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Teacher Workforce Developments:

Recent Changes in Academic Competitiveness and Job Satisfaction of New Teachers

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Running head: Teacher Workforce Developments

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Abstract

Policy makers and school leaders are perennially concerned with the capacity of the nation's public schools to recruit and retain highly skilled teachers. Over the past two decades, policy strategies including the federal No Child Left Behind Act and alternative pathways to teaching, as well as changes in the broader labor market, have altered the context in which academically skilled college graduates choose whether to enter teaching, and, if so, where to teach. Using data from 1993 to 2008, we find that schools nationwide are recruiting a greater share of academically skilled college graduates into teaching, and that increases in teachers' academic skills are especially large in urban school districts that serve predominantly non-white students. On the other hand, the increase in the share of academically skilled teachers coincides with the lower likelihood of non-white teachers being employed. Once teaching, non-white teachers report substantially lower job satisfaction than other teachers. The issue of how to recruit and support an academically skilled and diverse teacher workforce remains pressing.

Keywords: Teacher workforce, Teacher academic skills, Job satisfactions of teachers

JEL code: J21; J24; J28

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<A>1. Introduction

The capacity of the nation's public schools to attract highly skilled college graduates into teaching is a perennial concern of both policy-makers and school leaders. While research provides evidence that teachers' academic qualifications are only modestly aligned with measures of their instructional effectiveness (Goldhaber 2008; Murnane and Steele 2007), the academic ability of individuals entering teaching is an indicator of the attractiveness of the profession, and may reflect the schools' capacity to recruit talented individuals along other, unobserved dimensions. Comparative analyses of highly successful school systems such as Finland, Korea, and Japan frequently contrast those nations' success at recruiting "top talent" into teaching with the comparatively low status of the teaching profession in the U.S. (Auguste, Kihn, and Miller 2010; Darling-Hammond 2010; OECD 2012; Tucker 2011). In 2009, the former U.S. Secretary of Education Arne Duncan called for America's colleges of education to increase the selectivity of students and improve their programs to better prepare new teachers. More recently, the U.S. Department of Education, in partnership with the nation's two largest teacher unions, Teach for America, and several other organizations, launched the TEACH campaign aimed at recruiting America's best to teach (Rich 2013). These recent policy initiatives further elevate the national discussion of recruiting "top talent" into the teaching profession.

Over the last two decades, significant federal legislation including the No Child Left Behind (NCLB) Act of 2001 contain features intended to promote the recruitment of more "high quality" teachers such as higher minimum standards for teachers' certification (Loeb and Miller 2006). Available evidence shows a trend from 1993 to 2007 that teachers after NCLB are working longer hours, perceive greater control in their own classrooms, and feel greater support among peers, administrators, and parents (Grissom, Nicholson-Crotty, and Harrington 2014).

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This change may influence new graduates' view of teaching profession and their job satisfaction once they enter into this profession.

Spurred by both the NCLB legislation and by the difficulty of attracting teachers in many schools and subject areas, alternate pathways into teaching also expanded rapidly. In 1995, 6,932 teachers were prepared through alternative certification programs. That number jumped to 59,000, or about one-third of newly hired teachers in 2007 (Grossman and Loeb 2008, p.4). Many alternate pathways, including such prominent programs as Teach for America and Troops to Teachers, focus on filling teaching assignments in hard-to-staff schools in particular. The increase in the diversity of pathways into the teaching profession might be an important source of the increase in academic talent in the profession (Johnson, Birkeland, and Peske 2005).

Alongside political efforts and evolving pathways into teaching, substantial fluctuations in the nation's economic conditions and accompanying impacts on labor markets and on public financing of education likely influenced the attractiveness of the teaching profession to new college graduates. The tech-boom of the early 2000's and the aftermath of the financial collapse in 2008 represent sharp contrasts in this respect. The latter corresponded to substantial reductions in state education spending in many states as well as reductions in private-sector jobs (Leachman and Mai 2013). There is some evidence of an increase in the instructional effectiveness of teachers entering the profession during the "Great Recession," potentially due to these labor market conditions and the associated increase in the relative attractiveness of teacher salaries relative to salaries in alternative occupations (Nagler, Piopiunik, and West 2015).

Previous research describing the academic qualifications of incoming teachers indicates that higher-scoring college graduates had become increasingly less likely to enter teaching since the 1950's, but that this trend may have reversed in recent years. As of the 1990's, higher-

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scoring college graduates were significantly less likely to enter teaching, capping a decline over several previous decades as changes in the labor market opened up more alternative career opportunities for women (Bacolod 2007; Corcoran, Evans, and Schwab 2004). However, more recent evidence indicates that the academic quality of new teachers may have rebounded since then, with increases in the aggregate SAT scores, GPA, and college competitiveness of prospective and new teachers (Goldhaber and Walch 2013; Lankford et al. 2014).

While the recent uptick in incoming teachers' academic competitiveness nationwide has been highlighted as an encouraging development (Goldhaber and Walch 2013), extant research has not examined the other characteristics of teachers that are contributing to this trend such as race/ethnicity, nor where teachers with higher academic ability are recruited to teach. In addition, it remains unclear whether improvements in schools' ability to recruit more academically skilled teachers correspond to more positive job experiences for new teachers after they are employed so that they would more likely stay. Both teacher job and pay satisfaction have been shown to be predictive of teacher retention decisions, yet we know little about changes in such satisfaction of new teachers (Guarino, Santibañez, and Daley 2006; Stockard and Lehman 2004)

Along with concerns about the quality of new teacher recruits in the aggregate, a substantial body of research has documented disparities in the qualifications and academic ability levels of individuals teaching in "hard-to-staff" schools that serve more poor, black and Hispanic students, particularly in urban contexts (Clotfelter, Ladd, and Vigdor 2007; Lankford, Loeb, and Wyckoff 2002; Peske and Haycock 2006). Teachers in these schools historically have been more likely to be provisionally or emergency certified, and typically scored lower on ability tests and licensure exams. Moreover, despite research indicating that being taught by a teacher of the same race improves students' academic outcomes (Dee 2005; Villegas and Lucas 2004), there has

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been a persistent and large gap between the percentage of non-white students and the percentage of non-white teachers in the U.S. system. For example, about 32 percent of students enrolled in 1993-04 and 41 percent of students enrolled in 2007-08 were not white, while the percentage of non-white teachers was 13 percent in 1993-94 and 17 percent in 2007-08 (Ingersoll and May 2011). Another challenge of building a diverse teaching workforce is that minority teachers frequently teach in more challenging environments, tend to be less satisfied with their jobs, and are correspondingly less likely to remain in teaching (Ingersoll and May 2011). In light of these challenges, improving the capacity of schools to recruit and retain an academically skilled and diverse workforce may be critical to addressing the persistent academic achievement gaps of minority students.

In this study, we build on prior research by examining the improvement in new teachers' academic qualifications in greater detail, and by considering the work experiences of new teachers after they began teaching. Using the Baccalaureate and Beyond (B&B) studies in 1993, 2000, and 2008, we describe the subgroups of incoming teachers that have seen the most change in academic background, as well as the characteristics of schools where academically skilled teachers are increasingly employed. We supplement data on the academic ability scores of new teacher hires with survey data on new teachers' job satisfaction over time, both overall and related to specific aspects of the job. These additional data provide information regarding the relative attractiveness of teaching in comparison to other professions, over time. The observed patterns offer insight into the potential drivers of recent changes.

We specifically ask the following five research questions:

1. How has the academic ability of recent college graduates entering teaching changed across the graduating classes of 1993, 2000, and 2008?

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2. How have new teachers' academic ability varied over time as a function of teachers' characteristics, including their demographics and the grades and subjects in which they teach?
3. How has the distribution of academically skilled new teachers to schools changed over this period, particularly for schools that serve disproportionately poor and minority students?
4. How has new teachers' reported job satisfaction changed over time, both overall and with regard to job pay and job security in particular?
5. How have changes in teachers' reported job satisfaction varied by teacher characteristics and school contexts?

<A>**2. Data Description**

Our analyses rely on data from three Baccalaureate and Beyond (B&B) studies conducted by the National Center for Education Statistics (NCES). Each study includes a nationally representative survey of graduates from postsecondary institutions, and in each case we use survey data from graduates collected in the year immediately after they earned their bachelor degrees (i.e. 1994, 2001, and 2009). These survey data are linked to extensive information about graduates' educational experience and test scores, demographic backgrounds, and post-graduation work experiences.

In the case of teachers, the B&B studies include data about the schools at which they reported working, drawn from the U.S. Department of Education's Common Core of Data (CCD). When linking teachers to schools, we identify the most recent school they taught at following graduation. We summarize our key measures below.

<B>***Teacher Characteristics and Job Experiences***

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The B&B studies include a range of information about recent graduates and about incoming teachers. We specifically utilize data on graduates' gender, race and academic ability. When comparing teachers to other graduates, we include only teachers who are employed full time in grades K-12, excluding substitute teachers and teacher aides. We derive the measure of graduates' academic ability from individuals' SAT and ACT test performance. Within our nationally representative sample, we estimate individuals' relative percentile ranking on SAT and ACT scores separately, both for their combined scores and for verbal and math separately. Our academic ability measures are thus individuals' test score percentile relative to that of their peer graduates from postsecondary institutions. We use ACT percentile ranks as a substitute measure for those individuals who did not take the SAT or for whom SAT data are unavailable.[1] In order to examine teachers' on-the-job experiences, we consider three survey questions about degree recipients' job satisfaction that were identical in the 2000 and 2008 cohort surveys.[2] These questions, which were given to all employed degree recipients, asked whether graduates were satisfied with their jobs overall, with their job pay, and with their job security in the year after graduation. As a benchmark, we compare responses from teachers to those from other professionals within each cohort.

<B>***School and Role Characteristics***

In order to evaluate the distribution of teachers by academic ability level and reported job satisfaction, we include several characteristics of teachers' roles and the schools where they taught. Our role characteristics include a measure of the highest grade level taught by the teacher

[1] The correlations between the ACT and SAT percentiles among those who took both SAT and ACT in our three samples are 0.86 in the 1993 cohort, 0.88 in the 2000 cohort, and 0.91 in the 2008 cohort. These high correlation coefficients indicate that an individual who scored well on the SAT would most likely have scored well on the ACT if he or she were to take this test.
[2] The job satisfaction survey questions of our interest were either unavailable or were framed in substantially different ways in the 1993 cohort B&B survey. Thus, we exclude this year's data from the analysis.

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as well as the subject matter taught. We use teachers' grade level assignment to distinguish between secondary (grades 7-12) and elementary (grades K-6) school teachers, and we use subject area assignments to distinguish secondary teachers who teach science, math, and technology (i.e. "STEM" subjects) from secondary teachers in other subject areas.

Our available data on school characteristics include whether each teacher's school is public or private, the school's locale (urban, rural, or other), and information about the demographic composition of the students, including race/ethnicity and eligibility for lunch subsidies as a proxy for family income. Available lunch eligibility data from the 2000 cohort include the percent of students eligible for free lunch. This differs slightly from the 1993 and 2008 cohorts, where we have data on the combined percent of students eligible for free or reduced price lunch status. To standardize our measures of student poverty across cohorts, we calculate a relative proportion of low-income students by ranking schools within each cohort according to the poverty indicator available for that cohort. Finally, we create indicator measures for schools that serve predominantly non-white students (>66%), and for schools in the top third of the distribution of the proportion of students eligible for subsidized lunch.

<A>3. Analytic Strategies

To address our research questions, we first provide descriptive summaries of the academic ability scores and job satisfaction rates of teachers and other graduates. In each case, we include information regarding the confidence intervals around our point estimates from the nationally representative samples. We also examine patterns in the distribution of teacher academic ability scores as a function of teacher and school characteristics.

We then use multivariate regression analyses to predict (1) the academic ability score percentiles of new teachers across different teacher and school characteristics; and (2) the job

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satisfaction rates of new teachers across a range of teacher and school characteristics. When predicting job satisfaction, we utilize logit models to estimate the likelihood that teachers are satisfied with their job across different teacher and school characteristics, and report the results in the form of odds ratios. Our analyses utilize the sampling weights and the Balanced Repeated Replication (BRR) weights appropriate to each of the individual B&B samples in question.

Some individual and school characteristics data are missing for individual survey respondents, related to the B&B study design and implementation. Missing data occur, for instance, when a surveyed teacher did not provide sufficient information to identify the school where they taught, or when CCD datasets were missing information about a school that was successfully identified. We impute data in cases of missing values for each of our independent variables of interest using a multiple imputation strategy. We also include additional information related to the instances of missing data via two descriptive tables in Appendix A. Table A-1 details the extent of missing data for each of the variables in our analyses, and Table A-2 examines whether observations with and without any missing school-level data appear significantly different in terms of observable characteristics of teachers. By and large, they do not. Nevertheless, since these data are not missing at random, it is possible that our results may be biased in some instances due to missing data. We provide additional technical details of our approach to handling missing data in Appendix B.

<A>4. Findings

<B>*How Has the Academic Ability of Recent College Graduates Entering Teaching Changed across the Graduating Classes of 1993, 2000, and 2008?*

In line with recent research about the improving academic qualifications of incoming teachers (Goldhaber and Walch 2013), Figure 1 shows a drop in teachers' average academic

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ability from the 1993 to 2000 cohort, though statistically insignificant, but a statistically significant increase in teachers' average academic test scores from the 2000 to 2008 cohort.[3] College graduates entering the teaching profession from the 2000 cohort ranked around the 42nd percentile in SAT and ACT scores relative to their peers, on average, while teachers from the 2008 cohort ranked in the 48th percentile. Moreover, as shown in Figure 2, although the peak of the 2008 cohort distribution was still among low performers (i.e. in the 20th percentile), there were fewer very low-scoring college graduates and more very high-scoring graduates entering teaching in 2008 relative to the 2000 cohort. The uptick in incoming teachers' test scores represents an interruption of the downward trend in schools' capacity to attract top performers in prior decades that has been documented in several studies (Bacolod 2007; Corcoran, Evans, and Schwab 2002)[4].

The improvement in average new teacher test scores between the 2000 and 2008 cohorts is driven primarily by schools' ability to recruit teachers with higher math ability. As shown in Figure 1, math scores reached their lowest point in 2000 before rebounding strongly in 2008. Incoming teachers' verbal test scores increased only modestly, with no statistically significant differences across the three cohorts.[5]

[FIGURE 1 HERE]

[3] Approximately the same percentage of college graduates are either entering teaching or preparing to teach in each of the three cohorts (1993, 2000, and 2008). Comparable test score increases are apparent among both full time teachers and those who are still just preparing to teach in the 2008 cohort.

[4] Bacolod (2007) documented a decline in the quality of young female college graduates going into teaching between 1960 and 1990, using standardized test scores, undergraduate institution selectivity, and positive assortative mating (e.g., their husband's position in male wage distribution and their husband's education) as indicators of quality. This decline in teacher quality was significantly explained by the increase in alternative opportunities for young women in other professions. Corcoran, Evans, and Schwab (2004) depicted a similar trend about high school graduates spanning the classes of 1957 to 1992. The likelihood for a female from the top of her high school class to enter teaching fell dramatically during this period of time.

[5] This increase in teachers' math ability scores does not, however, correspond to a commensurate increase in the propensity for graduates from STEM majors to begin careers in teaching (Goldhaber and Walch 2013).

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[FIGURE 2 HERE]

<B>***How Have Trends in These New Teachers' Academic Ability Varied by Teachers' Demographics?***

Trends in the academic ability of incoming teachers vary by gender. While roughly a quarter of incoming teachers are men in each cohort, the test scores trends of men and women differ over time. Among women, ability scores were flat between 1993 and 2000 and then increased between 2000 and 2008, though the latter difference is not statistically significant. The test scores of men who enter teaching, on the other hand, have fluctuated substantially and significantly, reaching their nadir in the 2000 cohort before rebounding in 2008.

[FIGURE 3 HERE]

The fluctuation in test scores among men parallels the decline in average math scores in the 2000 cohort, and may be a function in part of the prevailing economic conditions that college graduates faced in the year following graduation. Low unemployment around the time of the 2000-2001 tech boom (i.e., 4.4 percent in the winter following graduation, compared to 6.6 percent in the same period for the 1993 cohort and 7.7 percent for the 2008 cohort[6]) corresponds to lower average math scores for all teachers, particularly lower scores for men going into teaching.[7] Scores rebounded strongly in 2008-09 with the onset of the "Great Recession." This pattern suggests that male graduates and graduates with greater math ability may be more sensitive to alternative job opportunities when choosing whether or not to enter teaching. These findings align with Nagler and colleagues' study on the effectiveness of teachers who entered the profession during recession (Nagler, Piopiunik, and West 2015). They were more effective—as

[6] Unemployment rates are seasonally adjusted rates as reported by the US Bureau of Labor Statistics for January 1st of the year following college graduation (i.e. 1994, 2001, and 2009).
[7] Subject and gender trends appear to be independent. Math scores declined in 2000 among both men and women, and both math and verbal scores declined among male teachers in the 2000 cohort.

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captured by teacher value-added to student test scores—than teachers who entered the profession during non-recessionary periods. This pattern is also consistent with the supply of workers for public sector jobs in the U.S. more generally during economic downturns (e.g., Krueger 1988; Borjas 2002). Moreover, Nagler et al. (2015) observed that male teachers seemed to be more affected by the recession than female teachers, which might suggest that the career options of men were more strongly influenced by recessions than those of women.

Over the same time frame, we observe changes not only in average test scores but also in the proportion of black and Hispanic college graduates who enter teaching and in the test scores of this subgroup of teachers. As shown in Figure 3, incoming black and Hispanic teachers' average test scores were lowest in the 2000 cohort, with a significant difference relative to scores in the 2008 cohort. However, the proportion of black and Hispanic graduates entering teaching, at 21.2 percent, was higher than the proportion of black and Hispanic college graduates overall, at 17.0 percent. In contrast, in the 2008 cohort the average ability test scores of incoming black and Hispanic teachers increased, but minority representation among incoming teachers, at 15.7 percent, was less than their share of the college graduate population at 18.5 percent.[8] These results provide evidence that the increase in academic selectivity of new teachers coincides with the reduction in the diversity of the teaching force of the 2008 cohort.

<B>***How Have New Teachers' Academic Ability Varied Over Time by What They Teach and Where They Teach?***

While incoming teachers' academic ability in the aggregate is one measure of the health of the profession, *what* academically skilled graduates end up teaching and *where* they teach are also of significant interest to policymakers and school leaders. Elementary and secondary school

[8] The over and under-representation of black and Hispanic teachers in the 2000 and 2008 time points, respectively, are statistically significant at p-values of less than 0.1.

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teachers might differ in terms of their responsiveness to policy and economic changes as a function of the skills required to fill those different roles, particularly new hires in STEM subject areas. Moreover, the NCLB legislation has an explicit focus on the recruitment of high-quality teachers in schools serving more non-white and poor students. We, therefore, analyze the distribution of teacher academic ability scores across schools as a function of teachers' grade level, subject area, and school sector. Table 1 provides these results.

We find that teachers in secondary grades (7-12) and particularly STEM teachers who teach in secondary grades have consistently higher ability scores than elementary teachers. This disparity is consistent across cohorts. For instance, in the 2008 cohort secondary teachers' SAT percentiles were, on average, roughly six percentage points higher than elementary teachers when controlling for other factors. Secondary school teachers who teach STEM subjects tend to score even higher than other secondary school teachers (around 10 percentage points higher, on average, than other secondary school teachers in 2008). This differential is not surprising, given that graduates who have majored in STEM subjects typically have higher SAT scores than their non-STEM peers (Goldhaber and Walch 2013).

[TABLE 1 HERE]

To further understand the differences between elementary and secondary schools, we contrast the relative ability level of teachers entering public schools with that of teachers entering private schools. The average SAT percentile rank of teachers employed by private *elementary* schools was around four percentage points higher than their public school peers in 1993, but by 2008 their scores were roughly five percentage points lower. Thus, while new teachers at private *secondary* schools retained a sizeable ability advantage over those entering public secondary schools, the overall public-private school ability gap had shrunk from a more than seven

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percentage point gap in 1993 to virtually none as of 2008. As shown in Figure 4, this change is driven primarily by a substantial reduction in the average academic ability of new teachers entering private elementary schools over time.

[FIGURE 4 HERE]

We, next, examine the distribution of teachers with higher academic ability as a function of the students and locales that they serve. As shown in Table 2, schools that serve predominantly minority students employed teachers with test score percentile ranks approximately four and nine points lower, in 1993 and 2000, respectively, when controlling for the urbanicity of the schools and whether they serve a high-poverty student population.[9] However, as of the 2008 cohort, high-minority schools on average employed teachers with academic ability levels approximately three points higher than other schools on average. In these models, our reference group is teachers worked in settings that are non-urban, non-rural, and neither high-poverty nor high-minority in terms of the student composition.

[TABLE 2 HERE]

The recent improvement in the ability level of new teachers entering high-minority schools is driven almost entirely by a shift in the competitiveness of teachers working in high-minority *urban* school settings. While high-minority, non-urban schools continue to employ teachers of lower academic ability as of 2008, high-minority urban schools in the most recent cohort employed teachers whose academic ability scores were above average for incoming teachers. Urban high-minority schools have gone from employing teachers who ranked roughly

[9] Associations between high-minority schools and incoming teacher test scores are very similar in a specification that does not include controls for school percent poverty indicators. While school percent minority and percent low-income characteristics are fairly highly correlated (ρ=0.56), the bulk of the associations we observe between teacher ability levels and students served stem from the percent of minority students in the teachers' schools, rather than the percent of poor students served. As a consequence, we focus the bulk of our analyses on high-minority schools in particular.

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four percentage points lower than non-urban, low-minority schools in 1993 to employing teachers who ranked approximately eight percentage points higher than non-urban low-minority schools in 2008, when controlling for school poverty levels.

The improvement in teacher scores in urban high-minority schools corresponds to a striking bi-modal distribution. As shown in Figure 5, these schools went from employing predominantly teachers with very low academic ability in 1993 and 2000 to employing from a mix of both of teachers with very low and very high academic ability in 2008. This distinctive shift to a bi-modal distribution of teacher academic ability scores suggests that the increase in test scores in urban high-minority schools may reflect a targeted outreach to very high-performing college graduates in particular.[10]

[FIGURE 5 HERE]

While academic ability score improvements are apparent among teachers of all racial groups in the 2008 cohort, the distribution of these improvements differs between black and Hispanic teachers and other teachers. Figures A-1 and A-2 in the appendix section illustrate teacher score distributions in high-minority urban schools separately within the non-black and non-Hispanic teacher sample and the black or Hispanic teacher sample, respectively. Incoming non-black and non-Hispanic teachers in these schools include a dramatically larger proportion of very high scoring individuals. Black and Hispanic teachers' scores have also improved substantially, but primarily through a marked reduction in the share of teachers with very low academic ability employed.

<B>***How Has New Teachers' Reported Job Satisfaction Changed Over Time?***

[10] Urban high-minority schools have also employed an increasing share of college graduates over time. They employed 9.5% of graduates from the 1993 cohort, 12.2% from 2000, and 15.5% from the 2008 cohort. This trend could relate to demographic and mobility changes among students and families over time, as well as to changes in these schools' propensity to hire more teachers with college degrees after NCLB.

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Improvements in new teachers' academic ability scores over time provide evidence that schools are increasingly successful at recruiting academically talented college graduates. However, recruiting more academically skilled individuals into teaching may be of limited utility if teachers at these schools are unsatisfied with their job. In this section, we examine the overall job satisfaction, job pay satisfaction, and job security satisfaction of college graduates who enter teaching, in comparison to graduates who are employed in other fields. It is worth noting that our two time points for which satisfaction data are available, 2000 and 2008, reflect divergent economic conditions that may have contributed to changes in teachers' job satisfaction relative to their non-teacher peers. Figure 6 illustrates the results, comparing job satisfaction rates in each period for teachers, all non-teachers, and a potentially more comparable group of non-teachers who are employed in non-profit or local, state, or federal government industries.

[FIGURE 6 HERE]

Recent college graduates' overall job satisfaction declined between the 2000 and 2008 graduating cohorts for teachers, non-teachers, and non-profit and government workers. However, as of the 2008 cohort, teachers remained more satisfied (84.7 percent) with their jobs overall than either non-teachers overall (71.0 percent) or government and non-profit employees (77.6 percent), and in both cases this advantage in relative job satisfaction represents a slight increase between the two periods. Teachers' satisfaction with job pay also increased slightly (though not significantly) between these two periods, while non-teachers saw a significant decline. Thus, while teachers were less likely to be satisfied with their pay than non-teachers in 2000, they were more likely to be satisfied with their pay in 2008. This reversal may stem from the relative inelasticity of teacher pay scales. Public school teacher pay is likely to be slower to change in response to economic conditions, while non-teacher pay may have a greater reduction as a result

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of the onset of the recession in 2008. In keeping with these trends, non-profit and government workers similarly appear less impacted in terms of job pay satisfaction than non-teachers overall, with only a modest decline between the two periods.

In contrast with the results for teachers' satisfaction with pay, teachers' satisfaction with their job security decreased more than that of non-teachers over the same periods. In 2000, incoming teachers were significantly more likely to report being satisfied with their job security (90.1 percent versus 83.3 percent, respectively), while in 2008 both teachers and non-teachers reported roughly the same levels of job security. The steeper decline in teacher job security may reflect the degree of uncertainty in public school budgets as a result of growing deficits around the peak of the recession or the public emphasis on teacher accountability which was taking hold at this time.[11] Non-profit and government workers experienced less of a decline in job security than either teachers or non-teachers overall.

<B>***How has Teachers' Reported Job Satisfaction Varied over Time for Different Types of Teachers and across Different School Contexts?***

Finally, in keeping with our exploration of teacher academic ability scores, we examine whether teachers of different ability levels, demographic groups, roles, or school contexts saw differentially trends in job satisfaction in during this period. As shown in Table 3, we find that black and Hispanic teachers were less likely to report job satisfaction overall in both the 2000 and 2008 cohorts, when controlling for teacher gender, ability levels, and school levels. The magnitude of this difference is apparent in a descriptive comparison of the two groups. While the

[11] California, for example, experienced a particularly steep decline in new teachers' job satisfaction in 2008-09, with job security satisfaction rates going from 91% in 2000-01 to 38% in 2008-09, as shown in appendix Figure A-3. This sharp decrease in reported job security among new teachers in California corresponds to the substantial shortfall in public school funds that educators and policymakers anticipated during the 2008-09 school year in particular (The Associated Press 2009).

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majority of black and Hispanic teachers report being satisfied with their job in each cohort (89 and 78 percent, respectively), they are less likely to be satisfied than white teachers in the same cohort (95 and 86 percent, respectively). [12][13] We do not, however, observe that teachers' academic skills predict either higher or lower job satisfaction in any period.

[TABLE 3 HERE]

In line with our previous finding of reduced teacher ability levels in private elementary schools, we see a marked decrease in the likelihood that private elementary teachers will be satisfied with their job overall and with job pay between the two periods. While these teachers were similarly likely to be satisfied in the 2000 cohort, incoming private elementary teachers in the 2008 cohort were significantly less likely to be satisfied with their job pay and significantly less likely to be satisfied with their job overall compared to their peer teachers in public elementary schools.

In a similar vein, we see a substantial difference in teacher satisfaction in high-minority schools in urban versus non-urban settings as of the 2008 cohort. Urban high-minority school teachers appear to be trending higher in both their job and pay satisfaction. In contrast, teachers in non-urban high-minority settings report lower job satisfaction than teachers in schools that serve fewer minority students. Teachers in urban high-minority schools report overall job satisfaction with odds roughly twice that of either teachers in high-minority non-urban schools or of teachers in urban schools that serve fewer minority students. These results suggest that the changes we observe in urban high-minority schools' capacity to recruit more talented teachers

[12] These results are consistent with Ingersoll and May (2011), who also provide evidence that minority teachers are more often hired into more challenging work environments.
[13] Results are virtually identical in a model that includes addition controls for school context, including urbanicity and high-minority and high-poverty contexts that we ran as an additional specification check.

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correspond to other material changes in the job that have simultaneously buttressed teachers' satisfaction with their work.

[TABLE 4 HERE]

<A>5. Discussion and Conclusion

The ability of K-12 schools to recruit and retain an academically skilled teacher workforce is a barometer of the health of the teaching profession in the United States. In this study, we utilize cross-sectional data over a fifteen-year period to examine the career decisions and job experiences of recent college graduates entering teaching. We highlight changes over time in who chooses to teach, where they teach, and how satisfied they are once they enter the profession, and consider these results in light of factors including the prevailing economic conditions and evolving K-12 education policies. We expand upon previous research on new college graduates entering teaching by considering measures of both teacher academic quality and job satisfaction, and by identifying substantial heterogeneity in our results across teacher demographics, types of school organizations, and teaching assignments.

We observe teachers during a time of substantial increase in test-based accountability for schools; however, the time points are also relatively unique economic periods of low unemployment (in 2000) and emerging recession (2008). Data from these periods can offer valuable evidence regarding employment patterns and working conditions for teachers under differing economic contexts, but may also affect our ability to infer broader trends in teacher recruitment and satisfaction due to policy changes.

Among the 1993, 2000, and 2008 cohorts, we find that incoming teachers' test scores were highest for the graduating class of 2008, who entered teaching at a time of greater accountability as well as rapidly rising unemployment rates associated with early stages of the

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"Great Recession," while scores were lowest for the graduating class of 2000, who entered teaching in the midst of the tech-boom of the early 2000's. Consistent with prior research, the decisions of whether to enter teaching for men and individuals with higher test scores fluctuate more dramatically than do those of other college graduates (Guarino, Santibañez, and Daley 2006). The uptick in the 2008 class is in line with previous research (Goldhaber and Walch 2013; Lankford et al. 2014), and is promising, potentially reflecting a greater recruitment effort. The patterns may also reflect the role of the economy and the increasing relative appeal of teaching as other job opportunities become more difficult to find. Yet, even if the economic changes drove the observed increases in the academic ability and relative satisfaction of new teachers, the results provide evidence that the substantial policy changes in accountability did not have a great enough negative effect, if their effect was negative at all, to lead to lower likelihood of attracting academically skilled college graduates to teaching.

While the academic ability level of incoming teachers shifted substantially over the period of our study, teachers retained a relative advantage over non-teachers in terms of their job satisfaction rates. Teachers tended to be more satisfied with their jobs overall than graduates going into other careers, and this advantage persisted across both the 2000 and 2008 cohorts. These results are consistent with other research indicating robust teacher job satisfaction through the post-NCLB period (Grissom, Nicholson-Crotty, and Harrington 2014; Sun, Ye, and Saultz 2014). Moreover, while other recent graduates saw a decline in their job pay satisfaction between those two periods, teachers' pay satisfaction was unchanged or even improved somewhat. The relative inelasticity of teacher pay scales may be an appealing attribute during challenging economic times. On the other hand, new teachers experienced a greater decline in their reported job security between the 2000 and 2008 cohorts than non-teachers, perhaps due to the decline in

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public financing of education during the recession period or an increase in accountability. Particularly given that the studied sample includes new (un-tenured) teachers, they often feel less secure in their jobs than veteran teachers, because under the Collective Bargaining Agreement and when layoffs do happen due to the financial downturn, the "last hired, first fired" provisions make seniority the determining factor for which teachers are laid off (Goldhaber and Theobald 2013). The impact of education-specific policies may also help to explain why teacher job security dropped substantially in the early stages of the Great Recession, while non-profit and government workers' job security did not register the same decline.

Aggregate shifts in new teachers' academic skills and job satisfaction rates mask substantial variation in where academically skilled new teachers are teaching and where they report being more satisfied with their jobs. We observe a large increase in the number of new teachers with very high academic ability teaching in urban schools that serve predominantly non-white students and have historically been among the hardest to staff (Lankford, Loeb, and Wyckoff 2002). The increasing competitiveness of teacher hiring in high-minority urban schools may be the result of intentional efforts by districts and educational organizations in the post-NCLB period. One example is the growth of alternative pathways such as Teach for America that recruited an increasing number of high-ability teachers into hard-to-staff districts during this period.[14] Another example is The New Teacher Project that became active in partnership with large urban school districts to improve their hiring and recruiting process by filling vacancies earlier and working with district human resources staff to shape district policies. In addition, the

[14] Teach for America (TFA) recruits primarily teachers of very high academic ability and places many of their teachers in high-poverty urban school settings. Their efforts may have played a meaningful – but likely not the only – role in the increasing numbers of very high-scoring teachers entering high-minority urban schools. For instance, 3,600 new TFA teachers entered a mix of urban and non-urban schools in 2008, compared to our estimate of around 18,000 total new teachers recruited by high-minority urban schools nationwide from the 2008 cohort of college graduates.

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observed patterns may have resulted in part from the expansion of charter schools, which are most prevalent in urban settings and which may be more likely than regular public schools to recruit recent college graduates into teaching (Epple, Romano, and Zimmer 2015).

The study results highlight the uneven distribution of teacher academic quality. While urban high-minority schools' incoming teachers are increasingly more academically skilled, we observe persistent and substantial disparities in new teachers' academic ability and job satisfaction in non-urban high-minority schools. In addition, even as the ability scores of new teachers have improved, the diversity of the incoming teaching workforce and in particular the hiring of black and Hispanic college graduates into teaching has dropped off as of 2008. Moreover, once hired, minority teachers report substantially lower job satisfaction rates than other teachers, a trend that has been consistent over time. Preparing and supporting an academically skilled and diverse teacher workforce as a whole remain as a pressing issue.

This study is descriptive in nature. We do not explicitly evaluate potential drivers of change in teachers' academic ability levels or job satisfaction, and, thus, can only speculate as to the underlying causes of the trends that we observe in incoming teachers. In addition, the specific cohorts that we examine correspond to varying economic and labor market circumstances and thus the trends we observe may be the result economic as well as policy forces. We lack sufficient data to assess whether the shifts toward increased academic ability levels and relative job satisfaction among incoming teachers are likely to continue over time and across changing economic circumstances. Nevertheless, the patterns that we observe at both the aggregate level and within high-minority urban schools suggest that efforts by policy makers and practitioners over the past two decades to bolster the recruitment of academically skilled college graduates into teaching may in fact be bearing fruit.

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Tables

Table 1. Predicting New Teachers' SAT Percentiles as a Function of Their School Type, Grade, and Subject area

	1993 Cohort		2000 Cohort		2008 Cohort	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Secondary Grades	8.308**	7.680*	8.150***	6.232*	6.378**	5.049*
	(3.319)	(3.393)	(2.645)	(2.796)	(2.704)	(2.927)
STEM Secondary	5.424	5.435	6.945*	8.998**	9.758***	9.512***
	(4.288)	(4.282)	(3.207)	(3.182)	(3.399)	(3.422)
Private Schools	9.348***	7.09	7.160*	-0.805	0.217	-4.585
	(3.406)	(5.427)	(4.725)	(6.214)	(2.92)	(3.594)
Private Secondary Schools		4.88		16.952*		8.638
		(9.013)		(7.001)		(5.742)
N of teachers	710		1,150		1,160	

Note. ACT scores are used in cases where SAT test score data were unavailable. Analysis excludes teachers who did not take either the SAT or ACT or for whom test score data were unavailable. SAT/ACT Percentile ranks are relative to all college graduates in each cohort. Missing values of exploratory variables were imputed using a multiple imputation procedure detailed in Appendix B. STEM = Science and math teachers in secondary grades 7-12. Our analyses utilize the sampling weights and the Balanced Repeated Replication (BRR) weights appropriate to each of the individual B&B samples. Sample sizes rounded to the nearest 10.
Standard errors are included in the parentheses.
*** p<0.001, ** p<0.01, * p<0.05, † p<0.1.

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Table 2. Predicting New Teachers' SAT Percentiles as a Function of Their School's Locale and Students Served

	1993 Cohort		2000 Cohort		2008 Cohort	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Urban Schools	2.313	6.300†	2.210	-1.852	1.364	-6.323*
	(3.100)	(3.574)	(3.385)	(3.295)	(2.925)	(3.164)
Rural Schools	-3.302	-3.010	-2.839	-2.951	-3.219	-4.132
	(3.109)	(3.089)	(2.697)	(2.720)	(2.733)	(2.653)
High-poverty Schools	-3.967	-3.943	-3.645	-3.194	-2.911	-3.001
	(2.963)	(2.950)	(5.356)	(5.350)	(3.798)	(3.479)
High-minority Schools	-3.761	1.648	-8.894***	-15.948***	3.311	-5.075
	(3.775)	(4.685)	(3.973)	(5.500)	(3.527)	(3.591)
High-minority Urban Schools		-12.38		14.138*		19.355***
		(7.818)		(7.151)		(5.507)
N of teachers	710		970		1,150	

Note. ACT scores are used in cases where SAT test score data were unavailable Analysis excludes teachers who did not take either the SAT or ACT or for whom test score data were unavailable. SAT/ACT Percentile ranks are relative to all college graduates in each cohort. Missing values of exploratory variables were imputed using a multiple imputation procedure detailed in Appendix B. High-minority schools are defined as schools with >66% minority students. High-poverty schools are defined as schools in the top tercile in each period in terms of the proportion of students eligible for subsidized lunches. Our analyses utilize the sampling weights and the Balanced Repeated Replication (BRR) weights appropriate to each of the individual B&B samples. Sample sizes rounded to the nearest 10.
Standard errors are included in the parentheses.
*** p<0.001, ** p<0.01, * p<0.05, † p<0.1.

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Table 3. Predicting the Likelihood of a Teacher Being Satisfied with Their Job Overall, Their Job Pay, or Their Job Security, as a Function of School Type, Teacher Role and Teacher Characteristics

	2000 Cohort			2008 Cohort		
	Job Overall	Job Pay	Job Security	Job Overall	Job Pay	Job Security
Secondary teachers	1.188	0.96	1.603	0.748	1.075	0.646*
STEM Secondary	0.864	0.916	0.749	1.231	0.903	1.606†
Private Schools	1.541	1.113	1.198	0.390*	0.193***	1.57
Private Secondary	0.888	0.794	0.86	1.162	5.043***	0.594
Teacher SAT / ACT Percentile	0.993	1.005	0.995	0.999	1.000	0.998
Male Teachers	0.598	1.343†	1.123	1.242	1.374	1.403
Black or Hispanic Teachers	0.358***	0.803	0.715	0.539*	0.937	0.576*
N of teachers		1,410			1,330	

Note. The table presents the results of logit estimations in which the dependent variable is an indicator for being satisfied (1=satisfied, 0=dissatisfied). The results are expressed in odds ratios. STEM = Science and math teachers in secondary grades 7-12. Missing values of exploratory variables were imputed using a multiple imputation procedure detailed in Appendix B. Our analyses utilize the sampling weights and the Balanced Repeated Replication (BRR) weights appropriate to each of the individual B&B samples. Sample sizes rounded to the nearest 10.
*** p<0.001, ** p<0.01, * p<0.05, † p<0.1.

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Table 4. Predicting the Likelihood of a Teacher Being Satisfied with Their Job Overall, Their Job Pay, or Their Job Security, as a Function of School Context

	2000 Cohort			2008 Cohort		
	Job Overall	Job Pay	Job Security	Job Overall	Job Pay	Job Security
Urban Schools	0.846	0.769	0.792	0.552†	0.608*	1.110
Rural Schools	0.689	0.875	0.652	0.680	0.984	1.472
High-minority Schools	1.308	1.034	1.160	0.519*	0.767	1.125
High-minority Urban Schools	0.696	1.065†	1.210	4.088*	2.278*	1.333
Teacher Characteristic Controls	Yes	Yes	Yes	Yes	Yes	Yes
N of teachers		1,190			1,230	

Note. The table presents the results of logit estimations in which the dependent variable is an indicator for being satisfied (1=satisfied, 0=dissatisfied). The results are expressed in odds ratios. High-minority schools are defined as schools with >66% minority students. Teacher characteristic controls include indicators for race, and gender. Missing values of exploratory variables were imputed using a multiple imputation procedure detailed in Appendix B. Our analyses utilize the sampling weights and the Balanced Repeated Replication (BRR) weights appropriate to each of the individual B&B samples. Sample sizes rounded to the nearest 10.
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Figure Titles

Figure 1. SAT/ACT Percentile Ranks of Recent College Graduates Entering Teaching, Overall and by Subject Area

Figure 2. Distribution and Mean of SAT/ACT Percentiles for Recent College Graduates Entering Teaching

Figure 3. SAT Percentile Ranks of Graduates Entering Teaching, by Gender and Race

Figure 4. SAT Percentile Ranks of New Teachers at Public and Private Elementary Schools, by Cohort

Figure 5. SAT Percentile Ranks of New Teachers at High-minority Urban Schools, by Cohort

Figure 6. Percent of Recent Graduates Reporting Satisfaction with their Job Overall, Job Pay, and Job Security, by Cohort and Job Type

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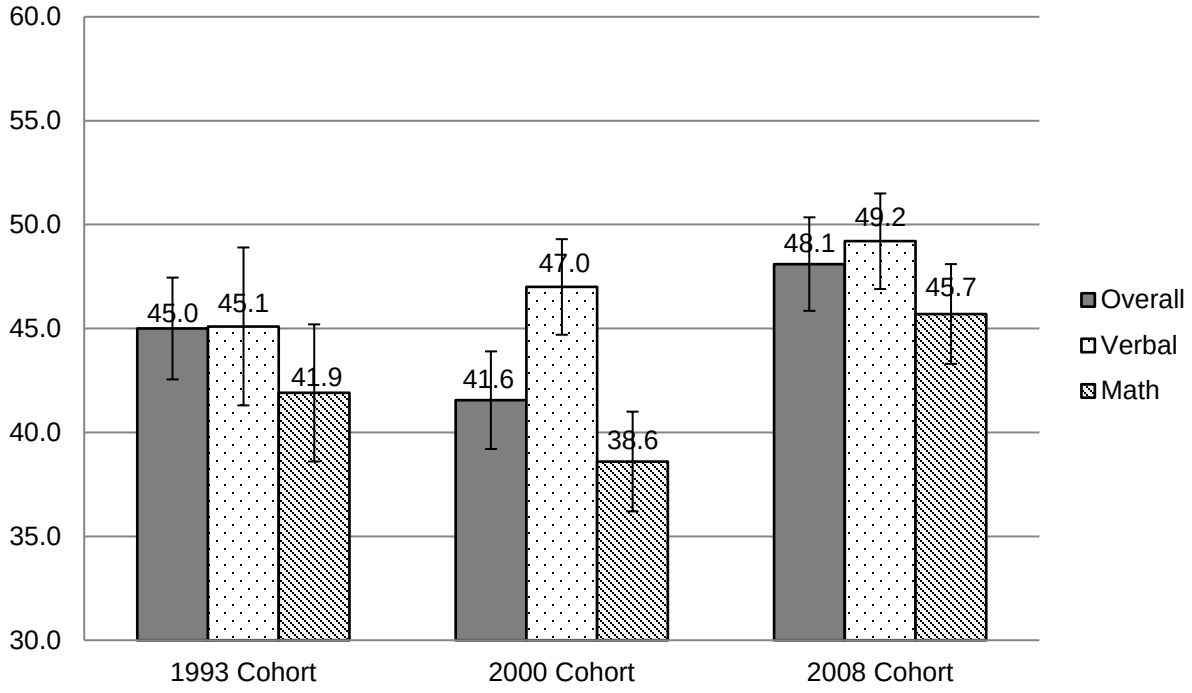
Teacher Workforce Developments:

Recent Changes in Academic Competiveness and Job Satisfaction of New Teachers

Figures:

Figure 1. SAT/ACT Percentile Ranks of Recent College Graduates Entering Teaching, Overall and by Subject Area



Note: The overall includes the average of verbal and math. The error bars indicate the 95% confidence intervals. Percentile ranks are relative to all college graduates in each cohort. ACT scores are used in cases where SAT test score data were unavailable. Sample of 1993 cohort graduates with available by-subject data is a subset of the sample for overall scores, due to missing data on by-subject ACT in 1993. Data points in all cells represent >10 observations.

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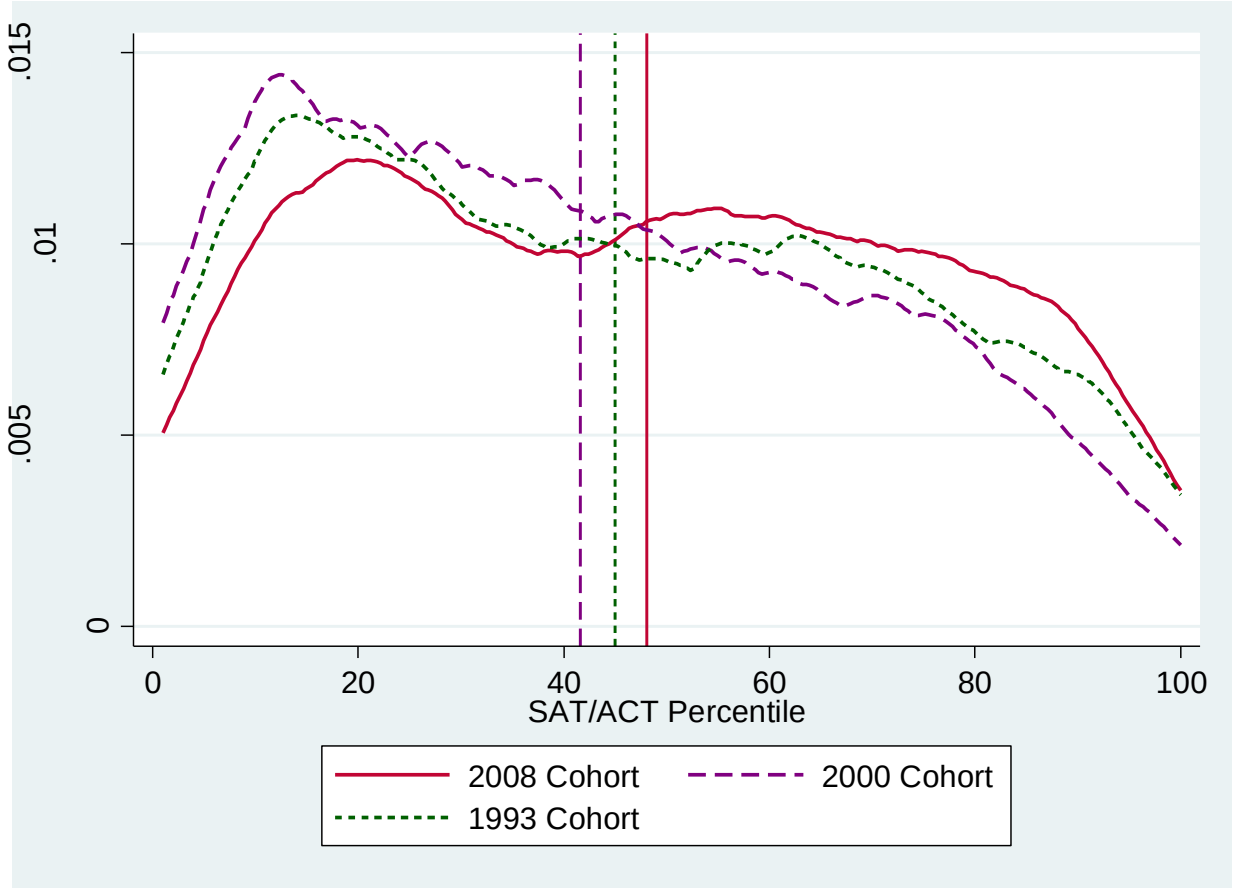
Figure 2. Distribution and Mean of SAT/ACT Percentiles for Recent College Graduates Entering Teaching



Note: Percentile ranks are relative to all college graduates in each cohort. ACT scores are used in cases where SAT test score data were unavailable. Data points used to estimate means all include >10 observations.

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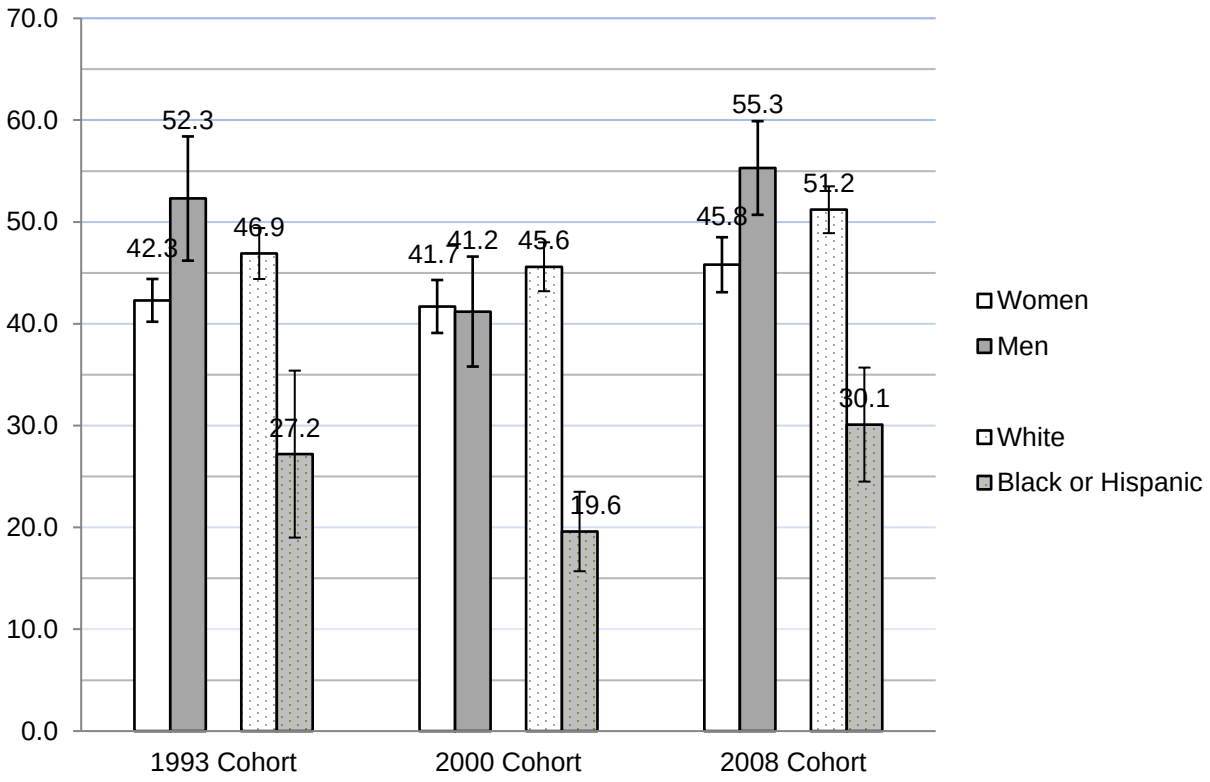
Figure 3. SAT Percentile Ranks of Graduates Entering Teaching, by Gender and Race



Gender and Race of Graduates Working in Teaching

% Male (Teachers)	27.1%	26.6%	24.2%
% White (Teachers)	85.7%	76.3%	78.6%
% Black or Hispanic (Teachers)	11.8%	21.2%	15.7%
% Black or Hispanic (All Professions)	11.3%	17.0%	18.5%

Note: The bar chart shows the trends in teachers' SAT percentile ranks by gender and race. The averages are labeled on the top of bars and the error bars indicate the 95% confidence intervals. ACT scores are used in cases where SAT test score data were unavailable.

The table underneath the bar chart shows the percentage of graduates working in teaching by gender and race. We also compare the ethno-racial composition of teachers to that of all professions. Data points in all cells represent >10 observations.

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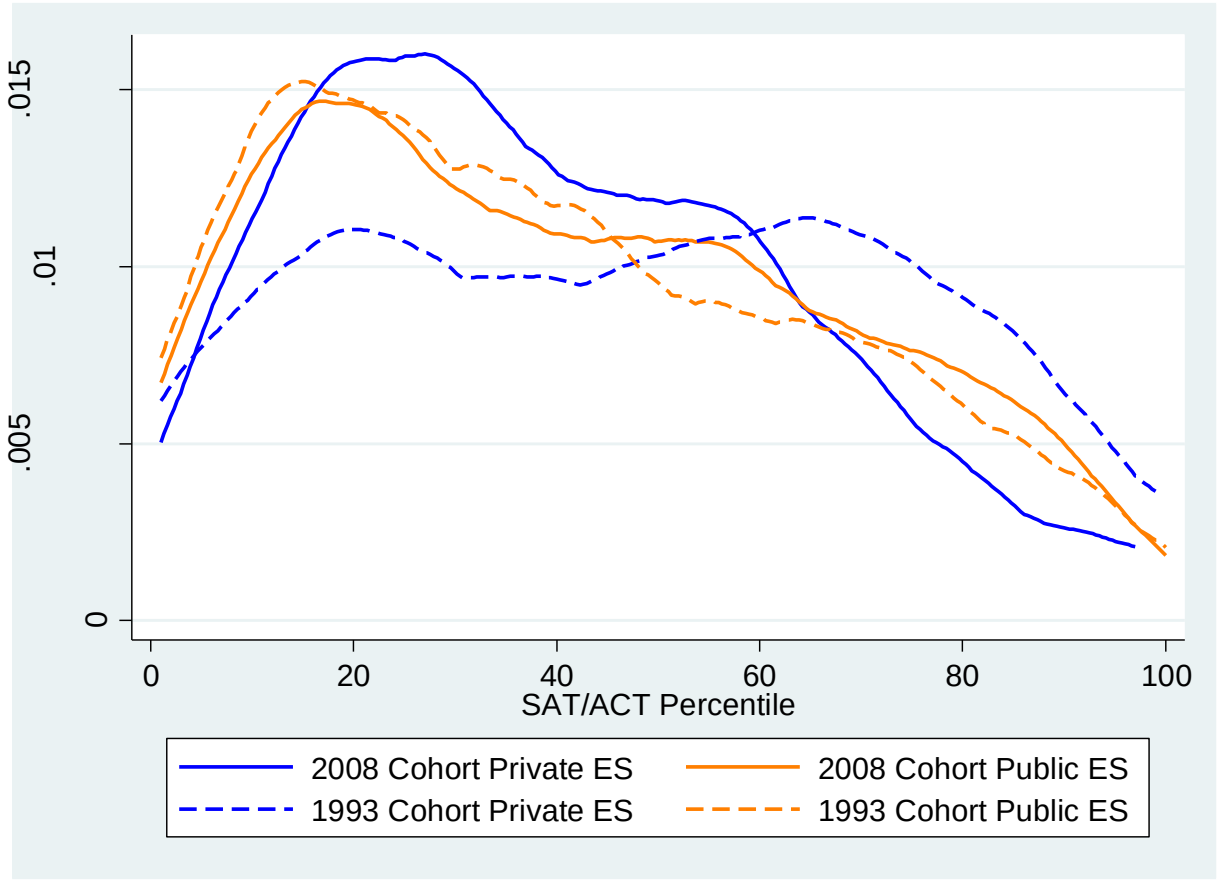
Figure 4. SAT Percentile Ranks of New Teachers at Public and Private Elementary Schools, by Cohort



Note. Percentile ranks are relative to all college graduates in each cohort. ACT scores are used in cases where SAT test score data were unavailable. ES = Elementary Schools.

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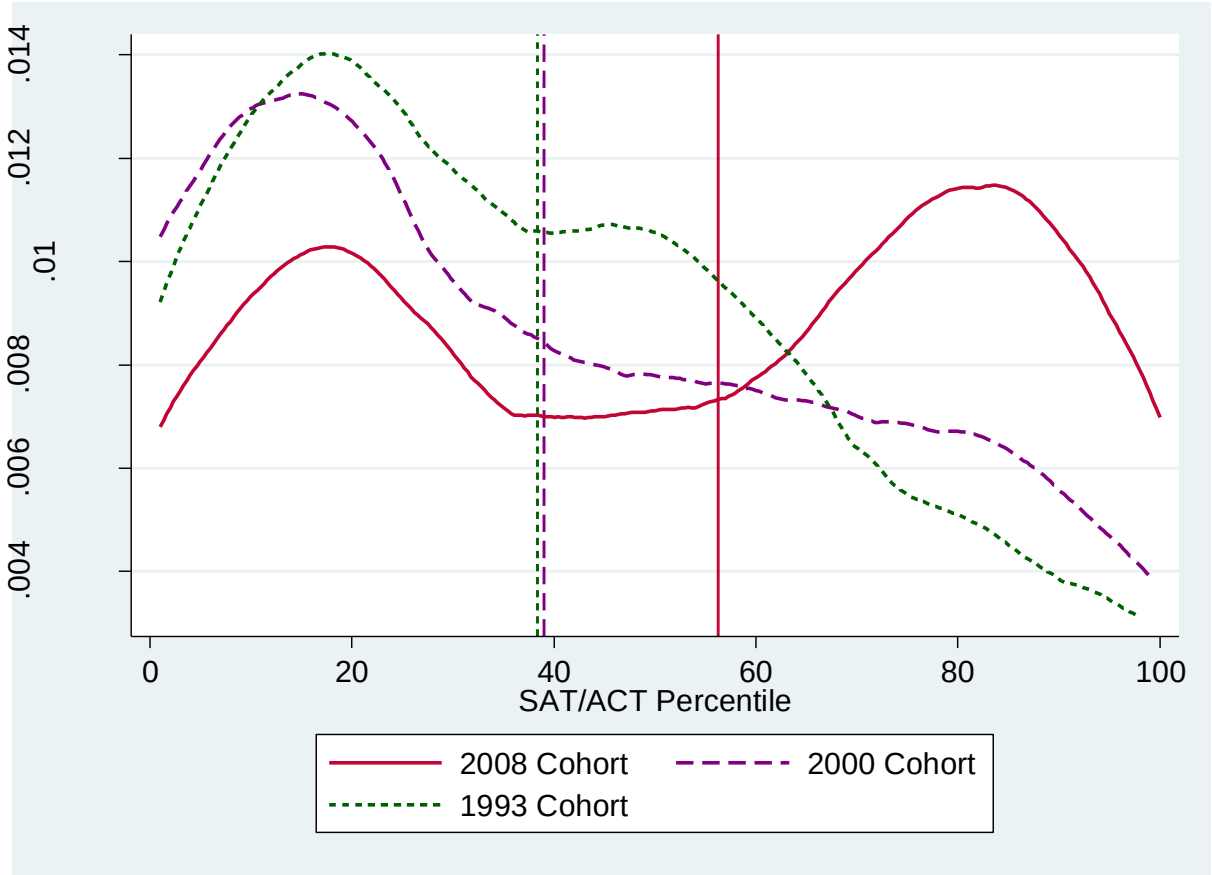
Figure 5. SAT Percentile Ranks of New Teachers at High-minority Urban Schools, by Cohort



Note. Percentile ranks are relative to all college graduates in each cohort. ACT scores are used in cases where SAT test score data were unavailable. High-minority schools are defined as schools serving >66% non-white students. Data points used to estimate means all include >10 observations.

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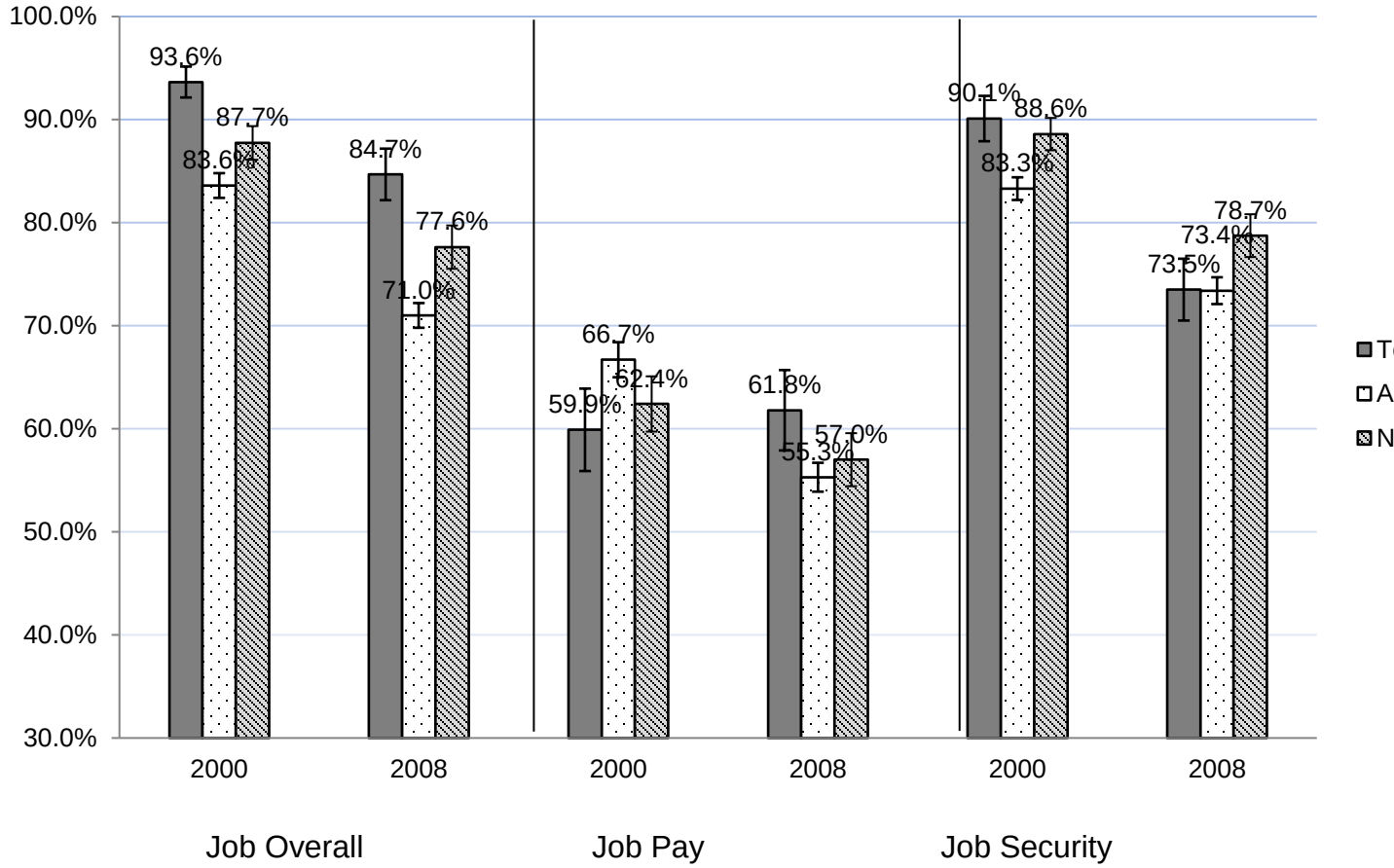
Figure 6. Percent of Recent Graduates Reporting Satisfaction with their Job Overall, Job Pay, and Job Security, by Cohort and Job Type



Note. The bars indicate the percentages of teachers and other professionals who reported being satisfied with their job overall, job pay, and job security. The error bars indicate the 95% confidence intervals. Data points in all cells represent >10 observations.

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Appendix A. Additional Tables and Figures

Table A-1. Proportion of Missing Observations for Each Independent Variable Used in Our analyses, by Cohort

	1993 Cohort	2000 Cohort	2008 Cohort
Teacher SAT / ACT Ability Score	0.310	0.239	0.175
School Sector (Public or Private)	0.124	0.200	0.076
School Poverty (% Eligible for Lunch Subsidies)	0.201	0.503	0.214
School % Minority Students	0.099	0.196	0.081
School Locale (e.g. Urban, rural, other)	0.222	0.198	0.077
School Level (Elementary or Secondary)	0.258	0.039	0.076

Note. Independent variables that had no missing data are not shown. Missing SAT scores include individuals who did not take the SAT or ACT and individuals for whom testing data are unavailable.

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Table A-2. Descriptive Statistics for Observations with and without Any Missing School Characteristic Data, by Cohort

	1993 Cohort			2000 Cohort			2008 Cohort		
	Missing Data	Non-Missing	T-test p-value	Missing Data	Non-Missing	T-test p-value	Missing Data	Non-Missing	T-test p-value
Teacher Proportion Male	0.288	0.256	0.253	0.292	0.238	0.130	0.241	0.242	0.978
Teacher Proportion White	0.855	0.859	0.906	0.736	0.793	0.071	0.739	0.799	0.159
Teacher Proportion Black or Hispanic	0.112	0.123	0.733	0.232	0.190	0.183	0.182	0.150	0.377
Teacher SAT / ACT Percentile	47.8	42.8	0.022	43.3	39.7	0.148	47.5	48.3	0.774

Note. For simplicity, observations are categorized as missing data if they were lacking data about school sector, school locale, school level, school proportion minority students, or school proportion of students eligible for lunch subsidies. T-tests examine the statistical significance of differences in means between individuals with and without missing data from any of these school characteristics in each cohort.

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List of Figures in Appendix A

Figure A-1. SAT Percentile Ranks of New Non-Black and Non-Hispanic Teachers at High-minority Urban Schools, by Cohort

Figure A-2. SAT Percentile Ranks of New Black or Hispanic Teachers at High-minority Urban Schools, by Cohort

Figure A-3. Satisfaction with Job Security, California Compared to Other States

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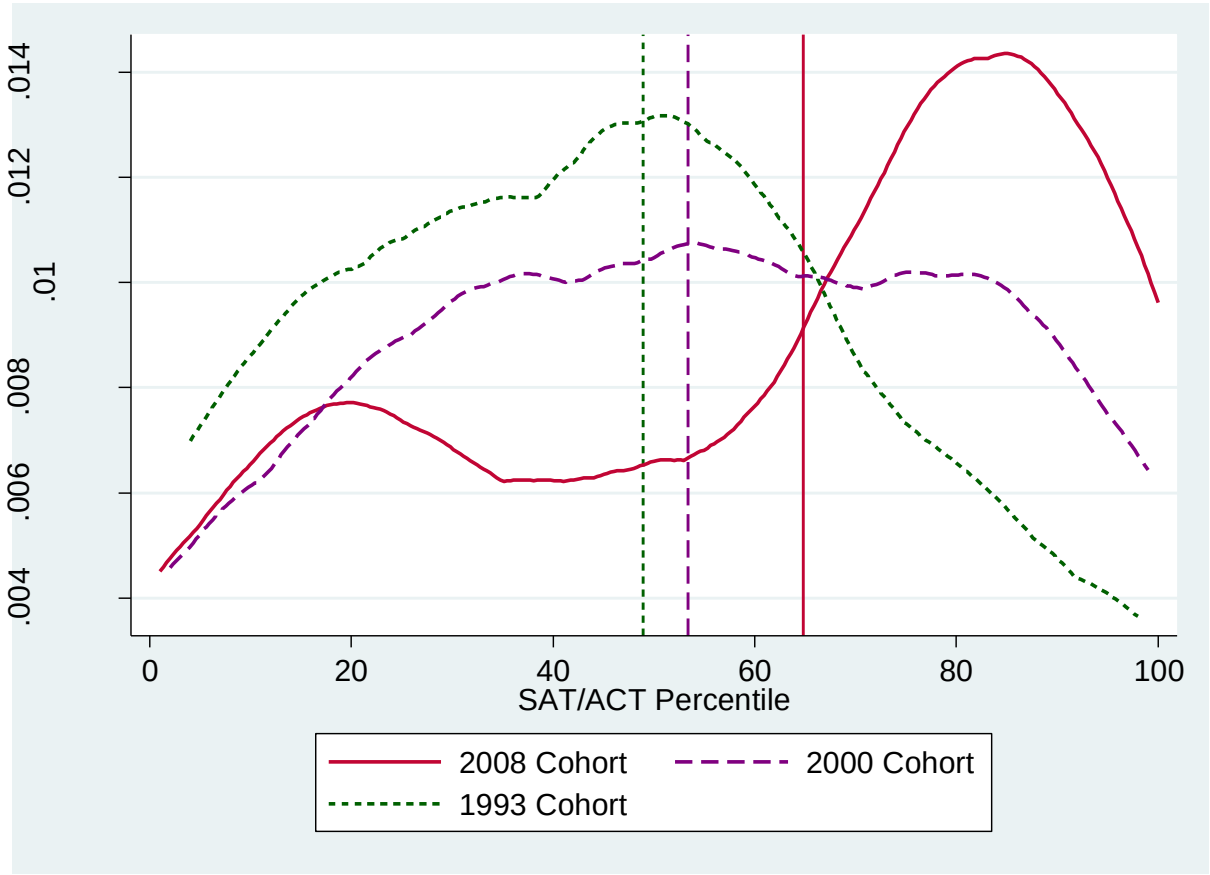
Figure A-1. SAT Percentile Ranks of New Non-Black and Non-Hispanic Teachers at High-minority Urban Schools, by Cohort



Note. Percentile ranks are relative to all college graduates in each cohort. ACT scores are used in cases where SAT test score data were unavailable. High-minority schools are defined as schools serving >66% non-white students. Data points used to estimate means all include >10 observations.

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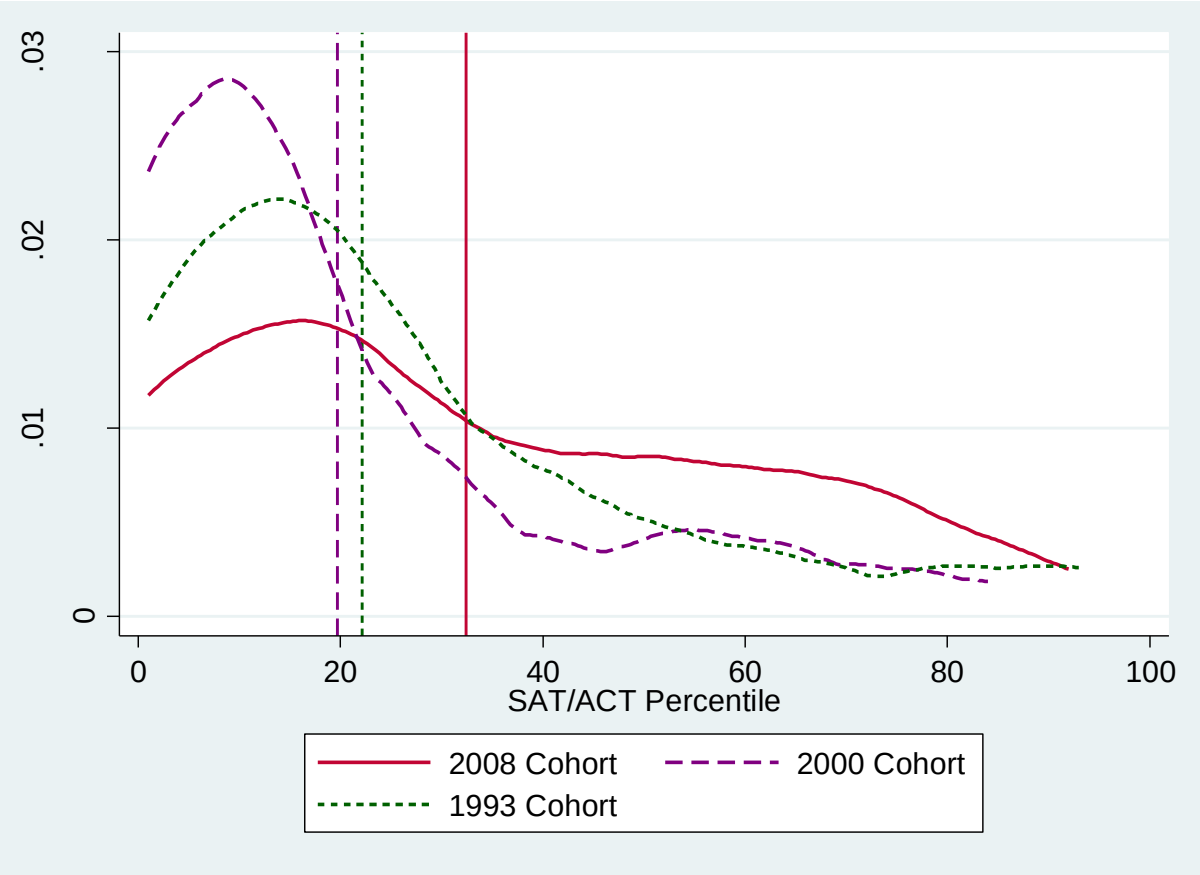
Figure A-2. SAT Percentile Ranks of New Black or Hispanic Teachers at High-minority Urban Schools, by Cohort



Note. Percentile ranks are relative to all college graduates in each cohort. ACT scores are used in cases where SAT test score data were unavailable. High-minority schools are defined as schools serving >66% non-white students. Data points used to estimate means all include >10 observations.

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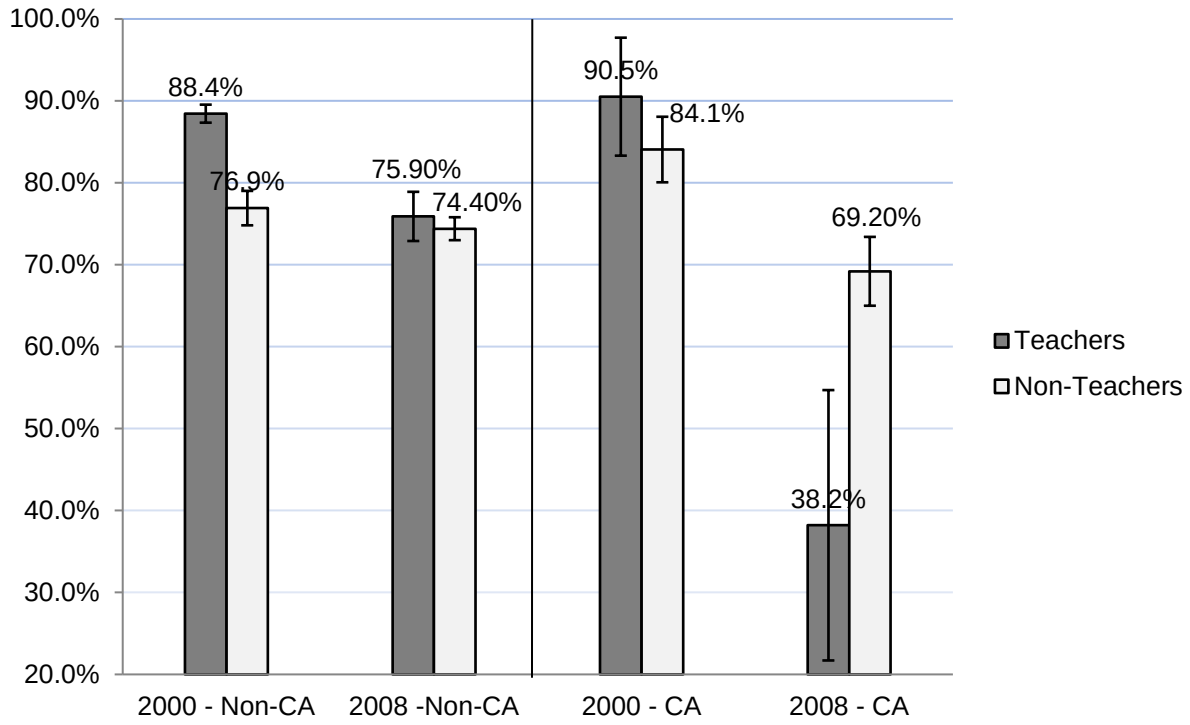
Figure A-3. Satisfaction with Job Security, California Compared to Other States



Note. The bars indicate the percentages of teachers and other professionals who reported being satisfied with their job security. The error bars indicate the 95% confidence intervals. Data points in all cells represent >10 observations.

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Appendix B. Description of Multiple Imputation Approach to Dealing with Missing Data

Values for some measures of teacher characteristics and school context are missing in each wave due to nonresponse or challenges associated with linking extant data sets. The percentage of missing on teacher characteristics averages around 5% in the 2008 cohort, 13% in 2000, and 15% in 1993. The percentage of missing on school characteristics is, on average, about 20% across these three waves, except that the number of schools missing free and reduced-price lunch data was around 50% in the 2000 cohort. We use multiple imputation (MI) to fill in missing data, following the methods implemented in the Stata- ice- package by Royston (Royston, 2004). This appendix describes the multiple imputation procedure that we use.

We impute five datasets, estimate the models separately for each data set, and combine the estimates. When choosing variables to include in the imputation stage, we include any other variables that provide information either about the true values of the missing data or about their probability of being missing, including the dependent variables. We use logit models for binary variables and OLS regression for continuous variables. The estimation only uses imputed values of explanatory variables, *not* imputed values of the dependent variables (e.g., teachers' SAT percentiles and their job satisfaction), in order to reduce the risks of overestimating model fit and regression estimates. We then combine the estimates across these five samples using Rubin (1987)'s method. All imputation and estimation procedures account for complex survey data by applying both sampling weights and the Balanced Repeated Replication (BRR) weights appropriate to each of the individual B&B samples.