Alternative Certification in the Long Run: Student Achievement, Teacher Retention and the Distribution of Teacher Quality in New York City

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A large number of school districts still struggle to hire qualified teachers, especially in subjects such as special education, math and science. However, over the last ten years the landscape of teacher supply has been dramatically altered by the substitution of alternatively certified teachers for unlicensed teachers in many school districts (Feistritzer, 2008). An increasing body of research has described the characteristics of alternatively certified teachers and compared their effectiveness on value-added outcomes for students and their attrition to the unlicensed teachers they replaced as well as to teachers from other pathways (Boyd et al., 2006, 2008, 2009a, 2009b; Constantine et al., 2009; Decker et al., 2004; Feistritzer, 2008; Grossman and Loeb, 2008; Kane et al., 2009; Xu et al., 2009). Alternatively certified teachers disproportionately teach in high needs schools and subjects. While results vary somewhat, these studies find that the students of teachers who enter teacher through highly-selective alternative routes experience better achievement gains than the students of the unlicensed teachers they replaced; comparable, or in some cases somewhat better, math achievement gains than the students of teachers from traditional preparation pathways; and comparable, or in some cases somewhat worse, achievement gains in English language arts than the students of teachers from traditional preparation pathways. This research also finds that alternatively certified teachers are more likely to leave their initial schools and districts than traditionally prepared teachers.

Because the widespread hiring of alternatively certified teachers is a relatively recent phenomenon, most of this research focuses on novice teachers and none of it examines the effects of teachers with more than three years of experience.   Thus, our understanding of the longer-run effects of the introduction of alternative routes, particularly highly-selective alternative routes, is weak. For this study, we employ a detailed database of all teachers in New York City from 2000-01 through 2007-08 to explore the long run implications of alternative certification. New York City is a good place for such an analysis, as the school district has employed large numbers of alternatively certified teachers since fall 2001 when New York City hired its first cohort of more than 1000 New York City Teaching Fellows (NYCTF) and about 100 Teacher for America (TFA) teachers. Hiring of alternatively certified teachers grew so that by 2003-04 nearly 2500 NYCTF teachers were hired in one year, constituting more than a quarter of all new hires. There are now a large group of alternatively certified teachers who began their teaching careers between 5 and 8 years ago. Data on these teachers and all other

teachers in the district allow us to explore a number of research questions that inform the understanding of the long-run implications of alternatively certified teachers.

To address this gap in our understanding, in this preliminary analysis we examine three broad research questions:

- How do the characteristics and careers of teachers from different pathways differ?

- What are the effects of teachers entering through different pathways on student achievement and how has this changed over time?

- To what extent does the leaving behavior of more or less effective teachers differ across pathways?

Each of these questions has a number of sub-questions and requires multiple approaches which we describe below. We note here, and will repeat elsewhere, that this analysis is based on data through 2008. We are in the process of extending this analysis to 2010 and exploring additional analyses to insure the robustness of our findings. With these caveats in mind, we find:

- The role of the New York City Teaching Fellows (NYCTF) has changed substantially since its inception in 2001 from supplying mostly Childhood Education teachers to a focus on the difficult to staff subjects of special education, mathematics, English as a Second Language and science. In many respects NYCTF has served as the supplier of last resort for NYC teaching vacancies.

- The NYCTF program recruits the largest percentage of teachers with higher certification scores, higher SAT scores and who attend more competitive colleges.

- We do not find meaningful student achievement value-added differences in the returns to experience by pathway.

- Pathway effects have been fairly consistent over time with the exception that the students of NYCTF teachers are experiencing somewhat smaller gains in math over time but somewhat larger gains in ELA relative to their peers from other pathways.

- NYCTF teachers transfer and exit somewhat more than traditional preparation teachers; TFA teachers transfer and exit substantially more than either NYCTF or traditional preparation teachers, except after their first year of teaching.

- Over time NYCTF teachers have become somewhat more likely to transfer following their first and second years of teaching and more likely to exit teaching in NYC following their first year.

- Some preliminary evidence suggests that it is the NYCTF teachers with low value-added who are more likely to exit than their higher value-added peers, although high value-

added NYCTF teachers still appear more likely to exit than high value-added teachers from traditional preparation programs.

BACKGROUND

In the years prior to 2000, the environment for teacher recruitment and retention in New York City was bleak. Much of New York City's difficulty in teacher recruitment is evidenced by the statistic that from at least as early as 1995–96 through 2001–02 roughly half of all new teachers were temporarily licensed (uncertified). Other measures of teacher qualifications were also notably weak. For example, 25% of newly hired teachers in 1999–2000 had failed the New York State certification exam on the first taking, 26% had attended undergraduate institutions rated by Barrons as uncompetitive, and, on average, newly hired teachers had average math and verbal SAT scores of 466 and 477, respectively.

New York City also had a weak record of teacher retention, especially in the most challenging schools and among their most qualified teachers. For example, between 1996 and 2002 only 20% of new teachers in the top quartile on the certification exam left high-achieving schools following their first year, but 34% of those teaching in low-achieving schools left after one year. By contrast, 14% of teachers in the *bottom* quartile on the certification exam left high-achieving schools after one year, and 17% left low-achieving schools.[1]

There were a number of reforms beginning in 2000 that dramatically changed the recruitment and retention of teachers. Reform efforts such as improving teacher compensation, especially for entering teachers, improving school leadership, attempting to enhance both financial incentives and supports for teachers, and making human resource processes more transparent and tied to measures of performance may all contribute to improving the quality of teaching in NYC. However, arguably one of the more dramatic changes was the series of reforms in policy and practice that led to the development of the New York City Teaching Fellows (NYCTF). In short, NYCDOE built the NYCTF program into a successful source for

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[1] D. Boyd, H. Lankford, S. Loeb, and J. Wyckoff, "Explaining the Short Careers of High-Achieving Teachers in Schools with Low-Performing Students," *American Economic Review Proceedings* 95 no. 2 (2005): 166–171.

recruiting between 20 and 30 percent of all new teachers. We explore some of the implications of the development of NYCTF on teaching and student achievement in NYC.

Data. For this analysis we employ various data files from NYCDOE and NYSED:
- individual-level administrative data characterizing the backgrounds, qualifications, and career histories of all NYC public school teachers (2000-2008);
- student-level achievement test results for grades 3-8 in math and ELA linked to the teaches who taught these students (2000-2008);
- administrative and other data characterizing the schools in which teachers teach (2000-2008);
- data on the first program path of teachers (2000-2008);

All are linked at the individual teacher level.

PATHWAYS INTO TEACHING IN NEW YORK CITY

How do the characteristics and careers of teachers from different pathways differ?

A series of changes in policy and practice had a substantial effect on teacher recruitment in NYC. In 1998 the New York State Regents passed regulations ending the use of temporary license teachers by Fall of 2003. At that time the Regents also allowed for the creation of alternative certification pathways as routes to certification in NYS. In response NYCDOE NYCDOE developed and implemented the New York City Teaching Fellows program. As shown in Figure 1, the number of temporary license first-year teachers, which comprised 5000 of the "Other Path" teachers in 2000 fell to virtually zero by 2005. The New York City Teaching Fellows program NYCTF) was created in 2000 and by 2004 supplied more than 2,500 teachers. As shown, there was also meaningful increase in first-year teachers coming from traditional teacher preparation programs (CR) and a smaller increase from Teach for America (TFA) over the same period.

The changes in the pathways through which teachers were recruited had important implications for the attributes of teachers. We focus on a few of the more striking differences. The appendix includes more detailed tabulations.

Certification Area. Among the most remarkable changes has been the evolution of the recruitment goals of NYCTF program over time. At its inception the NYCTF program was dominated by teachers whose certification was in Childhood Education (Figure 2). Sixty to seventy percent of NYCTF teachers where certified in Childhood Education which comprised about 30 percent of all teachers being hired by NYC with this certification area (Appendix Table

Figure 1. Number of First-Year Teachers by Pathway and Year
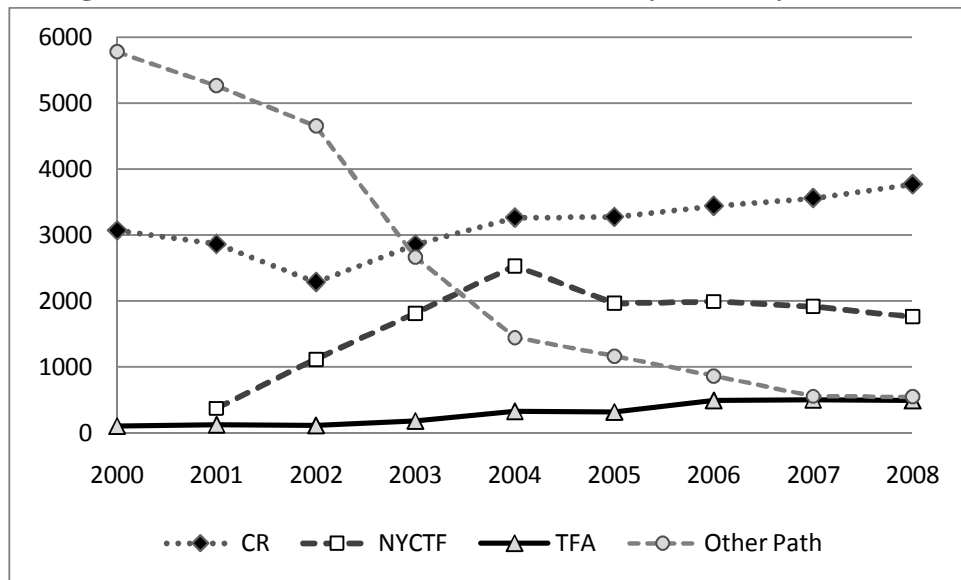
Note: Other Path includes Modified Teaching Licensed, Transitional B Licensed, Temporary Licensed, and Individual Evaluation Teachers.

A7). However, this quickly changed so that by 2006 fewer than 15 percent of all NYCTF teachers were Childhood Education certified.

The NYCTF program quickly shifted to focus its efforts on supplying teachers in key shortage areas, such as mathematics, science, special education and English as a second language. As shown in Figures 3a-d, NYCTF became the dominant source of supply for teachers in each of these certification areas. By 2006 NYCTF was supplying about 60 percent of all new math certified teachers, 40 percent of teachers certified in science, 50 percent of special education teachers, and 50 percent of ESL teachers. In many respects, NYCTF has become the supplier of last resort to difficult-to-staff subjects in NYC.

As might be expected, this change in teacher certification was accompanied by a change in the grade level of the schools in which NYCTF teachers taught. In 2002, 68 percent of NYCTF teachers were assigned to elementary schools; by 2008 that figure had fallen to 27 percent. The decline in elementary teacher assignments is roughly matched by equal increases in assignments to middle and high schools. Teachers from traditional teacher preparation programs

are disproportionately assigned to elementary schools (57 percent in 2008) while TFA teachers are almost exclusively assigned to elementary and middle schools.

Academic Ability. The NYCTF program has consistently recruited teachers with strong credentials as measured by tests of academic ability (Appendix Table A6) and the competitiveness of their undergraduate colleges (Appendix Table A1).   NYCTF recruits teachers who on average score consistently better than teachers entering NYC public schools through the traditional preparation programs (college recommended) or through the "Other" pathways group and consistently somewhat worse than those entering through TFA. This pattern is replicated in the Barron's rankings of the undergraduate colleges of teachers. About a third of NYCTF teachers graduated from the most competitive colleges, while about 12 percent of CR teachers and more than 60 percent of TFA did so (Appendix Table A1).

Figure 2. Teachers Certified in Childhood by Pathway and Year
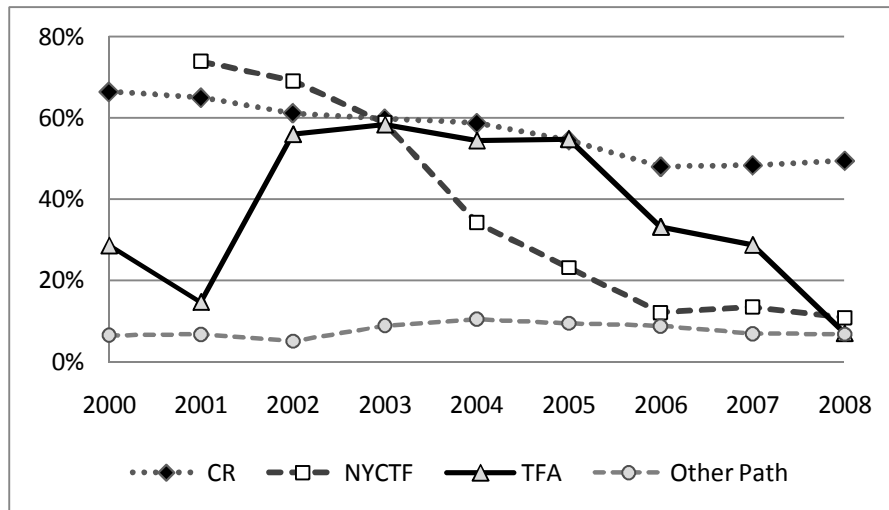
School Placements. The first teaching assignment of teachers from different pathways varies substantially, as might be expected from the differing goals associated with the pathways. NYCTF and TFA teachers are much more likely to teach students who are poor, Black or Hispanic, have been suspended from school, and who have lower math and ELA achievement test scores (Appendix Table A17). For example, in 2008, the students of an average first-year NYCTF teachers in grades 3-8 scored 0.25 standard deviations below those of the average

Figures 3a-d. Teachers Certified by Area, Pathway and Year
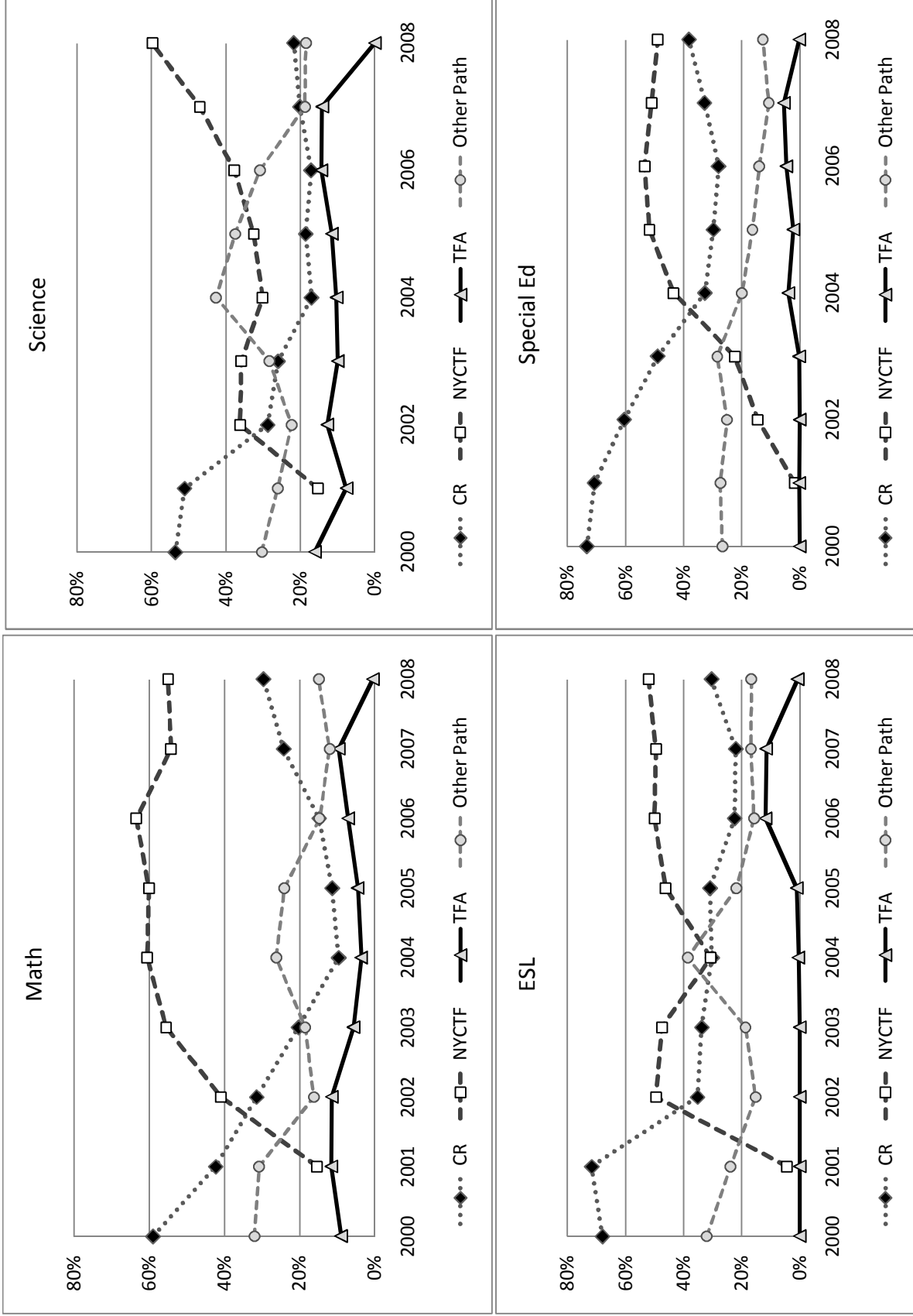
traditional teacher preparation teachers and about 0.13 standard deviations above the students entering the average first-year TFA teacher's classroom. While there is some variation, similar patterns exist across other measures and over time. In short, NYCTF and TFA teachers have consistently been assigned to what appear to be more challenging classrooms.

PATHWAYS AND STUDENT ACHIEVMENT

What are the effects of teachers entering through different pathways on student achievement and how has this changed over time?

The second part of this study examines the effectiveness of teachers from different pathways, asking what are the effects of teachers entering through different pathways on student achievement and how has this changed over time? There are several components to this analysis. First, the base model examines the average effects of teachers from different pathways over the full time-period of our data. In this base model, the standardized achievement level (test score) of a student is modeled as in equation (1).

$$A_{ijst} = \beta_0 + \beta_1 A_{ijs(t-1)} + \beta_2 A^2_{ijs(t-1)} + X_{it}\beta_3 + C_{ijst}\beta_4 + T_{jst}\beta_5 + \Pi_j + \nu_s + \varepsilon_{ijst} \qquad (1)$$

Here, the achievement (*A*) in math (ELA) of student *i* in year *t* with teacher *j* in school *s* is a function of his or her prior achievement in both ELA and math and of prior achievement in both subjects squared, time-varying and fixed student characteristics (*X*), characteristics of the classroom (*C*), characteristics of the teacher (*T*), indicator variables (fixed effect) for the pathway by which the teacher entered teaching in NYC (Π), a fixed-effect for the school (ν), and a random error term (ε).

Student characteristics include gender, race/ethnicity, poverty status, days absent during the prior year, and suspensions in the prior year. The aggregate classroom (teacher by grade by school by year) student characteristics include race/ethnicity, poverty status, average attendance in the prior year, average suspensions in the prior year, average student test scores in the prior year, and the standard deviation of student test scores in the prior year. Teaching experience is measured by dummy variables for each year of teaching from the first year through the twentieth and then an additional dummy variable for experience greater than twenty years. In addition, the model includes fixed effects for years, grades, and schools.

All teachers in this analysis are certified through one of the following pathways: college recommended, Teach for America, New York City Teaching Fellows, independent evaluation, Trans B license, temporary license, or pathway unknown. All analyses include teachers from every pathway, but our description of the findings focuses on the first three pathways: college recommended (CR), Teach for America (TFA), and the New York City Teaching Fellows (NYCTF). The reference group for each analysis is NYCTF so the results describe the effects of CR and TFA relative to NYCTF.

The standard errors are clustered at the teacher level to account for the fact that teacher pathway is a teacher-level variable. This model controls for all the attributes of students that typically remain constant from one year to the next, such as parental support and home environment. It also controls for all the characteristics of schools that do not change over the time period by including a school fixed effect. We estimated models separately for math and for English languages arts. We also estimated models separately for elementary grades (grades four and five) and middle school grades (grades sixth through eight) as well as a model that pools all grades.

We experimented with a large number of other models that make alternative assumptions regarding the determinants of student achievement, including the use of student fixed effects rather than school fixed effects, and additional lags in prior achievement. Unless noted, the results presented do not differ in any meaningful way from these alternative specifications.

In general we find that mean value-added differences among pathways mirror prior work--NYCTF and traditional preparation produce very similar results; TFA produces somewhat larger achievement gains in math.

How does the effect of experience by pathway change over time, especially for more experienced teachers?

To investigate whether there are differential effects over time and pathway, we augment the base model described above with pathway indicator variables interacted with experience indicator variables. Because the use of these interactions incorporate both returns to experience and the changing composition of the workforce as some teachers exit, we also estimate models that examine the returns to experience for teachers with 3 or more years of experience and 5 or

more years of experience. This has the effect of holding such attrition constant. The results of these analyses are not included in the body of this paper because nearly all of the results are insignificant. For math achievement, there are not significant differential returns to experience by pathway. However, for ELA, there is some evidence that middle school NYCTF gain in effectiveness relative to CR for later years of experience (4 and 5 years). These ELA results are statistically significant and of a roughly the same size as the difference between the average first and second year teacher (effect sizes of 0.03 to 0.06, (the results are in Appendix table A18). We consider these worthy of attention.

How has the value-added of pathways changed over time?

We assess how the relative effect of pathways may have changed over the period 2000-2008 in two ways: by cohorts and by calendar years. First, we examine the effects of cohorts of teachers and how these effects change over time. Here we identify cohorts of teachers by the year in which they began teaching. We then interact pathways and cohorts to get a sense of whether, for example, the teachers recruited in 2003 might differ in effectiveness from those recruited in 2007. We employ two measures of cohorts, a continuous measure and a measure that groups cohorts into early, middle and late groupings (early: 2000-2002, middle: 2003-2005, and late: 2006-2008).

Specifications 1 (continuous) and 2 (groupings) in Table 1 capture how the math effectiveness of pathway cohorts has changed over time. The continuous cohort*pathway effects capture the change in effectiveness for each successive cohort of a given pathway. Over time, cohorts of CR and TFA have been gaining effectiveness, relative to NYCTF, although again, the effects are small in magnitude in any given year. Over the 9 years of data studied, however, CR has gained 0.06 standard deviations relative to NYCTF. The same pattern can be seen in specification 2 where cohorts are designated by the groupings. Although not statistically significant, the coefficient estimates for math suggest that NYCTF teachers have become slightly less effective over time (both early and middle cohort estimates are about 0.013). It is also the case that NYCTF cohorts appear less effective than either CR or TFA cohorts. These results appear to be driven almost entirely by differences that exist at the middle school level, estimates for which are shown in Appendix Table A17).

Table 1: The Effects of Pathways over Time and Cohorts

	MATH				ELA			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
pathway: TransB	0.0533		-0.0524		0.0280		0.1030	
pathway: IE	-0.0313***		-0.0394***		0.0175**		0.0543***	
pathway: CR	-0.0165*		-0.0331**		0.0195***		0.0617***	
pathway: TFA	0.0032		-0.0197		0.0066		0.0329*	
pathway: unknown	-0.0177		-0.0337**		0.0195**		0.0552***	
pathway: temp license	-0.0310***		-0.0536***		-0.0043		0.0369***	
continuous cohort	-0.0051**				0.0014			
cont. cohort * TransB	-0.0135				-0.0028			
cont. cohort * CR	0.0072***				-0.0034			
cont. cohort * IE	0.0044				-0.0055*			
cont. cohort * TFA	0.0085*				-0.0009			
cont. cohort * unknown	-0.0009				-0.0037			
cont. cohort * temp.	0.0054				0.0091			
early cohort * CR		0.0092				0.0094		
early cohort * NYCTF		0.0129				-0.0031		
early cohort * TFA		0.0308*				-0.0044		
middle cohort * CR		0.0176*				0.0011		
middle cohort * NYCTF		0.0125				-0.0079		
middle cohort * TFA		0.0423**				0.0006		
late cohort * CR		0.0233**				0.0012		
late cohort * TFA		0.0487***				-0.0012		
continuous year			-0.0064***				0.0100***	
year * TransB			0.0056				-0.0127	
year * IE			0.0029				-0.0074***	
year * CR			0.0056***				-0.0078***	
year * TFA			0.0078**				-0.0039	
year * unknown			0.0025				-0.0067***	
year * temp. license			0.0064***				-0.0048***	
early year * CR				0.0114*				-0.0141***
early year * NYCTF				-0.0101				-0.0394***
early year * TFA				0.0330*				-0.0278**
middle year * CR				0.0181***				-0.0262***
middle year * NYCTF				0.0225***				-0.0450***
middle year * TFA				0.0368***				-0.0380***
late year * CR				0.0123*				0.0000
late year * TFA				0.0460***				0.0021

Specifications 5 and 6 show the cohort analyses for ELA teachers. There are no significant differential effects by pathways over the cohorts, although when specification 5 is estimated separately for elementary and middle schools, CR and TFA become statistically less effective in elementary schools, relative to NYCTF (the results are in Appendix Table A19). Specification 6 also shows no significant differences in the effectiveness of pathways by cohorts.

An alternative measure of the effect of time is to include an interaction between each pathway and a measure of the years, either a time trend or a grouping of years (early: 2000-2002, middle: 2003-2005, and late: 2006-2008) to our base model. This measure includes the mean effect of all teachers currently teaching in that year regardless of experience. This measure allows us to examine how the mean effectiveness of teachers from different pathways differs at varying points in time.

Specifications 3 and 4 show how the average math effectiveness of each pathway has changed over time. The gains in CR and TFA are similar in magnitude in both the cohort and year analyses, which indicates that most of the improvements in CR and TFA, relative to NYCTF, are due to changes in first year teachers entering each pathway, rather than differential attrition.

Even though we see few differences by pathway in cohorts of first year ELA teachers, specifications 7 and 8 show that there are significant differences in the effectiveness of pathways over time. On average NYCTF teachers have been gaining in effectiveness compared to CR. TFA has not been gaining relative to NYCTF (unlike the math results). Again, all of these effects are relatively small in magnitude. Specification 8 shows that early and middle year CR, TFA, and NYCTF are less effective than late year NYCTF. This finding is consistent with the notion that NYCTF have been becoming more effective over time in ELA.

PATHWAYS AND TEACHER RETENTION

How does teacher attrition differ by pathway and over time?

The retention analyses are based on the decisions of all New York City public school teachers who were in their first year of teaching between 1999-2000 and 2007-2008, a population of 72,925 teachers.[2] We examine teachers' decisions to stay at the same school, transfer schools within NYCDOE, or exit teaching in NYCDOE. We examine teachers' decisions after each of their first three years of teaching conditional on their prior year decisions. Since our data currently run through the 2007-08 year, our analysis for first-year retention

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[2] Our analysis is limited to teachers for whom we observe their first year of teaching in New York City to reduce the selection bias associated with employing teachers whose early careers we do not observe, some of whom are no longer in the NYC public schools.

decisions ends with the entering cohort of 2007. Similarly, second and third-year retention decisions conclude with the cohorts of 2006 and 2005 respectively. These analyses will extend an additional two years once we integrate the newly acquired data.

We estimate multinomial logit models with school fixed effects, controlling for pathway.[3] We include school fixed effects to control for the fact that teachers are not randomly distributed across schools, and teachers' decisions to transfer or exit are likely a function of their initial placements. We follow this analysis of mean pathway effects with analyses to test whether these relationships change over time. In particular, we are interested in whether more recent cohorts (as defined by a teacher's first year of teaching) of teachers have behaved differently than earlier cohorts.

Before turning to the results of our multinomial logit regressions, Table 2 presents descriptive statistics of the retention decisions of all teachers by year of experience unconditioned by school fixed effects. The Year 1 column describes all teachers' decisions after their first year of teaching. The Year 2 (Year 3) column describes teachers' decisions after their second (third) year of teaching for those teachers who stayed in the same school after their first (first and second) year(s) of teaching. As expected, by the third year of teaching teachers from traditional teacher preparation programs on average persist at higher rates, both in their original school assignments and in NYC than either NYCTF or TFA teachers. However, TFA teachers are substantially more likely to exit teaching in NYC following years 2 and 3 than either NYCTF or traditional preparation teachers. These patterns are not unexpected given two-year commitment of TFA members and the arguably more challenging working environments facing NYCTF and TFA teachers.

Table 3 presents multinomial logit analyses examining teacher retention patterns by pathways where teachers are compared to teachers from other pathways *in their own school*. For simplicity, we only present the results for NYCTF and TFA. The omitted group is CR teachers, so the odds ratios represent the likelihood of NYCTF and TFA teachers to transfer or exit relative to CR teachers. NYCTF teachers were significantly more likely to transfer than their CR peers. For example, they were approximately 50 percent more likely to transfer after their first

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[3] The pathways are college recommended (CR), New York City Teaching Fellows (NYCTF), Teach for America (TFA), individual evaluation, temporary license, and other/unknown.

year. In addition, they were also more likely to exit after their second or third year, but they were less likely to exit after their first year. The TFA results are more striking. Although TFA teachers were less likely to transfer or exit than their same school CR colleagues after their first year, they were more likely to transfer and exit after their second or third year. In fact, they were almost 11 times as likely to exit after their second year than CR teachers.

Table 2. Cumulative Retention Decisions by Pathway and Years of Experience

	After year 1	After year 2	After year 3
CR			
Same school	0.82	0.71	0.62
Transferred	0.08	0.13	0.17
Exit	0.09	0.15	0.20
NYCTF			
Same school	0.78	0.57	0.42
Transferred	0.13	0.21	0.26
Exit	0.09	0.21	0.31
TFA			
Same school	0.82	0.33	0.17
Transferred	0.08	0.13	0.16
Exit	0.10	0.54	0.67

Table 3. Multinomial Logit Estimates of Transfer and Exit Decisions with School Fixed Effects (Odds Ratios)

	Transfer			Exit		
	After year 1	After year 2	After year 3	After year 1	After year 2	After year 3
NYCTF	1.492**	1.764**	1.735**	0.827**	1.973**	2.224**
TFA	0.656**	1.677**	1.541*	0.710**	10.614**	5.658**
N	59086	35886	23415	59576	41064	27876

The results in Table 3 represent the average behavior of all teachers during the 2000-2008 period; however, retention patterns of teachers may have changed over time. We explore differences across time in Table 4, where we categorize teachers by their pathway and their cohort, with all results relative to behaviors of the late cohort of NYCTF teachers. Early cohort

teachers were in their first year of teaching in 2000-2002, mid cohort teachers from 2003-2005 and late cohort teachers from 2006-2008.

The results, supplemented by post-estimation tests of equivalence of coefficients, suggest several trends. First, NYCTF teachers became more likely to transfer after their first or second year over time, while TFA teachers became less likely to transfer after their first year. Second, CR teachers became less likely to exit after their first year, but NYCTF teachers became more likely to exit after their first year. Finally, TFA teachers became more likely to exit over time, particularly after their second year of teaching.

Table 4. Multinomial Logit Estimates of Transfer and Exit Decisions by Cohort and Pathway with School Fixed Effects (Odds Ratios)

	Transfer			Exit		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Early cohort*CR	0.473**	0.391**	0.555**	1.294**	0.486**	0.450**
Mid cohort*CR	0.745**	0.603**	0.616**	1.122+	0.527**	0.507**
Late cohort*CR	0.585**	0.465**	0.543**	1.029	0.455**	0.438**
Early cohort*NYCTF	0.633**	0.644**	0.881	0.554**	0.879	0.786
Mid cohort*NYCTF	0.882*	0.838*	1.038	0.978	0.979	1.126
Early cohort*TFA	0.504**	0.474*	0.744	0.583*	3.149**	1.803*
Mid cohort*TFA	0.471**	1.165	1.056	0.716*	5.023**	3.052**
Late cohort*TFA	0.323**	0.691+	0.751	0.894	6.280**	2.918**
N	59086	35886	23415	59576	41064	27876

To what extent does the leaving behavior of more or less effective teachers differ across pathways?

We are particularly interested in the differential career patterns of more and less effective teachers and how this differs across pathway. The current research literature and experts in the field have not settled on a single best method for creating teacher value-added measures. As such we plan to use multiple approaches and compare the robustness of our results across measures. In this analysis we employ a commonly used specification as described by equation (2).

$$A_{ijst} = \beta_0 + \beta_1 A_{ijs(t-1)} + X_{it}\beta_2 + C_{ijst}\beta_3 + S_{st}\beta_4 + T_{jst}\beta_5 + \tau_j + \varepsilon_{ijst} \qquad (2)$$

Like the value-added specification described above, we model a student's achievement as a function of prior achievement, individual student attributes, the characteristics of the students in that classroom, observed attributes of the school (S), teacher experience (T), and a teacher fixed effect, τ_j. The teacher fixed effect, captures our best estimate of a teacher's effectiveness, holding constant the other variables in the model. This specification has the virtue of allowing us to compare teacher effectiveness across schools and thus explore the comparative effectiveness of teacher retention by pathway across teachers in different school environments. The drawback is that there may be unobserved attributes of schools or students which influence retention decisions and which are correlated with teacher pathways, and thus may bias our results. We will explore this in detail for our final report.

Since value-added measures are only available for certain grades and subjects, for these analyses we limit our focus to ELA and math teachers in grades 4-8. Also, due to current data availability, our analyses using ELA value-added only include teachers whose first year of teaching was between 2001-2002 and 2007-2008, a population of 6,406 teachers. Our analyses based on math value-added cover first year teachers between 2000-2001 and 2007-2008, a population of 7,418 teachers. Finally, for these analyses we are only able to examine teachers' decisions after their first and second years of teaching due to small samples in the third year. .

Table 5 presents the mean value-added of teachers as a function of their retention decisions. The measures are standardized with mean 0 and standard deviation 1, so a value above zero is above average while a value below zero is below average. Notably, regardless of the year or subject, the mean value-added for teachers who transferred or exited was lower than that for teachers who remained in the same school.

Table 5. Mean Value-added by Retention Status and Years of Experience

	After year 1			After year 2
	N	mean	N	mean
ELA				
Same school	5302	0.03	3691	0.08
Transferred	599	-0.17	334	-0.17
Exit	505	-0.15	623	-0.03
Math				
Same school	6094	0.05	4410	0.07
Transferred	663	-0.24	385	-0.17
Exit	661	-0.24	672	0.02

Tables 6 and 7 present multinomial logit analyses for ELA and math respectively, with controls for teachers' pathways, value-added, and the interaction between pathway and value-added. Tables 6a and 7a are based on models that control for a continuous measure of value-added; Tables 6b and 76b contain the results of models that control for quartiles of value-added. In all models, the main effect of pathways is very consistent with the results from Table 3, despite employing a small subset of Table 3 observations and the inclusion of other controls.

There is little strong evidence of differences in retention behavior based on the pathway and value-added of the teacher. As indicated in Tables 6a, on average all teachers with higher ELA value-added are less likely to transfer following their first year (0.821) and although the point estimates suggest a reduced likelihood of transferring after year 2 and of exiting following years 1 and 2, these results are not statistically significant. None of the results for NYCTF or TFA teachers are significant, but they begin to paint an interesting picture. Higher ELA value-added NYCTF teachers appear somewhat more likely to transfer but less likely to exit than those with lower value-added.

The results based on quartiles tell a similar story (quartile 1 is the lowest, 4 the highest). Higher ELA value-added traditional prep teachers are less likely to transfer (not significant) and less likely to exit after year 1 (significant). However, although not statistically significant, higher ELA value-added NYCTF teachers appear more likely to transfer and less likely to exit. In the end, we find some suggestive but very few reliable relationships for ELA value-added.

Table 6a. Determinants of Retention Status by Years of Experience, Continuous ELA VA

	Transfer		Exit	
	After year 1	After year 2	After year 1	After year 2
NYCTF	1.362*	1.734**	0.921	2.252**
TFA	0.918	2.640**	0.698	12.609**
ELA VA	0.821*	0.876	0.909	0.921
ELA VA*NYCTF	1.155	1.066	0.807	0.906
ELA VA*TFA	1.095	1.394	1.115	1.329
N	2977	1378	3011	2300

Table 6b. Determinants of Retention Status by Years of Experience, Quartiles of ELA VA

| | Transfer | | Exit | |
	After year 1	After year 2	After year 1	After year 2
NYCTF	1.232	1.499	1.068	2.910**
TFA	0.822	1.441	0.543	10.450**
ELA-q2	0.715	0.645	0.503**	1.060
ELA-q3	0.832	0.723	0.600*	0.860
ELA-q4	0.707	0.607	0.704	0.952
ELA-q2*NYCTF	1.114	1.311	0.762	0.784
ELA-q3*NYCTF	0.972	0.959	1.147	0.539
ELA-q4*NYCTF	1.470	1.669	0.747	0.868
ELA-q2*TFA	1.556	2.265	2.110	0.772
ELA-q3*TFA	0.911	3.515	1.431	1.789
ELA-q4*TFA	0.989	1.622	0.664	1.375
N	2977	1378	3011	2300

The results for math are clearer. As depicted in Table 7a, higher math value-added NYCTF teachers are less likely to exit following their first year than their lower value-added peers. Similar relationships hold for traditional preparation and TFA teachers. For instance, a high value-added NYCTF teacher (1 standard deviation above average) was 47 percent[4] less likely to exit after his/her first year than an average value-added NYCTF teacher. Compared to an average value-added traditional preparation teacher, a high value-added CR teacher was 21 percent less likely to exit after his/her first year. Higher value-added teachers are less likely to transfer following the first year across all pathways. It also appears that higher math value-added NYCTF teachers are more likely to transfer following year 2; this result is not statistically significant. The quartile analyses tell a similar story and indicate that the relationship between value-added and retention was more pronounced for NYCTF teachers although the TFA results were not significant.

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[4] 0.47=1-.787*.676

Table 7a. Determinants of Retention Status by Years of Experience, Continuous Math VA

	Transfer		Exit	
	After year 1	After year 2	After year 1	After year 2
NYCTF	1.311+	1.606**	0.596**	2.110**
TFA	0.818	1.623	0.457**	12.647**
math VA	0.803**	0.880	0.787**	0.905
math VA*NYCTF	0.912	1.114	0.676**	1.044
math VA*TFA	0.966	0.732	0.603+	1.044
N	3359	1826	3848	2871

Table 7b. Determinants of Retention Status by Years of Experience, Quartiles of Math VA

	Transfer		Exit	
	After year 1	After year 2	After year 1	After year 2
NYCTF	1.221	1.134	0.922	1.876*
TFA	0.519	2.226	0.632	9.457**
math-q2	0.768	0.699	0.887	0.575*
math-q3	0.719	0.648	0.640*	0.781
math-q4	0.514**	0.770	0.618*	0.582*
math-q2*NYCTF	1.415	1.557	0.771	1.365
math-q3*NYCTF	0.961	1.804	0.397*	0.826
math-q4*NYCTF	0.990	1.483	0.477+	1.414
math-q2*TFA	3.016+	0.495	1.096	1.630
math-q3*TFA	0.783	1.499	0.709	1.208
math-q4*TFA	2.205	0.437	0.376	1.590
N	3359	1826	3848	2871

NEXT STEPS

We have made progress exploring the long run effects of alternative certification in NYC. This analysis has addressed some questions but we have more yet to do. The following list identifies the ways we plan to extend the analysis between this report and our final report, a draft of which we plan to submit in late March 2011.

- We have the data in hand and are preparing them to extend each of the analyses presented in this report through the 2009-10 school year.

- We will employ the extended database to (re)estimate a fuller range of teacher fixed effect VA estimates to employ in the analysis exploring retention by teacher

effectiveness. In particular, we will explore models that include alternative ways for controlling for student and school influences. We will also estimate the standard errors of the teacher effects so that we employ Empirical Bayes shrinkage to correct for measurement error in these estimates.

- Because there may well be difference in the attributes of classrooms in schools, we plan to estimate retention models that control for classroom level student attributes. As we add data we plan to extend our retention analyses to include retention for up to 5 years.

- We will address the fourth question in our research proposal, *How have teachers from different pathways affected the overall functioning of NYC public schools?*

Appendix

Table A1. First-Year Teachers from Most Competitive Colleges

Year	College Recommended			NYCTF			TFA			All Other Paths		
	freq	% of most comp	% of CR	freq	% of most comp	% of NYCTF	freq	% of most comp	% of TFA	freq	% of most comp	% of Other
2000	267	28.0%	8.7%	4	0.4%	36.4%	67	7.0%	68.4%	614	64.5%	10.6%
2001	276	27.0%	9.7%	106	10.4%	28.9%	74	7.2%	63.8%	568	55.5%	10.8%
2002	249	22.8%	10.9%	235	21.5%	21.1%	23	2.1%	21.1%	585	53.6%	12.6%
2003	318	23.0%	11.1%	597	43.1%	33.0%	98	7.1%	56.0%	372	26.9%	14.0%
2004	347	20.3%	10.6%	967	56.5%	38.2%	199	11.6%	61.8%	197	11.5%	13.7%
2005	389	28.8%	11.9%	599	44.3%	30.5%	208	15.4%	65.8%	156	11.5%	13.5%
2006	405	34.8%	11.8%	575	49.4%	28.9%	79	6.8%	16.2%	104	8.9%	12.1%
2007	125	61.0%	3.5%	28	13.7%	1.5%	1	0.5%	0.2%	51	24.9%	9.3%
2008	87	58.8%	2.3%	23	15.5%	1.3%	0	0.0%	0.0%	38	25.7%	7.0%

Table A2. First-Year Teachers from Competitive Colleges

Year	College Recommended			NYCTF			TFA			All Other Paths		
	freq	% of comp	% of CR	freq	% of comp	% of NYCTF	freq	% of comp	% of TFA	freq	% of comp	% of Other
2000	540	35.7%	17.6%	2	0.1%	18.2%	14	0.9%	14.3%	956	63.2%	16.6%
2001	524	35.0%	18.3%	55	3.7%	15.0%	19	1.3%	16.4%	898	60.0%	17.1%
2002	393	28.6%	17.2%	167	12.2%	15.0%	5	0.4%	4.6%	808	58.8%	17.4%
2003	555	40.0%	19.5%	353	25.4%	19.5%	19	1.4%	10.9%	462	33.3%	17.3%
2004	564	42.0%	17.3%	464	34.6%	18.3%	52	3.9%	16.1%	262	19.5%	18.2%
2005	573	47.3%	17.5%	395	32.6%	20.1%	41	3.4%	13.0%	203	16.7%	17.5%
2006	563	54.7%	16.4%	313	30.4%	15.7%	21	2.0%	4.3%	132	12.8%	15.4%
2007	265	66.8%	7.5%	26	6.5%	1.4%	2	0.5%	0.4%	104	26.2%	18.9%
2008	182	60.5%	4.8%	14	4.7%	0.8%	1	0.3%	0.2%	104	34.6%	19.1%

Table A3. First-Year Teachers from Less Competitive Colleges

Year	College Recommended			NYCTF			TFA			All Other Paths		
	freq	% of less comp	% of CR	freq	% of less comp	% of NYCTF	freq	% of less comp	% of TFA	freq	% of less comp	% of Other
2000	1296	36.8%	42.3%	2	0.1%	18.2%	5	0.1%	5.1%	2222	63.0%	38.5%
2001	1185	36.5%	41.4%	80	2.5%	21.8%	10	0.3%	8.6%	1968	60.7%	37.4%
2002	949	32.2%	41.5%	330	11.2%	29.7%	21	0.7%	19.3%	1643	55.8%	35.3%
2003	1165	47.5%	40.8%	355	14.5%	19.6%	10	0.4%	5.7%	921	37.6%	34.6%
2004	1311	56.5%	40.2%	556	24.0%	22.0%	22	0.9%	6.8%	431	18.6%	29.9%
2005	1189	59.7%	36.4%	454	22.8%	23.1%	18	0.9%	5.7%	329	16.5%	28.4%
2006	1123	64.5%	32.7%	340	19.5%	17.1%	7	0.4%	1.4%	271	15.6%	31.6%
2007	611	76.1%	17.2%	41	5.1%	2.1%	0	0.0%	0.0%	151	18.8%	27.4%
2008	439	71.5%	11.7%	31	5.0%	1.8%	4	0.7%	0.8%	140	22.8%	25.7%

Table A4. First-Year Teachers from Not Competitive Colleges

Year	College Recommended			NYCTF			TFA			All Other Paths		
	freq	% of not comp	% of CR	freq	% of not comp	% of NYCTF	freq	% of not comp	% of TFA	freq	% of not comp	% of Other
2000	708	32.6%	23.1%	3	0.1%	27.3%	3	0.1%	3.1%	1460	67.2%	25.3%
2001	660	32.7%	23.1%	44	2.2%	12.0%	4	0.2%	3.4%	1310	64.9%	24.9%
2002	471	29.9%	20.6%	127	8.1%	11.4%	0	0.0%	0.0%	979	62.1%	21.0%
2003	575	43.7%	20.2%	170	12.9%	9.4%	4	0.3%	2.3%	567	43.1%	21.3%
2004	629	54.4%	19.3%	233	20.1%	9.2%	11	1.0%	3.4%	284	24.5%	19.7%
2005	537	52.7%	16.4%	205	20.1%	10.4%	12	1.2%	3.8%	265	26.0%	22.9%
2006	482	58.2%	14.0%	178	21.5%	8.9%	4	0.5%	0.8%	164	19.8%	19.1%
2007	282	69.1%	7.9%	13	3.2%	0.7%	0	0.0%	0.0%	113	27.7%	20.5%
2008	232	70.1%	6.2%	10	3.0%	0.6%	0	0.0%	0.0%	89	26.9%	16.3%

Table A5. First-Year Teachers for whom College is Missing

Year	College Recommended			NYCTF			TFA			All Other Paths		
	freq	% of missing	% of CR	freq	% of missing	% of NYCTF	freq	% of missing	% of TFA	freq	% of missing	% of Other
2000	255	32.4%	8.3%	0	0.0%	0.0%	9	1.1%	9.2%	524	66.5%	9.1%
2001	214	26.0%	7.5%	82	10.0%	22.3%	9	1.1%	7.8%	519	63.0%	9.9%
2002	222	18.9%	9.7%	253	21.6%	22.8%	60	5.1%	55.0%	637	54.4%	13.7%
2003	240	25.0%	8.4%	334	34.8%	18.5%	44	4.6%	25.1%	341	35.6%	12.8%
2004	408	39.8%	12.5%	311	30.3%	12.3%	38	3.7%	11.8%	268	26.1%	18.6%
2005	581	51.2%	17.8%	310	27.3%	15.8%	37	3.3%	11.7%	206	18.2%	17.8%
2006	864	43.0%	25.1%	583	29.0%	29.3%	377	18.7%	77.3%	187	9.3%	21.8%
2007	2273	48.3%	63.9%	1805	38.4%	94.4%	495	10.5%	99.4%	132	2.8%	24.0%
2008	2825	54.8%	75.0%	1679	32.6%	95.6%	479	9.3%	99.0%	174	3.4%	31.9%

Table A6. Average Test Score of First-Year Teachers

Year	Test	College Recommended	NYCTF	TFA	All Other Paths*
2000	SAT Verbal	482	n/a	608	470
	SAT Math	470	n/a	572	459
	LAST	250	n/a	276	233
2001	SAT Verbal	490	574	594	475
	SAT Math	477	546	586	464
	LAST	247	268	273	232
2002	SAT Verbal	484	535	629	484
	SAT Math	475	506	615	476
	LAST	244	255	271	235
2003	SAT Verbal	492	562	608	494
	SAT Math	480	534	609	493
	LAST	245	262	271	239
2004	SAT Verbal	496	565	650	500
	SAT Math	491	547	622	494
	LAST	245	267	276	246
2005	SAT Verbal	499	552	625	502
	SAT Math	493	541	640	501
	LAST	247	271	279	245
2006	SAT Verbal	497	574	660	499
	SAT Math	494	558	638	495
	LAST	250	275	282	248
2007	SAT Verbal	496	557	644	487
	SAT Math	495	546	630	484
	LAST	252	271	280	247
2008	SAT Verbal	493	557	637	494
	SAT Math	493	547	652	485
	LAST	252	273	282	248

Table A7. Childhood-Certified First-Year Teachers

Year	College Recommended			NYCTF			TFA			All Other Paths*		
	freq	% of child cert	% of CR	freq	% of child cert	% of NYCTF	freq	% of child cert	% of TFA	freq	% of child cert	% of Other
2000	2035	76.9%	66.4%	0	0.0%	0.0%	28	1.1%	28.6%	585	22.1%	6.5%
2001	1857	68.1%	65.0%	271	9.9%	73.8%	17	0.6%	14.7%	582	21.3%	6.8%
2002	1397	52.9%	61.2%	768	29.1%	69.1%	61	2.3%	56.0%	417	15.8%	5.1%
2003	1706	48.2%	59.8%	1063	30.0%	58.8%	102	2.9%	58.3%	667	18.9%	8.9%
2004	1913	51.1%	58.7%	867	23.1%	34.3%	175	4.7%	54.3%	792	21.1%	10.5%
2005	1782	58.5%	54.5%	455	14.9%	23.2%	173	5.7%	54.7%	638	20.9%	9.5%
2006	1651	62.2%	48.0%	241	9.1%	12.1%	162	6.1%	33.2%	599	22.6%	8.8%
2007	1720	66.8%	48.4%	258	10.0%	13.5%	143	5.6%	28.7%	452	17.6%	6.9%
2008	1863	73.5%	49.5%	191	7.5%	10.9%	34	1.3%	7.0%	447	17.6%	6.8%

Table A8. Math-Certified First-Year Teachers

Year	College Recommended			NYCTF			TFA			All Other Paths*		
	freq	% of math cert	% of CR	freq	% of math cert	% of NYCTF	freq	% of math cert	% of TFA	freq	% of math cert	% of Other
2000	46	59.0%	1.5%	0	0.0%	0.0%	7	9.0%	7.1%	25	32.1%	0.3%
2001	33	42.3%	1.2%	12	15.4%	3.3%	9	11.5%	7.8%	24	30.8%	0.3%
2002	33	31.4%	1.4%	43	41.0%	3.9%	12	11.4%	11.0%	17	16.2%	0.2%
2003	68	20.3%	2.4%	186	55.5%	10.3%	19	5.7%	10.9%	62	18.5%	0.8%
2004	91	9.6%	2.8%	573	60.6%	22.6%	34	3.6%	10.6%	248	26.2%	3.3%
2005	88	11.3%	2.7%	467	60.1%	23.8%	35	4.5%	11.1%	187	24.1%	2.8%
2006	141	14.8%	4.1%	605	63.5%	30.4%	67	7.0%	13.7%	140	14.7%	2.1%
2007	180	24.2%	5.1%	403	54.2%	21.1%	71	9.6%	14.3%	89	12.0%	1.4%
2008	181	29.6%	4.8%	336	55.0%	19.1%	3	0.5%	0.6%	91	14.9%	1.4%

Table A9. Science-Certified First-Year Teachers

Year	College Recommended			NYCTF			TFA			All Other Paths*		
	freq	% of sci cert	% of CR	freq	% of sci cert	% of NYCTF	freq	% of sci cert	% of TFA	freq	% of sci cert	% of Other
2000	30	53.6%	1.0%	0	0.0%	0.0%	9	16.1%	9.2%	17	30.4%	0.2%
2001	47	51.1%	1.6%	14	15.2%	3.8%	7	7.6%	6.0%	24	26.1%	0.3%
2002	27	28.7%	1.2%	34	36.2%	3.1%	12	12.8%	11.0%	21	22.3%	0.3%
2003	55	25.9%	1.9%	76	35.8%	4.2%	21	9.9%	12.0%	60	28.3%	0.8%
2004	76	17.0%	2.3%	135	30.1%	5.3%	46	10.3%	14.3%	191	42.6%	2.5%
2005	74	18.5%	2.3%	130	32.5%	6.6%	46	11.5%	14.6%	150	37.5%	2.2%
2006	62	17.1%	1.8%	137	37.7%	6.9%	52	14.3%	10.7%	112	30.9%	1.7%
2007	91	20.1%	2.6%	213	47.0%	11.1%	64	14.1%	12.9%	85	18.8%	1.3%
2008	81	21.7%	2.2%	223	59.8%	12.7%	0	0.0%	0.0%	69	18.5%	1.1%

Table A10. ESL-Certified First-Year Teachers

Year	College Recommended			NYCTF			TFA			All Other Paths*		
	freq	% of ESL cert	% of CR	freq	% of ESL cert	% of NYCTF	freq	% of ESL cert	% of TFA	freq	% of ESL cert	% of Other
2000	53	67.9%	1.7%	0	0.0%	0.0%	0	0.0%	0.0%	25	32.1%	0.3%
2001	48	71.6%	1.7%	3	4.5%	81.7%	0	0.0%	0.0%	16	23.9%	0.2%
2002	37	35.2%	1.6%	52	49.5%	4.7%	0	0.0%	0.0%	16	15.2%	0.2%
2003	47	33.8%	1.6%	66	47.5%	3.6%	0	0.0%	0.0%	26	18.7%	0.3%
2004	65	30.2%	2.0%	66	30.7%	2.6%	1	0.5%	0.3%	83	38.6%	1.1%
2005	61	31.0%	1.9%	91	46.2%	4.6%	2	1.0%	0.6%	43	21.8%	0.6%
2006	73	22.5%	2.1%	162	50.0%	8.1%	38	11.7%	7.8%	51	15.7%	0.8%
2007	67	22.1%	1.9%	150	49.5%	7.8%	35	11.6%	7.0%	51	16.8%	0.8%
2008	80	30.4%	2.1%	137	52.1%	7.8%	2	0.8%	0.4%	44	16.7%	0.7%

Table A11. Special Ed-Certified First-Year Teachers

Year	College Recommended			NYCTF			TFA			All Other Paths*		
	freq	% of spec ed cert	% of CR	freq	% of spec ed cert	% of NYCTF	freq	% of spec ed cert	% of TFA	freq	% of spec ed cert	% of Other
2000	398	73.3%	13.0%	0	0.0%	0.0%	0	0.0%	0.0%	145	26.7%	1.6%
2001	364	70.7%	12.7%	9	1.7%	2.5%	1	0.2%	0.9%	141	27.4%	1.6%
2002	313	60.4%	13.7%	75	14.5%	6.7%	0	0.0%	0.0%	130	25.1%	1.6%
2003	401	48.9%	14.1%	184	22.4%	10.2%	2	0.2%	1.1%	233	28.4%	3.1%
2004	537	32.6%	16.5%	715	43.4%	28.2%	65	3.9%	20.2%	329	20.0%	4.4%
2005	393	29.7%	12.0%	685	51.8%	34.9%	29	2.2%	9.2%	216	16.3%	3.2%
2006	378	27.9%	11.0%	723	53.4%	36.3%	63	4.7%	12.9%	189	14.0%	2.8%
2007	465	32.7%	13.1%	725	51.1%	37.9%	78	5.5%	15.7%	152	10.7%	2.3%
2008	527	38.1%	14.0%	676	48.9%	38.5%	3	0.2%	0.6%	176	12.7%	2.7%

Table A12. Other-Certified First-Year Teachers

Year	College Recommended			NYCTF			TFA			All Other Paths*		
	freq	% of oth cert	% of CR	freq	% of oth cert	% of NYCTF	freq	% of oth cert	% of TFA	freq	% of oth cert	% of Other
2000	760	63.1%	24.8%	0	0.0%	0.0%	54	4.5%	55.1%	390	32.4%	4.4%
2001	726	57.9%	25.4%	70	5.6%	19.1%	83	6.6%	71.6%	375	29.9%	4.4%
2002	579	54.1%	25.4%	170	15.9%	15.3%	36	3.4%	33.0%	286	26.7%	3.5%
2003	829	48.1%	29.1%	345	20.0%	19.1%	55	3.2%	31.4%	496	28.8%	6.6%
2004	1000	40.2%	30.7%	472	19.0%	18.6%	130	5.2%	40.4%	886	35.6%	11.7%
2005	941	45.6%	28.8%	404	19.6%	20.6%	125	6.1%	39.6%	592	28.7%	8.8%
2006	1059	48.1%	30.8%	392	17.8%	19.7%	154	7.0%	31.6%	596	27.1%	8.8%
2007	1138	58.4%	32.0%	278	14.3%	14.5%	151	7.7%	30.3%	382	19.6%	5.9%
2008	1283	51.3%	34.1%	301	12.0%	17.1%	479	19.2%	99.0%	438	17.5%	6.7%

Table A13. Elementary School Teachers

	College Recommended			NYCTF			TFA			All Other Paths		
Year	freq	% of elem	% of CR	freq	% of elem	% of NYCTF	freq	% of elem	% of TFA	freq	% of elem	% of Other
2000	2,059	41.2%	67.2%	8	0.2%	72.7%	52	1.0%	53.1%	2,882	57.6%	49.9%
2001	1,889	41.1%	66.1%	253	5.5%	68.9%	67	1.5%	57.8%	2,388	51.9%	45.4%
2002	1,408	35.5%	61.6%	758	19.1%	68.2%	61	1.5%	56.0%	1,741	43.9%	37.4%
2003	1,627	46.8%	57.0%	992	28.6%	54.8%	95	2.7%	54.3%	760	21.9%	28.5%
2004	1,706	50.8%	52.3%	1,030	30.7%	40.7%	134	4.0%	41.6%	487	14.5%	33.8%
2005	1,849	60.3%	56.6%	628	20.5%	32.0%	156	5.1%	49.4%	433	14.1%	37.4%
2006	1,951	62.8%	56.8%	572	18.4%	28.8%	226	7.3%	46.3%	357	11.5%	41.6%
2007	2,036	64.8%	57.3%	633	20.1%	33.1%	197	6.3%	39.6%	276	8.8%	50.1%
2008	2,155	70.0%	57.2%	475	15.4%	27.0%	192	6.2%	39.7%	256	8.3%	47.0%

Table A14. Middle School Teachers

	College Recommended			NYCTF			TFA			All Other Paths		
Year	freq	% of middle	% of CR	freq	% of middle	% of NYCTF	freq	% of middle	% of TFA	freq	% of middle	% of Other
2000	498	24.8%	16.2%	3	0.1%	27.3%	42	2.1%	42.9%	1,469	73.0%	25.4%
2001	475	22.0%	16.6%	63	2.9%	17.2%	49	2.3%	42.2%	1,568	72.8%	29.8%
2002	415	19.3%	18.2%	202	9.4%	18.2%	48	2.2%	44.0%	1,480	69.0%	31.8%
2003	524	28.2%	18.4%	427	23.0%	23.6%	80	4.3%	45.7%	828	44.5%	31.1%
2004	696	37.2%	21.4%	663	35.4%	26.2%	174	9.3%	54.0%	338	18.1%	23.4%
2005	588	40.3%	18.0%	483	33.1%	24.6%	139	9.5%	44.0%	250	17.1%	21.6%
2006	594	41.4%	17.3%	494	34.4%	24.8%	191	13.3%	39.1%	157	10.9%	18.3%
2007	567	42.2%	15.9%	487	36.2%	25.5%	211	15.7%	42.4%	80	5.9%	14.5%
2008	546	43.4%	14.5%	447	35.5%	25.4%	165	13.1%	34.1%	101	8.0%	18.5%

Table A15. High School Teachers

	College Recommended			NYCTF			TFA			All Other Paths		
Year	freq	% of high	% of CR	freq	% of high	% of NYCTF	freq	% of high	% of TFA	freq	% of high	% of Other
2000	291	26.6%	9.5%	0	0.0%	0.0%	0	0.0%	0.0%	801	73.4%	13.9%
2001	305	27.5%	10.7%	32	2.9%	8.7%	0	0.0%	0.0%	774	69.7%	14.7%
2002	286	23.1%	12.5%	99	8.0%	8.9%	0	0.0%	0.0%	854	68.9%	18.4%
2003	445	31.9%	15.6%	211	15.1%	11.7%	0	0.0%	0.0%	740	53.0%	27.8%
2004	513	37.7%	15.7%	485	35.6%	19.2%	5	0.4%	1.6%	359	26.4%	24.9%
2005	448	37.6%	13.7%	477	40.0%	24.3%	6	0.5%	1.9%	262	22.0%	22.6%
2006	495	42.3%	14.4%	463	39.6%	23.3%	24	2.1%	4.9%	187	16.0%	21.8%
2007	491	46.9%	13.8%	437	41.7%	22.8%	29	2.8%	5.8%	91	8.7%	16.5%
2008	575	47.7%	15.3%	478	39.7%	27.2%	58	4.8%	12.0%	94	7.8%	17.2%

Table A16. Other School Teachers

Year	College Recommended			NYCTF			TFA			All Other Paths		
	freq	% of other	% of CR	freq	% of other	% of NYCTF	freq	% of other	% of TFA	freq	% of other	% of Other
2000	218	25.8%	7.1%	0	0.0%	0.0%	4	0.5%	4.1%	624	73.8%	10.8%
2001	190	25.6%	6.6%	19	2.6%	5.2%	0	0.0%	0.0%	533	71.8%	10.1%
2002	175	21.7%	7.7%	53	6.6%	4.8%	0	0.0%	0.0%	577	71.7%	12.4%
2003	257	33.3%	9.0%	179	23.2%	9.9%	0	0.0%	0.0%	335	43.5%	12.6%
2004	344	35.7%	10.6%	353	36.6%	13.9%	9	0.9%	2.8%	258	26.8%	17.9%
2005	384	38.9%	11.7%	375	38.0%	19.1%	15	1.5%	4.7%	214	21.7%	18.5%
2006	397	37.4%	11.6%	460	43.4%	23.1%	47	4.4%	9.6%	157	14.8%	18.3%
2007	462	47.0%	13.0%	356	36.2%	18.6%	61	6.2%	12.2%	104	10.6%	18.9%
2008	489	48.5%	13.0%	357	35.4%	20.3%	69	6.8%	14.3%	94	9.3%	17.2%

Table A 17: Mean Attributes of Students of First Year Teachers by Pathway, 2000-2008

	% Black or Hispanic Students				% Free or Reduced Price Lunch Students			
	CR	NYCTF	TFA	Other Path	CR	NYCTF	TFA	Other Path
2000	74.7%	94.1%	98.4%	86.8%	85.7%	97.5%	98.9%	92.4%
2001	71.8%	97.3%	97.8%	82.7%	84.8%	97.8%	97.7%	89.9%
2002	70.1%	94.2%	98.0%	79.1%	83.6%	96.0%	98.3%	88.3%
2003	69.8%	92.6%	97.7%	77.4%	85.3%	95.6%	97.1%	89.0%
2004	69.5%	88.3%	95.6%	71.9%	86.3%	94.4%	96.8%	87.9%
2005	69.9%	85.1%	96.0%	73.2%	85.8%	93.3%	95.6%	87.9%
2006	73.0%	85.9%	96.1%	77.0%	85.5%	91.7%	95.8%	85.5%
2007	73.2%	86.8%	95.7%	76.2%	86.3%	92.0%	94.8%	88.4%
2008	70.8%	85.6%	95.4%	73.0%	83.3%	89.3%	93.7%	85.4%

	Mean Suspensions per 100 Students				Mean Student Absences			
	CR	NYCTF	TFA	Other Path	CR	NYCTF	TFA	Other Path
2000	4.2	5.5	5.8	5.5	12.6	15.1	14.9	14.4
2001	4.6	6.4	6.4	6.3	12.8	17.1	16.1	14.4
2002	2.0	1.8	2.8	2.4	12.1	14.8	15.6	13.7
2003	2.0	2.2	2.7	2.9	12.1	14.8	14.9	13.7
2004	2.3	2.4	2.0	2.7	12.1	14.6	15.4	12.9
2005	2.8	4.3	3.5	4.0	12.2	14.4	15.7	12.9
2006	4.3	6.7	6.2	5.3	12.9	15.1	17.8	13.6
2007	11.6	17.8	16.8	12.6	12.4	14.7	15.6	12.9
2008	8.6	14.8	13.8	9.8	11.4	13.6	14.7	11.8

	Average Prior Normalized Math score					Average Prior Normalized ELA score			
	CR	NYCTF	TFA	Other Path		CR	NYCTF	TFA	Other Path
2000	-0.04	-0.40	-0.37	-0.22		-0.04	-0.36	-0.38	-0.22
2001	0.01	-0.48	-0.42	-0.14		0.00	-0.43	-0.43	-0.15
2002	0.05	-0.34	-0.41	-0.09		0.03	-0.33	-0.46	-0.11
2003	0.01	-0.30	-0.44	-0.10		0.01	-0.33	-0.43	-0.09
2004	0.03	-0.23	-0.36	-0.03		0.03	-0.25	-0.39	-0.03
2005	0.02	-0.21	-0.35	-0.03		0.02	-0.23	-0.36	-0.04
2006	0.00	-0.19	-0.38	-0.05		-0.01	-0.19	-0.34	-0.05
2007	-0.02	-0.22	-0.34	-0.08		-0.01	-0.21	-0.31	-0.09
2008	0.00	-0.25	-0.38	-0.07		0.00	-0.21	-0.40	-0.06

Table A18: The Average Value-Added Effects of Pathways by Experience and School Level, Math and ELA

The effects estimated in specifications 1 – 3 capture both the differential returns to experience by pathway and also differences in attrition. In an effort to separate these two effects, these basic specifications are estimated again conditional on teachers staying 3 or 5 years.

Math:

	Full Sample:			Conditional on Exp. >3:			Conditional on Exp. >5:		
	Pooled	Elem.	Middle	Pooled	Elem.	Middle	Pooled	Elem.	Middle
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
exp = 2	0.0482***	0.0654***	0.0432***	0.0476***	0.0629***	0.0425***	0.0378***	0.0644***	0.0244**
exp = 3	0.0791***	0.0906***	0.0782***	0.0742***	0.0871***	0.0719***	0.0508***	0.0570***	0.0551***
exp = 4	0.0918***	0.1100***	0.0837***				0.0670***	0.1040***	0.0479***
exp = 5	0.0925***	0.1260***	0.0747***				0.0679***	0.1060***	0.0480**
exp = 4 plus				0.0896***	0.1190***	0.0749***			
exp = 6 plus	0.1020***	0.1370***	0.0769***				0.0802***	0.119***	0.0513*
pathway: TransB	-0.0418*	-0.0412	-0.0395*	-0.0103	0.0087	-0.0097	-0.0533*	0.158***	-0.0807***
pathway: IE	0.0003	0.0204	-0.0098	-0.0035	0.0182	-0.0143	-0.0180	-0.0017	-0.0226
pathway: CR	0.0049	0.0151	0.0121	0.0035	0.0156	0.0110	-0.0143	-0.0001	-0.0088
pathway: TFA	0.0285**	0.0057	0.0532***	0.0483***	0.0270	0.0703***	-0.0620**	-0.0942*	-0.0417*
pathway: unknown	-0.0177*	0.0001	-0.0241*	-0.0079	0.0115	-0.0179	-0.0259*	-0.0152	-0.0317
pathway: temp license	-0.0083	-0.0040	-0.0092	-0.0066	0.0018	-0.0095	-0.0242**	-0.0150	-0.0282**
exp 2 * CR	0.0123	-0.0007	0.0095	0.0101	-0.0019	0.0081	0.0149	-0.0080	0.0213
exp 3 * CR	-0.0074	-0.0099	-0.0159	-0.0067	-0.0105	-0.0159	0.0144	0.0133	0.0079
exp 4 * CR	-0.0097	-0.0168	-0.0131				0.0086	-0.0189	0.0164
exp 5 * CR	-0.0049	-0.0288	0.0033				0.0148	-0.0144	0.0261
exp 4 plus * CR	-0.0230	-0.0404*	-0.0194	-0.0132	-0.0267*	-0.0179	-0.0071	-0.0291	0.0011
exp 6 plus * CR	0.0158	0.0129	0.0057	-0.0144	-0.0104	-0.0261	0.0519	0.0913	0.0236
exp 2 * TFA	0.0095	0.0510	-0.0251	-0.0101	0.0259	-0.0406	0.0447	0.1250*	-0.0116
exp 3 * TFA	0.0126	0.0707*	-0.0529				0.0808**	0.1460**	-0.0037
exp 4 * TFA	-0.0159	-0.0674	0.0855				0.0700	0.0384	0.1530**
exp 5 * TFA								0.0957	
exp 4 plus * TFA				-0.0311	-0.0078	-0.0659*			
exp 6 plus * TFA	-0.0351	-0.0027	-0.0981**						-0.0021

30

Preliminary Analysis, Do Not Cite or Quote

12/6/2010

ELA:

	Full Sample:			Conditional on Exp. >3:			Conditional on Exp. >5:		
	Pooled	Elem.	Middle	Pooled	Elem.	Middle	Pooled	Elem.	Middle
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
exp = 2	0.0378***	0.0329***	0.0397***	0.0386***	0.0397***	0.0381***	0.0502***	0.0456***	0.0520***
exp = 3	0.0686***	0.0553***	0.0752***	0.0685***	0.0587***	0.0739***	0.0698***	0.0502***	0.0877***
exp = 4	0.0640***	0.0581***	0.0690***				0.0753***	0.0611***	0.0898***
exp = 5	0.0537***	0.0772***	0.0381**				0.0566***	0.0773***	0.0486***
exp = 4 plus				0.0599***	0.0742***	0.0527***			
exp = 6 plus	0.0634***	0.0868***	0.0382*	0.0576*	0.0782	0.0583*	0.0654***	0.0882***	0.0427*
pathway: TransB	0.0588	0.0840	0.0543				0.1070***	0.1680	0.0959*
pathway: IE	0.0215**	0.0167	0.0340***	0.0250**	0.0276*	0.0354**	0.0321**	0.0255	0.0505***
pathway: CR	0.0195***	0.0160*	0.0309***	0.0214***	0.0239**	0.0309***	0.0265***	0.0206	0.0452***
pathway: TFA	0.0113	-0.0007	0.0172	0.0182	0.0155	0.0188	-0.0048	-0.0300	0.0126
pathway: unknown	0.0075	0.0018	0.0120	0.0154	0.0161	0.0157	0.0182	0.0152	0.0218
pathway: temp license	0.0066	-0.0130	0.0232**	0.0114	-0.0032	0.0255**	0.0183*	-0.0025	0.0373***
exp 2 * CR	-0.0064	0.0059	-0.0189*	-0.0093	-0.0040	-0.0197	-0.0213*	-0.0103	-0.0351**
exp 3 * CR	-0.0269***	-0.0024	-0.0455***	-0.0295***	-0.0101	-0.0465***	-0.0330***	-0.0019	-0.0672***
exp 4 * CR	-0.0141	0.0096	-0.0396***				-0.0305**	-0.0002	-0.0663***
exp 5 * CR	0.0017	0.0009	-0.0104				-0.0061	-0.0047	-0.0284
exp 4 plus * CR									
exp 6 plus * CR	-0.0037	0.0019	-0.0123	-0.0054	0.0043	-0.0279**	-0.0105	-0.0046	-0.0241
exp 2 * TFA	-0.0066	-0.0023	-0.0111	-0.0182	-0.0232	-0.0164	0.0113	0.0238	-0.0009
exp 3 * TFA	-0.0239	-0.0126	-0.0325	-0.0350*	-0.0299	-0.0402*	0.0055	0.0270	-0.0114
exp 4 * TFA	-0.0135	0.0791**	-0.0626**				-0.0023	0.1060*	-0.0691*
exp 5 * TFA	-0.0143	-0.0457	0.0173				0.0052	-0.0032	0.0132
exp 4 plus * TFA									
exp 6 plus * TFA	0.0153	0.0313	0.0062	-0.0093	0.0218	-0.0326	0.0364	0.0648	0.0158

Table A19: The Average Value-Added Effects of Pathways by School Level, Math and ELA

| | Math | | | | ELA | | | |
	Elem.	Middle	Elem.	Middle	Elem.	Middle	Elem.	Middle
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
pathway: TransB	0.0429	0.0364	-0.1810	-0.0782	0.233**	-0.0687	0.311*	0.0000
pathway: IE	-0.0237	-0.0446***	-0.0026	-0.0669***	0.0339***	0.0056	0.0801***	0.0305*
pathway: CR	-0.0115	-0.0267*	0.0041	-0.0631***	0.0369***	0.0029	0.0809***	0.0422***
pathway: TFA	0.0133	-0.0102	0.0260	-0.0548*	0.0278	-0.0066	0.0739***	0.0047
pathway: unknown	-0.0074	-0.0343**	0.0123	-0.0735***	0.0405***	0.0038	0.0796***	0.0321*
pathway: temp license	-0.0208	-0.0414***	-0.0165	-0.0885***	0.0398***	-0.0201	0.0619***	0.0104
continuous cohort	-0.0055	-0.0070**			0.0051	-0.0025		
cont. cohort * TransB	-0.0002	-0.0099			-0.0523**	0.0143		
cont. cohort * CR	0.0069*	0.0111***			-0.0081**	0.0019		
cont. cohort * IE	0.0065	0.0052			-0.0098**	-0.0025		
cont. cohort * TFA	0.0020	0.0150**			-0.0087*	0.0028		
cont. cohort * unknown	0.0023	0.0007			-0.0118***	0.0022		
cont. cohort * temp. license	0.0008	0.0079			-0.0241**	0.0158*		
continuous year			-0.0009	-0.0110***			0.0123***	0.0073***
year * TransB			0.0324	0.0090			-0.0374	-0.0013
year * IE			-0.0012	0.0057*			-0.0105***	-0.0038
year * CR			0.0002	0.0104***			-0.0095***	-0.0051**
year * TFA			-0.0017	0.0148***			-0.0099**	-0.0001
year * unknown			-0.0024	0.0070**			-0.0098***	-0.0031