PRELIMINARY DRAFT
COMMENTS WELCOME

Do more effective teachers earn more outside of the classroom?

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Abstract: We examine earnings records for more than 90,000 classroom teachers employed by Florida public schools between the 2001-02 and 2006-07 school years, roughly 20,000 of whom left the classroom during that time. A majority of those leaving the classroom remained employed by public school districts. The earnings distribution of former teachers is wider than their earnings while teaching, even when excluding likely part-time workers. Among teachers in grades 4-8 leaving for other industries, a 1 standard deviation increase in estimated value-added is associated with 3-5 percent higher earnings outside of teaching. High school math, science, and social studies teachers also earn 11-14 percent more after leaving for other industries than do former English teachers. The relationship between both effectiveness and subject-area expertise and earnings appears to be stronger in other industries than for the same groups of teachers while in the classroom, suggesting that current compensation systems do not fully account for the higher opportunity wages of effective teachers and teachers in high-demand subjects.

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1. Introduction

Every debate about teacher compensation policy—be it overall salary levels, merit pay, or subject-specific pay—draws heavily on arguments about what current teachers could be making in other sectors of the economy (their opportunity wages).[1] Discussions about how to recruit and retain the best teachers similarly emphasize the need to ensure that teaching positions are attractive to the most effective current and potential members of the profession. But very little evidence is available regarding the non-teaching job opportunities available to teachers in general, and to specific groups of teachers defined in terms of their effectiveness in promoting student achievement or subject-area expertise. This paper seeks to fill that gap using a unique administrative dataset that links the experiences of current and former teachers, including the academic performance of their students and the subject in which they teach, to the earnings records of those same teachers.

Existing research supports the notion that alternative labor market opportunities affect the decisions of teachers to enter and remain in the classroom. Dolton and van der Klaauw (1995, 1999) show that teaching salaries and opportunity wages strongly influence the decisions of a national sample of early-career teachers in the United Kingdom to remain in the profession. Earlier research by Murnane and Olsen (1989, 1990) also found that opportunity wages affected teachers' career lengths in Michigan and North Carolina. More recently, Hoxby and Leigh (2004) provide evidence that the post-1960 decline in the measured aptitude of female teachers in the United States reflected union-induced compression of wages with respect to aptitude within teaching. However, each of these papers derives estimates of opportunity wages for individual teachers or groups of teachers based on their observed characteristics and geographic

[1] See, for example, Ballou and Podgursky (1997), Boardman et al (1982), Murnane et al (1991), and Podgursky and Tongrut (2006).

location. None of them has direct information on the earnings of leaving teachers or on those teachers' classroom effectiveness.

Two recent papers use state administrative datasets to examine the earnings of teachers leaving the classroom for other occupations. Podgursky et al (2004) merge employment data on Missouri teachers with earnings information from the state's unemployment insurance system, while Scafidi et al (2006) do the same for Georgia. Both sets of authors conclude that, contrary to common perceptions, very few exiting teachers take jobs that pay more than their prior salaries as teachers.[2]

We contribute to this literature by providing what is, to our knowledge, the first evidence on the relationship between the earnings of a large sample of exiting teachers and their estimated effectiveness and subject area while teaching. More specifically, we follow the careers of more than 90,000 classroom teachers employed by Florida public schools between the 2001-02 and 2006-07 school years, roughly 20,000 of whom left the classroom during that time. Uniform quarterly earnings data are available from the state's unemployment insurance system for all current teachers and for those former teachers who worked elsewhere in the state. We are therefore able to observe the industries in which departing teachers worked and their average annual earnings in their new careers.

For math and reading teachers in grades 4-8, we use information on their students' performance on state tests to estimate value-added measures of classroom effectiveness. For teachers in grades 9-12, we observe the specific courses they teach. This information makes it possible to compare the relationships between both classroom effectiveness and subject-area

[2] Stinebrickner (2002) performs a similar exercise for an over-sample of teachers included in the National Longitudinal Study of the High School Class of 1972, but his ability to draw inferences about the current labor market for teachers is limited by the relatively small numbers of teachers in the dataset and by the fact that most of the teachers in his data graduated from college in 1976.

expertise and earnings inside and outside of teaching for the common samples of teachers who left the classroom for other positions in public school districts or for another industry altogether.

Our analysis yields several noteworthy results. First, a majority of those leaving the classroom remained employed by public school districts, suggesting that a substantial amount of attrition from classroom teaching reflects movement into administrative or other non-teaching positions within the public school system. The growth in the number of administrative and support positions in American school systems in recent decades is well documented in national data. For example, the U.S Department of Education (2008, table 80) reports that the ratio of students to total full-time equivalent staff employed by public school systems fell by more than 41 percent (from 13.6 to 8.0) between 1970 and 2006, including a 13 percent reduction after 1990.[3] Our evidence indicates that this pattern may well have led to higher rates of attrition from classroom teaching.

The median annual earnings of teachers moving into other sectors of the Florida economy fell by more than 20 percent upon leaving teaching, with the largest drops observed for females and teachers in grades K-8. These large overall declines, however, include a substantial share of former teachers who appear to have moved into part-time work. Among former teachers earning more than a full-time minimum-wage worker in the state, male teachers saw a slight increase in median earnings upon leaving for another industry while female teachers experienced only a modest decline. However, the earnings distribution for former teachers is more dispersed than their earnings while teaching, suggesting substantial wage compression within the teaching profession.

[3] The number of teachers hired for each student also fell during this period, but at a slower rate than the number of total staff: The number of students per full-time equivalent teacher decreased by 23 percent between 1970 and 2006 and by 10 percent after 1990.

Most important, we show that teachers who were more effective in the classroom (as measured by their students' test score gains) earn more in other industries than other teachers who left the profession. Among full-time workers, a one standard deviation increase in estimated value added is associated with 3-5 percent greater earnings outside of teaching. Math, science, and social studies teachers also earn substantially more after leaving teaching than do former teachers of other subjects. The relationships between both classroom effectiveness and subject-area expertise and earnings are consistently stronger outside of teaching than for the same groups of teachers while in the classroom. The patterns strongly suggest that existing teacher compensation systems do not fully account for differences in opportunity wages among current teachers.[4]

The remainder of the paper is organized as follows. The next two sections introduce our data and methods. Section 4 compares the earnings distribution of teachers who left the classroom for other jobs in public school districts and for jobs outside of the public education system to their earnings while teaching. Section 5 compares the relationship between teacher value-added and earnings inside and outside of teaching for 4th- through 8th-grade teachers, while section 6 performs the same analysis for the subject area taught by 9th- through 12th-grade teachers. Section 7 concludes by discussing the implications of our results for teacher compensation policy.

[4] Although these comparisons are based on leavers, this is a relevant population for policymaking and we see little reason not to expect that the same patterns would hold for teachers who remained in the profession throughout the period of our analysis.

2. Data

The central innovation in our study is the linking of information from the Florida Department of Education's K–20 Education Data Warehouse (EDW) with earnings records from the Florida Education and Training Placement Information Program (FETPIP). Our EDW data extract contains observations of every student in Florida who took the state assessment tests from 1998–99 to 2006–07, with each student linked to his or her courses (and corresponding teachers) for 2001–02 through 2006–07. The FETPIP data consist of state Unemployment Compensation records that include the earnings of current public school teachers and former teachers working in Florida from the first quarter of 2001 through the third quarter of 2008.

The EDW data include test score results from the Florida Comprehensive Assessment Test (FCAT), the state accountability system's "high-stakes" test, and the Stanford Achievement Test, a nationally norm-referenced test that is administered to students alongside the FCAT but is not used for accountability purposes. Beginning in 2000–01, students in grades 3 through 10 took both tests each year in math and reading. Thus annual gain scores can be calculated for virtually all students in grades 4 through 10 beginning in 2001–02. The data also contain information on the demographic and educational characteristics of each student, including gender, race, free or reduced-price lunch eligibility, limited English proficiency status, special education status, days in attendance, and age.

The EDW data also contain detailed information on individual teachers, including their demographic characteristics and experience. We construct an employment file based on course enrollment data (that matches students and teachers) in order to track whether and where teachers were employed in classroom teaching positions in a given year. A separate file from the EDW enables us to identify the specific jobs of former classroom teachers that remained employed in

the public schools. We also use the course enrollment files to identify the subject(s) taught by each teacher. The teacher experience variable we construct reflects all years the teacher has spent in the profession, including both public and private schools in both Florida and other states. Given our interest in the subsequent earnings of exiting teachers, we restrict our analysis to observations of teachers that were 54 years of age or younger in order to exclude likely retirees.[5]

The FETPIP data indicate, for each teacher, quarter, and employer, the amount earned, the randomly generated employer ID number, the number of workers at the firm, and the employer's North American Industry Classification System (NAICS) code. Only earnings received in Florida and reported to the state Unemployment Compensation system are included in these records.

We inflate all quarterly earnings to 2008 dollars using the average of the monthly Consumer Price Indexes (CPI) for each quarter. We then calculate each current and former teacher's earnings in each school year from 2001–02 through 2006–07 by combining the earnings from the last quarter of the calendar year in which the school year began with the earnings from the first three quarters of the calendar year in which the school year ended. For example, earnings for 2001–02 are calculated as earnings from October 2001 through September 2002.[6] In order to exclude likely part-time teachers, we only include teachers that earned at least $20,000 from the public schools in every year that they were a classroom teacher.

We divide this sample of classroom teachers into three groups: those who remained as teachers during the period that we observe them, those who left teaching for other jobs within

[5] Most Florida teachers become eligible for retirement with full pension benefits at age 62 or after 30 years of service. Assuming an entry age of 25, the earliest possible retirement age with full benefits is therefore 55.

[6] The timing of the collection of the quarterly earnings data requires that we include September in the wrong school year, introducing a modest amount of measurement error.

Florida public school districts, and those who left teaching for non-teaching jobs in the state.[7] There are also a substantial number of teachers who left teaching but do not appear in the FETPIP wage data (because they withdrew from the labor force or left Florida); these teachers are included in the descriptive statistics presented in Appendix Tables 1 and 3 but are excluded from our main analyses. In order to allow for leaves of absence as well as transitions between teaching and non-teaching jobs (in both the public schools and elsewhere), we do not count as either in-teaching or non-teaching earnings experienced during an individual's first year outside of the classroom.[8] Teachers who are observed for only one year after leaving the classroom are therefore excluded from the analysis. We also exclude all teachers who first appear in the last two years of our data (2005–07 or 2006–07), as such teachers could never be observed beyond their first year of non-teaching earnings.

3. Analytic Strategy

Our primary aim is to examine how teachers' opportunity wages vary with their effectiveness and subject-area expertise. We first explain our approach to measuring effectiveness and subject area, and then describe the models used to relate these measures to current and subsequent earnings.

[7] We identify whether a teacher was employed as a teacher in a given year using the student course enrollment files. We then use the FETPIP employer codes to identify teachers that left teaching but remained employed by a public school district. A former teacher is defined as working in public schools in a given academic year if they received the majority of their earnings from a public school district. Teachers who, during their non-teaching years, earned the majority of their earnings in public schools in some years and elsewhere in others are included in both groups of leavers (with only the relevant years of earnings considered for each group).

[8] Among teachers that were in the classroom in 2001-02 but not in 2002-03, we find that 20 percent had returned to the classroom in 2003-04, suggesting that a sizable number of apparent "leavers" return after just one year of absence.

Measuring Teacher Effectiveness and Subject Area

To measure teacher effectiveness we use student test score data to construct value-added measures for teachers of math and reading courses in grades 4-8.[9] Value-added measures attempt to isolate the causal effect that teachers have on their students' test scores. Of course, teacher quality has other dimensions, most of which are difficult to measure and all of which are outside the scope of our analysis. The interpretation of our main findings hinges on the assumption that the test instruments used are, on average, a reasonable proxy for students' overall academic development. We focus our discussion on value-added measures that use FCAT math and reading test scores only. Because the FCAT is the test for which schools are held accountable, schools should have a particular interest in recruiting and retaining teachers who are effective in boosting performance on that test. However, all findings reported below concerning the relationship between the FCAT-based teacher effectiveness measure and earnings are qualitatively similar to those obtained using effectiveness measures based on the low-stakes Stanford Achievement Test.[10]

We use the course files to match 4th- and 5th-grade students (most of whom are enrolled in self-contained classrooms) to their primary teacher and 6th- through 8th- grade students to their math and reading/English Language Arts teachers.[11] We exclude from the estimation of teacher

[9] Although Florida also tests students annually in grades 9 and 10, the wide variety of math and reading course offerings in these grades makes it difficult to construct reliable measures of value-added.

[10] The correlation coefficient between effectiveness of teachers as measured by their students' FCAT performance and effectiveness as measured by the Stanford Achievement Test is 0.70 and 0.59 for 4th- and 5th-grade math and reading, respectively, and 0.62 and 0.51 for 6th- through 8th-grade reading and math. Estimates of the relationship between the SAT-based teacher effectiveness measure and earnings are available from the authors upon request.

[11] For 4th- and 5th-grade students, the course files do not always clearly identify the student's regular classroom teacher. In order to match the maximum number of students to their teachers, we examined students' general (e.g., self-contained classroom), math, and reading teachers and matched them to the one or two teachers with whom they spent at least 40 percent of their academic (general, math, and reading) time. We then dropped students who were matched to two teachers and students who were not matched to any teachers. A large and increasing number of 4th- and 5th-grade students in Florida appear to have more than one regular classroom teacher, perhaps reflecting an

value added students who repeated or skipped a grade, whose prior-year test scores may not be comparable to those of their classmates.[12] A very small number of 4th- and 5th-grade students who were in classrooms of fewer than ten or more than forty students are also dropped from the analysis.

To generate value-added estimates for each teacher, we regress students' math and reading test scores separately on their prior-year test scores (including squared and cubed terms); vectors of student, classroom, and school characteristics; dummy variables for teacher experience; and grade-by-year fixed effects.[13] Additional student-level control variables include the number of days absent the previous year and dummy variables for race, gender, limited English proficiency status, special education status, migrant status, whether the student was in a different school the previous year, and free or reduced-price lunch eligibility. Classroom- and school-level control variables include all of the student-level characteristics aggregated to the appropriate level. In addition, they include class size and the percentage of students in the classroom and school who were repeating a grade.

The model, then, is

$$A_{it} = \omega A_{i,t-1} + \beta X_{it} + \gamma C_{it} + \phi S_{it} + \delta W_{it} + \pi_{it} + \varepsilon_{it} \quad , \tag{1}$$

where A_{it} is the test score of student i in year t (standardized by grade and year to have a mean of zero and standard deviation of one); $A_{i,t-1}$ includes the student's prior-year test scores in both

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increase in team teaching. We match 6th- through 8th-grade students to their primary reading and math teachers in a similar fashion. For each subject, we linked each student to the teacher(s) with whom they spent at least 40 percent of their time in that subject and dropped students who were matched to two teachers in a given subject.

[12] The number of students who skipped a grade is trivial, while the number who repeated a grade is more substantial. The repeaters are included in the calculation of classroom- and school-level peer variables. We also calculate and include in all regressions variables indicating the percentage of students in each classroom and school who were repeating a grade.

[13] We control for teacher experience using a dummy variable for each of the first twenty years of experience, so the omitted category includes all teachers with more than twenty years of experience.

subjects (and their squared and cubed terms); X, C, and S are student-, classroom-, and school-level characteristics; W is a vector of teacher experience dummy variables; π is a vector of grade-by-year fixed effects, and ε is a standard zero-mean error term. We estimate this equation separately by subject (reading and math) and grade-level (4th and 5th and 6th through 8th), and average the residuals by teacher and year to construct a value-added measure for each teacher in each year.[14] Finally, we use the Bayesian (shrinkage) estimator described by Kane et al (2006) to isolate the persistent component of each teacher's value added.[15] This persistent component forms the effectiveness measure used throughout our analysis. Consistent with previous research, we find that teacher effectiveness varies more for math than for reading and for elementary than for middle school teachers.[16]

Although widely used by researchers, the reliability of this kind of value-added model of teacher effectiveness using non-experimental data continues to be debated (see, e.g. Rothstein, forthcoming, Kane and Staiger 2009). The key potential confounding factor is the nonrandom matching of students and teachers both across and within schools, which would bias estimated teacher effects if there are unobserved differences across students that are not accounted for by the variables described above.[17]

[14] This added estimation approach is similar to the one used in Kane et al (2006).

[15] One key difference is that for each year and teacher Kane et al. (2006) compute average residuals by class, whereas we compute average residuals by teacher (which is identical to class for 4th- and 5th-grade teachers because each teacher only has one class, but 6th- through 8th-grade teachers often teach multiple classes). We do this because the nature of the EDW course records make it difficult to definitively assign middle school students to a specific math classroom even though we can confidently match them to a specific math teacher.

[16] For all teachers for whom we are able to estimate effectiveness measures, the standard deviations of these measures are (in standard deviations of student test scores): 0.11 and 0.05 for 4th- and 5th-grade math and reading, respectively, and 0.07 and 0.03 for 6th- through 8th-grade math and reading, respectively.

[17] One strategy to reduce bias from nonrandom matching is to use school fixed effects to restrict the analysis to differences in teacher effectiveness within schools. Although we can compute value added estimates that control for school fixed effects in place of school characteristics, we would be forced to limit our analysis of the relationship between effectiveness and wages to comparisons of teachers that left the same school for non-teaching jobs.

It is unclear, however, whether or in what direction the nonrandom matching of students and teachers would bias our estimates of the relationship between effectiveness and earnings. Classical measurement error will of course attenuate that relationship—and should do so by similar amounts when comparing the wage structure inside and outside of teaching for a common sample of teachers. But it is not obvious a priori whether any additional error introduced by nonrandom matching would be systematically related to opportunity wages. In short, there is little reason to suspect that the lack of experimental estimates of teacher effectiveness is an important limitation in this context.

The assignment of high school teachers to subject areas is more straightforward. We first computed the percentage of each teacher's time spent on instruction in each subject in each year (as a percentage of their total time in academic courses that year) and averaged these percentages over all years.[18] Teachers spending at least 60 percent of their time in a given subject were assigned to that subject. Teachers who did not spend at least 60 percent of their time in any one subject were assigned to a "multiple subjects" category. Given the prevalence of out-of-field teaching in high school education (Ingersoll 1999), our practice-based assignment method likely introduces considerable error in the measurement of true qualifications that would bias results towards a finding of no differences in outside earnings across subject areas.

[18] More specifically, teachers' time is weighted by the number of students in each class they teach. For example, a class that meets 3 hours per week with 20 students would be counted twice as heavily as a class that meets 3 hours per week with 10 students.

Relating Effectiveness, Subject Area, and Earnings

We use data at the teacher*year level to estimate the relationship between classroom effectiveness and earnings both in and out of teaching. Our value-added measures of teacher effectiveness are standardized separately by grade level (grades 4-5 and grades 6-8) and subject area (math and reading) to have a mean of zero and a standard deviation of 1. Because most teachers in grades 4 and 5 teach both math and reading in self-contained classrooms, we average their value-added measure in both subjects.

Combining elementary and middle school teachers, we estimate the following equation:

$$\log(earn_{it}) = \alpha + \lambda * VA_i + \phi_i + \varepsilon_{it}, \quad (2)$$

where $\log(earn_{it})$ is the natural logarithm of annual earnings for teacher i in academic year t, α is a constant, VA is the teacher's standardized value-added measure (which does not vary over time because it is calculated using all available data), ϕ is set of dummy variables corresponding to the teacher's grade level and subject (middle school math or middle school English/reading, with elementary school teachers making up the omitted category), and ε is a zero-mean error term. Standard errors are adjusted for clustering at the teacher level to account for the fact that teachers appear multiple times in the dataset for two reasons: (1) most teachers are observed in more than one year and (2) some teachers are assigned to classrooms in more than one grade level and subject area.

We also estimate specifications of equation (2) that successively include district fixed effects and controls for teacher demographics. Because Florida's countywide school districts approximate local labor markets, district fixed effects should help eliminate any lingering bias in our measures of teacher effectiveness associated with geographic differences in job opportunities. The results of models including district fixed effects represent our preferred

estimates, as they should provide policymakers with the best information on how opportunity wages vary with teacher effectiveness. Results including teacher demographic characteristics, in contrast, allow us to see whether any observed relationships between effectiveness and earnings are in fact driven by differences in job opportunities associated with those characteristics.

Finally, we repeat this analysis for our sample of high school teachers by running the same set of regressions, but replacing the continuous value-added measure in equation (2) with a set of dummy variables corresponding to the subject area taught by each teacher. Results from models with district fixed effects represent our preferred estimates of the degree to which opportunity wages differ for teachers across subjects.

4. Industry choice and median earnings among leaving teachers

We begin by examining the overall rate of attrition among Florida classroom teachers, the new industries chosen by those leaving the classroom, and their median earnings. After the exclusion restrictions discussed in section 2, our analytic sample includes 90,000 teachers who taught core academic subjects (defined as general, math, and reading in grades K-5 and general, math, reading, social studies, science, and foreign language in grades 6-12) in grades K-12.

The overall attrition rate among Florida teachers in these subjects who are not yet at retirement age is relatively modest. Among teachers who were in the classroom in the 2001–02 school year, for example, 90 percent were teaching in 2003, 84 percent in 2004, 78 percent in 2005, 74 percent in 2006, and 72 percent in 2007 (hereafter we often refer to school years using the calendar year of the spring semester). The analogous numbers for those employed in 2002–03 are similar: 90 percent in 2004, 83 percent in 2005, 78 percent in 2006, and 76 percent in 2007. The share of teachers remaining in the classroom in a given year includes both individuals

who taught continuously and those returning from temporary leaves of absence. The steadily declining percentages for both cohorts therefore indicate that the number of leaving teachers each year exceeds the number returning from a leave.

Table 1a reports the destination industries of teachers leaving the classroom for more than one consecutive year between 2002 and 2007 using a set of categories based on the North American Industry Classification System (NAICS). Exiting teachers with multiple employers are assigned to the industry in which they received the majority of their earnings.[19] The analysis is necessarily limited to former teachers who had reported earnings in Florida and therefore excludes those withdrawing from the labor market and those moving to another state. The percentage of all exiting teachers for whom earnings data are available is 73-74 percent, as shown in the last column of Table 1a. It is higher for males than females at the elementary school level. Appendix Table 1, which compares the observed characteristics of exiting teacher who did not have reported earnings in Florida to those who did, indicates that these teachers are less likely to be male, black, or Hispanic and are modestly younger on average.

Perhaps surprisingly, a majority of leavers across all grade levels for whom earnings data are available continue to draw most of their earnings from public school districts. Appendix Table 2 shows that the modal such teacher moved to a position as a teacher or aide assigned to specific student populations (e.g. in special education or Title I). Substantial proportions also became principals (or assistant principals) or entered positions supporting classroom teachers (curriculum or instruction specialists and subject coaches). The share of former classroom teachers remaining employed by districts is highest for elementary and middle grade teachers (66 percent) and lowest among high school teachers (52 percent). Females are between 8 and 12

[19] The tiny fraction (0.25%) of teachers that did not earn the majority of earnings from a single industry are included in the "Other" category.

percentage points more likely to remain employed by districts than males, depending on the grade level. Given the large share of teachers who remained employed by public school districts, the remainder of our analysis looks separately at the experiences of those who did and did not stay in public schools.

Only 4 percent of exiting teachers moved into teaching positions in private elementary and secondary schools. A similarly small share left for other jobs in educational services outside of elementary and secondary schools. Among those leaving the public school system, most therefore left for jobs in non-education industries. The most common category for former teachers at all grade levels was Professional Services, which includes Information; Finance and Insurance; Real Estate and Rental and Leasing; Professional, Scientific, and Technical Services; Management of Companies and Enterprises; and Administrative and Support and Waste Management and Remediation Services.[20]

Table 1b reports median average annual earnings for all leaving teachers for the same sample of teachers for whom outside earnings data are available. Median earnings for former teachers remaining in public school districts were higher than for the same group while teaching, but the differences were modest and could reflect seniority-related pay increases within the same compensation system. Former teachers working elsewhere, meanwhile, experienced a substantial decline in median earnings. The decline was largest for female teachers, who saw median earnings drop by roughly one fifth to one third. But males also saw declines of 8-9 percent.

[20] Roughly similar shares of leavers entered jobs classified as Health Care, Other Services (including Arts, Entertainment, and Recreation; Accommodation and Food Services; and Other Services), Public Administration, or Other (including Agriculture, Forestry, Fishing, and Hunting; mining, Quarrying, and Oil and Gas Extraction; Utilities; Construction; Manufacturing; Wholesale Trade; Retail Trade; and Transportation and Warehousing).

Figures 1a compares the distribution of average annual earnings for exiting teachers who remained employed by public school districts before and after leaving the classroom; Figure 2a does the same for leavers to other industries. The plots indicate that a substantial share of both groups of leavers had very low levels of earnings after leaving, suggesting that they moved into part-time employment. Among teachers not working in public school districts, the distribution peaks at a level below $10,000. Although movement into part-time employment is clearly an important phenomenon in teacher labor markets, our primary aim in this paper is to compare the structure of compensation for full-time employment inside and outside of teaching. We therefore also look separately at the sample of individuals with annual earnings above $14,420, or what a full-time minimum wage worker in Florida would have earned during this period.[21]

Tables 2a and 2b replicate the analysis of destination industries and changes in median earnings among likely full-time workers. The distribution of destination industries is little changed from Table 1a, though the share of leaving teachers remaining employed in non-teaching positions in public school districts increases modestly. As expected, median earnings for former teachers increase by a greater amount among those remaining in public school districts when excluding part-time employment. Among teachers leaving for other industries, median earnings declined by just 5 percent for elementary and middle teachers and were essentially unchanged for high school teachers. Female teachers experienced somewhat larger declines, while male teachers leaving for other industries saw modest increases in median earnings of 4-5 percent.

[21] Specifically, we exclude from the data any academic year in which the teacher earned less than $14,420. Thus teachers that earned less than $14,420 in every post-teaching year in our data are excluded from this analysis. Appendix Table 1 shows that likely full-time workers across all grade levels are somewhat more likely to be male and black than the full samples of exiting teachers but are otherwise similar in terms of the demographic characteristics that we observe.

Table 2b indicates that Florida teachers leaving for full-time employment in other industries are not taking jobs that are, on average, better compensated than their positions as teachers. Taking into account fringe benefits, which are typically more generous for public school teachers than for workers in other sectors of the economy, would presumably strengthen this conclusion. Moreover, because most exits from public school teaching in Florida and elsewhere are voluntary, those who do leave are likely to have higher opportunity wages than those that remain.

But Figures 2a and 2b, which display the distribution of average annual earnings for the full-time sample, confirm that the distribution of earnings among former teachers is considerably more dispersed than the earnings of the same groups while teaching. This is especially true of those leaving the classroom for other industries. Among leavers working within public school districts, the $90^{th}/50^{th}$ percentile earnings ratio among likely full-time workers increased from 1.4 to 1.5 as they left classroom teaching. Among leavers working elsewhere in Florida, the 90/50 earnings ratio increased more sharply: from 1.3 to 1.8. These patterns suggest substantial wage compression (relative to individual opportunity wages) among classroom teachers, but also likely reflect the greater heterogeneity in the working conditions of jobs taken by the former teachers (as compared to when they were all in the same profession). The next two sections consider whether this variation in the non-teaching earnings of former teachers is related to their relative effectiveness and subject area while teaching.

5. Classroom effectiveness and earnings

To examine the relationship between classroom effectiveness and earnings, we use the sample of teachers in grades 4-8 for whom we are able to calculate value-added measures of their contribution to student learning based on equation (1). We first examine the raw (unadjusted) relationship between estimated value added and (log) earnings while teaching and while not teaching. Then we examine the robustness of these results to the inclusion of district fixed effects and standard demographic controls. We focus throughout on the sample of likely full-time workers (those with annual earnings greater than $14,420). Parallel results for all workers with positive earnings are available in Appendix Tables 4 and 5.

Appendix Table 3 provides summary statistics for the three groups of teachers in our analysis: teachers who remained in the classroom throughout the period covered by our data (stayers), teachers who left for non-teaching positions in public school districts (leavers working in public school districts), and teachers who left for positions with other employers (leavers working elsewhere in Florida).[22] Among likely full-time workers, stayers and leavers working in public school districts had slightly higher average value added (0.03-0.04 standard deviations above the mean) than leavers elsewhere (-0.04). In addition to being slightly less effective on average, those leaving for full-time employment outside of public school districts were more likely than stayers to be male, black, and Hispanic and less likely to have a masters degree in any field. Teachers with master's degrees are over-represented among leavers for other positions in public school districts, suggesting that districts use this credential to screen internal candidates for non-teaching jobs.

[22] Appendix Table 3 also provides information on leavers who do not appear in the Florida earnings data, who we only observe while teaching. Compared to the other leavers in the value added sample, these teachers are more likely to be white and female and are modestly younger on average.

Table 3 presents estimates of the raw relationship between individual teacher effectiveness and the log of annual earnings. For both groups of leavers, the correlation is presented separately using annual earnings while teaching and while in other positions. Comparing the results for either group while teaching and while not teaching indicates differences in the structure of compensation inside and outside of teaching for a common sample of teachers. Comparing the results for stayers to those for both groups of leavers while teaching provides suggestive evidence on the extent to which findings concerning the structure of compensation while teaching for leavers are generalizable to the full population of teachers in these grades.

The first row reveals a modest but statistically significant correlation between estimated value added and earnings while teaching for all three groups, with point estimates suggesting that a 1 standard deviation increase in value added is associated with an increase in earnings of 0.7 percent (for stayers), 0.8 percent (for leavers remaining employed by public school districts), and 2.0 percent (for leavers working elsewhere). Because our value-added measures control for teacher experience, this relationship should not be driven by salary schedules offering higher pay for more senior teachers. It may instead reflect Florida's bonus program for schools improving their performance on the state's accountability system, pilot district-level merit pay schemes, or simply differences in average compensation levels across school districts (West and Chingos 2009).

Among leavers for other positions in public school districts, the point estimate for the relationship between value added while teaching and subsequent earnings increases modestly but remains quite small. This suggests that many teachers leaving for jobs in public education remain on the same salary schedule so that relative differences in pay are preserved. Appendix

Table 4 shows a stronger relationship among the full sample of teachers (including likely part-time workers), suggesting that more effective leavers that remain in the public schools are somewhat more likely to take on full-time responsibilities than less effective teachers (a pattern also evident in Appendix Table 3).

Among leavers for jobs in other industries, however, the relationship between value added and subsequent earnings increases in magnitude and remains statistically significant, with a 1 standard deviation increase in value added is associated with an increase in earnings of 5.1 percent. The estimate, which is statistically significantly different at the 5 percent level from the analogous estimate for the same group while teaching, provides suggestive evidence that the returns to classroom effectiveness (or the attributes associated with it) are greater outside of teaching than within the public school system.[23] Moreover, Appendix Table 4 shows that the same relationship is much stronger (8.6 percent) among the sample of all teachers with positive earnings, indicating that more effective teachers were also more likely to be employed in positions paying more than $14,420 annually.

The remaining rows of the table provide separate estimates of the same relationship for elementary school teachers using only their math or reading value-added measure and for middle school math and reading teachers. None of the estimates for these groups differ by statistically significant amounts from the analogous estimates for the pooled sample. In order to maximize statistical power, we therefore focus on the pooled sample as we consider the robustness of these

[23] We test the significance of this difference by running a pooled model (including earnings while both teaching and non-teaching) that includes a dummy variable that identifies the non-teaching observations and an interaction between that dummy and our measure of value added. The coefficient on the interaction term and its standard error allow us to test the significance of the difference between the value added coefficient while teaching as compared to while not teaching. These models also include interactions between the non-teaching dummy and any control variables.

results to the inclusion of district fixed effects and demographic control variables.[24] We focus on the sample of leavers that worked outside of the public schools.[25]

Table 4 estimates the relationship between value added and earnings conditional on district fixed effects and demographic variables including gender, race and ethnicity, age, and education credentials. As noted above, because Florida school districts are coterminous with counties, district fixed effects are useful to account for differences in regional labor markets. They also may eliminate any lingering bias in our estimates of teacher value added that are correlated with differences across districts. The additional control variables are included to see whether the relationship between value added and earnings reflects differences in earnings opportunities across demographic groups.

The coefficients on the control variables yield several interesting patterns. Males earned 9 percent more than females while not teaching, as compared to 2 percent while teaching. This pattern may suggest that male teachers are more likely than females to prioritize salary when considering other job opportunities. A master's degree is associated with earnings that are 12 percent higher. The earnings premium for a doctoral degree (a credential held by only 2 percent of all leavers) is far greater, perhaps suggesting that teachers who have invested in this credential are only likely to leave education for highly paid positions.

More important, the relationship between effectiveness and earnings is only modestly changed from the analysis in Table 3. Among leavers for other industries, controlling for district fixed effects reduces the coefficient of 0.051 to 0.038; adding the other control variables further reduces it to 0.031. However, the teaching vs. non-teaching coefficient comparisons remain

[24] Supplemental tables with results of models with control variables by grade level and subject are available from the authors upon request.

[25] Analagous results for leavers who remained in the public schools are available from the authors.

largely unchanged: in the raw results, the teaching coefficient is about 2.5 times as large the non-teaching coefficient; in the results with all of the controls added, the teaching coefficient is 3 times as large as the non-teaching coefficient. The difference across models is statistically significant at the 10 percent level when only district fixed effects are added, but insignificant when the full set of controls is added.

Table 5 presents the results of models that replace the continuous measure of teacher value added with dummy variables identifying teachers in each quartile of the effectiveness distribution. This non-linear specification indicates that teachers in the third and fourth effectiveness quartiles earn 15 percent and 10 percent more, respectively, than teachers in the bottom quartile. Although the difference between the coefficients on the variables identifying the top two quartiles of teachers is not statistically significant, their relative magnitudes are not as expected. This result indicates that the overall relationship between effectiveness and earnings is driven primarily by differences between the least effective teachers and those in the top half of the distribution rather than by more refined distinctions across the spectrum of teacher effectiveness.

This pattern suggests a potential concern with interpreting our results as evidence that more effective teachers have better opportunity wages outside of teaching. More specifically, the observed relationship between effectiveness and non-teaching earnings could be an artifact of higher quality teachers leaving voluntarily if they find a better job opportunity and less effective teachers leaving involuntarily (and thus suffering a displacement loss). Anecdotal evidence, however, suggests that involuntary departures from public school teaching are rare. Moreover, demand for teachers surged in Florida during this period due to rapid enrollment growth and the implementation of a 2002 constitutional amendment mandating sharp class-size reductions,

making large numbers of dismissals even more unlikely (West and Chingos 2008). In addition, we estimated the effectiveness-earnings relationship separately for teachers who had at least three years of experience in the Florida public schools and thus were tenured, effectively making dismissal impossible. These estimates are less precise due to the reduced sample size, but they are qualitatively similar to and never statistically significantly different from the estimates for the full sample. We therefore interpret the results in Tables 4 and 5 as strong evidence that attributes associated with teacher effectiveness as measured by value added are in fact valued by employers outside of teaching.

6. Subject area and earnings

Our parallel analysis of the relationship between subject area and earnings inside and outside of teaching exploits the sample of teachers that taught at least one academic subject in grades 9-12. We again focus in the main text and tables on results for the sample of likely full-time workers but present results for all workers in Appendix Tables 6 and 7. English teachers serve as the reference category in all regressions.

Table 6 shows that, among teachers who remained in the classroom throughout the period of our analysis, math, science, and social studies teachers earned 1-3 percent more than English teachers. However, this same pattern is not consistently evident in the data for either group of leavers while they were teaching. Among leavers who continued to work in public school districts, math teachers had an earnings premium of more than 5 percent while foreign language teachers had earnings that were, on average, 10 percent lower. Both of these differences increased in magnitude for the same group of teachers after leaving the classroom for other

positions. The earnings of science and social studies teachers did not differ from those of English teachers by statistically significant amounts either while teaching or while not teaching.

Among leavers for other industries, math, science, and social studies teachers all earned considerably (between 12 and 17 percent) more than former English teachers after leaving the teaching profession. While they were teaching, the earnings of these same teachers in these three subjects did not differ from those of English teachers, with the exception of social studies teachers (who earned about 5 percent more). Table 7, which incorporates district fixed effects and demographic controls, confirms this basic pattern of results for both groups of leavers. Math, science, and social studies teachers all earn 11-14 percent more after leaving for other industries than former English teachers, a pattern not evident among the same group of teachers while in the classroom.

Among teachers that left for a job elsewhere, science teachers are over-represented among leavers overall and among leavers with positive earnings, while social studies teachers are under-represented (Appendix Table 1). Assuming that it is those teachers with the best outside opportunities who leave for other industries, the strong earnings for exiting science teachers may therefore understate the extent to which science teachers as a whole have better earnings opportunities outside of teaching while the results for social studies teachers may be overstated. Overall, the data strongly suggest that any existing efforts by Florida districts to provide better pay for teachers in the high-demand subjects of math and science are insufficient to compensate for differences in opportunity wages stemming from job opportunities outside of teaching.

7. Conclusions

The results presented above represent the first evidence on the extent to which opportunity wages outside of teaching are correlated with classroom effectiveness and subject area expertise, a question of considerable interest to policymakers. And we are able to compare the relationship between these characteristics and earnings inside and outside of the teaching profession for a common sample of leaving teachers.

There are several important limitations on this evidence. A relatively small number of the teachers in our data leave the classroom for other jobs—and many of those who do remain employed by public school districts. Those leaving teaching prior to retirement age are obviously a selected group, raising questions about the generalizability of our results to the broader population of current teachers. Moreover, a substantial share of exiting teachers do not appear in our earnings data at all, making it impossible to determine whether they withdrew from the labor market altogether or moved to another state. Finally, our evidence comes only from a single state. Though teacher compensation policies in Florida school districts closely resemble those in use elsewhere, it is possible that our findings are driven by peculiarities of the state's labor market or other education policies.

Even so, our results have clear implications for teacher compensation policies in Florida and likely beyond. The greater dispersion in the earnings of leaving teachers after moving into other industries than for the same individuals while in the classroom suggests that teacher salaries are compressed relative to opportunity wages. This is hardly surprising given the role that collective bargaining plays in the determination of teacher salaries and could also reflect greater heterogeneity in working conditions across multiple industries. Yet it confirms that many

teachers have far better earnings opportunities outside of the profession while others likely earn more in teaching than would be the case elsewhere.

More importantly, we show that teachers who are most successful in raising student achievement earn more in other industries. Although teaching is surely a unique endeavor requiring highly specialized skills, the same attributes that make for effective teachers also appear to be rewarded in the broader labor market. High school math and science teachers also appear to have particularly strong earnings opportunities outside of education. The specific design of policies to offset differences in opportunity wages is beyond the scope of our analysis, but it seems safe to conclude that ongoing experimentation with merit pay and other incentive schemes should continue. By largely ignoring the realities of the outside labor market, the dominant teacher compensation systems in American school districts are ill-designed to recruit and retain their most valuable employees.

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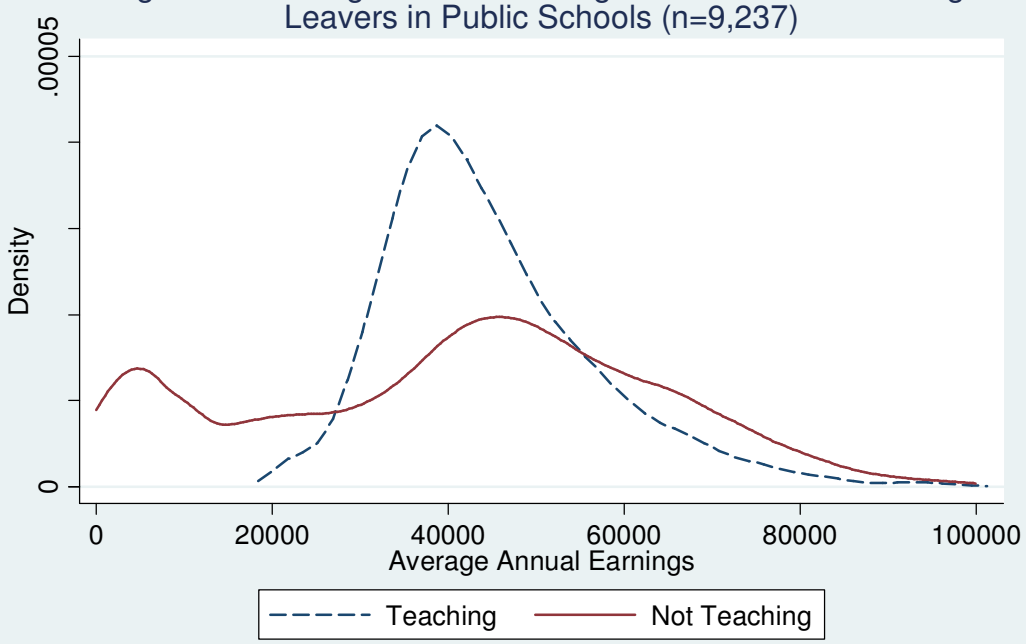
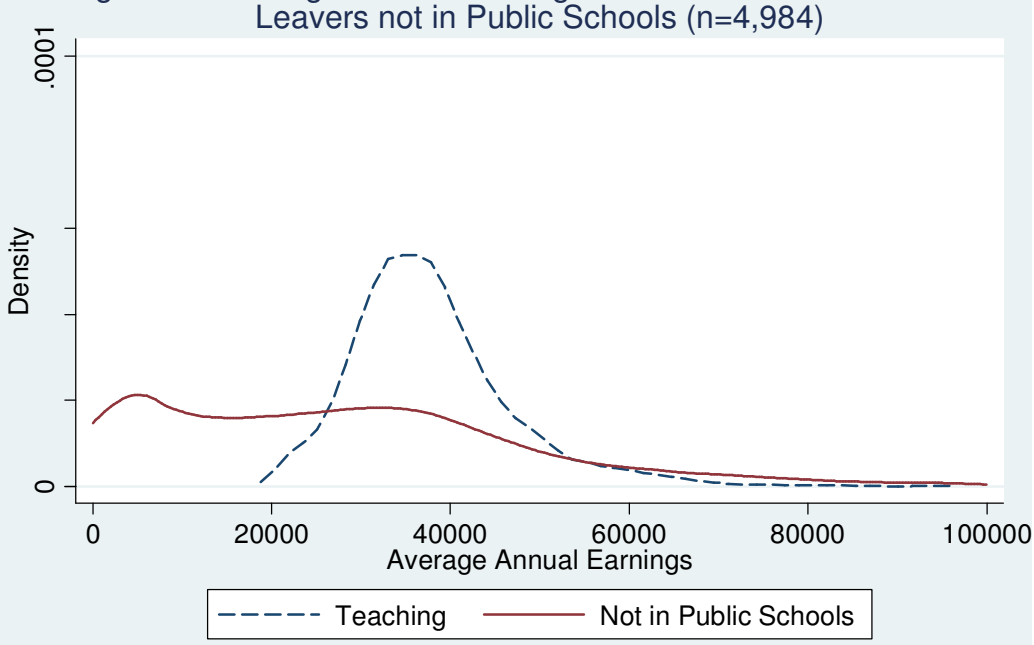
Figure 1a. Average Annual Earnings In and Out of Teaching: Leavers in Public Schools (n=9,237)

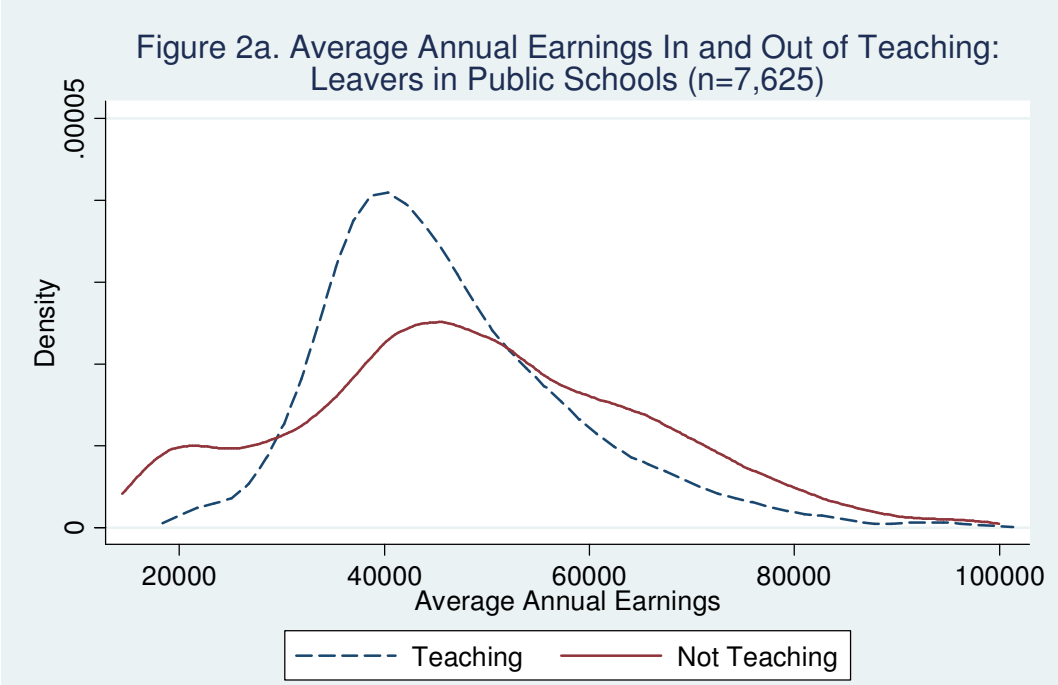


Note. Teachers with average annual earnings over $100,000 excluded from figure.

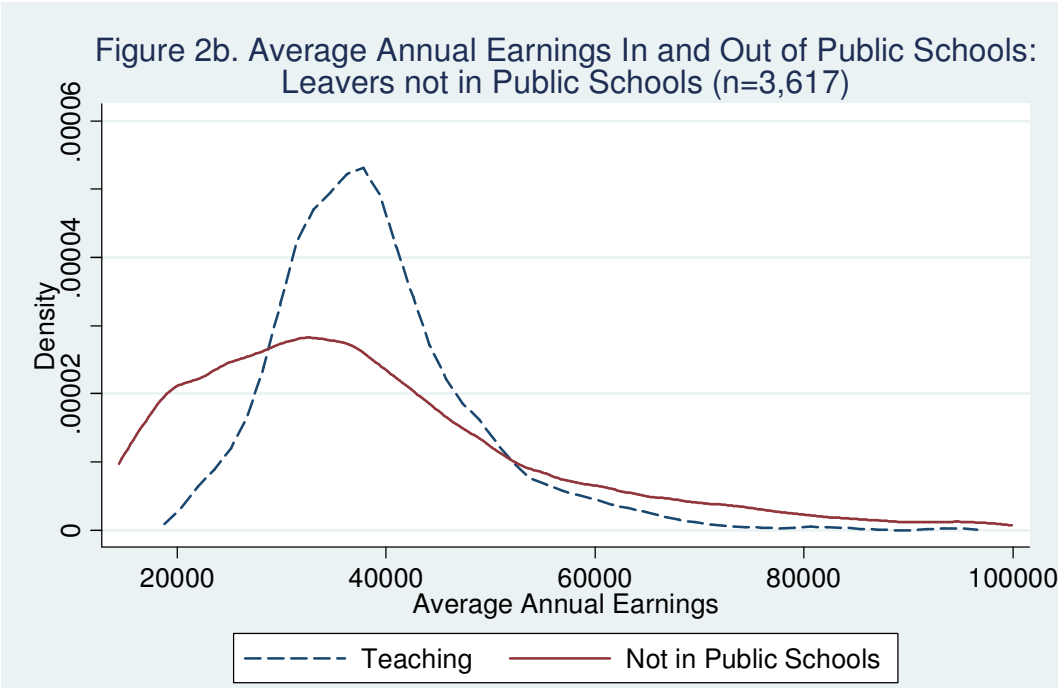
Figure 1b. Average Annual Earnings In and Out of Public Schools: Leavers not in Public Schools (n=4,984)



Note. Teachers with average annual earnings over $100,000 excluded from figure.



Note. Annual earnings less than $14,420 excluded from averages.
Teachers with average annual earnings over $100,000 excluded from figure.



Note. Annual earnings less than $14,420 excluded from averages.
Teachers with average annual earnings over $100,000 excluded from figure.

Table 1a. Destination Industries of Former Florida Teachers, 2002-2007

	Public Elem/Sec Schls	*Private Elem/Sec Schls*	*Other Education*	*Prof Services*	*Health Care*	*Other Services*	*Public Admin*	*Other or Multiple*	*N*	*Workers as % of Leavers*
All K-8 Teachers	66%	4%	5%	8%	5%	3%	2%	6%	11,063	74%
All Male K-8 Teachers	56%	3%	6%	12%	5%	4%	5%	9%	1,890	79%
All Female K-8 Teachers	68%	5%	5%	8%	5%	3%	2%	5%	9,173	74%
All 9-12 Teachers	52%	4%	9%	12%	6%	3%	4%	8%	3,844	73%
All Male 9-12 Teachers	47%	4%	10%	15%	5%	3%	5%	11%	1,534	73%
All Female 9-12 Teachers	55%	5%	9%	11%	7%	3%	4%	7%	2,310	73%

Notes: Categories are based on North American Industry Classification System (NAICS) codes. "Other Education" includes all Educational Services other than Elementary and Secondary Schools. "Prof Servies" includes Information; Finance and Insurance; Real Estate and Rental and Leasing; Professional, Scientific, and Technical Services; Management of Companies and Enterprises; and Administrative and Support and Waste Management and Remediation Services. "Health Care" includes Health Care and Social Assistance. "Other Services" includes Arts, Entertainment, and Recreation; Accommodation and Food Services; and Other Services (except Public Administration). "Other" includes Agirculture, Forestry, Fishing, and Hunting; mining, Quarrying, and Oil and Gas Extraction; Utilities; Construction; Manurfacturing; Wholesade Trade; Retail Trade; and Transportation and Warehousing.

Table 1b. Median Earnings of Florida Teachers, 2002-2007

	Stayers	Leavers Working in Public School Districts			Leavers Working Elsewhere		
	Teaching	*Teaching*	*Not Teaching*	*Difference*	*Teaching*	*Not in Public Schools*	*Difference*
All K-8 Teachers	$43,932	$42,643	$45,264	$2,621	$37,334	$28,685	-$8,649
	56,208	*7,838*	*7,838*	6%	*3,615*	*3,615*	-23%
All Male K-8 Teachers	$45,081	$44,386	$49,789	$5,403	$38,121	$35,253	-$2,868
	7,640	*1,145*	*1,145*	12%	*815*	*815*	-8%
All Female K-8 Teachers	$43,767	$42,408	$44,630	$2,223	$37,066	$26,870	-$10,196
	48,568	*6,693*	*6,693*	5%	*2,800*	*2,800*	-28%
All 9-12 Teachers	$46,598	$44,845	$48,982	$4,136	$39,057	$33,384	-$5,673
	20,274	*2,216*	*2,216*	9%	*1,762*	*1,762*	-15%
All Male 9-12 Teachers	$47,779	$45,874	$51,132	$5,258	$40,040	$36,476	-$3,564
	7,597	*799*	*799*	11%	*793*	*793*	-9%
All Female 9-12 Teachers	$45,847	$44,327	$47,679	$3,352	$38,170	$30,967	-$7,203
	12,677	*1,417*	*1,417*	8%	*969*	*969*	-19%

Note: The numbers of teachers appear in italics.

Table 2a. Destination Industries of Former Florida Teachers with Annual Earnings of at Least $14,420

	Public Elem/Sec Schls	*Private Elem/Sec Schls*	*Other Education*	*Prof Services*	*Health Care*	*Other Services*	*Public Admin*	*Other or Multiple*	*N*	*Workers as % of Leavers*
All K-8 Teachers	70%	4%	4%	7%	5%	2%	3%	5%	8,877	60%
All Male K-8 Teachers	59%	3%	5%	11%	4%	3%	6%	8%	1,587	66%
All Female K-8 Teachers	73%	5%	4%	6%	5%	2%	2%	4%	7,290	59%
All 9-12 Teachers	55%	5%	8%	12%	6%	2%	5%	8%	3,128	60%
All Male 9-12 Teachers	50%	4%	9%	14%	5%	3%	5%	10%	1,292	62%
All Female 9-12 Teachers	59%	5%	7%	10%	6%	2%	5%	6%	1,836	58%

Notes: Categories are based on North American Industry Classification System (NAICS) codes. "Other Education" includes all Educational Services other than Elementary and Secondary Schools. "Prof Servies" includes Information; Finance and Insurance; Real Estate and Rental and Leasing; Professional, Scientific, and Technical Services; Management of Companies and Enterprises; and Administrative and Support and Waste Management and Remediation Services. "Health Care" includes Health Care and Social Assistance. "Other Services" includes Arts, Entertainment, and Recreation; Accommodation and Food Services; and Other Services (except Public Administration). "Other" includes Agirculture, Forestry, Fishing, and Hunting; mining, Quarrying, and Oil and Gas Extraction; Utilities; Construction; Manurfacturing; Wholesade Trade; Retail Trade; and Transportation and Warehousing.

Table 2b. Median Earnings of Florida Teachers with Annual Earnings of at Least $14,420

	Stayers	Leavers Working in Public School Districts			Leavers Working Elsewhere in Florida		
	Teaching	*Teaching*	*Not Teaching*	*Difference*	*Teaching*	*Not in Public Schools*	*Difference*
All K-8 Teachers	$43,932 *56,208*	$43,840 *6,491*	$48,726 *6,491*	$4,886 11%	$38,241 *2,557*	$36,500 *2,557*	-$1,741 -5%
All Male K-8 Teachers	$45,081 *7,640*	$45,313 *999*	$52,720 *999*	$7,408 16%	$38,773 *625*	$40,799 *625*	$2,026 5%
All Female K-8 Teachers	$43,767 *48,568*	$43,607 *5,492*	$48,169 *5,492*	$4,562 10%	$38,051 *1,932*	$35,144 *1,932*	-$2,907 -8%
All 9-12 Teachers	$46,598 *20,274*	$46,603 *1,819*	$52,363 *1,819*	$5,760 12%	$39,859 *1,377*	$39,694 *1,377*	-$165 0%
All Male 9-12 Teachers	$47,779 *7,597*	$47,144 *672*	$55,056 *672*	$7,912 17%	$40,496 *649*	$41,937 *649*	$1,441 4%
All Female 9-12 Teachers	$45,847 *12,677*	$46,258 *1,147*	$51,272 *1,147*	$5,014 11%	$39,402 *728*	$38,247 *728*	-$1,155 -3%

Note: The numbers of teachers appear in italics.

Table 3. Relationship between Log(Earnings) and Effectiveness: Teachers in Value-Added Sample with Annual Earnings of at Least $14,420

	Stayers	Leavers Working in Public School Districts		Leavers Working Elsewhere in Florida	
	Teaching	*Teaching*	*Not Teaching*	*Teaching*	*Not in Public Schools*
All Teachers (4-5 Combined, 6-8 Math, and 6-8 Reading)	0.007 [0.001]*** *23,574*	0.008 [0.005]* *2,479*	0.015 [0.008]*	0.020 [0.007]*** *913*	0.051 [0.016]***
All 4-5 Teachers, Average of Math and Reading	0.008 [0.002]*** *14,404*	0.012 [0.006]** *1,551*	0.021 [0.010]**	0.019 [0.009]* *485*	0.060 [0.020]***
All 4-5 Teachers, Math	0.008 [0.002]*** *14,402*	0.009 [0.006] *1,550*	0.015 [0.010]	0.019 [0.009]** *485*	0.061 [0.021]***
All 4-5 Teachers, Reading	0.004 [0.002]** *14,401*	0.013 [0.006]** *1,550*	0.026 [0.010]**	0.008 [0.011] *485*	0.036 [0.021]*
All 6-8 Math Teachers	0.008 [0.003]*** *5,237*	0.009 [0.011] *524*	0.011 [0.019]	0.012 [0.017] *246*	0.045 [0.035]
All 6-8 Reading Teachers	0.004 [0.003] *6,036*	-0.003 [0.011] *609*	-0.001 [0.020]	0.029 [0.014]** *256*	0.028 [0.034]

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets; numbers of teachers appear in italics (the number of teacher*year observations is greater). The value-added measures are each standardized to have a mean of zero and standard deviation of one. In the "All Teachers" results (row one), dummies for 6-8 math and 6-8 reading are included in all regressions.

Table 4. Relationship between Log(Earnings) and Effectiveness with Controls: Leavers in Value-Added Sample with Annual Earnings of at Least $14,420

	Leavers Working Elsewhere in Florida			
	Teaching	*Not in Public Schools*	*Teaching*	*Not in Public Schools*
Value-Added in Math and/or Reading	0.011 [0.007]	0.038 [0.016]**	0.010 [0.007]	0.031 [0.016]*
Male			0.017 [0.015]	0.093 [0.040]**
Black			-0.036 [0.018]**	-0.115 [0.042]***
Hispanic			-0.034 [0.024]	0.076 [0.060]
Age in 2007			0.004 [0.001]***	-0.006 [0.002]***
Master's Degree			0.078 [0.015]***	0.120 [0.037]***
Doctoral Degree			0.129 [0.034]***	0.358 [0.084]***
District Fixed Effects?	Yes	Yes	Yes	Yes
Teacher*Year Observations	2,098	1,853	2,086	1,832
Number of Teachers	913		905	
R-squared	0.15	0.09	0.19	0.14

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets. The value-added measures are each standardized (separately for 4-5, 6-8 math, and 6-8 reading) to have a mean of zero and standard deviation of one. Dummies for 6-8 math and 6-8 reading are included in all regressions.

Table 5. Relationship between Log(Earnings) and Effectiveness Quartile: Leavers in Value-Added Sample with Annual Earnings of at Least $14,420

	Leavers Working Elsewhere in Florida			
	Teaching	*Not in Public Schools*	*Teaching*	*Not in Public Schools*
Second Value-Added Quartile	-0.015 [0.017]	0.038 [0.039]	-0.010 [0.017]	0.031 [0.038]
Third Value-Added Quartile	-0.010 [0.019]	0.145 [0.043]***	-0.001 [0.018]	0.129 [0.042]***
Top Value-Added Quartile	0.032 [0.021]	0.097 [0.049]**	0.034 [0.020]	0.096 [0.047]**
Male			0.018 [0.015]	0.091 [0.040]**
Black			-0.036 [0.018]**	-0.115 [0.042]***
Hispanic			-0.035 [0.024]	0.082 [0.060]
Age			0.004 [0.001]***	-0.005 [0.002]**
Master's Degree			0.077 [0.015]***	0.122 [0.036]***
Doctoral Degree			0.127 [0.034]***	0.367 [0.085]***
District Fixed Effects?	Yes	Yes	Yes	Yes
Teacher*Year Observations	2,098	1,853	2,086	1,832
Number of Teachers	913		905	
R-squared	0.15	0.10	0.20	0.14

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets. The omitted value-added quartile dummy is for the bottom quartile. Dummies for 6-8 math and 6-8 reading are included in all regressions.

Table 6. Relationship between Log(Earnings) and Subject Area Taught, Grade 9-12 Teachers with Annual Earnings of at Least $14,420

	Stayers	**Leavers Working in Public School Districts**		**Leavers Working Elsewhere in Florida**	
	Teaching	*Teaching*	*Not Teaching*	*Teaching*	*Not in Public Schools*
Math	0.027 [0.005]***	0.053 [0.018]***	0.086 [0.027]***	-0.003 [0.020]	0.126 [0.035]***
Science	0.021 [0.006]***	-0.002 [0.019]	0.042 [0.032]	0.003 [0.019]	0.123 [0.034]***
Social Studies	0.010 [0.006]*	0.004 [0.021]	0.042 [0.030]	0.052 [0.030]*	0.173 [0.045]***
Foreign Language	0.001 [0.008]	-0.096 [0.033]***	-0.194 [0.059]***	-0.058 [0.024]**	0.022 [0.058]
Multiple Subjects	-0.009 [0.006]	-0.005 [0.018]	-0.027 [0.029]	0.002 [0.023]	-0.009 [0.047]
Teacher*Year Observations	93,901	4,705	3,221	2,658	2,659
Number of Teachers	20,274	1,819		1,377	

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets. Omitted subject area is English/reading.

Table 7. Relationship between Log(Earnings) and Subject Area Taught with Controls, Grade 9-12 Leavers with Earnings of at Least $14,420

	Leavers Working Elsewhere in Florida			
	Teaching	*Not in Public Schools*	*Teaching*	*Not in Public Schools*
Math	-0.004 [0.018]	0.129 [0.035]***	-0.016 [0.017]	0.124 [0.035]***
Science	0.021 [0.018]	0.128 [0.034]***	0.012 [0.016]	0.109 [0.035]***
Social Studies	0.062 [0.026]**	0.180 [0.044]***	0.037 [0.024]	0.137 [0.043]***
Foreign Language	-0.054 [0.026]**	0.014 [0.058]	-0.078 [0.023]***	-0.024 [0.054]
Multiple Subjects	0.030 [0.021]	0.004 [0.050]	0.011 [0.019]	0.014 [0.048]
Male			0.055 [0.012]***	0.072 [0.026]***
Black			-0.008 [0.017]	-0.116 [0.034]***
Hispanic			-0.018 [0.019]	-0.001 [0.042]
Age in 2007			0.005 [0.001]***	0.001 [0.002]
Master's Degree			0.117 [0.013]***	0.076 [0.027]***
Doctoral Degree			0.154 [0.030]***	0.287 [0.053]***
District Fixed Effects?	Yes	Yes	Yes	Yes
Teacher*Year Observations	2,658	2,659	2,615	2,590
Number of Teachers	1,377		1,345	
R-squared	0.15	0.08	0.23	0.12

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets. Omitted subject area is English/reading.

Appendix Table 1. Summary Statistics

K to 8th-Grade Teachers	Stayers	Leavers Working in Public School Districts		Leavers Working Elsewhere in Florida		Leavers Not Working or Not in Florida
	All	*All*	*Full-Time*	*All*	*Full-Time*	*All*
Percent Male	13.6%	14.6%	15.4%	22.5%	24.4%	13.7%
Percent Black	14.4%	19.2%	20.3%	16.7%	17.6%	11.9%
Percent Hispanic	9.9%	13.7%	13.8%	11.9%	12.4%	6.4%
Age in 2007	44.5	41.8	42.3	38.3	38.7	37.6
Percent with Master's	39.0%	56.0%	60.5%	30.1%	31.0%	27.4%
Percent with Doctorate	2.2%	3.2%	3.4%	2.6%	3.1%	2.0%
Number	56,208	7,838	6,491	3,615	2,557	4,810

9th- to 12th-Grade Teachers	Stayers	Leavers Working in Public School Districts		Leavers Working Elsewhere in Florida		Leavers Not Working or Not in Florida
	All	*All*	*Full-Time*	*All*	*Full-Time*	*All*
Percent Male	37.5%	36.1%	36.9%	45.0%	47.1%	38.8%
Percent Black	13.4%	22.6%	23.5%	16.2%	16.3%	13.4%
Percent Hispanic	9.9%	12.6%	13.1%	13.2%	13.4%	6.5%
Age in 2007	45.6	42.2	42.6	38.2	38.3	38.3
Percent with Master's	43.7%	59.7%	64.3%	32.8%	32.8%	31.1%
Percent with Doctorate	3.7%	5.0%	5.2%	4.9%	5.5%	2.6%
Breakdown by Subject						
English	26.7%	29.2%	28.9%	26.4%	25.6%	28.0%
Math	20.9%	19.6%	19.6%	20.0%	21.1%	20.3%
Science	17.5%	13.6%	13.1%	22.8%	23.5%	19.2%
Social Studies	15.9%	13.9%	13.8%	14.1%	13.5%	15.0%
Foreign Language	6.0%	4.8%	4.0%	6.6%	6.3%	6.2%
Multiple Subjects	12.9%	18.9%	20.7%	10.1%	10.0%	11.2%
Number	20,274	2,216	1,819	1,762	1,377	1,877

Notes: Full-time is defined as having annual earnings greater than $14,420.

Appendix Table 2. Job Categories of Former Classroom Teachers Who Remained Employed in Public Schools

All

	K-8	9-12
Teacher/Aide	44%	37%
Principal/Assistant Principal	14%	22%
Instruction/Curriculum Specialist or Subject Coach	17%	12%
Counselor/Psychologist/Social Worker/Behavior Specialist	7%	9%
Library/Media Services/Instructional Technology	4%	2%
Clerical/Administrative Job	4%	6%
Other	2%	2%
Unknown	8%	9%
Number of Teachers	*7,838*	*2,216*

Annual earnings of at least $14,420

	K-8	9-12
Teacher/Aide	44%	36%
Principal/Assistant Principal	17%	26%
Instruction/Curriculum Specialist or Subject Coach	20%	14%
Counselor/Psychologist/Social Worker/Behavior Specialist	8%	10%
Library/Media Services/Instructional Technology	4%	3%
Clerical/Administrative Job	4%	7%
Other	2%	2%
Unknown	1%	2%
Number of Teachers	*6,491*	*1,819*

Notes: Each teacher*year observation is weighted equally. For teachers working in multiple job categories in a single year, each job is weighted equally.

Appendix Table 3. Summary Statistics, 4th- to 8th-Grade Teachers in Value-Added Sample

	Stayers	Leavers Working in Public School Districts		Leavers Working Elsewhere in Florida		Leavers Not Working or Not in Florida
	All	*All*	*Full-Time*	*All*	*Full-Time*	*All*
Value-Added (Standardized)	0.04	0.01	0.03	-0.05	-0.04	-0.01
Percent Male	15.9%	17.6%	18.5%	25.3%	27.8%	14.8%
Percent Black	16.3%	21.0%	22.4%	18.5%	19.0%	12.8%
Percent Hispanic	9.3%	12.7%	12.7%	11.2%	11.6%	5.2%
Age in 2007	44.3	41.5	41.8	38.7	39.1	38.1
Percent with Master's	40.6%	57.5%	61.9%	31.5%	33.0%	28.3%
Percent with Doctorate	2.3%	3.5%	3.6%	2.6%	2.8%	2.0%
Number	24,096	3,021	2,513	1,265	925	1,599

Notes: Full-time is defined as having annual earnings greater than $14,420.

Appendix Table 4. Relationship between Log(Earnings) and Effectiveness, All Teachers in Value-Added Sample

	Stayers	**Leavers Working in Public School Districts**		**Leavers Working Elsewhere in Florida**	
	Teaching	*Teaching*	*Not Teaching*	*Teaching*	*Not in Public Schools*
All Teachers (4-5 Combined, 6-8 Math, and 6-8 Reading)	0.007 [0.001]*** *23,574*	0.012 [0.004]*** *2,981*	0.041 [0.019]**	0.020 [0.007]*** *1,251*	0.086 [0.038]**
All 4-5 Teachers, Average of Math and Reading	0.008 [0.002]*** *14,404*	0.014 [0.005]*** *1,887*	0.047 [0.024]**	0.018 [0.009]** *670*	0.065 [0.046]
All 4-5 Teachers, Math	0.008 [0.002]*** *14,402*	0.012 [0.005]** *1,886*	0.024 [0.024]	0.022 [0.008]*** *670*	0.071 [0.046]
All 4-5 Teachers, Reading	0.004 [0.002]** *14,401*	0.014 [0.006]** *1,886*	0.079 [0.026]***	0.001 [0.010] *670*	0.027 [0.050]
All 6-8 Math Teachers	0.008 [0.003]*** *5,237*	0.013 [0.010] *612*	0.043 [0.041]	0.017 [0.014] *323*	0.119 [0.086]
All 6-8 Reading Teachers	0.004 [0.003] *6,036*	0.001 [0.010] *730*	0.015 [0.041]	0.025 [0.014]* *356*	0.109 [0.084]

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets; numbers of teachers appear in italics (the number of teacher*year observations is greater). The value-added measures are each standardized to have a mean of zero and standard deviation of one. In the "All Teachers" results (row one), dummies for 6-8 math and 6-8 reading are included in all regressions.

Appendix Table 5. Relationship between Log(Earnings) and Effectiveness with Controls, All Leavers in Value-Added Sample

	Leavers Working Elsewhere in Florida			
	Teaching	*Not in Public Schools*	*Teaching*	*Not in Public Schools*
Value-Added in Math and/or Reading	0.012 [0.006]*	0.061 [0.038]	0.013 [0.006]**	0.063 [0.038]*
Male			0.019 [0.013]	0.340 [0.085]***
Black			-0.020 [0.015]	0.005 [0.089]
Hispanic			-0.017 [0.020]	0.174 [0.131]
Age in 2007			0.005 [0.001]***	0.010 [0.004]**
Master's Degree			0.079 [0.013]***	0.178 [0.079]**
Doctoral Degree			0.131 [0.031]***	0.520 [0.204]**
District Fixed Effects?	Yes	Yes	Yes	Yes
Teacher*Year Observations	2,821	2,577	2,808	2,553
Number of Teachers	1,251		1,242	
R-squared	0.15	0.05	0.20	0.07

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets. The value-added measures are each standardized (separately for 4-5, 6-8 math, and 6-8 reading) to have a mean of zero and standard deviation of one. Dummies for 6-8 math and 6-8 reading are included in all regressions.

Appendix Table 6. Relationship between Log(Earnings) and Subject Area Taught, Grade 9-12

	All Teachers				
	Stayers	**Leavers Working in Public School Districts**		**Leavers Working Elsewhere in Florida**	
	Teaching	*Teaching*	*Not Teaching*	*Teaching*	*Not in Public Schools*
Math	0.027 [0.005]***	0.043 [0.017]***	0.111 [0.069]	0.011 [0.017]	0.220 [0.076]***
Science	0.021 [0.006]***	-0.006 [0.018]	0.068 [0.073]	0.013 [0.016]	0.170 [0.075]**
Social Studies	0.010 [0.006]*	0.000 [0.019]	0.093 [0.070]	0.056 [0.025]**	0.168 [0.087]*
Foreign Language	0.001 [0.008]	-0.096 [0.028]***	-0.497 [0.150]***	-0.054 [0.021]**	-0.107 [0.144]
Multiple Subjects	-0.009 [0.006]	0.012 [0.016]	0.151 [0.062]**	0.008 [0.021]	0.064 [0.093]
Teacher*Year Observations	93,901	5,699	3,736	3,412	3,475
Number of Teachers	20,274	2,216		1,762	

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets. Omitted subject area is English/reading.

Appendix Table 7. Relationship between Log(Earnings) and Subject Area Taught with Controls, All Grade 9-12 Leavers

	Leavers Working Elsewhere in Florida			
	Teaching	*Not in Public Schools*	*Teaching*	*Not in Public Schools*
Math	0.009 [0.016]	0.244 [0.077]***	-0.003 [0.015]	0.207 [0.079]***
Science	0.021 [0.015]	0.179 [0.077]**	0.015 [0.014]	0.133 [0.079]*
Social Studies	0.061 [0.021]***	0.190 [0.089]**	0.037 [0.020]*	0.094 [0.089]
Foreign Language	-0.052 [0.023]**	-0.125 [0.146]	-0.068 [0.020]***	-0.194 [0.146]
Multiple Subjects	0.028 [0.019]	0.102 [0.098]	0.009 [0.018]	0.085 [0.098]
Male			0.058 [0.010]***	0.248 [0.053]***
Black			-0.022 [0.015]	-0.082 [0.075]
Hispanic			-0.019 [0.016]	0.090 [0.087]
Age in 2007			0.005 [0.001]***	0.004 [0.004]
Master's Degree			0.105 [0.011]***	0.153 [0.059]***
Doctoral Degree			0.142 [0.028]***	0.469 [0.142]***
District Fixed Effects?	Yes	Yes	Yes	Yes
Teacher*Year Observations	3,412	3,475	3,356	3,388
Number of Teachers	1,762		1,722	
R-squared	0.14	0.04	0.22	0.06

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; robust standard errors adjusted for clustering at the teacher level appear in brackets. Omitted subject area is English/reading.