The effectiveness and retention of teachers with prior career experience

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\textbf{A B S T R A C T}

As schools and districts seek to recruit teachers, individuals in non-teaching professions are an appealing possible pool. These potential teachers come with work experience and may have expertise that would serve them well in the classroom. While there has been substantial rhetoric assailing the virtues of teachers with prior professional experience, no research that we know of has assessed the effectiveness of these teachers in terms of student learning. This study uses data from New York City to assess the relative effectiveness and retention of career-switchers. It provides some evidence that these teachers are no more effective than other new teachers, and, in fact, they appear to be less effective at raising math scores of elementary and middle school students. There is little difference in overall transfer or leave rates between teachers with prior experience and other teachers, although career-switchers from college recommended programs do appear more likely to transfer schools.

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1. Introduction

As schools, districts, and states struggle to improve student test scores, administrators and policy-makers are in a constant search for ways to get more effective teachers into their classrooms. While one potential solution is to better-train existing teachers and new teachers following traditional career paths, another possibility is to recruit teachers from populations that might not have considered teaching in the past. One such population that might provide a pool of highly skilled teachers is professionals from other occupations. These possible recruits offer the promise of practical experience and substantive knowledge. In fact, representatives of states and school districts provide anecdotal accounts that career-switchers offer an important pool of highly skilled and motivated teachers (e.g., Jacobson, 2007). Still, there is little research-based evidence addressing the relative effectiveness of teachers with prior work experience (i.e., career-switchers). In particular, we know of no large-scale, quantitative studies of the effects of these teachers on student performance.

Apart from their effectiveness in terms of student performance, another important issue with career-switchers is their likelihood of remaining in teaching long term. Given the high costs of recruiting and hiring new teachers, as well as the fact that research consistently indicates that teachers improve over their first two to five years (e.g., Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2008), when determining the overall benefit of recruiting teachers from other careers, it is important to consider their retention patterns,
as well as their effectiveness. However, there is also little research on the attrition patterns of career-switchers. In this paper we use a novel dataset on New York City public school teachers and students to examine both the effectiveness and the retention of teachers with prior work experience.

2. Who are career-switchers?

Before discussing related research and the details of the present study, it is important to clarify exactly whom we are talking about when we discuss career-switchers (see The Woodrow Wilson National Fellowship Foundation, 2008 for a review of research related to the demographics of career-switchers). When people think of career-switchers, they most likely think of former elite professionals such as lawyers and engineers; however, many studies show that career-switchers are a much more diverse (and perhaps less accomplished) group (e.g., Humphrey & Wechsler, 2007; Morton, Williams, & Brindley, 2006; National Center for Education Information (NCEI), 2005; Zientek, 2007). For example, in a non-research-based article in Educational Leadership, Resta, Huling, and Rainwater (2001) mention that they worked with career-switchers from a variety of fields, including a biological researcher, an analytical chemist, a paralegal assistant, a technical writer, an editor, a juvenile probation officer, a sales representative, a television producer, a cruise ship officer, and a professional musician.

While there are teacher certification programs that target prestigious professionals such as scientists (e.g., Harvard’s MidCareer Math and Science Program), others target very different types of career-switchers. For instance, the Troops to Teachers program helps military personnel become teachers, and the now defunct Pathways to Teaching Careers Program targeted paraprofessionals/noncertified teachers and former Peace Corps volunteers, in addition to precollege and college students.

In most of this study, we do not distinguish among different types of career-switchers.1 We are mainly interested in the overall effectiveness and retention of this category of teachers, as compared to teachers without any prior work experience. Still, it is important to keep the diversity of career-switchers in mind both when interpreting the results of the present study and when considering previous research. On the one hand, studies that do not distinguish among different types of career-switchers could mask significant variation within this group of teachers. On the other hand, studies that examine only a particular subset of teachers with prior experience may not generalize to career-switchers as a whole. In the end both types of research are useful, depending upon the question at hand. Research, including the present study, that investigates the effects of career-switchers as a whole is most useful when evaluating general policies intended to bring midcareer professionals from a variety of industries into teaching, while studies of specific types of career-switchers are more applicable when determining the effectiveness of particular programs.

3. Previous research

In this section we review the limited research related to the effectiveness and retention of career-switchers (see The Woodrow Wilson National Fellowship Foundation, 2008 for a more comprehensive review of research about midcareer and second-career teachers). Given the dearth of studies that directly examines these topics, we also discuss studies that are more tangentially related but still have implications for the likely effectiveness and/or retention of teachers with prior experience.

3.1. Research related to the effectiveness of career-switchers

To our knowledge, no previous research has directly examined the effectiveness of teachers with prior experience in terms of student achievement. However, there have been studies that hint at the potential effectiveness of career-switchers.

A 2001 study of the Pathways to Teaching Careers Program (PTCP) most closely relates to the effectiveness of teachers with prior experience (The Urban Institute). The PTCP program was launched in 1989 and included four program strands, two of which targeted career-switchers. The most encompassing part of the program provided scholarships and support services for paraprofessionals and non-certified teachers who wanted to become certified teachers. Another strand of the program targeted former Peace Corps volunteers. In 2001 The Urban Institute released a report with the findings of a six year evaluation of these two strands of PTCP. As part of this report, they addressed the teaching quality of graduates of the program. They were able to use three data sources to examine the quality of PTCP teachers. First, they collected ratings from student teaching supervisors. Second, once program graduates were serving as teachers of record, they collected ratings from principals. Finally, they conducted direct classroom assessments for a sample of graduates using the Praxis III Teacher Performance Assessments. All three sets of data suggested that PTCP graduates were considered to be relatively effective teachers. For instance, on the Praxis III the sample of graduates received an average overall rating of 2.2, which is greater than the 2.0 expected of beginning teachers.

Of course, the implications of this study are limited. PTCP graduates represent two very specific types of career-switchers; and thus, it is unlikely that the results are generalizable to the larger population of teachers with prior experience. Furthermore, The Urban Institute did not measure the effectiveness of these teachers in terms of student achievement. Still, this is the only study of which we are aware that examined the quality of career-switchers. Other studies of career-switchers are suggestive about their potential effectiveness but do not directly address the quality of these teachers.

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1 We do examine a few subgroups of career-switchers (elementary versus middle school teachers, teachers from different pathways into teaching), but importantly, we are unable to distinguish teachers by their prior profession.
One of the main arguments in favor of recruiting career-switchers into teaching is that they will be effective teachers because they possess strong content knowledge. For instance, as a program manager at the National Commission on Teaching and America’s Future, Ben Schaefer claimed, “Tapping the knowledge and interest of retirees is a great way to increase the number of highly effective teachers” (Jacobson, 2007). However, in order for this reasoning to be valid, at least three conditions must hold: (1) career-switchers must have strong content knowledge; (2) strong content knowledge must be positively related to student achievement; (3) career-switchers must not have other characteristics which are negatively related to student achievement and which might overwhelm any benefits of strong content knowledge. It is not immediately clear whether each of these requirements holds, so it is important to examine the evidence.

As discussed in Section 2, career-switchers come from a variety of backgrounds, and several studies indicate that the majority of teachers with prior experience come from non-elite professions (e.g., Humphrey & Wechsler, 2007; NCEI, 2005; Zientek, 2007). For instance, in a survey of alternatively certified teachers, NCEI found that only 18 percent had a master’s degree in a field other than education (2005). Furthermore, out of 2554 respondents, there were only 23 lawyers, 8 physicians, and 27 Ph.D.s in fields other than education. Thus, it seems that many career-switchers may not possess significant content knowledge. At the very least, whether career-switchers possess significant content knowledge is a hypothesis that should be tested rather than assumed. Unfortunately, we know of no such studies.

The research on the relationship between teacher content knowledge and student achievement is more extensive. A number of researchers have examined the relationship between proxies for content knowledge, such as degrees, teacher certification tests, professional development, and coursework, and student achievement. The results of these studies have been mixed. For instance, as part of a review of the literature, Wayne and Youngs (2003) examined whether teachers with additional degrees and/or coursework are more effective in terms of student achievement. Based on four studies using only two datasets, they concluded that high school math teachers with more mathematics-related coursework and degrees are more effective. However, they were unable to draw any conclusions about math teachers in earlier grades or teachers of other subjects (history, English, or science).

Recognizing the limitations of using proxies, two more recent studies have used a direct measure of content knowledge. Hill, Rowan, and Ball (2005) developed their own test in order to examine the relationship between elementary school teachers’ math content knowledge and the performance of their students. Drawing on a diverse sample of elementary school teachers and students from across the United States, they found that their measure was strongly and significantly related to student performance: a one standard deviation difference in a teacher’s content knowledge was associated with one-half to two-thirds of a month of additional growth in student achievement. Building on Hill et al. (2005), Rockoff, Jacob, Kane, and Staiger (2010) used the same measure to assess the content knowledge of new elementary and middle school math teachers in New York City. They also found that the measure was positively and significantly related to student achievement.

Based upon studies such as these, it appears that a teacher’s content knowledge does matter for students’ performance in mathematics, but evidence for other subjects is lacking. Thus, to the extent that career-switchers are teaching mathematics and possess strong content knowledge in mathematics, there is reason to believe that they may be high quality in this respect.

Of course, even if teachers with prior experience possess strong content knowledge and if content knowledge is positively related to student performance, this still does not necessarily imply that career-switchers are effective teachers. Rather, if career-switchers also possess other qualities that are negatively related to student performance, then these effects may wipe out any benefits of strong content knowledge.

Although it would be difficult for quantitative research to address this type of concern (except, of course, by measuring the overall effectiveness of teachers), a number of qualitative studies suggest that career-switchers do sometimes struggle as teachers. In their study of a certification program for career-switchers in Florida, Morton et al. (2006) concluded that, while a teacher’s previous experience could be beneficial, it could also lead to clashes with school culture. For instance, one career-switcher had trouble adjusting to the regimented nature of the school schedule. As a student teacher, he once left school grounds during lunch in order to purchase basketball tickets. Similarly, Resta et al. (2001) offer anecdotal evidence that, “Despite the many good qualities that well-prepared, second-career teachers offer, they also bring some special challenges for school administrators.” (p. 62).

Based upon studies such as these, The Woodrow Wilson National Fellowship Foundation (2008) concludes in its review of the literature that, “While such skills [the skills that career-switchers are often presumed to possess] could be extremely useful for teaching, these and other workplace abilities and experience can also clash with the skills and dispositions needed in teaching...” (p. 28). In other words, it seems possible, if not likely, that career-switchers often possess qualities that cause problems in the classroom.

Taking these strands of evidence (or lack thereof) together, it appears that the argument that career-switchers are effective teachers because they possess strong content knowledge is questionable. First, it is unclear whether or not teachers with prior experience possess strong content knowledge. Second, the importance of content knowledge for student achievement has not been established, except, perhaps, for mathematics. Finally, anecdotal and qualitative evidence suggest that career-switchers may possess other qualities that may make them
less effective teachers, and these negative attributes could outweigh any benefit of strong content knowledge.

In sum, the evidence on the effectiveness of career-switchers is extremely limited. The single study that directly addressed the quality of these teachers focused on a very limited subset of teachers with prior experience, and it did not examine the effectiveness of these teachers in terms of student achievement. Furthermore, evidence related to the popular argument that career-switchers are effective teachers because they possess strong content knowledge is also lacking. The present study helps to fill this gap in the literature by directly examining the effectiveness of career-switchers as a whole in terms of student achievement.

3.2. Research related to the retention of career-switchers

While there is little to no evidence on the effectiveness of career-switchers, the evidence on the retention of these teachers is more substantial and generally indicates that teachers with prior experience are more likely to stay in the profession.

As part of the study of PTCP discussed previously, The Urban Institute examined the retention of program graduates, as well as their quality (2001). They found that 81 percent of graduates taught for at least three years. Furthermore, they noted that this rate was much higher than national three-year retention rates reported by other researchers. Still, it should be noted that this result could be the product of the fact that most PTCP participants signed a non-binding agreement to remain in teaching for a specified period of time. Also, given the uniqueness of PTCP participants, these results may not generalize to other career-switchers.

Other research has examined retention rates by the entry age of a teacher into the profession. As part of their meta-analysis of research related to teacher retention, Borman and Dowling (2008) examined four such studies. Their findings corroborated those of The Urban Institute (2001). They found that teachers who were older at entry (at least 31) were less likely to leave the profession. Similarly, based on data on teachers in Michigan and North Carolina in the 1970s, Murnane, Singer, Willitt, Kemple, and Olsen (1991) found that older entering female teachers were less likely to leave teaching.

While the two previous papers examined retention in the profession, Johnson and Birkeland (2003) examined the movement of 50 first and second year Massachusetts public school teachers across schools, as well as out of public school teaching. They found that mid-career entrants were three times as likely to have moved schools by their third year. However, a substantial number of the mid-career teachers had issues with job placement; so this result may be the product of particularly poor fit between those teachers and their first jobs.

In addition to studies which have examined the actual retention of career-switchers (or older entering teachers), a number of other studies have reported on the intentions of these teachers to remain in the profession. As part of the previously mentioned survey of alternatively certified teachers, NCEI found that teachers who were older when they entered the profession were more inclined to stay in teaching longer (2005). Similarly, Grissmer (2000) presents data from the Baccalaureate and Beyond Longitudinal Study of 1992–1993 indicating that late-entering teachers are more likely to expect to stay in the profession for the long term. For instance, 82 percent of new teachers aged 30–39 indicated that they intended to stay in teaching for the long term, compared to 65 percent of new teachers aged 23–24.

In sum, the existing evidence suggests that career-switchers may stay in the profession longer than teachers without prior experience. However, the available studies have several flaws including using a teacher’s age rather than his/her prior experience as an indicator of career-switching and depending on measures of a teacher’s intentions to stay in the profession rather than actual data on retention. In addition, only one of the studies examined teachers’ movement across schools. In this paper we directly investigate the retention of career-switchers using data on a teacher’s prior experience and his/her retention (within a school and within the district).

4. Data and methodology

4.1. Data

For this study, we use a unique dataset on New York City public school teachers and students. We use data from school year 2004–2005, and we focus on teachers who were in their first year of teaching. The data come from several sources including a survey we administered to teachers and administrative data on teachers, students and their classrooms, and schools.

4.1.1. Teacher data: Survey

In the spring of 2005, we administered a survey to all first year teachers in New York City. Participation in the survey was voluntary and was estimated to take approximately 25 min to complete. The survey was completed by 4303 teachers (a response rate of almost 70 percent of teachers surveyed). These teachers are the basis of our study. Although the survey contained over three hundred questions addressing a variety of topics (e.g., preparation experiences, characteristics of the schools in which they taught, teaching practices, and goals), for the purposes of this paper, we only use teachers’ responses to the question about prior work experience. Specifically, the survey asked teachers how long they worked in a profession other

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1 Of course, not all older teachers necessarily have prior experience, and vice versa, but experience and age should be highly correlated, and thus, studies of a teacher’s age at entry should still be informative.

2 Although it would be preferable to examine a more encompassing group of teachers, the survey was only administered to new teachers in 2005, so we must limit our study to that subset of teachers.

3 Technically, the survey was completed by 4360 teachers, but 57 were missing the teacher identification variable, so those responses are unusable.
than teaching full-time after completing their undergraduate degree: not at all, less than one year, one to two years, three to five years, or six or more years. Of the 4303 teachers who submitted surveys, 4016 (over 93 percent) answered this question.

Based on their responses to this item, we categorized teachers into three groups: no prior experience, some prior experience (less than one year to five years), and significant prior experience (six or more years). A little less than half of the teachers indicated that they had no prior work experience (46 percent, \( N = 1837 \)). Thirty-five percent indicated that they had some prior experience (\( N = 1414 \)), and the remaining 19 percent (\( N = 765 \)) indicated that they had more than six years of prior work experience.

4.1.2. Administrative data

Once we had selected the sample of teachers who had answered the prior experience survey question, we merged the survey data with administrative data on teachers, students and their classrooms, and schools using unique teacher and school identifiers. These data were provided by the New York City Department of Education (NYCDOE) and the New York State Department of Education (NYSED).

4.1.2.1. Administrative data: Teachers. The administrative data on teachers include information on retention, as well as a variety of variables that we use as controls. The retention variable indicates what career decision the teacher made at the end of the 2004–2005 school year. Specifically, a teacher could have made one of three decisions: stay in the same school, transfer to a different public school within New York City, or leave public school teaching in the New York City. We have retention data on 3550 teachers.\(^6\)

The control variables include demographic variables (gender, ethnicity, age) and background variables (initial pathway into teaching and certification exam scores). The initial pathway into teaching variable describes which route a teacher initially took into the teaching profession.\(^7\) Specifically, it includes six categories: college-recommended (completed a university-based teacher preparation program), New York City Teaching Fellows (NYCTF), Teach for America (TFA), temporary license, individual evaluation, and other.\(^8\) The certification exam score

variables indicate how a teacher performed on the Liberal Arts and Science Test (LAST) exam, a state teacher certification exam that measures general knowledge.

4.1.2.2. Administrative data: Students and classrooms. Most importantly, the student-level administrative data include annual standardized\(^9\) achievement test scores in English Language Arts (ELA) and math for students in grades 4–8.\(^10,11\) These scores come from exams administered by New York City and the State of New York.\(^12\) For 2005, we have 20,130 student observations with test scores in ELA and 22,462 observations with test scores in math. These students represent 636 teachers and 595 teachers, respectively.\(^13\)

In addition to these achievement variables, we also have a variety of other student-level variables, which we use as controls. These include gender, ethnicity, language spoken at home, English language learner (ELL) status, free lunch status, lagged attendance, and lagged suspensions. Furthermore, we also have similar composite measures at the classroom level, as well as a measure of class size.

4.1.2.3. Administrative data: Schools. Finally, at the school level we have several additional control variables. Specifically, we have data on the ethnic makeup of the school, the percent of students eligible for free lunch, and the enrollment of the school.

4.2. Methodology

The analyses address two questions: are career-switchers more or less effective than teachers without prior work experience, and do career-switchers follow different retention patterns than teachers without prior work experience? In both instances we are mainly interested in how career-switchers differ from “traditional” first-career teachers, without controlling for any other teacher characteristics. We do not attempt to assess the causal effects of prior experience. Although it would be interesting and important to understand the actual effects of professional

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\(^6\) We are missing retention data for some teachers because our administrative data are imperfect; they come from multiple sources at the state and city levels and do not always merge perfectly.

\(^7\) Pathway information came from several sources: teacher certification application data maintained by the NYSED on whether an individual had completed a college-recommended teacher preparation program and the level of degree obtained, data from the New York City Teaching Fellows program, and data from Teach for America.

\(^8\) College-recommended indicates teachers who followed the “traditional” pathway into teaching and completed a college-recommended teaching program. NYCTF teachers participated in the New York City Teaching Fellows program, an alternative path to certification designed for people who want to teach in New York City and targeted towards both recent college graduates and career-switchers. TFA teachers participated in the Teach for America program, a nationwide alternative certification program targeted towards talented recent college graduates from prestigious schools. The temporary license pathway denotes individuals who failed to complete one or more requirements for a teaching certificate but who were still allowed to teach under the temporary license.

\(^9\) We standardized scores for each grade and year to have a standard deviation of one and a mean of zero.

\(^10\) Data on students were excluded if the student took a test for the same grade two years in a row, if the student skipped a grade in between testing, or if the student was part of a classroom with fewer than 10 students or more than 50 students.

\(^11\) Scores are also available for students in third grade, but for our analyses we also require lagged scores, so we cannot use third grade scores as an outcome variable.

\(^12\) Prior to 2006 New York State administered standardized exams in grades 4 and 8, while New York City administered its own exams in grades 3, 5, 6, and 7.

\(^13\) The number of teachers matched with students is much lower than the total number of teachers who completed the survey (4303) because we are only able to match teachers who taught students in grades 4–8 in ELA and/or math.
experience outside of education, our data and methodology do not allow us to determine whether any effects we uncover are causal or the result of selection.\textsuperscript{14} At points we do control for a few key teacher characteristics that may be highly correlated with prior experience, but even then we do not claim to uncover causal effects. Rather, we are simply interested in whether knowing a teacher’s level of prior experience provides any additional information beyond the other control variables. Despite this limitation we believe the results of these analyses are important and policy-relevant. Even if it is unclear whether any effects are causal or the result of selection, they still provide critical information on the value of recruiting teachers away from other professions.

4.2.1. The effectiveness of career-switchers

In order to assess the effectiveness of career-switchers, we run value-added analyses using students’ test scores. The base model is similar to that found in Boyd, Grossman, Lankford, Loeb, and Wyckoff (2009) and takes the form:

\[ A_{igty} = \beta_i A_{gty}^{(-1)} + \gamma_t S_{ip} + \gamma_y C_{ip} + T_{ip} + \pi_t + \epsilon_{igty} \]

where \( A_{igty} \) is the achievement of student \( i \) in school \( s \), grade \( g \), teacher \( t \), and year \( y \); \( A_{gty}^{(-1)} \) is the achievement of student \( i \) in the previous year; \( S_{ip} \) is a vector of fixed and time-varying student characteristics; \( C_{ip} \) is a vector of classroom characteristics; \( T_{ip} \) is a vector of fixed and time-varying teacher characteristics; \( \pi_t \) is a grade fixed effect; \( \pi_i \) is a school fixed effect; and \( \epsilon_{igty} \) is the random error term clustered at the teacher level.

\( S_{ip} \) and \( C_{ip} \) include the student and classroom variables described previously. Depending on the specification, \( T_{ip} \) may contain one or more variables. First, we run a set of models where \( T_{ip} \) only includes the prior experience variable. These models tell us whether career-switchers are more or less effective than other teachers before taking any other teacher characteristics into consideration. Second, as mentioned earlier, we also run a specification including other key teacher characteristics (gender, ethnicity, LAST performance, program pathway) in order to assess the added value of knowing a teacher’s prior experience level. Finally, we run models where we include a teacher’s age as well as the other teacher characteristics. These models attempt to distinguish between teachers’ experience and their age; however, given that these two variables are necessarily highly correlated, we are concerned about multi-collinearity issues. Also, theoretically it is unclear whether age versus experience is a distinction that we want to make. In fact, part of the effect of experience may simply be age. Because of these methodological and theoretical issues, we do not emphasize these results but simply present them for the purpose of completeness.

In addition to the student, classroom, and teacher variables, we also include two fixed effects: a grade-level fixed effect and a school fixed effect. The grade-level fixed effect controls for any differences across grades. The school fixed effect essentially restricts our analyses so that we are only comparing teachers within the same school.\textsuperscript{15} Importantly, this eliminates the possibility of bias due to career-switchers teaching in systematically different schools than teachers without prior experience.\textsuperscript{16}

After running these main models, we also run a number of alternative specifications. First, we test whether effects vary across grade levels (elementary versus middle). Since the skills required to teach elementary school students likely differ from those necessary to teach middle school students, we might expect career-switchers to be more effective at teaching one group of students. For example, if career-switchers do possess strong content knowledge, this may be more useful at the higher grades where the content-knowledge requirements are presumably more demanding.

Second, we run separate analyses for the two main pathways into teaching: college-recommended programs and NYCTF. This allows us to examine whether the effect of prior career experience varies as a function of pathway. Since the pathways differ in their recruiting and training strategies, career-switchers that come through different programs may differ in terms of effectiveness.

4.2.2. The retention of career-switchers

The second set of analyses estimates the relationship between prior work experience and teacher retention. First, we run simple logistic regressions to examine whether career-switchers differ from teachers without any prior experience in their likelihood of making any transition out of a school (to a different New York City public school or out of the New York City Department of Education (NYCDOE)) after their first year of teaching (2004–2005). These models take the form:

\[ Pr(d_{iy} = 0) = \frac{1}{1 + \exp(T_{iy}B^1_{iy} + \pi^1_i) } \]

\[ Pr(d_{iy} = 1) = \frac{\exp(T_{iy}B^1_{iy} + \pi^1_i) }{1 + \exp(T_{iy}B^1_{iy} + \pi^1_i) } \]

where \( d_{iy} = 0 \) represents the decision to stay at the same school and \( d_{iy} = 1 \) represents the decision to leave the school; \( T_{iy} \) is a vector of fixed and time-varying teacher characteristics; and \( \pi^1_i \) is a school fixed effect. For these analyses, we are essentially taking a school-level perspective; schools (i.e., principals) are only concerned about

\textsuperscript{14} In fact, it would be very difficult to determine the causal effects of prior experience since people who choose to go into teaching immediately after college are necessarily different from those who choose to pursue teaching after working in another profession.

\textsuperscript{15} As a robustness check, we also run ordinary least squares (OLS) models with the school-level control variables in lieu of the school fixed effects. However, it should be emphasized that we strongly prefer the school fixed effects models because we do not believe that our limited set of school-level controls adequately controls for the possibility of bias from teachers sorting across schools.

\textsuperscript{16} This specification requires there to be two or more teachers within a school; otherwise, these teachers are dropped from the analysis. In our data teachers are distributed across 1103 schools, and on average there are 3.9 teachers per school. Only 245 teachers (5.6 percent) from the survey sample are the only teacher in their school; therefore, we believe that our results should generalize to most new teachers.
whether or not teachers leave the school; it is irrelevant where they go.

After conducting the simple transitions analyses, we then turn to multinomial logit analyses in which we distinguish between a teacher’s decision to transfer to a different school and his/her decision to leave the district entirely. These models are very similar to the logistic models and take the form:

\[
Pr(d_{iy} = 0) = \frac{1}{1 + \sum_{j=1}^{2} \exp(T_{ij} B_{ij} + \pi_{ij})}
\]

\[
Pr(d_{iy} = j) = \frac{\exp(T_{ij} B_{ij} + \pi_{ij})}{1 + \sum_{j=1}^{2} \exp(T_{ij} B_{ij} + \pi_{ij})}
\]

where the dependent variable is now the previously discussed three-level measure indicating whether at the end of the school year the teacher: stayed at the same school \((j = 0)\), transferred to another public school within New York City \((j = 1)\), or left NYCDOE \((j = 2)\). Here we are taking more of a district-level perspective; a district (i.e., superintendent) should care both about teachers transferring among schools within the district and about teachers leaving the district.

As for the effectiveness analyses, for all of the retention analyses, we vary which variables we include in \(T_{ij}\): (1) just prior experience, (2) prior experience plus other key teacher characteristics, and (3) prior experience, other key characteristics, and age, but we do not focus on the analyses that include age. Also, we again include school fixed effects to control for possible sorting across schools.\(^\text{18}\)

After running our main models, we run a limited set of alternative specifications. Specifically, as for the effectiveness analyses, we examine effects separately for the two largest pathways into teaching in New York City: college-recommended programs and NYCTF.\(^\text{19}\) Again, given the different recruiting and training strategies of different pathways, career-switchers who enter teaching through college-recommended programs may follow different retention patterns than their peers who participated in NYCTF.

5. Results

5.1. Descriptive statistics

We start with descriptive statistics to illustrate how career-switchers differ from other teachers. These differences are important to keep in mind when considering the results of the effectiveness and retention analyses. Namely, because of these differences, as well as the distinct possibility of additional differences on unobservables, our results should not be interpreted as the causal effect of obtaining career experience prior to entering teaching but as the overall effectiveness of this group of teachers relative to other new teachers. That is, we do not conclude that prior work caused differential effectiveness but only that teachers with prior work are differentially effective.

Table 1 contains means of key teacher characteristics as a function of prior experience level. As expected, teachers with some prior experience are older on average than those with no prior experience, and teachers with significant prior experience are older on average than teachers with no prior experience and teachers with some prior experience. Gender is also related to experience level; fewer teachers with prior experience are female. On the other hand, more teachers with experience are black. As far as performance on the LAST exam, career-switchers perform better than teachers without any prior experience. More teachers with prior experience pass the exam on their first try, and their average scores are higher as well.

It is also clear that teachers with different levels of prior experience take different program paths into teaching. In particular, more teachers without any prior experience attend college-recommended programs, while more career-switchers participate in NYCTF. Also, it is not surprising that very few teachers with experience participate in TFA since that program specifically targets recent college graduates.

Because of these differences, in some of our effectiveness and retention specifications we include these variables (age, gender, ethnicity, LAST performance, program pathway) as controls. As discussed previously, these controls allow us to determine whether we gain any

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\(^{17}\) Technically, we run two sets of binomial logit analyses because standard software packages such as STATA do not allow for fixed effects with the multinomial logit command. For more information on our estimation technique, see Boyd, Grossman, Lankford, Loeb, and Wyckoff (2007).

\(^{18}\) Again, we also run models with school-level controls instead of school fixed effects as a robustness check.

\(^{19}\) We do not run the grade-level specifications described for the effectiveness analyses because theoretically, there is little reason to expect the differential retention of career-switchers to vary as a function of grade level.
additional knowledge from knowing a teacher's prior experience level.

In addition to differing in terms of teacher characteristics, we were also concerned that career-switchers might work in different types of schools than teachers without prior experience. Table 2 presents average school characteristics for teachers with different levels of prior experience. Most of the differences are not statistically significant. The two exceptions are percent black and percent white students. On average, teachers with significant prior experience work at schools with a higher percentage black students than their peers with no prior experience or some prior experience. They also teach at schools with a lower percentage white students than teachers without any prior experience. Even though the school characteristics differences are small and usually insignificant, we still include school fixed effects in our models because of the possibility of differences on unobservables.

5.2. Generalizability of survey data

Before addressing our research questions, we first briefly examine the quality of our survey data. A concern with all survey data is that respondents may differ from non-respondents and that this may limit the generalizability of the results. Fortunately, our survey had a high response rate which alleviates this concern to a degree. To further address this issue, we compared survey respondents to non-respondents on a number of teacher characteristics (ethnicity, test scores, program pathway into teaching, etc.) using t-tests. Table A1 in Appendix A gives the results.

The results suggest that teachers who responded to the survey are significantly different from those who did not complete it, but most of the differences are not large. Respondents were younger (30.1 versus 31.8), more likely to be female (.76 versus .73), less likely to be of an ethnicity other than black, Hispanic, or white (.09 versus .10), and they performed better on the LAST (average score of 257 versus 253; pass rate of .90 versus .88). These differences, while significant, are small. They were also significantly and meaningfully more likely to have entered teaching through NYCTF (0.35 versus .17) or TFA (0.06 versus 0.03) and less likely to have entered teaching through a college-recommended program (.42 versus .45), individual evaluation (.08 versus .13), or some other pathway (.09 versus .22). As described previously, we run some analyses separately for the two main program paths of college-recommended program and NYCTF, which should reduce the potential bias from this difference in response rate.

5.3. The effectiveness of career-switchers

Our first research question asks whether career-switchers are more or less effective than other teachers. Table 3 presents the focal results of our basic specifications for teacher effectiveness. Columns 2–4 contain our preferred specifications with include school fixed effects. Columns 5–7 contain the alternative models which use school-level controls instead. Columns 2 and 5 do not control for any teacher characteristics other than prior experience; Columns 3 and 6 control for other key teacher characteristics; and Columns 4 and 7 control for other key teacher characteristics and age. In the text we focus on the results which control for school fixed effects because we strongly prefer this specification. When the results for the models with school-level controls differ, we describe them in the footnotes. Also, as mentioned previously, we do not emphasize the results that control for a teacher's age.

The school fixed effects results for ELA are all small and insignificant indicating that career-switchers are neither more nor less effective than other teachers in their first year of teaching. The math results are more interesting. Regardless of whether or not we include controls for other teacher characteristics, career-switchers with significant prior experience are significantly and substantially less effective at raising their students' achievement in math. For example, even after controlling for other key teacher characteristics (but not age), students of teachers with significant prior experience gain 0.111 standard deviation less than students of teachers without any prior experience. The size of this effect is large, approximately three times the size of the differential gains of white students relative to black students (0.037).

5.3.1. Alternative specifications

As was described in the methodology section (Section 4.2.1), there is reason to believe that these results may be masking heterogeneity among career-switchers. In particular, the results may vary depending upon (1) the grade-level or (2) the teacher's program path into teaching. Therefore, we present results for alternative specifications that allow effects to vary across these dimensions.

Table 4 contains results by grade-level. Columns 2–4 contain the results for ELA, and Columns 5–7 contain the results for math. Here, we only present the school fixed effects results, but we continue to describe the school-level control variables results in the footnotes when they differ. The ELA results indicate that career-switchers are not differentially effective at either the elementary or the mid-

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20 Full results are available from the authors upon request.
21 The OLS results with school controls suggest that teachers with significant prior experience are less effective in ELA, but the effect is small (−0.040 when controlling for other key teacher characteristics).
22 The math results with school controls are all insignificant.
Table 3
Teacher effectiveness for teachers in grades 4–8 during first year.

<table>
<thead>
<tr>
<th></th>
<th>School fixed effects</th>
<th>School control variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No teacher controls</td>
<td>Teacher controls except age</td>
</tr>
<tr>
<td><strong>ELA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>−0.066</td>
<td>(0.019)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>−0.022</td>
<td>(0.023)</td>
</tr>
<tr>
<td><strong>Math</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>−0.029</td>
<td>(0.024)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>−0.113**</td>
<td>(0.026)</td>
</tr>
</tbody>
</table>

Notes: N sizes are 16,443 students (556 teachers) for ELA and 17,337 students (524 teachers) for math.

*  $p < 0.10$.

**  $p < 0.05$.

***  $p < 0.01$.

dle school level. However, career-switchers still appear to be less effective at teaching math than other teachers. All of the math results in Table 4 are significant for teachers with significant prior experience except for the middle school specification including age. The results are stronger for the elementary grades than for middle school. When we allow for teacher controls other than age, the results indicate that elementary school students of teachers with significant prior experience gain 0.183 of a standard deviation less than their peers who have teachers without any prior experience. This magnitude is over twice as large as the effect for middle school teachers with significant prior experience (−0.086). Thus, career-switchers with significant prior experience seem to particularly struggle instructing elementary school students in math. Table 5 presents results separately for teachers who attended college-recommended programs and teachers who participated in NYCTF. Again, we only present the school fixed effects results. These analyses show some significant results for ELA, as well as for math. For both teachers who attended a college-recommended program and NYCTF teachers, there is some evidence that career-switchers with some prior experience are less effective than their peers (who followed the same program path) without any prior experience. For instance, when we control for teacher characteristics other than age, the results

23 The analyses with school-level controls again indicate that career-switchers are sometimes less effective in ELA than their peers without prior experience. In particular, there are significant negative results for middle school teachers with some prior experience. For instance, when controlling for other key teacher characteristics, the effect is −0.064 ($p < 0.01$).

24 The analyses with school-level controls for math are generally insignificant.

25 The school-level controls results for college-recommended teachers with prior experience are all insignificant. The school-level controls results for NYCTF participants are similar to the fixed effect results for teachers with some prior experience. In addition, they also suggest that NYCTF participants with significant prior experience are less effective (−0.109 ($p < 0.01$) when controlling for other key teacher characteristics).
indicate that the students of NYCTF career-switchers with some prior experience gain 0.126 of a standard deviation less than their peers who have NYCTF teachers without any prior experience.

The math results also follow a different pattern than those from previous specifications. The negative effect of career-switchers with significant prior experience on students’ math achievement is limited to those teachers who attended college-recommended programs. The results for NYCTF are insignificant and very small.26

5.3.2. Summary

Taken together, these results suggest that career-switchers with significant prior experience are less effective than their peers without any prior experience. However, the effects are not universal but specific to certain teachers in specific grades and subjects. In particular, the negative effects are largely concentrated in mathematics. Also, they are stronger for elementary school teachers. Finally, they are driven largely by teachers who attended college-recommended programs.

5.4. The retention of career-switchers

We now turn to the results of our retention analyses. Table 6 presents simple descriptive statistics of teachers’ decisions at the end of their first year of teaching. These statistics suggest that teachers’ decisions may vary by their prior experience. In particular, more teachers with significant prior experience leave schools, and this difference is attributable to them transferring more often.

Importantly, these descriptive statistics do not control for either differences in the schools at which the teachers teach or other teacher characteristics. Therefore, we use logit analyses to adjust for these differences. Table 7 presents the focal results of the basic logit analyses examining a teacher’s likelihood of making any transition out of a school.27 The results are presented as odds ratios (OR) so that a value greater than one indicates that teachers with prior experience are more likely to make a transition, while a value less than one indicates the opposite. Columns 2–4 contain our preferred specifications which control for school fixed effects, while Columns 5–7 use school-level control variables. As for the effectiveness analyses, in the text we discuss the analyses with school fixed effects. If the results with school controls differ, we describe them in the footnotes. Also, we again do not emphasize the results which control for a teacher’s age.

Although the point estimates for the school fixed effects models are generally greater than one, suggesting a higher likelihood of leaving for career-switchers, none of the estimates in Table 7 are significant.28 Thus, it does not appear that teachers with prior experience are more or less likely to leave a school after the first year of teaching.

26 The results controlling for school-level variables are all insignificant.

27 Full results are available from the authors upon request.

28 The results for the analyses with school controls are also largely insignificant. The one exception is the estimate for teachers with significant prior experience in the no teacher controls model (1.277, p < 0.10), which suggests that these teachers are more likely to leave.

Table 5
Teacher effectiveness for teachers in grades 4–8 during first year by pathway (controlling for school fixed effects).

<table>
<thead>
<tr>
<th>College-recommended</th>
<th>ELA</th>
<th>Math</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No teacher controls</td>
<td>Teacher controls except age</td>
</tr>
<tr>
<td>Some prior experience</td>
<td>−0.045 (0.031)</td>
<td>−0.056* (0.031)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>0.013 (0.053)</td>
<td>0.026 (0.045)</td>
</tr>
<tr>
<td>NYCTF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>−0.103* (0.053)</td>
<td>−0.126* (0.064)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>−0.049 (0.049)</td>
<td>−0.118 (0.078)</td>
</tr>
</tbody>
</table>

Notes: N sizes for college-recommended analyses are 8094 students (298 teachers) for ELA and 7159 students (263 teachers) for math; N sizes for NYCTF analyses are 4202 students (114 teachers) for ELA and 6339 students (140 teachers) for math.

* p < 0.10.

† p < 0.05.

‡ p < 0.01.

Table 6
Teacher retention descriptive statistics.

<table>
<thead>
<tr>
<th></th>
<th>Leave school</th>
<th>Transfer schools</th>
<th>Leave public school teaching in NYC</th>
</tr>
</thead>
<tbody>
<tr>
<td>No prior experience</td>
<td>0.16</td>
<td>0.17</td>
<td>0.20</td>
</tr>
<tr>
<td>Some prior experience</td>
<td>0.09</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>0.10</td>
<td>0.07</td>
<td></td>
</tr>
</tbody>
</table>

Notes: N = 3180. For “Leave school” the difference between no prior and significant prior and the difference between some prior and significant prior are significant at p < 0.10. For “Transfer schools” the difference between no prior and significant prior is significant at p < 0.10.
Table 7
Teacher decision to leave a school after first year of teaching.

<table>
<thead>
<tr>
<th>School fixed effects</th>
<th>School control variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No teacher controls</td>
</tr>
<tr>
<td>Some prior experience</td>
<td>1.165 (0.164)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>1.206 (0.199)</td>
</tr>
</tbody>
</table>

Notes: N sizes are 1501 for the school fixed effects analyses and 3180 for the school control variables analyses.

* p < 0.10.
** p < 0.05.
*** p < 0.01.

Table 8
Teacher decision to transfer schools or leave district after first year of teaching.

<table>
<thead>
<tr>
<th>School fixed effects</th>
<th>School control variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No teacher controls</td>
</tr>
<tr>
<td>Transfer schools</td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>1.168 (0.217)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>1.415 (0.315)</td>
</tr>
<tr>
<td>Leave NYCDOE</td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>1.212 (0.246)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>1.070 (0.245)</td>
</tr>
</tbody>
</table>

Notes: N sizes are 913 for school fixed effects “Transfer schools” analyses, 796 for school fixed effects “Leave NYCDOE” analyses, and 3180 for all school control variables analyses.

* p < 0.10.
** p < 0.05.
*** p < 0.01.

Table 8 contains the results of the multinomial logit analyses which distinguish between the decision to transfer schools and the decision to leave the district (NYCDOE). Again, none of the results for the school fixed effects analyses are significant, although the point estimates are generally greater than one.20

5.4.1. Alternative specifications
There is reason to believe that the retention of career-switchers might vary as function of the program path they took into teaching, as discussed for the teacher effectiveness analyses. Therefore, in Table 9 we present results separately for teachers who attended college-recommended programs and those who participated in NYCTF. We see that teachers with significant prior experience who attended college-recommended programs are significantly more likely to leave the school at the end of the year relative to their peers who had no experience (OR = 1.865, p < 0.10) if we do not control for other teacher characteristics. When we include teacher characteristics except age, the point estimate is still greater than one, but the result is no longer significant.30 None of the results for NYCTF participants are significant.

A similar pattern emerges when we examine a teacher’s decision to transfer schools: career-switchers with significant experience who attended college-recommended programs are significantly more likely to transfer schools, even after controlling for other key teacher characteristics (OR = 4.868, p < 0.05). Thus, it appears that the previous result is driven by teachers transferring schools, rather than leaving NYCDOE entirely. Again, all of the NYCTF results are insignificant.31

5.4.2. Summary
In sum, there is some evidence that the retention patterns of teachers from college-recommended programs may differ by prior experience level. Specifically, teachers with significant prior experience from these programs transfer more often than their peers without any prior

20 The only significant school control variables result is for the model without other teacher controls, and it suggests that teachers with significant prior experience may be more likely to transfer (1.316, p < 0.10).
30 When we use school controls, the effect for teachers with significant prior experience in the model with teacher controls except age is also significant (1.593, p < 0.05).
31 In the analyses with school controls, all of the “Leave NYCDOE” results for NYCTF teachers with some prior experience are less than one and significant, suggesting that these teachers are less likely to leave the district.
Table 9
Teacher retention results after first year of teaching by program path (with school fixed effects).

<table>
<thead>
<tr>
<th>Leave school</th>
<th>No teacher controls</th>
<th>Teacher controls except age</th>
<th>Teacher controls with age</th>
</tr>
</thead>
<tbody>
<tr>
<td>College-recommended</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>1.111</td>
<td>1.088</td>
<td>1.079</td>
</tr>
<tr>
<td>(0.295)</td>
<td>(0.298)</td>
<td>(0.297)</td>
<td></td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>1.865*</td>
<td>1.764</td>
<td>1.453</td>
</tr>
<tr>
<td>(0.621)</td>
<td>(0.615)</td>
<td>(0.591)</td>
<td></td>
</tr>
<tr>
<td>NYCFT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>1.031</td>
<td>1.045</td>
<td>0.971</td>
</tr>
<tr>
<td>(0.298)</td>
<td>(0.313)</td>
<td>(0.296)</td>
<td></td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>1.390</td>
<td>1.369</td>
<td>0.882</td>
</tr>
<tr>
<td>(0.446)</td>
<td>(0.461)</td>
<td>(0.424)</td>
<td></td>
</tr>
<tr>
<td>Transfer schools</td>
<td>No teacher controls</td>
<td>Teacher controls except age</td>
<td>Teacher controls with age</td>
</tr>
<tr>
<td>College-recommended</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>1.095</td>
<td>1.001</td>
<td>1.011</td>
</tr>
<tr>
<td>(0.443)</td>
<td>(0.434)</td>
<td>(0.375)</td>
<td>(0.374)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>4.681**</td>
<td>2.877</td>
<td>0.856</td>
</tr>
<tr>
<td>(2.660)</td>
<td>(2.965)</td>
<td>(0.490)</td>
<td>(0.478)</td>
</tr>
<tr>
<td>NYCFT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some prior experience</td>
<td>1.460</td>
<td>1.386</td>
<td>0.689</td>
</tr>
<tr>
<td>(0.539)</td>
<td>(0.566)</td>
<td>(0.339)</td>
<td>(0.334)</td>
</tr>
<tr>
<td>Significant prior experience</td>
<td>1.787</td>
<td>1.177</td>
<td>0.980</td>
</tr>
<tr>
<td>(0.753)</td>
<td>(0.759)</td>
<td>(0.672)</td>
<td>(0.733)</td>
</tr>
</tbody>
</table>

Notes: N sizes for “Leave school” analyses are 357 for college-recommended and 339 for NYCFT. N sizes for “Transfer schools” analyses are 167 for college-recommended and 231 for NYCFT. N sizes for “Leave NYCDOE” analyses are 202 for college-recommended and 143 for NYCFT.

* p < 0.10.
** p < 0.05.
*** p < 0.01.

experience. However, there are no similar results for NYCFT teachers or career-switchers as a whole.

6. Discussion and future research

Our results suggest that recruiting career-switchers into teaching may not be the panacea for teacher quality issues for which some policymakers and administrators have hoped. Our effectiveness results indicate that career-switchers are less effective at teaching math than other teachers during their first year of teaching, and in no instances do career-switchers appear more effective than their peers without prior experience. Furthermore, our retention results suggest that, at the school-level, career-switchers from college-recommended programs may be less stable than their peers without prior experience. Similar to Johnson and Birkeland (2003), our results indicate that these career-switchers are more likely to leave a school after their first year of teaching. Given the costs of turnover, this phenomenon could be quite problematic (Ronfeldt et al., 2011).

Although we are able to shed some light on the value of recruiting career-switchers into teaching, in the end our research provides questions, as well as answers; the need for additional research is clear. In particular, we believe that future research should address at least three specific issues. First, it is important to remember that our analyses rely on survey data. Survey data has a number of limitations. They are self-report, and we do not know how accurately teachers report their prior work experience. In addition, approximately 30 percent of teachers did not respond to the survey, and survey respondents may not be representative of non-respondents.

Second, our effectiveness analyses are limited to elementary and middle school teachers. It is possible that career-switchers are more effective at the high school level. In fact, given the more stringent content requirements at the secondary-level, this might be where we would expect to see the most positive effects. Thus, it is important for future studies to examine the effectiveness of career-switchers at this level.

Third, as was highlighted previously (see Section 2), career-switchers are a very diverse group of teachers in terms of prior experience, and thus, future research could benefit from examining the relative effectiveness of career-switchers with different professional backgrounds. In this study we focused on the effectiveness of career-switchers as a whole, but when we did examine subgroups of career-switchers (along dimensions other than professional background), we uncovered some interesting differences. Thus, it seems highly probable that research examining the effectiveness of career-switchers as a function of former profession will also reveal important distinctions.

Finally, it will be important for future researchers to examine the effectiveness and retention of career-switchers over time using longitudinal data. We focused on career-switchers in their first year of teaching, but it is
possible that career-switchers may become relatively more (or less) effective as they gain experience. Also, their long-term retention patterns may look very different from their decisions after their first year.

In this paper we have provided some evidence related to the effectiveness and retention of career-switchers. Given the lack of previous research on teachers with prior experience, this is a significant contribution to the literature. Still, there are many remaining questions, and the bottom line is that much more research is needed before we will know the true value of policies and programs designed to attract career-switchers into teaching.

Appendix A.

Table A1 T-tests of teacher characteristics by survey participation.

<table>
<thead>
<tr>
<th></th>
<th>Nonrespondent</th>
<th>Respondent</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2206</td>
<td>2206</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>31.8</td>
<td>30.1</td>
<td>0.00</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2206</td>
<td>2206</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.73</td>
<td>0.76</td>
<td>0.01</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>2124</td>
<td>4167</td>
<td>0.12</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2124</td>
<td>4167</td>
<td>0.10</td>
</tr>
<tr>
<td>White</td>
<td>2124</td>
<td>4167</td>
<td>0.69</td>
</tr>
<tr>
<td>Other ethnicity</td>
<td>2124</td>
<td>4167</td>
<td>0.09</td>
</tr>
<tr>
<td>LAST performance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passed LAST first time</td>
<td>2071</td>
<td>4207</td>
<td>0.00</td>
</tr>
<tr>
<td>LAST score first time</td>
<td>2206</td>
<td>4303</td>
<td>0.90</td>
</tr>
<tr>
<td>Initial program path</td>
<td></td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>College-recommended</td>
<td>2124</td>
<td>4228</td>
<td>0.42</td>
</tr>
<tr>
<td>NYCiT</td>
<td>2124</td>
<td>4228</td>
<td>0.35</td>
</tr>
<tr>
<td>TFA</td>
<td>2124</td>
<td>4228</td>
<td>0.06</td>
</tr>
<tr>
<td>Temporary license</td>
<td>2124</td>
<td>4228</td>
<td>0.01</td>
</tr>
<tr>
<td>Individual evaluation</td>
<td>2124</td>
<td>4228</td>
<td>0.08</td>
</tr>
<tr>
<td>Other path</td>
<td>2124</td>
<td>4228</td>
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References


