CERTIFICATION REQUIREMENTS AND TEACHER QUALITY: A COMPARISON OF ALTERNATIVE ROUTES TO TEACHING *

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Abstract

Traditionally, states have required individuals complete a program of study in a university-based teacher preparation program in order to be licensed to teach. In recent years, however, various "alternative certification" programs have been developed and the number of teachers obtaining teaching certificates through routes other than completing a traditional teacher preparation program has skyrocketed. In this paper I use a rich longitudinal data base from Florida to compare the characteristics of alternatively certified teachers with their traditionally prepared colleagues. I then analyze the relative effectiveness of teachers who enter the profession through different pathways by estimating "value-added" models of student achievement. In general, alternatively certified teachers have stronger pre-service qualifications than do traditionally prepared teachers, with the least restrictive alternative attracting the most qualified perspective teachers. These differences are less pronounced when controlling for the grade level of teachers, however. On average, alternatively certified science teachers have also had much more coursework in science while in college than traditionally prepared science teachers. The same is not true for math teachers, where the hours of college coursework are approximately equal across pathways. Of the three alternative certification pathways studied, teachers who enter through the path requiring no coursework have substantially greater effects on student achievement than do either traditionally prepared teachers or alternative programs that require some formal coursework in education. These results suggest that the additional education coursework required in traditional teacher preparation programs either does little to boost the human capital of teachers or that whatever gains accrue from traditional teacher education training are offset by greater innate ability of individuals who enter teaching through routes requiring little formal training in education.

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I. Introduction

Traditionally, states have required individuals complete a program of study in a university-based teacher preparation program in order to be licensed to teach. In 1985/86 less than 300 teachers in the United States obtained teaching certificates through routes other than completing a traditional teacher preparation program. Two decades later, in 2005/06, the number of teacher teachers who obtained teaching certificates through alternate routes mushroomed to 59,000.[1] This rapid rise in alternative certification begs the question of how do alternatively certified teachers perform relative to their traditionally prepared colleagues and whether alternative certification is an efficient mechanism for obtaining classroom teachers.

In this paper I seek to analyze the characteristics of alternatively certified and traditionally prepared teachers and to compare their relative productivity in boosting student achievement. The analysis focuses on the State of Florida, which has one of the highest growth rates in alternatively certified teachers and one of the most diverse set of alternative routes to certification. Not only is Florida one of the leading states in terms of the number of alternatively certified teachers, it is also one of the few places in which teachers can be linked both to their own pre-service educational records as well as to the performance of students they subsequently teach.

I begin by briefly discussing the economics of licensure and worker quality.[2] This is followed by a review of the existing literature on alternative routes to teaching. I next describe the teacher licensure environment in Florida and the available data. The analysis of the data proceeds in two steps. First, I

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[1] See "Overview of Alternate Routes to Certification" at http://www.teach-now.org/overview.cfm.

[2] Even though they have distinct meanings in the economics literature, following standard practice in education I use the terms "licensure" and "certification" interchangeably. Both teacher licensure and certification refer to state statutes that set out requirements that must be met for an individual to teach on a permanent basis.

provide descriptive statistics on the pre-service education and test performance of teachers by the route they take to certification. In the second part of the analysis I estimate cumulative achievement functions in order to determine the relative productivity or "value-added" by teachers who obtain certification by completing a traditional teacher preparation program vis-à-vis various alternative routes.

II. The Economics of Professional Licensure

In order to understand the potential costs and benefits of alternative certification, it is useful to briefly review the rationale for licensure in general and associated effects of licensure on the quality of practitioners. There are essentially two competing theories of professional regulation. In the "public interest" approach, licensing is viewed as a mechanism for ensuring quality when consumers are poorly informed. By setting minimum quality standards, licensure indirectly provides consumers information and avoids the classic "lemons problem" whereby consumers' inability to distinguish quality differences leads to only low quality practitioners in the market (Leland (1979)). The public interest approach implies that professional licensure would be most prevalent where the cost to consumers of obtaining information is high and the loss from consuming low quality services is great. In contrast, the "capture" theory of regulation posits that professionals will seek out licensure as a means of restricting entry into a profession, thereby raising wages (Stigler (1971), Peltzman (1976)).

As in many other professions, there are two components to the licensure of teachers in most states. First, there is a minimum educational requirement. Traditionally teachers had to complete a teacher preparation program at a college or university, receiving a bachelor's degree in a specific field of education. Most alternative routes still require attainment of a bachelor's degree, but do not require a particular major. Second, most states also require passage of one or more examinations for a teacher to

become fully certified. The exam requirements typically apply to both traditionally prepared and alternatively certified teachers.

The effect on teacher quality of loosening educational requirements depends on which theory of regulation holds sway. If teacher licensure serves to promote quality by requiring coursework that makes teachers more effective, then alternatively certified teachers, who are not required to take as many education courses as traditionally prepared teachers, should be less productive. If licensure is primarily motivated by capture, then alternatively certified teachers would be of equal or even higher quality than traditionally prepared teachers. Lott (1996) argues that minimum educational requirements could actually reduce quality by differentially raising the cost of licensure to the most talented potential entrants into a profession. For example, in the education context, potential teachers working in other occupations may be discouraged from entering teaching because of the high opportunity cost of taking required coursework before being certified to teach. Likewise, undergraduates who possess talents in non-educational fields may find requirements mandating numerous education courses that do not produce transferable skills particularly burdensome. Further, if traditional teacher preparation programs are sequenced in a way that precludes graduation in less than four years, the brightest and most diligent students may shun the education field for other majors in which they can graduate early.

III. Existing Evidence on the Effects of Alternative Certification

While prior research on various aspects of teacher preparation dates back to the 1960s (Wilson, Floden and Ferrini-Mundy (2001)), only recently has there has there been rigorous quantitative research that compares the effectiveness of teachers who complete traditional teacher preparation programs to those who enter teacher through alternative routes. Two recent quasi-experimental studies, Boyd, et al. (2006) and Kane, Rockoff and Staiger (2008), examine elementary and middle school teachers in New

York City. In New York City alternative routes involve the same requirements as the traditional teacher preparation program pathway, but entrants are allowed to begin teaching after 200 hours of pre-service training and passage of the requisite teacher exams. The alternative-route teachers must then enroll in teacher education programs and complete the coursework required for certification while they are teaching.

Boyd et al. focus their analysis on the two primary alternative pathways in New York City, the NYC Teaching Fellows program (Fellows) and the Teach for America program (TFA). These programs target different types of potential teachers. The TFA program recruits graduates of elite colleges and universities to teach in high-poverty schools. In contrast, the Fellows program is designed to attract both mid-career professionals and recent college graduates into teaching.

When using student covariates to control for student heterogeneity, Boyd et al. find that Fellows are less effective in teaching both math and ELA than traditionally prepared teachers. When student fixed effects are added to the model, however, the difference in math effectiveness is no longer statistically significant and the ELA effectiveness differential is cut in half, suggesting that Fellows are more likely to teach in classes with lower achieving students. Boyd et al. also find that Fellows tend to improve over time relative to their traditionally prepared colleagues. In the elementary grades Fellows are initially less effective but by their third year are equally as effective as traditional route teachers. At the middle school level, Fellows in their third year of teaching are actually more effective in both math and English-Language Arts (ELA).

TFA teachers tend to be stronger in teaching math than Fellows, though follow similar patterns with respect to experience and grade level of instruction. Combining grades 4 through 8 and using student covariates to control for student heterogeneity, TFA teachers are just as effective as traditionally prepared teachers in math but less effective than teacher preparation program completers in ELA

instruction. These results are unchanged when student fixed effects are used to control for observed and unobserved student characteristics. The effectiveness differential in ELA is driven primarily by results for rookie teachers; after the first year, TFA teachers and traditionally-prepared teachers are equally effective in teaching ELA. There are also interesting cross-grade differences as well. TFA middle-school math teachers actually appear more effective in their first year than traditionally prepared middle-school math teachers. In contrast, the lower effectiveness of first-year TFA teachers, relative to traditionally prepared teachers, is observed at both the elementary and middle school levels.

Kane, Rockoff and Staiger perform a similar analysis, but possess an additional year of data and can thus produce more precise estimates of the effectiveness of alternatively certified teachers, particularly those with more than two years of experience. They find no difference between the effectiveness of Fellows and traditionally prepared teachers in math. Fellows are slightly less effective in ELA instruction initially, but close the gap by their third year of teaching. TFA teachers are found to be more effective than traditionally prepared teachers in math, but no different in ELA instruction.

The TFA program is distinctive in that it targets new college graduates, participants commit to teaching for two years and they are typically assigned to schools with a high proportion of students living in poverty. All of these factors would tend to lead to high attrition rates as many TFA teachers may view participation as a short-term public service, rather than initiation of a long-term career. Both Boyd et al. and Kane, Rockoff and Staiger find evidence supporting these expectations. Boyd et al. find that after their requisite two years of service, attrition among TFA teachers is more than double that of traditionally prepared teachers. Even when adjusting for school quality, the four-year cumulative attrition rate among TFA teachers is nearly twice that of traditionally prepared teachers. Kane, Rockoff and Staiger estimate the differential attrition leads to a steady state where 45 percent of TFA teachers are in their first or second year whereas only 20 percent of traditionally prepared teachers are rookies or

second-year teachers. Since teacher effectiveness increases with early-career experience, the high attrition rate tends to mitigate any gains from employing TFA teachers. Kane, Rockoff and Staiger estimate that the greater effectiveness of TFA teachers in mathematics (relative to traditionally prepared teachers) is essentially offset in the steady state by the higher attrition rate of TFA teachers.

Another recent quasi-experimental study, Xu, Hannaway and Taylor (2011), studies the performance of TFA teachers at the high school level in North Carolina. Using school effects and cross-subject student fixed effects to control for non-random assignment of teachers to schools and classrooms within a school, they find that TFA teachers generally out-perform their traditionally prepared colleagues. If one takes into account the fact that TFA teachers generally possess less experience than traditionally-prepared teachers, TFA teachers boost student achievement by 13 percent of a standard deviation, averaged over all subjects. In math the difference in student learning is also 13 percent of a standard deviation and for science it is 19 percent of a standard deviation, suggesting a smaller effect for subjects like English. When experience is not controlled, the differential in math is reduced by more than half and is statistically insignificant, but only falls slightly, to 16 percent of a standard deviation, in science and is significantly different from zero.

Two teams of researchers from Mathematica have conducted experimental evaluations of alternative certification programs. Glazerman, Mayer and Decker (2006) compare TFA teachers with traditionally prepared teachers teaching in the same grade and school where students were randomly assigned to classrooms. The evaluation was conducted in 17 schools spanning 6 geographic areas. Their results are strikingly similar to those of Xu, Hannaway and Taylor. Glazerman, Mayer and Decker find TFA teachers outperform traditionally prepared teachers in math by 15 percent of a standard deviation, but the difference in reading achievement is not significantly different from zero. As in Xu,

Hannaway and Taylor, the differential in teacher effectiveness was larger when TFA teachers are compared to traditionally prepared teachers with similar experience.

Like Glazerman, Mayer and Decker, Constantine, et al (2009) compare outcomes for pairs of teachers in the same grade and school in which classroom assignment was random. However, rather than analyze TFA teachers, Constantine study less selective alternative certification programs with data from 63 schools in 20 school districts. Alternative certification programs were divided into two categories, those requiring relatively less coursework (75-274 hours) and those requiring more coursework (275-795). Thus both groups still received considerable formal training in education. In contrast to the selective TFA program, the alternative certification teachers studied by Constantine et al., were no different than traditionally prepared teachers in terms of the selectivity of the college they attended or their scores on college entrance exams. The study found no significant differences in effectiveness between alternative and traditionally prepared teachers or between alternatively certified teachers with "high" and "low" coursework requirements. Similarly, the content of pre-service coursework or receipt of a bachelor's degree in education was uncorrelated with teacher effectiveness. While the results certainly cast doubt on the notion that traditional teacher programs boost the productivity of classroom teachers, the implications must be tempered by the fact that the alternatively certified teachers in fact had substantial coursework in education prior to becoming teachers.

IV. Pathways to Teaching in Florida

The nature and breadth of alternative certification routes distinguish Florida from New York City and other jurisdictions.[3] Currently there exist nine different sets of certification requirements or pathways, any one of which can be met in order to obtain a professional teaching certificate in Florida:[4]

- Initial Degree College Courses in Traditional Teacher Preparation Program
- After Degree – District Alternative Certification Competency-based Program
- After Degree – Education Preparation Institute Competency-based Program
- After Degree – A valid ABCTE Passport Certificate in the Subject Area
- After Degree – Two semesters of successful college full-time teaching experience
- Initial and After Degree Approved College Professional Training Option – Content Major & College Education Courses per Rule 6A-4.006
- After Degree – Professional Preparation College Courses per Rule 6A-4.006
- After Degree – Full Reciprocity
- After Degree – A valid NBPTS Certificate in the Subject Area

The traditional teacher preparation program option requires completion of an approved teacher preparation program at a post-secondary institution within Florida. Program completers must also pass general knowledge and professional education certification tests as well as any necessary subject certification exams.

Currently, the most frequently traveled alternative pathway to certification in Florida is the district alternative certification option. Unlike Teach for America or the Teaching Fellows program in New York City, the district alternative certification option does not involve any special recruitment procedures and teachers are not required to work toward an education degree while teaching. In fact, no formal education coursework is required. To become certified under this option, one must pass the

[3] The variety of alternative routes in Florida is partly driven by the high demand for teachers stimulated by population growth and class-size restrictions. For details on recent trends in the sources of new teachers in Florida see Yecki (2006).

[4] Professional certificates are valid for five years and are renewable. Individuals who have not met all of the requirements for professional certification may receive a temporary certificate that is valid for three years and is non-renewable.

standard general knowledge and professional education certification exams and complete a competency-based alternative certification program. The details of the program vary somewhat across districts, but involve an initial assessment of skills, an individualized training plan, mentoring, a training curriculum that targets a set of "accomplished teacher practices" and summative assessment that documents mastery of the practices. The training programs are frequently web-based, but some also involve collaborations with local community colleges or universities.

Three additional alternative routes to certification, the "Educator Preparation Institute" option, "ABCTE Passport" option and the "College Teaching Experience" option, are all relatively new. The education preparation institutes (EPIs) are essentially two-semester non-degree programs, nearly all of which are housed in community colleges. Typically they consist of seven required classes and a field experience component. Courses are specific to the EPI program and credits are not transferable to traditional education majors. Coursework is often a combination of face-to-face meetings and online instruction. Individuals completing the EPI program must also pass the standard certification exams to receive professional certification. The ABCTE passport option requires individuals to obtain a certificate issued by the American Board for Certification of Teacher Excellence and demonstrate professional education competence in the classroom. To obtain the ABCTE certificate candidates must pass both a professional teaching knowledge exam and a subject area exam administered by ABCTE. Candidates prepare for the exams with online and electronic documents provided by ABCTE. As they name implies, the college teaching experience option requires that one have successfully taught for two semesters at a community college or four-year university. No general knowledge or professional education exams are required; applicants need only pass a subject area certification exam.

The "Approved College Professional Training" and "Professional Preparation College Courses" options are essentially indistinguishable. In both cases an individual must complete a handful of core

education courses, obtain teaching experience and pass the teacher certification exams. The former option covers cases where an individual receives a non-education college degree but minors in education and takes the required core classes as part of a minor in education. This education-minor route is very new. The later option covers any individual who has successfully completed the required core education courses. The courses need not be part of a formal course of study nor from a single institution. Thus this route is a "catch all" category that includes individuals with a variety of educational backgrounds. Education majors who do not complete all of their institution's teacher preparation program requirements, but have passed the required core education courses can obtain certification through this route. Likewise, individuals who earn a non-education college degree and either took the required education courses while an undergraduate, or completed the required courses once they start teaching, can obtain certification in this manner. In the analysis these two routes are combined under the rubric "Course Analysis."

Due to population growth and constitutionally mandated class-size restrictions, there was a high demand for new teachers in Florida until the economic downturn in Fall 2008. As a result, unlike New York and other states in the Northeast and Midwest, Florida has been a net importer of teachers until recently. There are three avenues by which individuals from out of state can obtain certification when they move to Florida. New graduates of teacher preparation programs outside of Florida must meet the same requirements as those completing traditional teacher preparation programs within Florida. Experienced teachers receive certification in Florida if they possess a valid standard teaching certificate issued by another state or if they hold a valid certificate from the National Board for Professional Teaching Standards (NBPTS). To obtain NBPTS certification a teacher must be certified to teach in their state, have three years of experience, submit a portfolio of materials for evaluation and pass an exam. Since NBTS requires pre-existing state certification, the NBPTS option is only relevant for

teachers whose state-issued certificate has lapsed or who require certification in a subject area not covered by their state certification. The few teachers who achieve professional certification in this way have been lumped together with certified teachers from states other than Florida in the analysis.

Given the specifics of the certification provisions, the initial analysis of pathways to certification in Florida considers the following categories:

Pathway	**Certification Requirement Options**
Graduate of a Florida Teacher Preparation Program	Initial Degree College Courses in Traditional Teacher Preparation Program
District Alternative Certification Program	After Degree – District Alternative Certification Competency-based Program
Course Analysis	Initial and After Degree Approved College Professional Training Option – Content Major & College Education Courses per Rule 6A-4.006 After Degree – Professional Preparation College Courses per Rule 6A-4.006
Graduate of an Out-of-State Teacher Preparation Program	Initial Degree College Courses in Traditional Teacher Preparation Program
Certified in Another State	After Degree – Full Reciprocity After Degree – A valid NBPTS Certificate in the Subject Area
ABCTE	After Degree – A valid ABCTE Passport Certificate in the Subject Area
Education Preparation Institute	After Degree – Education Preparation Institute Competency-based Program
College Teaching Experience	After Degree – Two semesters of successful college full-time teaching experience

However, the descriptive analysis demonstrates that graduates from traditional preparation programs, be they recent in-state or out-of-state graduates, or out-of-state state experienced teachers, possess similar characteristics. Likewise, individuals entering through the catch-all category of "course analysis" are similar to teacher preparation program graduates. I therefore focus on the three distinctly different alternative routes, district alternative certification, education preparation institutes and ABCTE, in the subsequent analysis of teacher productivity.

V. Data

Data for the analysis come from two sources. The Florida Education Data Warehouse (FL-EDW) provides longitudinal information on all public school students, including demographic information, enrollment and attendance, program participation, disciplinary actions and achievement test scores, beginning in 1995. The state administers two sets of reading and math tests to all 3rd through 10th graders in Florida. The "Sunshine State Standards" Florida Comprehensive Achievement Test (FCAT-SSS) is a criterion-based exam designed to test for the skills that students are expected to master at each grade level. It is a "high-stakes" test used to determine school grades, student retention in some grades and passage of the 10th grade exam is a requirement for graduation from high school. The second test is the FCAT Norm-Referenced Test (FCAT-NRT), a version of the Stanford Achievement Test used throughout the country. No accountability measures are tied to student performance on the NRT. Scores from both exams are currently available for the years 2000/2001 through 2006/2007.[5]

The FL-EDW data also contain administrative data on individual teachers, including demographic information, experience, educational attainment and certification status. Each classroom has a unique identifier, so I can reliably link teachers and students to specific classrooms at each grade level.

The determination of pathways into teaching and teacher certification exam scores is accomplished by linking data files from the Florida Department of Education's Office of Teacher Certification with the FL-EDW data. Pathways are determined from information indicating the method by which each individual teacher was certified.

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[5] The FCAT-NRT was first administered in 1999/2000 whereas the FCAT-SSS was given in all grades 3-10 beginning in 2000/2001

The ability to link teachers to their university coursework is an additional strength of the Florida data. For relatively young teachers (those who attended a Florida public university or community college since 1995) the FL-EDW data contain complete college transcript information, including entrance exam scores, courses taken, majors and degrees received. Because Florida has a uniform course numbering system, I am able to determine the subject area of each course taken. Certification records allow identification of the undergraduate institution of new teachers, whether they graduated from a public or private university in Florida or elsewhere. However, information on college major and college coursework is only available for teachers who attended public community colleges and universities in Florida.[6]

In order to align the analysis with previous work in New York City and to avoid possible biases, I restrict the sample for analysis in a number of ways. First, students with disabilities are eliminated from the sample. [7] Second, students who skip a grade or who repeat a grade are dropped. Third, in order to identify the teacher responsible for instruction, I restrict the analysis to students who receive instruction in the relevant subject area from a single teacher.

VI. Methods

In order to gauge the impact of pathways into teaching on subsequent teacher performance I estimate a "value-added" model that relates current student achievement to a vector of student/family inputs, $\mathbf{X}_{it}$ (where students are indexed by i), a vector of classroom peer characteristics, $\mathbf{P}_{-ijmt}$ (where the subscript –i denotes students other than individual i in classroom j in school m), a vector of time-varying

[6] If students transfer from out of state or between public and private post-secondary institutions in Florida the FL-EDW data will not capture their entire undergraduate record. Therefore coursework information is only used for teachers when at least 100 credit hours are accounted for.

[7] While special education students are excluded from the analysis, they are included when determining peer group characteristics, so long as they spend at least one hour per day in the regular education self-contained class.

teacher characteristics, $\mathbf{T}_{kt}$ (where k indexes teachers), a vector of time-invariant teacher characteristics ($\mathbf{Z}_k$) and time-invariant school characteristics denoted by the "school fixed effect," ϕ_m (where m indexes schools). Student achievement in the prior year, A_{it-1}, serves as a sufficient statistic for all prior schooling inputs. The model can thus be expressed as:

$$A_{it} = \beta_0 + \beta_1 A_{it-1} + \boldsymbol{\beta}_2 \mathbf{X}_{it} + \boldsymbol{\beta}_3 \mathbf{P}_{-ijmt} + \boldsymbol{\beta}_4 \mathbf{T}_{kt} + \boldsymbol{\beta}_5 \mathbf{Z}_k + \phi_m + \nu_{it} \quad (1)$$

where ν_{it} is a normally distributed, mean zero error. The effects of teacher preparation pathways are captured by a set of indicator variables contained in the vector $\mathbf{Z}_k$.

In order to judge the affect of model assumptions and test instruments on the estimates, several different variants of the base model, equation (1), are estimated. First, the time invariant component of student heterogeneity is taken into account by including either observable student characteristics in the vector $\mathbf{X}_{it}$ or by including a student fixed effect, γ_i.[8] Second, due to the problems with simultaneously identifying pathway and school effects, models with and without school effects are estimated.[9] All specifications are estimated using both the FCAT-SSS and FCAT-NRT exams to measure student achievement.[10]

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[8] The student fixed effect controls for non-random assignment of students to teachers based on their time-invariant innate ability. As noted by Rothstein (2008, 2009, 2010), if student-teacher assignments are determined by dynamic shocks to achievement, then student fixed effects will not eliminate bias associated with non-random sorting of students and teachers into classrooms. However, Koedel and Betts demonstrate the phenomenon may be transitory and the problem may go away with a sufficient number of observations per teacher.

[9] For a discussion of the potential problems with trying to identify both school and training program effects, see Mihaly, et al. (2011).

[10] In addition, alternative specifications which use the achievement gain, ΔA_{it}, as the dependent variable and remove lagged achievement from the right hand side of the equation were estimated. This assumes that β_1 is zero, which implies that there is no decay in the effect of past educational inputs on current outcomes. Results from these "gain-score" specifications were qualitatively similar and are available upon request.

VII. Results

A. Summary Statistics

Table 1 reports mean characteristics of teachers who obtained certification by graduating from a Florida teacher preparation program versus those who entered from each of the other seven routes. Teachers who obtain certification through the three distinctly alternative routes (district alternative certification, Educator Preparation Institutes and ABCTE) have stronger credentials than graduates of Florida teacher preparation programs. A greater proportion graduated from the most competitive colleges and fewer graduated from the least competitive colleges.[11] Similarly, except for the essay exam, teachers entering via the district alternative certification and EPI pathways were more likely to pass the general knowledge certification exams on the first try. Virtually all ABCTE teachers passed each of the certification exams on the first try. The variation in certification exam performance appears to be due in part to differences in pre-college ability; combined SAT scores are significantly higher for alternatively certified teachers, about 100 points greater for district alternative certification and EPI teachers and over 150 points greater for ABCTE teachers.

If alternatively certified teachers are entering teaching as a second career, they might be more likely to teach in middle and high school. This could skew the comparisons, since the majority of traditionally prepared teachers teach at the elementary school level. However, when comparing the characteristics of traditionally-prepared and alternatively certified teachers who are certified in elementary education in Table 2, the same general pattern of differences remains. While the number of EPI and ABCTE teachers who are certified in elementary education are too few to yield very precise

[11] The difference in the proportion of graduates from "most competitive" colleges for ABCTE teachers is significant at only the 94 percent confidence level.

mean differences, results for the largest alternative certification group, district alternative certification participants, are similar to those from the full sample.

Data on the modal college majors of teachers, broken down by pathway and certification subject area are provided in Table 3. Teachers who entered via the catch-all "Course Analysis" pathway were most often elementary education majors, who evidently just submitted proof of their college coursework rather than completion of their University's preparation program to satisfy intial certification requirements. In contrast, teachers who entered from the distinctly "alternative" routes of district alternative certification, EPIs or ABCTE, possessed bachelor's degrees in a very different set of majors. For the district alternative certification and ABCTE pathways the modal college major is English Language and Literature, while for EPI it is Communications.[12] Similarly, for elementary education and middle school math certifications, the dominate route for traditionally prepared teachers is elementary teacher education, whereas for the alternate routes business administration, criminal justice and political science dominate. At the high school level, traditionally prepared teachers tend to earn degrees in the relevant sub-discipline of education (e.g. mathematics teacher education) while alternatively certified teachers are most likely to hold degrees in the relevant subject area (e.g. math or biology).

Information on the specific coursework of Florida teacher preparation program graduates relative to entrants from the three distinctively alternative routes is provided in Table 4. Florida teacher preparation program graduates earn over half their credits in education courses, whereas alternate-route teachers average one three credit-hour education course or less. Interestingly, both traditionally prepared and alternatively certified teachers average about two math or statistics courses. Course taking differences are more pronounced. Whereas traditionally prepared teachers average just under three

[12] Major information is only available for degree recipients of Florida public universities. Thus college major is known for only about half of the teachers who obtained certification through pathways other than completing a Florida teacher preparation program.

sciences courses (8.49 credit hours), district alternative certification and EPI completers take nearly five science courses on average. The few number of ABCTE teachers with complete college transcripts average nearly 11 science courses (32.42 credit hours).

B. Value-Added Model Estimates

Estimates of equation (1), with partial persistence of prior inputs and student covariates employed to control for student heterogeneity, are presented in Table 5. Estimates of the value added of district-alternative-certification, EPI and ABCTE teachers for both math and reading achievement, using each of the two achievement tests given in Florida, are displayed. Test scores are normed by grade and year so coefficient estimates can be interpreted in standard deviation units. The sample is limited to teachers in their first three years of teaching in Florida.[13] Differences in the productivity of traditionally prepared and district alternatively certified teachers are in all cases quite small (less than three-quarters of one percent of a standard deviation), and in most cases are statistically insignificant. In contrast, EPI completers generally perform worse than traditionally prepared teachers, with value-added scores that are three to four percent of a standard deviation lower. The performance of ABCTE teachers in teaching math is substantially better, on average, than for preparation program graduates. Across all specifications and tests, ABCTE teachers boost math achievement by six to eleven percent of a standard deviation more than do traditionally prepared teachers. In reading, the performance of ABCTE teachers is not much different than that of traditionally prepared teachers, being about one percent of a standard deviation higher when FCAT-SSS scores are used to measure student achievement and not significantly different when FCAT-NRT scores are employed.

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[13] The value-added analysis includes teachers with 0-2 years of experience, whereas the descriptive statistics of teachers by pathway are only for teachers in their first year of teaching. Consequently the samples are different.

Table 6 presents estimates from achievement models in which student fixed effects are used to account for student heterogeneity. Since student-fixed-effects models measure within-student variation in achievement over time, they tend to be "noisy" relative to models that make cross-student comparisons in performance (controlling for observable student characteristics). For both district-alternative-certification and EPI teachers, their estimated value-added to student achievement is not statistically different from that of traditionally prepared teachers in all test/specification combinations. However, differences in value-added estimates for ABCTE teachers remain large and statistically significant in math when using the FCAT-SSS exam.

Table 7 presents results from the same specifications as were presented in Table 5, but for the more homogeneous sample of middle and high school teachers. The results are generally similar to the full-sample results in Table 5. As with the full sample, the differences between traditionally prepared and district alternatively certified teachers in middle and high school are very small and often insignificant. EPI graduates tend to be less productive than traditionally prepared teachers, with value added scores that are generally three to six percent of a standard deviation lower. ABCTE teachers continue to show higher value added in math, about seven to nine percent of a standard deviation above that of traditionally prepared teachers. In reading, there are no statistically significant differences between ABCTE teachers and graduates of Florida teacher preparation programs.

VIII. Summary and Conclusions

Traditionally, the only way to be licensed to teach was to major in education and complete a university-based teacher preparation program. In recent years there has been a shift away from this paradigm as many states have adopted laws and regulations permitting individuals to enter the teaching

profession in other ways. Much attention has been paid to the peace-corps style program called Teach for America, which recruits graduates from prestigious universities to work in urban schools for a minimum of two years. Indeed Teach for America has received the most examination of any alternative certification program. However, TFA teachers only make up a small minority of alternatively prepared teachers in most states. In this paper I explore the effects of more generic alternative certification programs that have no special recruitment efforts, no minimum time commitment and do not require participants to take formal university based education courses while teaching.

Using a rich panel data set from Florida I explore the characteristics of individuals who enter teaching through alternative certification programs and measure their effectiveness in promoting student achievement. Florida has three distinct alternative certification programs. The largest is the "District Alternative Certification" program which allows applicants to become certified through an individualized training program that includes mentoring and on-line training, but does not require and form education coursework. Smaller, but growing in popularity are the Educator Preparation Institutes, which involve taking two semesters of non-transferrable coursework at a community college, and the ABCTE pathway, which has no coursework requirement whatsoever; all that is required is passage of a test.

In general I find that alternatively certified teachers have stronger pre-service academic skills, as evidenced by higher initial pass rates on certification exams and higher college entrance exam scores than traditionally prepared teachers. The measured contribution of alternatively certified varies considerably across pathways, however. The value added of district-alternative certification teachers is generally on par with that of recent Florida teacher preparation program graduates. In contrast, the value-added scores of EPI completers are often three to four percent of a standard deviation below those of traditionally prepared teachers. Most stark are the differences in the performance of ABCTE teachers

relative to traditionally prepared teachers in math. Across a variety of model specifications and test metrics ABCTE teachers outperform their traditionally prepared colleagues by a wide margin – six to eleven percent of a standard deviation. Like previous findings for TFA teachers, the performance of ABCTE teachers is generally equivalent to that of preparation program graduates in promoting achievement in reading.

The positive results for ABCTE math teachers must be interpreted with caution, given the relatively small sample of ABCTE teachers in tested grades. However, when combined with prior evidence on TFA teachers in other locales, some general patterns emerge. For both TFA and ABCTE no prior coursework in education is required, but in both cases perspective teachers come from more competitive schools and have better pre-college test scores. It appears that the low entry requirements of both programs attract individuals with greater intellectual ability and (at least for math) this trumps any human capital enhancement that may accrue from coursework in education. In contrast, the EPI pathway, which requires essentially two semesters of non-transferable coursework attracts individuals with somewhat weaker measured ability and they end up performing worse, on average, than traditionally prepared teachers in math.

The varied findings for the three programs in Florida highlight the fact that alternative certification programs are in fact quite diverse and one should be cautious about making blanket statement about the relative performance of "alternatively certified" teachers. However, it does appear that certification programs with low entry requirements can produce teachers that are as productive, or even more productive, than traditionally prepared teachers. Given the opportunity cost of a four-year degree in education, this implies that allowing some low-cost portals into the teaching profession would appear to be an efficient mechanism for increasing the supply of teachers.

References

Angrist, Joshua, and Jonathan Guryan. 2008. "Does Teacher Testing Raise Teacher Quality? Evidence From State Certification Requirements." *Economics of Education Review* 27(5):483-503.

Boyd, Donald, Pamela Grossman, Hamilton Lankford, Susanna Loeb and James Wyckoff. 2006. "How Changes in Entry Requirements Alter the Teacher Workforce and Affect Student Achievement." *Education Finance and Policy* 1(2):176-216.

Boyd, Donald, Pamela Grossman, Hamilton Lankford, Susanna Loeb and James Wyckoff. 2009. "Teacher Preparation and Student Achievement." *Educational Evaluation and Policy Analysis* 31(4): 416.

Constantine, Jill, et al. 2009. "An Evaluation of Teachers Trained through Different Routes to Certification." Final Report for National Center for Education and Regional Assistance 142.

Kane, Thomas J., Jonah E. Rockoff and Douglas O. Staiger. 2008. "What Does Certification Tell Us About Teacher Effectiveness? Evidence from New York City." *Economics of Education Review* 27(6):615-631.

Koedel, Cory, and Julian Betts. 2011. "Does Student Sorting Invalidate Value-Added Models of Teacher Effectiveness? An Extended Analysis of the Rothstein Critique." *Education Finance and Policy* 6(1):18-42.

Leland, Hayne E. 1979. "Quacks, Lemons and the Market Mechanism: A Theory of Minimum Quality Standards." *Journal of Political Economy* 87:1328-46.

Lott, John R., Jr. 1996. "Why Does Professional Licensing Rely on Minimum Schooling Requirements." Working paper, University of Chicago.

Mihaly, Kata, Daniel McCaffrey, J.R. Lockwood and Tim R. Sass. 2011. "Where You Come From or Where You Go? Distinguishing Between School Quality and the Effectiveness of Teacher Preparation Program Graduates." Unpublished manuscript.

Peltzman, Sam. 1976. "Toward a More General Theory of Regulation." *Journal of Law and Economics* 19:211-40.

Rothstein, Jesse. 2008. "On the Identification of Teacher Quality: Fixed Effects, Tracking, and Causal Attribution." Working paper, Princeton University.

Rothstein, Jesse. 2009. "Student Sorting and Bias in Value-Added Estimation: Selection on Observables and Unobservables." *Education Finance and Policy* 4(4):537-571.

Rothstein, Jesse. 2010. "Teacher Quality in Educational Production: Tracking, Decay, and Student Achievement." *Quarterly Journal of Economics* 125(1):175-214.

Stigler, George J. 1971. "The Theory of Economic Regulation." *Bell Journal of Economics and Management Science* 2:3-21.

Wilson, Suzanne, Robert E. Floden and Joan Ferrini-Mundy. 2001. *Teacher Preparation Research: Current Knowledge, Gaps, and Recommendations*. Seattle, WA: Center for the Study of Teaching and Policy.

Xu, Zeyu, Jane Hannaway and Colin Taylor. 2011. "Making a Difference? The Effects of Teach for America in High School." *Journal of Policy Analysis and Management* 30(3):447-469.

Yecki, Cheri P. 2006. "The State of Teacher Quality and Supply in Florida," powerpoint presentation, State Board of Education Workshop, October 17, 2006.

Table 1 - Select Characteristics of First-Year Teachers by Pathway (Teachers with any Certification)

Pathway	Proportion from Most Competitive Colleges (Barron's Ratings)	Proportion from Least Competitive Colleges (Barron's Ratings)	Proportion who Passed General Knowledge State Certification Exam on First Attempt	Proportion Non-White	Proportion Male	Average Total SAT Score
Graduate of a Florida Teacher Preparation Program (n= 17,392)	0.139	0.196	Math 0.663 Reading 0.803 English 0.816 Essay 0.911	0.316	.134	937
Course Analysis (n=30,052)	0.192*	0.160*	Math 0.645* Reading 0.818* English 0.820 Essay 0.880*	0.316	0.230*	955*
Certified in Another State (n=12,827)	0.078*	0.213*		0.167*	0.188*	
Graduate of an Out-of-State Teacher Preparation Program (n=6,016)	0.075*	0.233*	Math 0.559* Reading 0.718* English 0.740* Essay 0.727*	0.269*	0.226*	
District Alternative Certification Program (n=1,473)	0.229*	0.135*	Math 0.764* Reading 0.910* English 0.921* Essay 0.926	0.263*	0.314*	1029*
Educator Preparation Institute (n=206)	0.223*	0.144*	Math 0.772* Reading 0.926* English 0.957* Essay 0.931	0.189*	0.272*	1029*
ABCTE (n=96)	0.225	0.180	Math 0.977* Reading 1.000* English 1.000* Essay 0.976*	0.188*	0.354*	1096*
College Teaching Experience (n=55)	0.358*	0.094*	Math 0.615 Reading 0.692 English 0.615 Essay 1.000*	0.327	0.473*	

Note: "most competitive" category includes "most competitive," "highly competitive" and "special" designations; "least competitive" category includes "less competitive" and "non-competitive" Barron's designations. The omitted category includes "very competitive" and "competitive" schools. Values not reported if relevant data are available for fewer than 10 percent of teachers from the given pathway or if total number of teachers in pathway is less than 25. * t-test indicates mean significantly different than mean for graduates of Florida teacher preparation programs at 95 percent confidence level.

Table 2 - Select Characteristics of First-Year Teachers by Pathway (Teachers with Elementary Ed. Certification)

Pathway	Proportion from Most Competitive Colleges (Barron's Ratings)	Proportion from Least Competitive Colleges (Barron's Ratings)	Proportion who Passed General Knowledge State Certification Exam on First Attempt	Proportion Non-White	Proportion Male	Average Total SAT Score
Graduate of a Florida Teacher Preparation Program (n= 9,707)	0.110	0.217	Math 0.623 Reading 0.789 English 0.799 Essay 0.908	0.304	0.071	928
Course Analysis (n=11,011)	0.165*	0.181*	Math 0.622 Reading 0.800 English 0.798 Essay 0.890*	0.284*	0.088*	941*
Certified in Another State (n=5,876)	0.069*	0.219		0.164*	0.097*	
Graduate of an Out-of-State Teacher Preparation Program (n=2,554)	0.067*	0.246	Math 0.561* Reading 0.769 English 0.787 Essay 0.781*	0.227*	0.104*	
District Alternative Certification Program (n=189)	0.257*	0.123*	Math 0.780* Reading 0.912* English 0.956* Essay 0.944	0.180*	0.095	966
Educator Preparation Institute (n=31)	0.240	0.160	Math 0.692 Reading 0.923* English 0.885 Essay 0.923	0.161*	0.161	979
ABCTE (n=19)						
College Teaching Experience (n=11)						

Note: "most competitive" category includes "most competitive," "highly competitive" and "special" designations; "least competitive" category includes "less competitive" and "non-competitive" Barron's designations. The omitted category includes "very competitive" and "competitive" schools. Values not reported if relevant data are available for fewer than 10 percent of teachers from the given pathway or if total number of teachers in pathway is less than 20. * t-test indicates mean significantly different than mean for graduates of Florida teacher preparation programs at 95 percent confidence level.

Table 3 - Modal Major of First Bachelor's Degree by Pathway and Certification Area

	Modal Major of First Bachelor's Degree				
Pathway	All Certifications	Elementary Education Certification	Middle School Math Certification	High School Math Certification	Biology Certification
Graduate of a Florida Teacher Preparation Program	Elementary Teacher Education	Elementary Teacher Education	Elementary Teacher Education	Mathematics Teacher Education	Science Teacher Education
Course Analysis	Elementary Teacher Education	Elementary Teacher Education	Elementary Teacher Education	Mathematics Teacher Education	Biology
Certified in Another State	Elementary Teacher Education	Elementary Teacher Education	Elementary Teacher Education	Mathematics Teacher Education	Science Teacher Education
Graduate of an Out-of-State Teacher Preparation Program	Elementary Teacher Education	Elementary Teacher Education	Journalism		Elementary Teacher Education
District Alternative Certification Program	English Lang. & Lit.	Business Administration	Criminal Justice	Mathematics	Biology
Educator Preparation Institute	Communications	Business Administration	Business Administration	Health Professions	Food Sciences & Technology
ABCTE	English Lang. & Lit.	Political Science		Finance	Biology
College Teaching Experience	Elementary Teacher Education	Elementary Teacher Education	Business Administration	Business Administration	Food Sciences & Technology

Note: Statistics not reported when cell size equals 10 or less. Number of observations equals the number of teachers with a known major, which excludes teachers receiving their degree from a private Florida college or university or a post-secondary institution outside of Florida.

Table 4 - Coursework Credit Hours by Alternative Pathway (All Certifications)

	Florida Teacher Preparation Program Graduates [n=4,457]	District Alternative Certification Program [n=145]	Educator Preparation Institute [n=14]	ABCTE [n=14]
Coursework Category	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**
All Education Coursework	63.08 (22.89)	3.29 (5.49)	2.36 (5.79)	1.29 (2.81)
Education - Field-based	14.85 (6.49)	0.42 (1.03)	0.21 (0.80)	0.20 (0.75)
Math Education	3.81 (4.84)	0.02 (0.25)	0.00 (0.00)	0.00 (0.00)
Science Education	2.09 (2.64)	0.02 (0.25)	0.00 (0.00)	0.00 (0.00)
Language Arts Education	8.59 (6.48)	0.29 (1.14)	0.00 (0.00)	0.00 (0.00)
English as a Second Language (ESL) Education	2.39 (3.01)	0.12 (1.05)	0.00 (0.00)	0.21 (0.80)
Math	5.65 (7.71)	4.04 (5.70)	4.80 (5.10)	6.75 (10.21)
Statistics	1.41 (2.19)	1.76 (2.29)	2.07 (2.34)	1.47 (2.02)
All Science Coursework	8.49 (8.70)	13.83 (17.74)	14.75 (13.74)	32.42 (36.65)
Biology	3.10 (4.64)	5.32 (7.96)	3.59 (4.78)	15.99 (20.53)
Chemistry	1.63 (3.67)	3.86 (7.73)	6.14 (8.71)	9.19 (11.61)
Physics	1.72 (2.72)	2.42 (3.35)	2.93 (3.67)	5.24 (5.23)
Engineering	1.31 (3.18)	3.75 (10.95)	5.88 (15.16)	2.36 (2.92)
English Literature	7.58 (7.92)	14.82 (15.74)	13.78 (13.69)	8.51 (12.34)
Credits Not in Educ., Math, Stat., Sci., Eng., Health Sci.	49.43 (27.23)	89.99 (28.38)	96.89 (40.06)	74.39 (44.34)
Arts	9.82 (20.79)	6.13 (13.98)	8.64 (11.52)	10.50 (24.79)
Social Science	7.11 (7.71)	14.54 (16.02)	12.93 (10.26)	13.62 (18.00)
Foreign Language	2.30 (5.12)	7.60 (10.62)	9.87 (15.24)	6.74 (7.14)
Business	1.12 (5.42)	10.36 (20.81)	2.35 (5.88)	10.16 (23.31)

Note: sample includes only teachers with 100 or more known credit hours in university-designated courses taken in Florida public community colleges and universities prior to first year of teaching in Florida public schools.

Table 5 – The Impact of Teacher Pathways on Student Achievement in Math and Reading, 2000/01 – 2006/07
[Teachers with 0-2 Years of Experience, Grades 4-10, Florida Preparation Program Completers are the Reference Group]

	Math				Reading			
	SSS	NRT	SSS	NRT	SSS	NRT	SSS	NRT
District Alternate Cert.	0.0072+	-0.0013	0.0023	0.0026	-0.0026	-0.0098+	-0.0013	-0.0041**
	(0.0037)	(0.0040)	(0.0051)	(0.0031)	(0.0037)	(0.0050)	(0.0014)	(0.0010)
Educator Prep. Inst.	-0.0342**	-0.0268+	-0.0437**	-0.0431**	-0.0026	-0.0237**	-0.0248**	-0.0421**
	(0.0089)	(0.0117)	(0.0031)	(0.0012)	(0.0059)	(0.0039)	(0.0028)	(0.0009)
ABCTE	0.1041**	0.0634**	0.1146**	0.0869**	0.0087**	-0.0103	0.0110**	0.0003
	(0.0089)	(0.0058)	(0.0050)	(0.0026)	(0.0019)	(0.0136)	(0.0022)	(0.0012)
Persistence	Partial	Partial	Partial	Partial	Partial	Partial	Partial	Partial
Student F.E.	No	No	No	No	No	No	No	No
School F.E.	Yes	Yes	No	No	Yes	Yes	No	No
R-squared	0.641	0.630	0.628	0.619	0.582	0.562	0.573	0.553
Number of Obs.	794,454	811,704	794,454	811,704	702,330	723,878	702,330	723,878

Note: All models include time varying teacher and peer explanatory variables as well as indicators for each pathway (other than Florida preparation program completers).
Standard errors adjusted for clustering at the pathway level are in parentheses.
+ significant at 10%; * significant at 5%; ** significant at 1%. Estimates are not reported if there are fewer than 20 teachers in a pathway.

Table 6 – The Impact of Teacher Pathways on Student Achievement in Math and Reading, 2000/01 – 2006/07
[Teachers with 0-2 Years of Experience, Grades 4-10, Florida Preparation Program Completers are the Reference Group]

	Math				Reading			
	SSS	NRT	SSS	NRT	SSS	NRT	SSS	NRT
District Alternate Cert.	0.0017	0.0014	-0.0002	-0.0050	-0.0042	-0.0074	0.0042	-0.0022
	(0.0028)	(0.0033)	(0.0067)	(0.0069)	(0.0111)	(0.0123)	(0.0060)	(0.0121)
Educator Prep. Inst.	-0.0071	-0.0199	-0.0215	-0.0305	0.0441	0.0197	0.0182	-0.0021
	(0.0218)	(0.0453)	(0.0250)	(0.0359)	(0.0334)	(0.0413)	(0.0167)	(0.0426)
ABCTE	0.1179*	0.0236	0.1141*	0.0539	-0.0174	-0.0261	-0.0097	-0.0087
	(0.0394)	(0.0391)	(0.0347)	(0.0289)	(0.0205)	(0.0449)	(0.0106)	(0.0209)
Persistence	Partial	Partial	Partial	Partial	Partial	Partial	Partial	Partial
Student F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School F.E.	Yes	Yes	No	No	Yes	Yes	No	No
R-squared	0.966	0.961	0.963	0.959	0.964	0.956	0.962	0.954
Number of Obs.	798,462	815,822	798,462	815,822	706,155	727,930	706,155	727,930

Note: All models include time varying teacher and peer explanatory variables as well as indicators for each pathway (other than Florida preparation program completers).
Standard errors adjusted for clustering at the pathway level are in parentheses.
+ significant at 10%; * significant at 5%; ** significant at 1%. Estimates are not reported if there are fewer than 20 teachers in a pathway.

Table 7 – The Impact of Teacher Pathways on Student Achievement in Math and Reading, 2000/01 – 2006/07
[Teachers with 0-2 Years of Experience, Grades 6-10, Florida Preparation Program Completers are the Reference Group]

	Math				Reading			
	SSS	NRT	SSS	NRT	SSS	NRT	SSS	NRT
District Alternate Cert.	0.0019	-0.0087	-0.0049*	-0.0080**	-0.0033	-0.0101+	-0.0048**	-0.0086**
	(0.0021)	(0.0024)	(0.0051)	(0.0020)	(0.0037)	(0.0051)	(0.0007)	(0.0005)
Educator Prep. Inst.	-0.0483**	-0.0403**	-0.0625**	-0.0601**	-0.0051	-0.0249**	-0.0287**	-0.0491**
	(0.0121)	(0.0137)	(0.0014)	(0.0007)	(0.0059)	(0.0061)	(0.0006)	(0.0009)
ABCTE	0.0949**	0.0723**	0.0901**	0.0768**	0.0007	-0.0133	0.0001	-0.0059**
	(0.0157)	(0.0061)	(0.0024)	(0.0025)	(0.0019)	(0.0165)	(0.0023)	(0.0012)
Persistence	Partial	Partial	Partial	Partial	Partial	Partial	Partial	Partial
Student F.E.	No	No	No	No	No	No	No	No
School F.E.	Yes	Yes	No	No	Yes	Yes	No	No
R-squared	0.655	0.658	0.646	0.649	0.585	0.552	0.576	0.543
Number of Obs.	541,922	553,104	541,922	553,104	455,792	475,674	455,792	475,674

Note: All models include time varying teacher and peer explanatory variables as well as indicators for each pathway (other than Florida preparation program completers). Standard errors adjusted for clustering at the pathway level are in parentheses.
+ significant at 10%; * significant at 5%; ** significant at 1%. Estimates are not reported if there are fewer than 20 teachers in a pathway.