student: Hispanic	102,469	50.7%	50.0%	0	1
Student: Asian	102,469	7.7%	26.7%	0	1
Student: other race	102,469	1.7%	13.0%	0	1
Student: full-time	102,469	28.0%	44.9%	0	1
Student: part-time	102,469	13.4%	34.1%	0	1
Student: unemployed	102,469	46.0%	49.8%	0	1
Student: not in labor force	102,469	12.5%	33.1%	0	1
Student NRS level: ABE Beginning Basic Education	102,469	3.0%	17.0%	0	1
Student NRS level: ABE Beginning Literacy	102,469	0.9%	9.4%	0	1
Student NRS level: ABE Intermediate High	102,469	13.0%	33.7%	0	1
Student NRS level: ABE Intermediate Low	102,469	9.4%	29.1%	0	1
Student NRS level: ASE High	102,469	6.7%	24.9%	0	1
Student NRS level: ASE Low	102,469	7.4%	26.2%	0	1
Student NRS level: ESL Advanced	102,469	7.1%	25.6%	0	1
Student NRS level: ESL Beginning Literacy	102,469	8.0%	27.2%	0	1
Student NRS level: ESL High Beginning	102,469	9.2%	28.9%	0	1
Student NRS level: ESL Intermediate High	102,469	10.0%	30.0%	0	1
Student NRS level: ESL Intermediate Low	102,469	6.0%	23.7%	0	1
Student NRS level: ESL Low Beginning	102,469	19.4%	39.5%	0	1

Program Variables

Research in K–12 education has shown that the characteristics of the educational setting are associated with student performance. To test whether this applies to adult education settings, we also included program level variables in our model. Program size indicates the average number of students enrolled; the average was around 3,100 students in our participating state during 2010–11. We also requested data on the percentage of students who completed an EFL by program to measure program performance. On average, 38% of students completed an educational level in 2010–11 across all local programs in the state. Lastly, we included indicators for program type. The six key program types available from the state participating in our study included community-based organizations (CBO), community colleges (CC), correctional institutions (COR), faith-based organizations (FBO), public universities (FYCU), and local educational agencies (LEA). Among all programs, more than 75 percent of the program providers were community colleges (Table 8).

Table 8. Key Program Input Variables in PY 2010–11

Variable	Number of observations	Percentage or mean	Standard deviation	Minimum	Maximum
Program size	102,469	3,105	2,349	45	8,369
Program performance (EFL advancement)	102,469	38.10%	10.90%	0.18	0.86
Program type: CBO	102,469	11.74%	32.19%	0	1
Program type: CC	102,469	77.21%	41.95%	0	1
Program type: COR	102,469	1.09%	10.38%	0	1
Program type: FBO	102,469	0.98%	9.85%	0	1
Program type: FYCU	102,469	0.14%	3.71%	0	1
Program type: LEA	102,469	8.84%	28.39%	0	1

III. Methods

Analytical Model 1: Logit Regression Model Controlling for Teacher, Student, and Program Characteristics

The first analytical model used, which served as a baseline to compare the results from other, more complicated models, was a Logit model with a binary outcome variable that indicates whether a student entered postsecondary education or not:

$$P(Y_i = 1 | X_{xij}) = \beta_0 + \beta_1 X_{it} + \sum_{p=1}^n \alpha_p T_{kt} + \sum_{q=1}^n \pi_q P_{mt} + \varepsilon_{it}$$

The subscripts i , k , and m denote individual students, teachers, and program site, respectively; X is a vector of student characteristics; T is a vector of teacher characteristics; and P is a vector of program site level characteristics.

This model was used to estimate the relationship between a student's entry into college and teacher characteristics while controlling for student characteristics and program site characteristics. However, the model did not take into account the nesting of students within teachers and might therefore have overstated the statistical significance of the results.

Analytical Model 2: Teacher Random Effects Logit (RELogit) Regression Model

To take the nesting of students within teachers into account, as our next model we employed a teacher RELogit model. The estimated model was of the following form:

$$P(Y_i = 1 | X_{xij}) = \beta_0 + \beta_1 X_{it} + \sum_{p=1}^n \alpha_p T_{kt} + \sum_{q=1}^n \pi_q P_{mt} + v_{kt} + \varepsilon_{it}$$

As before, X is a vector of student characteristics; T is a vector of teacher characteristics; P is a vector of program site characteristics; and v_{kt} is the teacher random effects (REs).

The results from this model were used to determine whether teacher characteristics were related to student transitions to postsecondary education while controlling for student and program characteristics, and taking the nesting of the students within teachers into account.

Analytical Model 3: Rare Event Regression Model

Literature on logistic regression has shown that there are two threats to obtaining an unbiased logit coefficient: small sample size and rare event data. Our analytical sample has nearly 310,000 students, which is a significantly higher number than the required sample size of at least 200 (King & Zeng, 2001). Logit results, however, have been shown to be biased when the event being modeled has a low rate of occurrence in the data. We used 10% as a rule of thumb for employing a rare event model (Tomz, King, & Zeng, 2003), which adjusts estimates for this known source of bias.

Comparison of Models

We began our analysis with a baseline logit regression model that controlled for teacher, student, and program characteristics. This model allowed us to obtain coefficients on all teacher variables of interest while controlling for observable student and program characteristics. Although the baseline logit model with teacher, student, and program controls accounted for all characteristics observable and attainable by researchers, we cannot account for potential nesting effects of students within teachers. Therefore, using teacher RELogit, we assumed that students were randomly assigned to different teachers and adjusted for the standard errors for each variable. Lastly, we used a rare event model to test if the low incidence of students going to college played a role in estimating the relationships between teacher characteristics and student choice.

According to our preliminary analysis of the student outcome variable, the low incidence (less than 10% of students) of entering postsecondary education only occurred among students who were in the lower ESL levels. Therefore, we could not conduct regression analyses for ESL students, with the exception of ESL advanced students, because the low incidence of entry to postsecondary education may not yield reliable estimates in our statistical model.

In Appendix A, we present full tables of regression coefficient results on key teacher, student, and program characteristics from all three models. Only the results from the teacher RE model are presented in the text, however, because this model takes the nesting of students within teachers into account and was expected to produce more accurate standard errors.

IV. Results

In Table 9, we present results from teacher RELogit models using both the full sample and subsamples of students with different EFLs. The coefficients in the table are odds ratios; they represent the probability of a student entering postsecondary education given the teacher, student, or program characteristic listed. An odds ratio of 1 indicates that the characteristic being tested is not related to whether or not a student transitions to postsecondary education. An odds ratio less than 1 implies that the characteristic is negatively associated with student transition (i.e., a student is *less* likely to transition if he or she has a teacher with that characteristic), while an odds ratio greater than 1 denotes a positive relationship. In Table 10, we also present marginal

effects results for the teacher RELogit models to show the degree of association between the variables in our models and entering postsecondary education. Marginal effects, also known as partial effects, measure the change in the probability of entering postsecondary education for a unit change in the independent variable, controlling for all the other independent variables by setting them to their means. This provides a way of interpreting the odds ratio in a more meaningful way, particularly for continuous variables (e.g., hours of PD, teaching experience, etc.). Readers are cautioned that the findings presented in this brief are correlational and cannot be used to make causal attributions.

Teacher Findings

Using the models discussed above, we conducted analyses separately for the full sample and for students in each EFL to investigate if there were relationships between teacher characteristics and students' probabilities of transitioning into postsecondary education. Based on data from the full sample, which included all student cohorts and EFLs, we found that:

- Having a female teacher was associated with a lower probability of a student entering postsecondary education compared to having a male teacher
- Having an African American teacher was associated with a higher probability of entering postsecondary education compared to having a White teacher, while students with a Hispanic teacher had a lower probability of transitioning
- Higher levels of teacher PD were associated with a lower probability of transitioning to postsecondary education, although the magnitude of this relationship was small and potentially counterintuitive. Looking at the marginal effects for PD (Table 10) allows us to provide a more substantively meaningful interpretation of that finding. Based on the marginal effect, we estimate that it would require a substantial amount of PD—100 hours—to be associated with a 1.7% reduction in the odds of a student transitioning
- Students with part-time teachers had a lower probability of transitioning into postsecondary education compared to students with full-time teachers

A more complex picture emerges when looking at the analyses by EFL, which further limits the confidence with which we can make conclusions about the relationships between teacher characteristics and transitioning to postsecondary education. Specifically, the relationships were found only among some groups of students, and the direction of the relationships was not consistent across groups or between certain groups and the full sample. For example:

- Converse to the negative relationship found in the full sample, having a female teacher rather than a male teacher was positively correlated with a student's probability of transitioning to college for students in ASE Low
- Having an African American teacher rather than a White teacher was positively associated with a student's probability of entering postsecondary education in ABE Beginning Literacy
- Having a Hispanic teacher rather than a White teacher was positively correlated with a student's probability of entering postsecondary education in ABE Beginning Literacy, but negatively correlated with a student's probability of transitioning in ESL Advanced

- Students in ABE Intermediate Low had a lower probability of entering college if their teachers' educational attainment was below an associate's degree
- The number of PD hours was found to be negatively correlated with a student's probability of entering postsecondary education among those in ABE Beginning Basic Education, ABE Intermediate High, ABE Intermediate Low, and ASE Low, although similar to the full sample finding, the effects were not substantively meaningful

Student Findings

Although teacher characteristics were the focus of our study, we also examined the relationship between student characteristics and transitioning to postsecondary education. We found that:

- The older a student was, the less likely he or she entered postsecondary education, although the magnitude of this relationship was small
- Both African American and Asian students had higher probabilities of entering postsecondary education in several EFLs, while Hispanic students had lower probabilities of transitioning than White students, overall and among students in most EFLs, with the exception of those in ABE Beginning Literacy
- Students working part-time had a higher probability of entering postsecondary education than full-time workers; this was true for the full sample and among students in ASE High and Low, as well as ESL Advanced. Unemployed adult students in ABE Intermediate High and Low, and ABE Beginning Basic Education had lower probabilities of transitioning into postsecondary education compared to students in those EFLs who were full-time workers
- Attendance hours were positively (although weakly) correlated with the probability of entering postsecondary education among students in ABE Intermediate High, and ASE Low, and ASE High

Program Findings

Program size was not correlated with students' probabilities of transitioning into postsecondary education. Program performance, however, measured as the percentage of students completing EFLs during the program year, was correlated with students' probabilities of entering postsecondary education. The higher the overall performance of a local program, the higher the probability that a student from that program entered postsecondary education. Compared to students receiving services from a CBO setting, students in CC, COR, FYCU, and LEA tended to have higher probabilities of transitioning into postsecondary education. Among all program types, students receiving services from a community college had the highest probability of transitioning into postsecondary education. It should be noted, however, that these analyses did not control for the possibility that students might self-select into different settings based on their prior educational attainment or experiences with different school settings. Also, the program types are aggregated when the participating state prepared the data, thus further analysis is needed to investigate if the findings hold when using data from other states.

Table 9. Regression Results From Teacher RELogit Model (Odds Ratios)

Variable	Full sample	ABE Beginning Literacy	ABE Beginning Basic Education	ABE Intermediate Low	ABE Intermediate High	ASE Low	ASE High	ESL Advanced
Female teacher	0.754*** (0.0367)	1.060 (0.214)	0.813* (0.102)	0.974 (0.0691)	1.018 (0.0589)	1.149** (0.0658)	1.070 (0.0606)	0.927 (0.0670)
Teacher: African American	1.696*** (0.109)	1.945*** (0.483)	1.190 (0.166)	1.142* (0.0901)	0.994 (0.0667)	0.875* (0.0602)	0.939 (0.0655)	0.927 (0.139)
Teacher: Hispanic	0.511*** (0.0406)	3.910*** (1.649)	1.661 (0.536)	1.268 (0.266)	1.252 (0.231)	1.243 (0.238)	1.222 (0.254)	0.687*** (0.0852)
Teacher: Asian	1.000 (0.126)	1.182 (0.904)	1.220 (0.640)	1.387 (0.474)	1.025 (0.407)	1.222 (0.552)	1.557 (0.744)	0.845 (0.154)
Teacher: other race	1.633*** (0.180)	3.145*** (1.280)	1.158 (0.418)	0.949 (0.204)	1.477** (0.255)	0.946 (0.165)	1.245 (0.216)	1.548*** (0.240)
Highest degree: GED	0.879 (0.538)		1.696 (3.061)	0.0778** (0.0802)	0.302* (0.208)	1.426 (1.132)	1.036 (0.846)	
Highest degree: associate's	0.990 (0.413)	3.073e+06 (7.840e+09)	4.414 (5.757)	0.197** (0.141)	0.509 (0.302)	0.991 (0.704)	0.596 (0.442)	0.591 (0.551)
Highest degree: bachelor's	0.828 (0.286)	2.358e+06 (6.015e+09)	1.128 (1.360)	0.202*** (0.123)	0.446* (0.218)	1.097 (0.664)	0.874 (0.560)	0.599 (0.473)
Highest degree: master's	0.760 (0.263)	1.850e+06 (4.721e+09)	0.934 (1.127)	0.196*** (0.119)	0.459 (0.225)	1.137 (0.689)	0.921 (0.590)	0.578 (0.457)
Highest degree: PhD	0.779 (0.288)	1.420e+06 (3.622e+09)	1.984 (2.474)	0.258** (0.165)	0.410* (0.213)	1.088 (0.688)	0.597 (0.405)	0.604 (0.490)
Highest degree: other	1.929* (0.702)	3.495e+06 (8.918e+09)	4.082 (5.091)	0.573 (0.370)	0.912 (0.481)	1.807 (1.146)	1.111 (0.751)	1.311 (1.055)
Part-time teacher	0.587*** (0.0503)	1.395 (0.534)	1.303 (0.273)	0.991 (0.114)	0.876 (0.0840)	1.000 (0.0913)	1.123 (0.103)	0.736* (0.119)
Years of adult education experience	0.998 (0.00197)	0.990 (0.00842)	1.001 (0.00482)	0.995* (0.00275)	0.994** (0.00227)	0.998 (0.00222)	1.001 (0.00217)	1.000 (0.00312)
Number of PD hours	0.996*** (0.000931)	0.999 (0.00829)	0.988*** (0.00473)	0.995** (0.00232)	0.996** (0.00186)	0.995*** (0.00198)	0.997 (0.00193)	1.004* (0.00251)
Student: age	0.987***	0.991*	0.990***	0.993***	0.992***	0.988***	0.981***	0.987***

Variable	Full sample	ABE Beginning Literacy	ABE Beginning Basic Education	ABE Intermediate Low	ABE Intermediate High	ASE Low	ASE High	ESL Advanced
	(0.000660)	(0.00519)	(0.00303)	(0.00170)	(0.00150)	(0.00188)	(0.00187)	(0.00207)
Student: attendance hours	1.000	1.001	1.000	1.000*	1.001***	1.001***	1.001***	1.000
	(8.43e-05)	(0.000663)	(0.000393)	(0.000208)	(0.000172)	(0.000211)	(0.000214)	(0.000242)
Student: AfAm/Black	1.039*	0.748	1.057	1.174***	1.169***	1.184***	1.048	2.766***
	(0.0221)	(0.163)	(0.119)	(0.0652)	(0.0479)	(0.0546)	(0.0481)	(0.275)
Student: Hispanic	0.494***	0.923	0.613***	0.634***	0.728***	0.854***	0.734***	0.545***
	(0.0109)	(0.218)	(0.0846)	(0.0438)	(0.0375)	(0.0486)	(0.0392)	(0.0301)
Student: Asian	1.065*	0.719	0.775	1.457***	1.406***	1.641***	1.443**	1.194**
	(0.0380)	(0.324)	(0.164)	(0.166)	(0.166)	(0.266)	(0.232)	(0.0839)
Student: other race	1.073	0.657	1.259	1.232	1.214*	1.012	1.134	0.965
	(0.0499)	(0.360)	(0.305)	(0.161)	(0.123)	(0.120)	(0.117)	(0.162)
Student: part-time	1.247***	1.619*	1.046	1.098	1.118*	1.350***	1.300***	1.140**
	(0.0293)	(0.414)	(0.154)	(0.0830)	(0.0642)	(0.0881)	(0.0782)	(0.0731)
Student: unemployed	1.042**	1.090	0.717***	0.884**	0.895**	1.078	1.062	0.928
	(0.0199)	(0.231)	(0.0842)	(0.0535)	(0.0414)	(0.0576)	(0.0525)	(0.0495)
Student: not in labor force	0.834***	0.838	0.700**	0.703***	0.804***	1.010	1.002	0.651***
	(0.0250)	(0.240)	(0.109)	(0.0640)	(0.0579)	(0.0851)	(0.0795)	(0.0543)
Program size	1.000***	1.000	1.000**	1.000**	1.000***	1.000***	1.000***	1.000***
	(9.66e-06)	(5.80e-05)	(3.41e-05)	(1.96e-05)	(1.69e-05)	(1.76e-05)	(1.72e-05)	(1.42e-05)
Program performance	3.428***	16.48***	3.343**	3.802***	3.059***	2.515***	2.275***	2.664**
	(0.489)	(14.93)	(1.675)	(1.035)	(0.656)	(0.564)	(0.492)	(1.110)
Program type: CC	5.699***	3.220**	3.497***	2.240***	2.176***	2.184***	1.784***	3.559***
	(0.491)	(1.474)	(1.012)	(0.362)	(0.297)	(0.315)	(0.250)	(0.643)
Program type: COR	2.978***	1.198	0.952	0.922	1.037	1.880**	1.566	
	(0.966)	(1.054)	(0.568)	(0.313)	(0.278)	(0.499)	(0.445)	
Program type: FBO	0.494***							2.454**
	(0.126)							(0.950)
Program type: FYCU	2.466**	0.388	2.543	1.115	1.368	1.028	1.136	2.37e-08
	(1.028)	(0.508)	(1.850)	(0.612)	(0.648)	(0.577)	(0.529)	(0.000198)
Program type: LEA	2.261***	1.895	1.875*	1.387*	1.253	1.339**	1.053	1.208
	(0.231)	(0.961)	(0.604)	(0.239)	(0.176)	(0.195)	(0.148)	(0.259)
year2009	1.118***	1.833***	1.336***	1.098*	1.041	1.009	0.945	1.011
	(0.0202)	(0.335)	(0.138)	(0.0568)	(0.0404)	(0.0441)	(0.0397)	(0.0565)
year2010	1.171***	1.589**	2.013***	1.437***	1.229***	1.017	0.943	0.893*
	(0.0223)	(0.308)	(0.205)	(0.0742)	(0.0483)	(0.0456)	(0.0410)	(0.0527)

Variable	Full sample	ABE Beginning Literacy	ABE Beginning Basic Education	ABE Intermediate Low	ABE Intermediate High	ASE Low	ASE High	ESL Advanced
Observations	309,866	3,059	9,420	27,621	37,778	21,660	20,074	27,968
Number of instructors	4,129	758	1,366	1,739	1,701	1,465	1,380	1,695

Note. Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 10. Marginal Effects From Teacher RELogit Model

Variable	Full sample	ABE Beginning Literacy	ABE Beginning Basic Education	ABE Intermediate Low	ABE Intermediate High	ASE Low	ASE High	ESL Advanced
Female teacher	-0.0141	0.00336	-0.0136	-0.00252	0.00223	0.0229	0.0133	-0.00482
Teacher: African American	0.0299	0.0435	0.0112	0.0128	-0.000696	-0.0219	-0.0124	-0.00465
Teacher: Hispanic	-0.0255	0.135	0.0392	0.0244	0.0304	0.0386	0.0413	-0.0208
Teacher: Asian	-5.03e-06	0.0104	0.0136	0.0350	0.00316	0.0354	0.0956	-0.00991
Teacher: other race	0.0285	0.102	0.00981	-0.00487	0.0556	-0.00917	0.0454	0.0325
Highest degree: GED	-0.00577		0.0418	-0.0965	-0.0977	0.0653	0.00702	
Highest degree: associate's	-0.000491	0.955	0.172	-0.0837	-0.0665	-0.00154	-0.0898	-0.0265
Highest degree: bachelor's	-0.00887	0.996	0.00759	-0.153	-0.102	0.0154	-0.0266	-0.0303
Highest degree: master's	-0.0129	0.997	-0.00428	-0.155	-0.0958	0.0215	-0.0163	-0.0358
Highest degree: PhD	-0.0106	0.955	0.0573	-0.0780	-0.0822	0.0144	-0.0898	-0.0259
Highest degree: other	0.0411	0.985	0.157	-0.0426	-0.0111	0.114	0.0214	0.0189
Part-time teacher	-0.0305	0.0178	0.0155	-0.000815	-0.0171	-5.45e-05	0.0226	-0.0218
Years of adult education experience	-9.79e-05	-0.000591	5.97e-05	-0.000490	-0.000733	-0.000405	0.000245	7.13e-07
Number of PD hours	-0.000170	-8.24e-05	-0.000783	-0.000485	-0.000489	-0.000863	-0.000624	0.000268
Student: age	-0.000641	-0.000550	-0.000631	-0.000661	-0.00104	-0.00201	-0.00385	-0.000836
Student: attendance hours	4.91e-06	5.92e-05	7.69e-06	3.66e-05	0.000117	0.000137	0.000160	-1.08e-05
Student: AfAm/Black	0.00181	-0.0168	0.00348	0.0151	0.0197	0.0285	0.00934	0.0969
Student: Hispanic	-0.0342	-0.00459	-0.0275	-0.0390	-0.0373	-0.0256	-0.0584	-0.0400
Student: Asian	0.00303	-0.0168	-0.0146	0.0407	0.0479	0.0940	0.0781	0.0118
Student: other race	0.00341	-0.0205	0.0159	0.0212	0.0259	0.00207	0.0256	-0.00219
Student: part-time	0.0112	0.0327	0.00285	0.00907	0.0144	0.0533	0.0539	0.00860
Student: unemployed	0.00197	0.00499	-0.0214	-0.0118	-0.0141	0.0124	0.0119	-0.00464
Student: not in labor force	-0.00807	-0.00986	-0.0204	-0.0299	-0.0258	0.00163	0.000424	-0.0236
Program size	-8.65e-06	-3.40e-06	-5.26e-06	-4.44e-06	-1.07e-05	-1.33e-05	-1.32e-05	-2.73e-06
Program performance	0.0582	0.163	0.0760	0.126	0.140	0.154	0.163	0.0616
Program type: CC	0.0597	0.0565	0.0626	0.0645	0.0845	0.115	0.107	0.0559
Program type: COR	0.0842	0.0112	-0.00303	-0.00739	0.00464	0.123	0.0968	

Variable	Full sample	ABE Beginning Literacy	ABE Beginning Basic Education	ABE Intermediate Low	ABE Intermediate High	ASE Low	ASE High	ESL Advanced
Program type: FBO	-0.0247							0.0830
Program type: FYCU	0.0645	-0.0371	0.0876	0.0107	0.0438	0.00462	0.0259	-0.0680
Program type: LEA	0.0526	0.0463	0.0490	0.0340	0.0299	0.0516	0.0103	0.0127
year2009	0.00537	0.0387	0.0191	0.00895	0.00510	0.00147	-0.0111	0.000660
year2010	0.00764	0.0293	0.0496	0.0358	0.0264	0.00278	-0.0116	-0.00697
Observations	309,866	3,059	9,420	27,621	37,778	21,660	20,074	27,968
Number of instructors	4,129	758	1,366	1,739	1,701	1,465	1,380	1,695

V. Recommendations on Data Collection

The National Reporting System (NRS) requires all states to have a student-level record system for reporting outcomes, attendance, and characteristics of students who attend federally funded adult education and literacy programs. The quality of NRS data systems has improved over the years as advances in technology have made data systems less expensive and more accessible. Likewise, the quality of the NRS data has improved, as states gain more experience in collecting and reporting data. Consequently, a rich body of data exists among the states and local programs that can be used for secondary data analyses to answer research and policy questions.

However, using NRS data for the purposes of analysis and research is not straightforward. Adult education data systems in most states are designed not for research but for annual reporting to the Office of Career, Technical, and Adult Education. Also, the data systems often contain only NRS-required data elements, and the quality and subsequent usability of data vary across states. To carry out the proposed study, AIR requested student longitudinal data that allow student-teacher matching from one state. As we cleaned and prepared the data set for analysis, we noted the issues associated with using state NRS data for analysis and research. Therefore, we offer the following recommendations that may help states maintain a data system that can be better used for their own analysis and program evaluation as well as for outside research.

- Use consistent categories for teachers' and students' demographic data.** Currently, states collect data that are based on their individual needs and reporting purposes. There are no standard data categories at the federal level to guide the data collection process. For instance, some states categorize their teachers into seven racial groups (White, African American, Hispanic, Native American, Native Indian, Asian, Other) while others categorize all teachers into four (White, African American, Hispanic, Other). For teacher and student education, the categories used are also not consistent within a state and across states. Having consistent categories is important not only for analytical purposes when states evaluate their own teachers and students, but also for comparing their students and teachers with those of other states on different measures.
- Create unique teacher identifiers to link student data to specific teachers.** Different from K–12 education, coteaching is very popular in adult education, which presents a great hurdle for researchers who are evaluating teacher effectiveness. In addition, not all

states have a unique identifier for each teacher that can be used to link to student data. If the state database cannot link individual teachers to students, it is impossible to relate teacher effectiveness directly to student outcomes or attendance. Consequently, policymakers and researchers cannot effectively evaluate the performance of individual teachers and how that related to student performance. It is also impossible to track how teacher quality evolves over time.

- **Improve state longitudinal data systems.** To examine teacher effectiveness over time, researchers need longitudinal data, which will allow them to follow the same students and teachers across years. There is a growing need to establish state longitudinal data systems for reporting and research purposes. Although the states that participated in our study possessed high-quality data systems that can produce a student and teacher longitudinal subset, we noticed inconsistencies when cleaning the data sets. For instance, states might not have a unique identifier for every student. When such students exit and reenter the program, they are treated as new students, which might bias analyses because they will be treated as a separate observation. Especially when we want to isolate the effects of adult education on individuals' academic and labor market outcomes from other educational services, we will want to identify all the services received by the individual. Constructing a high-quality longitudinal data system will also benefit the quality of state reporting and policy evaluation. The data system will enable state directors and policymakers to monitor state performance over time rather than in a snapshot because data are recorded and reported in a consistent way across years.
- **Avoid self-reported data.** Self-reported data have been shown to lead to biases in statistical analysis. The direction of biases depends on the variable. For instance, some states use student self-reported attendance hours to evaluate the relationship between attendance and performance. Students tend to overestimate their attendance hours, which might lead to upward bias when estimating its correlation with student achievement. The more reliable alternative is to record students' participation through a third party (e.g., teacher, program director, etc.) and combine information to calculate total attendance hours.

VI. Conclusion

This study was the first attempt to explore the relationship between teacher characteristics and student transitions into postsecondary education. Teacher gender, race, PD participation, and part-time status were all found to be correlated with student transition using data from one participating state. However, the relationship between these characteristics and students' probabilities of entering postsecondary education were often not consistent across students with different EFLs or were not substantively meaningful.

We faced multiple data challenges when conducting the analyses using models commonly used in the teacher value-added literature. Among these, the lack of longitudinal data systems that allow for more accurate teacher-student matching was the biggest hurdle in teacher value-added estimation. Although we originally planned to estimate teacher fixed effect (FE) logit models where we control for both observable and unobservable teacher characteristics, and to estimate a composite score for each adult education teacher, the available data did not allow us to do so.

Hence, the core of this study explored the correlation between observable teacher characteristics and student probabilities of transitioning to college.

The limited literature on teacher quality in adult education provided little information about which teacher variables should be included in our analytical models. High-quality research that can guide policy formation and implementation in the adult education field is needed. To conduct such research, states need to collect a wider range of data and to collect these data uniformly across programs and states. They need guidance on what data elements to include and how to record their data. For instance, states currently do not collect teacher information consistently across programs and years.

Because of the restrictions in the data available and the fact that our conclusions are drawn from data from one state, interpretation and conclusions drawn from our study should be applied with caution. Additional studies using data from other states or smaller studies with higher-quality data are needed to confirm our findings. The current study is only the first step in exploring the relationship between teacher characteristics and postsecondary education transitions in adult education.

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Appendix A

Table A1. Regression Results (Odds Ratios) From Logit, Teacher RELogit, and Rare Event Regression Models

Variable	Logit	Teacher RELogit	Rare event
Female teacher	0.891** (0.0129)	0.754* (0.0367)	0.891** (0.0129)
Teacher: African American	1.191** (0.0236)	1.696** (0.109)	1.191** (0.0236)
Teacher: Hispanic	0.577** (0.0195)	0.511** (0.0406)	0.577** (0.0195)
Teacher: Asian	0.896* (0.0440)	1.000 (0.126)	0.897* (0.0440)
Teacher: other race	1.474** (0.0557)	1.633** (0.180)	1.475** (0.0557)
Highest degree: GED	1.052 (0.240)	0.879 (0.538)	1.054 (0.240)
Highest degree: associate's	0.722* (0.116)	0.990 (0.413)	0.718* (0.116)
Highest degree: bachelor's	0.684** (0.0962)	0.828 (0.286)	0.679** (0.0954)
Highest degree: master's	0.692** (0.0973)	0.760 (0.263)	0.686** (0.0965)
Highest degree: PhD	0.631** (0.0932)	0.779 (0.288)	0.627** (0.0925)
Highest degree: other	1.462** (0.213)	1.929* (0.702)	1.450* (0.211)
Part-time teacher	0.841** (0.0199)	0.587** (0.0503)	0.841** (0.0199)
Years of adult education experience	1.000 (0.000584)	0.998 (0.00197)	1.000 (0.000584)
Number of PD hours	0.997** (0.000717)	0.996** (0.000931)	0.997** (0.000717)
Student: age	0.978** (0.000615)	0.987** (0.000660)	0.978** (0.000614)
Student: attendance hours	1.000** (6.86e-05)	1.000 (8.43e-05)	1.000** (6.86e-05)
Student: AfAm/Black	1.197** (0.0219)	1.039 (0.0221)	1.197** (0.0219)
Student: Hispanic	0.343** (0.00618)	0.494** (0.0109)	0.343** (0.00618)
Student: Asian	0.833** (0.0244)	1.065 (0.0380)	0.834** (0.0244)
Student: other race	1.038 (0.0447)	1.073 (0.0499)	1.039 (0.0447)
Student: part-time	1.427** (0.0310)	1.247** (0.0293)	1.427** (0.0310)
Student: unemployed	1.219** (0.0217)	1.042* (0.0199)	1.219** (0.0217)
Student: not in labor force	0.928** (0.0239)	0.834** (0.0250)	0.928** (0.0240)
Program size	1.000** (3.96e-06)	1.000** (9.66e-06)	1.000** (3.96e-06)
Program performance	3.983** (0.264)	3.428** (0.489)	3.983** (0.264)
Program type: CC	3.216** (0.0995)	5.699** (0.491)	3.214** (0.0994)
Program type: COR	1.957** (0.132)	2.978** (0.966)	1.958** (0.132)
Program type: FBO	0.433** (0.0514)	0.494** (0.126)	0.436** (0.0517)
Program type: FYCU	1.394* (0.220)	2.466* (1.028)	1.406* (0.222)
Program type: LEA	1.624** (0.0551)	2.261** (0.231)	1.623** (0.0551)

Variable	Logit	Teacher RELogit	Rare event
year2009	1.108** (0.0176)	1.118** (0.0202)	1.108** (0.0176)
year2010	1.131** (0.0181)	1.171** (0.0223)	1.131** (0.0181)
Observations	309,866	309,866	309,866
Number of instructors		4,129	

Note. Robust standard errors in parentheses.
* $p < .05$. ** $p < .01$.

Table A2. Regression Results (Odds Ratios) From Logit, Teacher RELogit, and Rare Event Regression Models by Student NRS Level

A2-1 Student NRS Level: ABE Beginning Literacy

Variable	ABE Beginning Literacy (odds ratios)		
	Logit	Teacher RELogit	Rare event
Female teacher	1.161 (0.160)	1.060 (0.214)	1.168 (0.159)
Teacher: African American	1.623** (0.300)	1.945** (0.483)	1.598** (0.287)
Teacher: Hispanic	2.841** (0.819)	3.910** (1.649)	2.644** (0.727)
Teacher: Asian	0.932 (0.457)	1.182 (0.904)	1.004 (0.485)
Teacher: other race	2.567** (0.719)	3.145** (1.280)	2.453** (0.672)
Highest degree: GED			
Highest degree: associate's	114,905** (73,671)	3.073e+06 (7.840e+09)	0** (0)
Highest degree: bachelor's	110,507** (59,772)	2.358e+06 (6.015e+09)	0** (0)
Highest degree: master's	85,727** (47,347)	1.850e+06 (4.721e+09)	0** (0)
Highest degree: PhD	65,967** (48,944)	1.420e+06 (3.622e+09)	0** (0)
Highest degree: other	160,525** (94,389)	3.495e+06 (8.918e+09)	0** (0)
Part-time teacher	1.093 (0.293)	1.395 (0.534)	1.095 (0.296)
Years of adult education experience	0.987* (0.00550)	0.990 (0.00842)	0.988* (0.00538)
Number of PD hours	0.996 (0.00673)	0.999 (0.00829)	0.997 (0.00666)
Student: age	0.994 (0.00417)	0.991 (0.00519)	0.994 (0.00412)
Student: attendance hours	1.001 (0.000555)	1.001 (0.000663)	1.000 (0.000554)
Student: AfAm/Black	0.621** (0.104)	0.748 (0.163)	0.608** (0.100)
Student: Hispanic	0.840 (0.164)	0.923 (0.218)	0.792 (0.152)
Student: Asian	0.562 (0.233)	0.719 (0.324)	0.563 (0.229)
Student: other Race	0.521 (0.263)	0.657 (0.360)	0.535 (0.267)
Student: part-time	2.105** (0.441)	1.619 (0.414)	2.117** (0.438)
Student: unemployed	1.141 (0.216)	1.090 (0.231)	1.137 (0.213)
Student: not in labor force	0.850 (0.214)	0.838 (0.240)	0.863 (0.215)
Program size	1.000 (4.33e-05)	1.000 (5.80e-05)	
Program performance	9.100** (5.774)	16.48** (14.93)	11.17** (6.901)

Variable	ABE Beginning Literacy (odds ratios)		
	Logit	Teacher RELogit	Rare event
Program type: CC	2.037* (0.624)	3.220* (1.474)	1.725 (0.498)
Program type: COR	0.505 (0.322)	1.198 (1.054)	0.517 (0.327)
Program type: FBO			
Program type: FYCU	0.336 (0.366)	0.388 (0.508)	0.486 (0.525)
Program type: LEA	1.887* (0.585)	1.895 (0.961)	1.720 (0.522)
year2009	1.729** (0.269)	1.833** (0.335)	1.684** (0.259)
year2010	1.571** (0.258)	1.589* (0.308)	1.531** (0.247)
Observations	3,059	3,059	3,059
Number of instructors		758	

Note. Robust standard errors in parentheses.

* $p < .05$. ** $p < .01$.

A2-2 Student NRS Level: ABE Beginning Basic Education

Variable	ABE Beginning Basic Education (odds ratios)		
	Logit	Teacher RELogit	Rare event
Female teacher	0.946 (0.0792)	0.813 (0.102)	0.980 (0.0810)
Teacher: African American	1.136 (0.107)	1.190 (0.166)	1.142 (0.106)
Teacher: Hispanic	1.759** (0.313)	1.661 (0.536)	1.736** (0.307)
Teacher: Asian	1.077 (0.254)	1.220 (0.640)	1.049 (0.245)
Teacher: other race	1.023 (0.226)	1.158 (0.418)	0.982 (0.217)
Highest degree: GED	1.835 (2.835)	1.696 (3.061)	1.308 (2.020)
Highest degree: associate's	4.472 (4.565)	4.414 (5.757)	2.834 (2.905)
Highest degree: bachelor's	0.955 (0.951)	1.128 (1.360)	0.605 (0.606)
Highest degree: master's	0.874 (0.870)	0.934 (1.127)	0.523 (0.524)
Highest degree: PhD	1.312 (1.327)	1.984 (2.474)	0.788 (0.801)
Highest degree: other	3.589 (3.643)	4.082 (5.091)	2.074 (2.116)
Part-time teacher	1.325 (0.196)	1.303 (0.273)	1.266 (0.192)
Years of adult education experience	1.002 (0.00321)	1.001 (0.00482)	1.003 (0.00320)
Number of PD hours	0.989* (0.00428)	0.988** (0.00473)	0.990* (0.00427)
Student: age	0.990** (0.00267)	0.990** (0.00303)	0.990** (0.00268)
Student: attendance hours	1.000 (0.000315)	1.000 (0.000393)	1.000 (0.000314)

Variable	ABE Beginning Basic Education (odds ratios)		
	Logit	Teacher RELogit	Rare event
Student: AfAm/Black	1.066 (0.103)	1.057 (0.119)	1.013 (0.0964)
Student: Hispanic	0.674** (0.0798)	0.613** (0.0846)	0.611** (0.0711)
Student: Asian	0.749 (0.144)	0.775 (0.164)	0.697 (0.132)
Student: other race	1.171 (0.253)	1.259 (0.305)	1.087 (0.233)
Student: part-time	1.101 (0.143)	1.046 (0.154)	1.120 (0.144)
Student: unemployed	0.737** (0.0792)	0.717** (0.0842)	0.751** (0.0799)
Student: not in labor force	0.685** (0.0935)	0.700* (0.109)	0.700** (0.0949)
Program size	1.000** (2.43e-05)	1.000** (3.41e-05)	
Program performance	3.949** (1.355)	3.343* (1.675)	6.318** (2.064)
Program type: CC	3.431** (0.669)	3.497** (1.012)	2.796** (0.546)
Program type: COR	1.101 (0.412)	0.952 (0.568)	1.025 (0.383)
Program type: FYCU	2.236 (1.039)	2.543 (1.850)	2.234 (1.037)
Program type: LEA	1.717* (0.370)	1.875 (0.604)	1.571* (0.339)
year2009	1.332** (0.121)	1.336** (0.138)	1.305** (0.118)
year2010	1.885** (0.168)	2.013** (0.205)	1.780** (0.156)
Observations	9,420	9,420	9,420
Number of instructors		1,366	

Note. Robust standard errors in parentheses.
* $p < .05$. ** $p < .01$.

A2-3 Student NRS Level: ABE Intermediate Low

Variable	ABE Intermediate Low (odds ratios)		
	Logit	Teacher RELogit	Rare event
Female teacher	0.970 (0.0412)	0.974 (0.0691)	0.970 (0.0411)
Teacher: AfAm/Black	1.106* (0.0525)	1.142* (0.0901)	1.106** (0.0524)
Teacher: Hispanic	1.151 (0.163)	1.268 (0.266)	1.159 (0.164)
Teacher: Asian	1.426 (0.297)	1.387 (0.474)	1.445* (0.301)
Teacher: other race	0.958 (0.126)	0.949 (0.204)	0.962 (0.126)
Highest degree: GED	0.102** (0.0857)	0.0778* (0.0802)	0.126* (0.105)

Variable	ABE Intermediate Low (odds ratios)		
	Logit	Teacher RELogit	Rare event
Highest degree: associate's	0.149** (0.0723)	0.197* (0.141)	0.150** (0.0723)
Highest degree: bachelor's	0.214** (0.0875)	0.202** (0.123)	0.208** (0.0852)
Highest degree: master's	0.229** (0.0937)	0.196** (0.119)	0.223** (0.0912)
Highest degree: PhD	0.300** (0.127)	0.258* (0.165)	0.293** (0.124)
Highest degree: other	0.668 (0.286)	0.573 (0.370)	0.651 (0.278)
Part-time teacher	1.075 (0.0759)	0.991 (0.114)	1.074 (0.0757)
Years of adult education experience	0.998 (0.00161)	0.995 (0.00275)	0.998 (0.00161)
Number of PD hours	0.998 (0.00188)	0.995* (0.00232)	0.998 (0.00188)
Student: age	0.993** (0.00158)	0.993** (0.00170)	0.993** (0.00158)
Student: attendance hours	1.001** (0.000185)	1.000 (0.000208)	1.001** (0.000185)
Student: AfAm/Black	1.247** (0.0615)	1.174** (0.0652)	1.246** (0.0614)
Student: Hispanic	0.655** (0.0415)	0.634** (0.0438)	0.655** (0.0415)
Student: Asian	1.455** (0.152)	1.457** (0.166)	1.457** (0.152)
Student: other race	1.247 (0.155)	1.232 (0.161)	1.252 (0.155)
Student: part-time	1.113 (0.0795)	1.098 (0.0830)	1.113 (0.0794)
Student: unemployed	0.896 (0.0513)	0.884* (0.0535)	0.896 (0.0512)
Student: not in labor force	0.708** (0.0581)	0.703** (0.0640)	0.709** (0.0581)
Program size	1.000** (1.25e-05)	1.000* (1.96e-05)	1.000** (1.24e-05)
Program performance	3.348** (0.615)	3.802** (1.035)	3.347** (0.614)
Program type: CC	2.252** (0.238)	2.240** (0.362)	2.242** (0.237)
Program type: COR	0.847 (0.176)	0.922 (0.313)	0.851 (0.176)
Program type: FYCU	1.068 (0.420)	1.115 (0.612)	1.122 (0.441)
Program type: LEA	1.254** (0.142)	1.387* (0.239)	1.250* (0.142)
year2009	1.069 (0.0503)	1.098* (0.0568)	1.068 (0.0502)
year2010	1.386*** (0.0633)	1.437*** (0.0742)	1.385** (0.0632)
year2010	27,621	27,621	27,621

Variable	Logit	ABE Intermediate Low (odds ratios)	
		Teacher RELogit	Rare event
Observations		1,739	
Number of instructors	0.970	0.974	0.970

Note. Robust standard errors in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

A2-4 Student NRS Level: ABE Intermediate High

Variable	Logit	ABE Intermediate High (odds ratios)	
		Teacher RELogit	Rare Event
Female teacher	1.012 (0.0315)	1.018 (0.0589)	1.012 (0.0315)
Teacher: AfAm/Black	0.949 (0.0360)	0.994 (0.0667)	0.949 (0.0360)
Teacher: Hispanic	1.346* (0.160)	1.252 (0.231)	1.351* (0.160)
Teacher: Asian	0.851 (0.259)	1.025 (0.407)	0.878 (0.267)
Teacher: other race	1.402** (0.138)	1.477* (0.255)	1.404** (0.138)
Highest degree: GED	0.266** (0.118)	0.302 (0.208)	0.277** (0.123)
Highest degree: associate's	0.304** (0.0971)	0.509 (0.302)	0.306** (0.0975)
Highest degree: bachelor's	0.373** (0.0955)	0.446 (0.218)	0.370** (0.0947)
Highest degree: master's	0.403** (0.103)	0.459 (0.225)	0.400** (0.102)
Highest degree: PhD	0.375** (0.102)	0.410* (0.213)	0.373** (0.102)
Highest degree: other	0.785 (0.218)	0.912 (0.481)	0.778 (0.216)
Part-time teacher	0.921 (0.0453)	0.876 (0.0840)	0.921 (0.0452)
Years of adult education experience	0.994** (0.00122)	0.994* (0.00227)	0.994** (0.00122)
Number of PD hours	0.994** (0.00150)	0.996* (0.00186)	0.994** (0.00149)
Student: age	0.993** (0.00139)	0.992** (0.00150)	0.993** (0.00139)
Student: attendance hours	1.001** (0.000143)	1.001** (0.000172)	1.001** (0.000143)
Student: AfAm/Black	1.257** (0.0451)	1.169** (0.0479)	1.257** (0.0451)
Student: Hispanic	0.694** (0.0324)	0.728** (0.0375)	0.694** (0.0324)
Student: Asian	1.349** (0.146)	1.406** (0.166)	1.353** (0.147)
Student: other race	1.208 (0.117)	1.214 (0.123)	1.210* (0.117)
Student: part-time	1.178** (0.0645)	1.118 (0.0642)	1.178** (0.0644)

Variable	ABE Intermediate High (odds ratios)		
	Logit	Teacher RELogit	Rare Event
Student: unemployed	0.955 (0.0415)	0.895* (0.0414)	0.955 (0.0415)
Student: not in labor force	0.872* (0.0553)	0.804** (0.0579)	0.873* (0.0553)
Program size	1.000** (1.01e-05)	1.000** (1.69e-05)	1.000** (1.01e-05)
Program performance	2.792** (0.389)	3.059** (0.656)	2.790** (0.389)
Program type: CC	1.779** (0.132)	2.176** (0.297)	1.775** (0.131)
Program type: COR	0.757* (0.0989)	1.037 (0.278)	0.757* (0.0989)
Program type: FYCU	1.065 (0.354)	1.368 (0.648)	1.098 (0.364)
Program type: LEA	0.958 (0.0738)	1.253 (0.176)	0.957 (0.0737)
year2009	1.038 (0.0365)	1.041 (0.0404)	1.037 (0.0365)
year2010	1.185** (0.0411)	1.229** (0.0483)	1.184** (0.0411)
Observations	37,778	37,778	37,778
Number of instructors		1,701	

Note. Robust standard errors in parentheses.

* $p < .05$. ** $p < .01$.

A2-5 Student NRS Level: ASE Low

Variable	ASE Low (odds ratios)		
	Logit	Teacher RELogit	Rare event
Female teacher	1.138** (0.0413)	1.149* (0.0658)	1.149** (0.0415)
Teacher: AfAm/Black	0.891* (0.0410)	0.875 (0.0602)	0.878** (0.0399)
Teacher: Hispanic	1.332* (0.194)	1.243 (0.238)	1.249 (0.179)
Teacher: Asian	1.186 (0.461)	1.222 (0.552)	1.167 (0.453)
Teacher: other race	0.955 (0.107)	0.946 (0.165)	0.919 (0.103)
Highest degree: GED	1.335 (0.777)	1.426 (1.132)	1.012 (0.587)
Highest degree: associate's	0.989 (0.533)	0.991 (0.704)	0.919 (0.494)
Highest degree: bachelor's	1.127 (0.552)	1.097 (0.664)	0.999 (0.487)
Highest degree: master's	1.184 (0.580)	1.137 (0.689)	1.015 (0.496)
Highest degree: PhD	1.119 (0.567)	1.088 (0.688)	0.950 (0.479)
Highest degree: other	1.864 (0.947)	1.807 (1.146)	1.577 (0.798)

Variable	Logit	ASE Low (odds ratios)	
		Teacher RELogit	Rare event
Part-time teacher	1.093 (0.0622)	1.000 (0.0913)	1.072 (0.0614)
Years of adult education experience	0.998 (0.00142)	0.998 (0.00222)	0.998 (0.00142)
Number of PD hours	0.996* (0.00173)	0.995** (0.00198)	0.997 (0.00172)
Student: age	0.988** (0.00179)	0.988** (0.00188)	0.988** (0.00179)
Student: attendance hours	1.001** (0.000179)	1.001** (0.000211)	1.001** (0.000178)
Student: AfAm/Black	1.218** (0.0506)	1.184** (0.0546)	1.179** (0.0484)
Student: Hispanic	0.815** (0.0429)	0.854** (0.0486)	0.740** (0.0371)
Student: Asian	1.651** (0.257)	1.641** (0.266)	1.466* (0.224)
Student: other race	1.024 (0.116)	1.012 (0.120)	0.990 (0.112)
Student: part-time	1.361** (0.0852)	1.350** (0.0881)	1.368** (0.0853)
Student: unemployed	1.100 (0.0560)	1.078 (0.0576)	1.115* (0.0565)
Student: not in labor force	1.030 (0.0774)	1.010 (0.0851)	1.024 (0.0767)
Program size	1.000** (1.18e-05)	1.000** (1.76e-05)	
Program performance	2.455** (0.402)	2.515** (0.564)	3.207** (0.508)
Program type: CC	2.077** (0.205)	2.184** (0.315)	1.834** (0.178)
Program type: COR	1.997** (0.298)	1.880* (0.499)	1.907** (0.284)
Program type: FYCU	0.979 (0.445)	1.028 (0.577)	1.006 (0.456)
Program type: LEA	1.382** (0.136)	1.339* (0.195)	1.307** (0.128)
year2009	1.019 (0.0417)	1.009 (0.0441)	1.008 (0.0411)
year2010	1.024 (0.0420)	1.017 (0.0456)	1.004 (0.0409)
Observations	21,660	21,660	21,660
Number of instructors		1,465	

Note. Robust standard errors in parentheses.
* $p < .05$. ** $p < .01$.

A2-6 Student NRS Level: ASE High

Variable	ASE High (odds ratios)		
	Logit	Teacher RELogit	Rare event
Female teacher	1.099** (0.0383)	1.070 (0.0606)	1.110** (0.0385)
Teacher: AfAm/Black	0.932 (0.0429)	0.939 (0.0655)	0.915 (0.0418)
Teacher: Hispanic	1.260 (0.204)	1.222 (0.254)	1.192 (0.192)
Teacher: Asian	1.473 (0.575)	1.557 (0.744)	1.444 (0.565)
Teacher: other race	1.141 (0.124)	1.245 (0.216)	1.101 (0.119)
Highest degree: GED	1.340 (0.851)	1.036 (0.846)	1.090 (0.689)
Highest degree: associate's	0.597 (0.358)	0.596 (0.442)	0.572 (0.343)
Highest degree: bachelor's	0.930 (0.510)	0.874 (0.560)	0.855 (0.470)
Highest degree: master's	1.004 (0.551)	0.921 (0.590)	0.891 (0.490)
Highest degree: PhD	0.694 (0.396)	0.597 (0.405)	0.627 (0.358)
Highest degree: other	1.244 (0.706)	1.111 (0.751)	1.086 (0.617)
Part-time teacher	1.276** (0.0715)	1.123 (0.103)	1.262** (0.0710)
Years of adult education experience	1.001 (0.00132)	1.001 (0.00217)	1.001 (0.00132)
Number of PD hours	0.996* (0.00168)	0.997 (0.00193)	0.997* (0.00167)
Student: age	0.983** (0.00176)	0.981** (0.00187)	0.982** (0.00175)
Student: attendance hours	1.001** (0.000181)	1.001** (0.000214)	1.001** (0.000179)
Student: AfAm/Black	1.077 (0.0452)	1.048 (0.0481)	1.054 (0.0438)
Student: Hispanic	0.715** (0.0353)	0.734** (0.0392)	0.665** (0.0315)
Student: Asian	1.365* (0.209)	1.443* (0.232)	1.243 (0.188)
Student: other race	1.146 (0.112)	1.134 (0.117)	1.120 (0.109)
Student: part-time	1.331** (0.0759)	1.300** (0.0782)	1.337** (0.0760)
Student: unemployed	1.073 (0.0502)	1.062 (0.0525)	1.080 (0.0504)
Student: not in labor force	0.993 (0.0682)	1.002 (0.0795)	0.983 (0.0673)
Program size	1.000** (1.10e-05)	1.000** (1.72e-05)	
Program performance	2.683** (0.404)	2.275** (0.492)	3.254** (0.476)

Variable	Logit	ASE High (odds ratios)	
		Teacher RELogit	Rare event
Program type: CC	1.746** (0.159)	1.784** (0.250)	1.565** (0.140)
Program type: COR	1.660** (0.266)	1.566 (0.445)	1.588** (0.254)
Program type: FYCU	1.103 (0.412)	1.136 (0.529)	1.100 (0.412)
Program type: LEA	1.144 (0.102)	1.053 (0.148)	1.087 (0.0963)
year2009	0.960 (0.0373)	0.945 (0.0397)	0.950 (0.0368)
year2010	0.958 (0.0378)	0.943 (0.0410)	0.940 (0.0368)
Observations	20,074	20,074	20,074
Number of instructors		1,380	

Note. Robust standard errors in parentheses.
* $p < .05$. ** $p < .01$.

A2-7 Student NRS Level: ESL Advanced

Variable	Logit	ESL Advanced (odds ratios)	
		Teacher-RELogit	Rare Event
Female teacher	0.986 (0.0479)	0.927 (0.0670)	0.987 (0.0479)
Teacher: AfAm/Black	0.878 (0.0934)	0.927 (0.139)	0.882 (0.0937)
Teacher: Hispanic	0.739** (0.0681)	0.687** (0.0852)	0.742** (0.0683)
Teacher: Asian	0.819 (0.105)	0.845 (0.154)	0.825 (0.105)
Teacher: other race	1.504** (0.180)	1.548** (0.240)	1.505** (0.180)
Highest degree: GED			
Highest degree: associate's	0.648 (0.576)	0.591 (0.551)	0.550 (0.489)
Highest degree: bachelor's	0.670 (0.538)	0.599 (0.473)	0.534 (0.429)
Highest degree: master's	0.656 (0.527)	0.578 (0.457)	0.524 (0.420)
Highest degree: PhD	0.640 (0.523)	0.604 (0.490)	0.515 (0.420)
Highest degree: other	1.406 (1.142)	1.311 (1.055)	1.122 (0.911)
Part-time teacher	0.568** (0.0596)	0.736 (0.119)	0.567** (0.0594)
Years of adult education experience	1.002 (0.00216)	1.000 (0.00312)	1.002 (0.00216)
Number of PD hours	1.006** (0.00179)	1.004 (0.00251)	1.006** (0.00179)
Student: age	0.987** (0.00211)	0.987** (0.00207)	0.987** (0.00211)

Variable	Logit	ESL Advanced (odds ratios)	
		Teacher-RELogit	Rare Event
Student: attendance hours	1.000 (0.000217)	1.000 (0.000242)	1.000 (0.000216)
Student: AfAm/Black	2.999** (0.268)	2.766** (0.275)	2.995** (0.268)
Student: Hispanic	0.541** (0.0290)	0.545** (0.0301)	0.542** (0.0289)
Student: Asian	1.261** (0.0851)	1.194* (0.0839)	1.260** (0.0849)
Student: other race	0.963 (0.157)	0.965 (0.162)	0.971 (0.158)
Student: part-time	1.158* (0.0722)	1.140* (0.0731)	1.158* (0.0722)
Student: unemployed	0.932 (0.0480)	0.928 (0.0495)	0.933 (0.0480)
Student: not in labor force	0.634** (0.0523)	0.651** (0.0543)	0.636** (0.0524)
Program size	1.000* (9.69e-06)	1.000** (1.42e-05)	1.000* (9.68e-06)
Program performance	2.938** (0.928)	2.664* (1.110)	2.931** (0.926)
Program type: CC	4.055** (0.642)	3.559** (0.643)	4.043** (0.639)
Program type: FBO	2.219* (0.725)	2.454* (0.950)	2.292* (0.748)
Program type: FYCU		2.37e-08 (0.000198)	
Program type: LEA	1.369 (0.246)	1.208 (0.259)	1.373 (0.246)
year2009	0.950 (0.0479)	1.011 (0.0565)	0.950 (0.0479)
year2010	0.838** (0.0452)	0.893 (0.0527)	0.839** (0.0451)
Observations	27,955	27,968	27,968
Number of instructors		1,695	

Note. Robust standard errors in parentheses.
* $p < .05$. ** $p < .01$.

Appendix B

Technical Notes

Data Cleaning Procedures

We worked directly with the participating state in preparing the data set to be used in the analyses. The participating state was first asked to fill out a survey of information available in their systems. The survey was divided into three sections: teacher variables, class- and program-level information, and student variables. The teacher variables we requested included teacher demographics, experience, education, and professional development. Class- and program-level variables included information on course (e.g., type or functioning level) and program characteristics. Student variables included student demographics, assessments, attendance, and job market outcomes. After the state reported back on the availability of data, the state was educated on how the data sets should be constructed, and mock data files were sent to the state. The participating state was asked to do the following:

Provide a data set that included one observation per student and teacher.

- Identify a primary teacher. If more than one teacher taught the class, identify the teacher who taught the class most in terms of numbers of hours taught as the primary teacher for that class.
- Identify a primary class for each student. If a student was enrolled in more than one course in the same subject, identify the class that the student attended most in terms of number of enrollment hours as the primary course.

During this process, we communicated with the state and answered questions to clarify the type of information needed in the data as well as the format of the data files.

Student, Teacher, and Class Data Match

Examining teacher characteristics by using student entry into postsecondary education as the outcome required linking student data with teacher data and class data using unique identifiers. In the following section, we describe how we created the final analyses files used in our analyses.

As part of working together with the participating state to prepare the data sets to be used in the analyses, we instructed the state on how to link the student, teacher, and class data files to create one data set for each school year. The state was asked to provide a data set that included one observation per student and information on the primary teacher, and class and program-level information. If a student was enrolled in more than one subject, states were asked to enter the information related to that assessment as separate variables (e.g., reading scale score, mathematics scale score, etc.).

During this process, we answered questions from the state and specified how the data files should be formatted. The participating state provided separate files for each program year in Microsoft Excel format. These files were transferred to the data format to be used in the analyses.

Data were checked to determine if there were any multiple observations per student within a year. We found that some students had more than one record. Upon further examination of these cases, we found that these multiple records were attributed to a student having more than one teacher. All the student outcomes were the same across multiple observations, and only teacher and course-level variables were different. Therefore, we needed to identify a primary teacher and course for these students. The multiple records were treated to assign one teacher per student, as described previously. That is, if a student was enrolled in more than one course in the same subject, we identified the class that the student attended most in terms of number of enrollment hours as the primary course. Similarly, if more than one teacher taught the class, we identified the teacher who taught the class most in terms of numbers of hours taught as the primary teacher for that class.

Data were also checked for inconsistencies and out-of-range responses. Variable names and formats (e.g., numeric or string) across years were standardized. We then combined the data from different years into one file that included year information.

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