Will Mid-career Entrants Help Avert a Teacher Shortage, Reduce Racial and Gender Imbalances, and Fill Vacancies in Hard-to-staff Subjects and Schools?

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Introduction

Facing an imminent, predicted public school teacher shortage, many researchers contend that expanding the teacher workforce and increasing rates of teacher retention are urgent policy objectives (Haselkorn & Hammerness, 2008; Gordon, Kane, & Staiger, 2006; Feistritzer, 2005; Ingersoll, 2001**)**. "The bottom line is rather stark," report Gordon, Kane, & Staiger (2006), "simply to maintain pupil-teacher ratios, we must increase the number of people entering teaching by roughly 35 percent—back to levels not seen since the cohorts that came out of high school in the 1960s." Increasingly, experts identify "mid-career entrants" to teaching—teachers who enter the profession after having worked in one or more prior occupations—as a source of teacher supply that public schools must tap if they are to avert a staffing crisis (*National Commission on Teaching and America's Future* [*NCTAF*], 2007; *American Competitiveness Initiative* [ACI], 2006; Gordon, Kane, & Staiger, 2006). In addition to their potential as a source of teacher supply, mid-career entrants have been heralded for their interest in working in hard-to-staff, urban schools (Natriello & Zumwalt, 1993) and their ability to help reduce the racial and gender imbalances that exist between teachers and students in U.S. public schools by bringing more males and minorities into teaching (Haselkorn & Hammerness, 2008; Feistritzer, 2005; Ruenzel, 2002; Shen, 1997, 1998).

Given mid-career entrants' potential to help solve a number of problems facing public education, numerous organizations—such as state departments of education, philanthropic entities, and graduate schools—have launched efforts to recruit mid-career entrants to teaching and prepare them for their work in schools. However, these initiatives have largely been created in the absence of nationally representative research that addresses the most basic questions about

mid-career entrants, such as how many are already entering teaching and what personal and professional characteristics they are bringing with them to their schools. Haselkorn and Hammerness (2008) stress the importance of addressing these basic questions when they write, "Researchers need to confirm the numbers of entering mid-career teachers nationally… They need to learn more about the racial and ethnic diversity of these candidates. They need to understand what kind of prior experiences career-changers have had…" (p. 35).

The answers to these basic questions may have profound implications for policies and practices that are meant to recruit, prepare, and retain teachers in the face of an impending teacher shortage. For instance, more detailed information about the trend in the percentage of mid-career teachers entering the profession in recent years might allow policymakers to provide more accurate estimates of the extent to which mid-career recruits will help solve future shortages. Teacher licensure programs might use information about the trends in mid-career entrants' enrollment into teaching to help them determine how to best allocate their resources and align their curricula to meet the needs of both older, professionally experienced mid-career entrants and younger first-career entrants, who typically enter teaching directly out of college. Information about mid-career entrants' professional backgrounds might help schools anticipate the skills and knowledge that mid- and first-career entrants are likely to bring to teaching and the supports or opportunities that these types of new teachers will need to be successful in their new careers and to remain committed to teaching over time. In addition, assessing the accuracy of policymakers' assumptions that mid-career entrants are more likely than first-career entrants to be male and from minority backgrounds (see the research summarized in Haselkorn & Hammerness, 2008) will help determine whether policies aimed at recruiting mid-career entrants

to teaching are likely to reduce the gender and racial imbalances that have detrimental effects on student outcomes (Dee, 2005).

In this study, I use a linear contrast methodology and national, cross sectional data from five administrations of the *Schools and Staffing Surveys* (1987-88, 1990-91, 1993-94, 1999-00, and 2003-04) to address three foundational questions about mid-career entrants:

1. What are mid-career entrants' personal and professional characteristics and how have these characteristics changed since the mid-1980s?

2. Has the probability that a first-year public school teacher is a mid-career entrant increased since the mid-1980s? And, if so, do trends in the percentage of mid-career entrants among first-year teachers differ by gender and race?

3. What role, if any, have mid-career entrants played in reducing gender and racial imbalances among new teachers? Given the trends in mid-career entrants' gender and racial characteristics, what role are mid-career entrants likely to play in reducing gender and racial imbalances in the future?

From my analysis, I present the first nationally representative descriptive information about mid-career entrants' personal and professional characteristics, including their average age, gender, race, former career, and the types of school (school level and school community) where they teach. To assess the legitimacy of policymakers' expectations that mid-career entrants will help avert a staffing crisis and reduce the gender and racial imbalances in teaching, I examine the nature of trends in first-year mid-career entrants' enrollment rates and in their gender and racial characteristics over the 16-year period of observation.

Overall, I found that the percentage of mid-career entrants among first-year teachers nearly doubled—from 20% to 39%—between 1987-88 and 2003-04. Supporting both policymakers' assumptions and findings from local and state-level studies, I discovered that mid-

career entrants were more likely than first-career entrants to be male and from minority, non-White racial/ethnic backgrounds. Nonetheless, I found that the increasing percentage of mid-career entrants in the new teacher workforce has not ameliorated the gender imbalance among first-year teachers and is not likely to do so in the future given the historic trends in the percentage of mid- and first-career entrants who are male. Mid-career entrants appear to have played a partial role in slightly reducing the racial imbalance among first-year teachers. I found that most of mid-career entrants' personal and professional characteristics—such as their average age, former career, and the level of the schools where they taught—did not change substantially over the 16-year period of observation. Those aspects of their backgrounds and preferences that did change over time, such as their movement from teaching in small towns and rural areas to teaching in urban and suburban settings, were mirrored by first-career entrants and thus seem likely to result from larger societal changes in urbanicity than from an increasing preference among mid-career entrants to work in urban settings. My research supports, extends, and challenges the findings from previous studies and a number of policymakers' key assumptions about mid-career entrants.

Background and Context

Mid-career entrants' presence in the public school teacher workforce is a relatively recent phenomenon, first observed in the mid-1980s when graduate school admissions officers discovered that applicants to teacher preparation programs were becoming increasingly older and more experienced (Novak and Knowles, 1992; Crow, Levine, & Nager, 1990; Tift, 1989). This suggested that a notable shift was occurring in the composition of the new teacher workforce. In the three prior decades, most new teachers entered the profession right out of college and

remained in teaching for the duration of their career (Spencer, 2001; Grant & Murray, 1999; Murnane, Singer, Willett, Kemple, & Olsen, 1991; Rury, 1989).

Systematic evidence that emerged subsequently supported admissions officers' anecdotal observations. For instance, Feistritzer (1999) reported that, between the mid-1980s and late-1990s, the number of teacher preparation programs that enrolled post-baccalaureate applicants jumped from 3% to over 25%. Broughman & Rollefson (2000) reported that the percentage of newly hired "delayed entrants"[1] increased from 9.3% of the public school teaching force in 1987-'88 to 15.3% in 1990-'91 and to 16.6% in 1993-'94. More recently, Johnson et al. (2004) found that, in randomly drawn samples of first- and second-year public school in seven U.S. states, between 28% and 47% were mid-career entrants, depending on the state.

Historically, policymakers have been interested in both the role that mid-career entrants can play in staffing public schools and in their potential for improving the quality of teaching and learning in the schools where they teach. Much of this interest has been driven by the mathematics and science community, which has suggested that mid-career entrants might help address both the persistent shortages of qualified teachers in these subject areas and the poor student performance that have plagued public school mathematics and science education in the post-Sputnik era (*American Competitiveness Initiative*, 2006; *National Academies Press*, 2000, 2005; *NCMST*, 2000; Natriello & Zumwalt, 1992).

Despite these grand expectations, there is not a substantial body of research on mid-career entrants. Much of what little we do know comes from state-specific studies (e.g. Johnson

[1] Broughman & Rollefson identify a "delayed entrant" as "a first-year teacher who had engaged in other activities in the year or years between graduating from college or receiving his or her highest degree and becoming a teacher."

et al., 2004) or from qualitative investigations of specific subgroups of mid-career entrants, such as those from mathematics and science backgrounds (e.g. Marinell, 2008; Merseth, Stein & Burack, 1994; Madfes, 1990; Darling-Hammond, Hudson, & Kirby, 1989). The findings from these studies have improved our understanding of mid-career entrants' routes of entry into teaching (Johnson et al., 2004; Darling-Hammond, Hudson, & Kirby, 1989), their expectations for their new career (Stein, 2001; Madfes, 1990), their academic and professional backgrounds (Marinell, 2008; Darling-Hammond, Hudson, & Kirby, 1989), and the skills and knowledge that they bring from their former careers (Marinell, 2008). However, most of these studies are small-scale investigations that were conducted years ago. The only national studies related to mid-career entrants (Broughman & Rollefson, 2000; Feistritzer, 1999) rely on data that were collected in the 1980s and 1990s, before many of the recent efforts to recruit and prepare mid-career entrants were underway. In addition, these previous analyses were conducted before large-scale retirements and attrition among new teachers created the current concerns regarding teacher shortages.

The Promise of Mid-career Entrants

To date, policymakers' assertions about mid-career entrants' potential to invigorate teaching have been based largely on conjecture and loosely related research on teachers' academic backgrounds. Murnane et al. (1991) reported that the most academically talented individuals did not enter the teaching profession. Goldhaber & Brewer (1997) found that teachers with stronger academic backgrounds might be more effective at raising student achievement. Taken together, these findings implied that, if teachers' academic training affected student achievement but the most talented individuals tended not to enter teaching, then luring mid-

career professionals into schools might enhance the quality of the teacher workforce and, thus, improve student performance.

There is some additional evidence that mid-career entrants may improve student performance by attracting individuals from under-represented subgroups into the public school teacher workforce. Research on alternative certification programs suggests that mid-career entrants may be more likely than first-career entrants to be men and from minority racial/ethnic backgrounds (Feistritzer, 2005; Chin, Young, & Floyd, 2004; Ruenzel, 2002; Shen, 1998; summarized in Johnson, Birkeland, & Peske, 2005). Attracting more males and minorities into teaching may have important consequences for student performance. Research suggests that the substantial gender and racial imbalances that exist between teachers and students today have detrimental effects on a variety of student outcomes, including students' performance on tests and feelings of self worth (e.g. Wiggan, 2007; Dee, 2004, 2005, 2006; Steele, 1997). Dee's (2006) analysis of data from the National Educational Longitudinal Survey (NELS) found that students performed better on assessments and were more engaged with their academic material when they were taught by a teacher of the same gender. Analyzing data from Tennessee's Project STAR, Dee (2004) found that a teacher's race had a similar effect on student performance.

These findings are particularly troubling in light of the historic and current demographic realities in U.S. public schools and their predicted trends for the future. For the past four decades, White women have constituted an increasing majority of all public school teachers. In 1971, the public teacher workforce was 66% female and 34% male. By 2001, the percentage of male teachers had fallen to its lowest point since 1961 (21%), as the percentage of female teachers grew to 79% (Center on Education Policy, 2006). Over this same time period, the percentage of

White public school teachers increased from 88% to 90%, while the percentage of African-American teachers dropped from 8% to 6% (Center on Education Policy, 2006). As the teacher workforce has become increasingly White, the student population has become more racially and ethnically diverse. Between 1972 and 2006, the percentage of public school students from minority racial/ethnic backgrounds increased from 22% to 43% (Planty et al., 2008). The U.S. Census Bureau projects that half of the nation's school-age children will be from minority racial/ethnic backgrounds by 2020 (as reported in Center on Education Policy, 2006).

Identifying "Mid-career Entrants"

A common definition of the term "mid-career entrant" has yet to emerge from the literature. Over the years, researchers and policymakers have identified, in slightly different ways, "delayed entrants" (Broughman & Rollefson, 2000), "post-baccalaureate" applicants to teacher preparation programs (Feistritzer, 1999), "mid-career entrants" (Marinell, 2008; Cannata, 2008; Haselkorn & Hammerness, 2008; Gordon, Kane, and Staiger, 2006; Johnson et al., 2004), and "career-changers" (Crow, Levine, & Nager, 1990). This definitional variation reflects the fact that researchers have identified different classes of mid-career entrants in order to explore their effect on a range of educational matters related to public school teacher staffing, teacher preparation, and instruction.

While few studies are explicit about the criteria that were used to identify the mid-career teachers of interest, nearly all share the common understanding that mid-career entrants are distinct from first-career entrants, who usually obtain their certification credentials directly after graduating from college and then immediately become teachers. In addition, some studies (e.g.

Broughman & Rollefson, 2000; Johnson et al., 2004; Crow, Levine, & Nager, 1990) imply that mid-career entrants are distinct from "re-entrants"—those who take a break in their teaching service before re-entering teaching—and from those who enter teaching later in life but still as a first-career, which is common among women who raise children before becoming teachers. Lastly, some studies (e.g. Marinell, 2008; Johnson et al. 2004) either state or suggest that, to be considered a mid-career entrant, one must have worked in his or her prior career for a substantial period of time—at the very least, five years.

In this study, because I am interested in understanding how mid-career entrants are likely to affect teacher staffing and the gender and racial imbalances in the profession, I employ an expansive definition of mid-career entrants. I identify mid-career entrants as those teachers who, in the year before they began full-time teaching, were older than 27,[2] had not previously taught in K-12 schools, and were engaged in one of the following activities: working in a career outside of education, working in an education-related job other than teaching (e.g. librarian, school nurse, principal, etc.), teaching at a pre-school or university, working in the military, retired from jobs other than teaching, or attending a university.[3] Because the *SASS* datasets only contain information about prior employment for participants who are new teachers, I am only able to identify mid-career entrants who are in their first year of teaching; I address the consequences of this constraint in the Limitations section below.

[2] I concur with studies that suggest that, to be considered a mid-career entrant, a teacher should have had substantial experience in a prior career. By limiting participants in my study to those older than 27, I aim to exclude individuals who transferred into teaching after having worked in another field for fewer than five years.

[3] I have assumed that the majority of those over 27-years-old who were attending university programs in the year prior to teaching were mid-career entrants enrolled in traditional, university-based teacher certification programs.

Research Design

Dataset

The *National Center for Educational Statistics'* (NCES) *Schools and Staffing Survey (SASS)* is a national, cross-sectional survey of K-12 teachers, principals, and district personnel within both the United States' public and private school systems. The *SASS* has been administered six times: 1987-88, 1990-91, 1993-94, 1999-00, 2003-04, and 2007-08. In this research, I employed the restricted public school teacher datasets from the first five of these waves; the 2007-08 dataset was not available at the time of my analyses. The *SASS* is the only national-level dataset that allows mid-career entrants to be identified using the previously described criteria. In addition, because the *SASS* was first administered in the late-1980s—roughly the same time that mid-career entrants' presence in the public teacher workforce was first observed—it is an appropriate dataset for investigating the questions guiding my research.

Limitations in the design of the *SASS* datasets profoundly affected my choice of analytic method. Different survey administrations employed different complex survey sampling methods. Therefore, I could not pool the multiple datasets into a single appended dataset for the purposes of a traditional trend-over-time analysis. However, I could still estimate sufficient statistics (means and standard errors) within each wave separately and take the complex survey design into account in my wave-by-wave estimation. Given these circumstances, I opted for the linear contrast methodology (described in detail below), which allowed me to test hypotheses on the outcomes over time by forming contrasts, from the wave-by-wave sufficient statistics, to represent my hypotheses about the linear trends in my outcomes.

Sample

The public school teacher samples from each of the first five administrations of the *SASS* contain 56,242 (1987-88); 46,705 (1990-91); 53,003 (1993-94); 42,086 (1999-00); and 52,478 (2003-04) teachers, more than 250,000 teachers overall. Within these larger samples, the following number of teachers were full-time, first-year teachers (including both first- and mid-career entrants): 1,286 (1987-88); 1,521 (1990-91); 1,821 (1993-94); 1,708 (1999-00); 1,456 (2003-04). Each of these smaller samples of full-time first-year teachers contains the following number of mid-career entrants: 269 (1987-88); 541 (1990-91); 589 (1993-94); 623 (1999-00); 582 (2003-04). Based on even the small mid-career entrant sample sizes, the analyses that I conduct in this study have the statistical power required to detect small effect sizes at conventional levels of Type I error (Light, Singer & Willett, 1990).[4]

Measures

The outcome of primary interest for this study is MIDCAREER, a dichotomous outcome that identifies whether a first-year, full-time K-12 public school teacher is a mid-career entrant (coded 1=mid-career entrant, 0=first-career entrant). It is not ideal to test the existence of a linear trend in a dichotomous outcome. However, given the limitations in the dataset just described, it is the only option for generating important descriptive information about mid-career entrants from a national dataset. Given the dichotomous nature of the MIDCAREER outcome, my results are approximations; however my estimates should not be asymptotically biased (Wooldbridge, 2006).

[4] I confirmed this assertion by conducting an a priori statistical power calculation at: http://www.danielsoper.com/statcalc/calc01.aspx

To generate the descriptive profiles of mid-career entrants, I created a number of outcome measures related to their personal and professional characteristics, such as SCHCOMM, a categorical outcome indicating the type of community in which mid-career entrants' schools are located, as categorized into U.S. Census school locales (1=large or mid-sized central city; 2=urban fringe of a large or mid-sized city; 3=small town/rural). A complete list of the outcome measures in this study appears below in Table 1.

Table 1: Outcome Measures

Outcome	Identification Criteria
MIDCAREER	Dichotomous variable indicating whether a first-year teacher is a mid-career entrant (1=mid-career entrant; 0=otherwise).
PRCAREER	Categorical outcome indicating first-year mid- and first-career entrants' previous career. Formed by categorizing a participant's self-reported previous career into one of 9 occupational groups[5] (e.g. 1=management, business and financial workers; 2=science, engineering, and computer professionals, etc.).
SCHCOMM	Categorical outcome indicating the type of community in which first-year mid- and first-career entrants' schools are located, as categorized into U.S. Census school locales (1=large or mid-sized central city; 2=urban fringe of a large or mid-sized city; 3=small town/rural).
SCHLVL	Categorical outcome indicating first-year mid- and first-career entrants' school level (1=primary; 2=middle; 3=high; 4=combined).
SCHSBJCT	Categorical outcome indicating first-year mid- and first-career entrants' main teaching assignment (1=early childhood/general elementary; 2=special education; 3=arts/music; etc.).
AGE	Continuous outcome indicating first-year mid- and first-career entrants' age
MCETYPE	Categorical outcome indicating first-year mid-career entrants' professional status in the year before they began teaching (1=education-related job other than teaching; 2=career outside of education; 3=student in a college or university; 4=military career; 5=retired; 6=preschool teacher; 7= postsecondary teacher.)

[5] NCES staff categorized participants' prior careers into an extensive set of occupational codes. For parsimony, I collapsed these classifications into the 9 occupational groups identified by the U.S. Equal Employment Opportunity Commission.

The question predictors of primary interest are $YEAR_1$-$YEAR_5$, a vector of dichotomous variables that distinguish among the five repeated administrations of the *SASS* (each coded 1 in the administration to which it refers, 0 otherwise). I also investigate whether my various outcome measures are affected by mid- and first-career entrants' race and gender, and thus I include the following two question predictors in this analysis: FEMALE, a dichotomous variable indicating whether participants are female (1=female; 0=otherwise); and RACE, a vector of dichotomous variables indicating whether participant are Asian, Black, Hispanic or White (coded 1 to represent the ethnicity in question, 0 otherwise). At various points, I condense the first three racial/ethnic categories in order to investigate whether differences exist in the various outcomes of interest among non-White and White mid- and first-career entrants.

Data Analysis

To address my research questions, I conducted a linear contrast analysis of outcome means in order to examine trends over time in mid-career teachers' entry into the profession and how this trend differed by gender and racial characteristics. More specifically, I used the linear contrast approach to investigate whether the estimated slope of any trend—such as the time trend in the percentage of first-year public school teachers who were mid-career entrants—differed from zero, on average in the population. I estimated similar linear contrasts to test whether the time trends differed by the gender and racial composition of the mid-career and first-career entrant groups. I conducted tests of difference to determine whether there were differences in the elevation and slope of related time trends. For instance, I tested whether the slopes of two estimated time trends—such as the trends in the percentage of males among the mid- and first-career entrant subgroups—differed from one-another, on average in the population. In addition, I

tested whether there were differences in the elevation of two related time trends, such as those just described, on average in the population.

All of my hypothesized linear contrasts were population means of the following form:

$$L = c_1\mu_1 + c_2\mu_2 + c_3\mu_3 + c_4\mu_4 + c_5\mu_5$$

where μ_1 through μ_5 are the population means of the outcome of interest and c_1 through c_5 are coefficients that I chose to represent my various hypotheses such that $\sum_{i=1}^{r} c_i = 0$ within the five *SASS* datasets (Neter, Wasserman, & Kutner, 1990).

In Figure 1, I display the computation of the coefficients needed to test hypotheses about the rate of change of a linear trend in the outcome. As depicted in this figure, the time intervals between the five *SASS* administrations were not identical: 3 years (1987-88 to 1990-91), 3 years (1990-91 to 1993-94), 6 years (1993-94 to 1999-00), and 4 years (1999-00 to 2003-04), respectively. Thus, if one were to create a timeline depicting the 16-year period of this study with Year 0 being the date on which the first *SASS* was administered, the remaining four surveys were administered in Years 3, 6, 12 and 16, respectively. I centered the times of these occasions of measurement on their mean value of 7.4. Under these conditions, as is shown in the derivation at the bottom of Figure 1, a population contrast for testing a linear trend in the population means of the outcome is:

$$L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5$$

and the associated null hypothesis is:

$$H_0: L = c_1\mu_1 + c_2\mu_2 + c_3\mu_3 + c_4\mu_4 + c_5\mu_5 = 0$$

To test whether a statistically significant linear trend existed for each outcome in my analysis, I first computed a sample estimate of $\hat{L}$ by substituting the appropriate sample estimates, $\hat{\mu}_1$ through $\hat{\mu}_5$, for the outcome of interest into the contrast. I also estimated an

appropriate standard error for $\hat{L}$ by substituting standard errors associated with each of the estimated outcomes into the following expression:

$$se(\hat{L}) = \sqrt{c_1{}^2[se(\hat{\mu}_1)]^2 + c_2{}^2[se(\hat{\mu}_2)]^2 + c_3{}^2[se(\hat{\mu}_3)]^2 + c_4{}^2[se(\hat{\mu}_4)]^2 + c_5{}^2[se(\hat{\mu}_5)]^2}$$

Then, I generated an observed *z-statistic* by dividing $\hat{L}$ by its estimated standard error. Lastly, I determined the statistical significance of this observed *z-statistic* by comparing it to an appropriate critical value drawn from a *z* distribution. For the two-tailed tests of difference that I applied in this study, a critical *z-statistic* of 1.96 represents statistical significance at the conventional 0.05 alpha level.

To determine the statistical significance of an observed difference in elevation between two trend lines, I first specified a null hypothesis that the equations of the two linear trends were equal:

$$H_0: c_1\mu_1{}^A + c_2\mu_2{}^A + c_3\mu_3{}^A + c_4\mu_4{}^A + c_5\mu_5{}^A = c_1\mu_1{}^B + c_2\mu_2{}^B + c_3\mu_3{}^B + c_4\mu_4{}^B + c_5\mu_5{}^B$$

The linear contrast on the left side of the equation (^{A}) might represent, for instance, the average percentage of males among the population of mid-career entrants, over time. Following this example, the contrast on the right side of the equation (^{B}) would represent the average percentage of males among the population of first-career entrants, over time. To test whether the elevations of the two linear trends differed, I used identically weighted values for the *c* coefficients. Since there are five outcome means, the appropriate coefficient for measuring differences in elevation is 0.2. Employing equally-weighted coefficients simply tests whether the average of the outcome means for one of the trend lines is statistically different from the average of the outcome means from the other trend. This hypothesis can be simplified as follows:

$$H_0: L = c_1(\mu_1{}^A - \mu_1{}^B) + c_2(\mu_2{}^A - \mu_2{}^B) + c_3(\mu_3{}^A - \mu_3{}^B) + c_4(\mu_4{}^A - \mu_4{}^B) + c_5(\mu_5{}^A - \mu_5{}^B) = 0$$

$$H_0: L = c_1\delta_1{}^{AB} + c_2\delta^{AB} + c_3\delta_3{}^{AB} + c_4\delta_4{}^{AB} + c_5\delta_5{}^{AB} = 0$$

For contrasts that examined the difference in the elevation of two trend lines, the standard error of L is as follows:

$$se(\hat{L}) = \sqrt{c_1{}^2\left[se\left(\hat{\mu}_1{}^A - \hat{\mu}_1{}^B\right)\right]^2 + c_2{}^2\left[se\left(\hat{\mu}_2{}^A - \hat{\mu}_2{}^B\right)\right]^2 + c_3{}^2\left[se\left(\hat{\mu}_3{}^A - \hat{\mu}_3{}^B\right)\right]^2 + c_4{}^2\left[se\left(\hat{\mu}_4{}^A - \hat{\mu}_4{}^B\right)\right]^2 + c_5{}^2\left[se\left(\hat{\mu}_5{}^A - \hat{\mu}_5{}^B\right)\right]^2}$$

where $se\left(\hat{\mu}_1{}^A - \hat{\mu}_1{}^B\right) = \sqrt{se\left(\hat{\mu}_1{}^A\right)^2 + se\left(\hat{\mu}_1{}^B\right)^2}$

To determine the statistical significance of the difference in the elevation of the two trend lines, I obtained an observed *z-statistic* by dividing $\hat{L}$ by its estimated standard error and comparing it to the 1.96 critical *z-statistic,* as before.

To determine whether linear slopes differed for a pair of related linear trends—such as the trend in the percentage of mid-career entrants who are male and the corresponding trend in the percentage of first-career entrants who are male—I used the equation from above (the one derived from subtracting the equation of one linear trend line from the equation of the other), but rather than selecting equally weighted coefficients, I used the coefficients that I had calculated to test the hypothesis about the rate of change of a linear trend in the outcome (see Figure 1).

Limitations

There are a number of limitations that affect the conclusions that I can draw from this investigation. First and most obviously, the *SASS* data are strictly observational, so I am unable to determine whether observed changes, such as mid-career entrants' movement from teaching in rural and small towns to teaching in urban and suburban communities, are the result of changes in the job market, changes in the preferences of mid-career entrants, or both. Second, I am only able to identify mid-career entrants who were in their first year of teaching, thus I can only

partially address the question about the role that mid-career entrants might play in staffing public schools in the future. Since staffing is affected by mid-career entrants' enrollment into teaching, their mobility between schools and districts, and their attrition from the profession, I ideally would have been able to identify the percentage of mid-career teachers entering the profession, the percentage of mid-career entrants in the entire teacher workforce, and the percentage who change schools or leave teaching at various points in their careers. The survey design only allows me to explore the first of these options. Third, I am not able to determine whether the mid-career entrants who were "attending a university or college" in the year prior to teaching were pursuing a university-based teacher certification program or were late baccalaureate graduates. I am also unable to determine whether this class of mid-career entrants held previous occupations before enrolling in colleges or universities and, if so, in what industries. The only information about mid-career entrants' previous careers comes from those who entered teaching directly from their former work, most likely after having either obtained an emergency license, pursued an alternative certification program, or enrolled in a district-based certification program.

The coding of participants' race and ethnicity changed in the last survey year (2003-04). In the first four *SASS* administrations, participants were allowed to select one exclusive item that categorized them into one of five racial/ethnic profiles: White, non-Hispanic; Black, non-Hispanic; Asian or Pacific Islander, non-Hispanic; Native American or Alaska Native, non-Hispanic; and Hispanic, regardless of race. In the 2003-04 *SASS*, however, participants could select as many of the racial/ethnic options as they felt described their origin, which resulted in 38 self-reported categorizations of race/ethnicity. To resolve this discrepancy in coding, I employed a deterministic fractional assignment technique (equal fractions; see Lee, 2000) to reclassify the

2003-04 responses according to the criteria that had been used in the previous four survey administrations.

Lastly, it is important to note that the *SASS* sampling frame and the procedures that were used for imputing missing data both changed between the 1987-88 and 1990-91 administrations. NCES publications (e.g. U. S. Department of Education, 1993) warn researchers to be cautious in their interpretations of changes that occur between these survey years. Indeed, many of my analyses depict substantial shifts in between these survey years and these shifts should certainly be interpreted cautiously; however, because I am examining trends in the data over five *SASS* administrations—rather than just the changes between the first two administrations—I believe that these procedural changes do not undermine the overall findings from this study.

Findings

In this section, I first present a brief descriptive portrait of the average first-year mid-career entrant. Subsequently, I describe how mid-career entrants' personal and professional characteristics changed over the study's 16-year period of observation and then briefly discuss the importance of these findings. I then present findings regarding the number and percentage of mid- and first-career teachers who entered the new teacher workforce in each of the five survey years, and I describe how these enrollment trends differ by gender and race. Lastly, I examine the changes in the gender and racial compositions of the mid-career and first-career subgroups in order to determine whether the employment of mid-career entrants appears to have reduced gender and racial imbalances among first-year teachers and to assess the possibility that they might do so in the future.

Mid-career Entrants' Personal and Professional Characteristics

Over the period of observation, the average first-year mid-career entrant was a White, 36-year-old female who had entered teaching directly from a college or university, most likely after attending a post-baccalaureate, university-based teacher certification program. Her previous career had been in a "Professional" occupation, such as social work, law, engineering, art, or medicine.[6] In her first year as a teacher, she taught general elementary education in a suburban elementary school in the southern U.S. Many of these characteristics remained stable throughout the five administrations of the *SASS*. For instance, mid-career entrants' average age remained relatively constant over time: 35.47-years-old (1987-88), 36.13 (1990-91), 36.23 (1993-94), 36.05 (1999-00), and 36.66 (2003-04), respectively. The percentage of mid-career and first-career entrants working in elementary schools—60% and 64% respectively, on average—also remained unchanged throughout the period of observation. Lastly, there was little change in the prior occupation of mid-career entrants who entered teaching directly from jobs outside of education. In all but one of the survey years, a larger percentage of this class of mid-career entrant came from "Professional" occupations (35% on average over the period of observation) than from the other eight occupational categories identified by the U.S. Equal Employment Opportunity Commission: Officials & Managers, Administrative Support Workers, Sales Workers, Craft Workers, Service Workers, Technicians, Operatives, and Laborers & Helpers. The only exception to this was in 1987-88, when the greatest percentage of mid-career entrants

[6] The U.S. Equal Employment Opportunity Commission's "Professional" classification is one of nine, wide-ranging occupational distinctions, the others being: Officials and Managers, Technicians, Sales Workers, Administrative Support Workers, Craft Workers, Operatives, Laborers and Helpers, and Service workers.

from careers outside of education had been employed as “Officials & Managers” (29%), rather than as “Professionals” (21%), in the year prior to teaching.

Other aspects of first-year mid-career entrants’ personal and professional backgrounds changed over time, but most of these were not surprising given documented trends in the composition of public schools and the public teacher workforce. For instance, first-year mid-career entrants gradually moved from teaching in small towns and rural areas to teaching in suburban and urban districts. This change—which was mirrored by first-career entrants—was likely the result of increasing national urbanicity rather than a change in mid-career entrants’ preferences. The percentage of schools in suburban and urban districts grew substantially over this time period relative to the percentage of schools in rural areas and small towns (e.g. U. S. Department of Education, 2002). First-year mid-career entrants’ route of entry into teaching also appeared to have changed over time, with greater percentages coming directly from jobs outside of education and from education-related jobs other than teaching. The percentage transferring to teaching from careers outside of education rose steadily from 18% in 1987-88 to 31% by 2003-04. Less pronounced but still notable, the percentage of mid-career entrants coming from education-related, non-teaching jobs also increased over time, from about 12% in 1987-88 to about 19% by 2003-04. While the majority of first-year mid-career entrants were enrolled in colleges and universities in the year prior to teaching, this percentage decreased steadily from 66% in 1987-88 to 44% in 2003-04.

These findings suggest that a substantial proportion of mid-career entrants are choosing to pursue alternative routes of entry into the profession, many of which were purposefully designed to draw them into teaching (Feistritzer, 2005; Johnson, Birkeland & Peske, 2005). However, these findings also suggest that university-based programs (whether traditional or

alternative) remain appealing to mid-career entrants and continue to play an important role in preparing career-changers to teach. In addition, the large percentage of mid-career entrants coming from education-related jobs suggests that professionals already working in non-teaching capacities within schools may be a relatively over-looked source of teacher supply, which future recruitment programs might target. These individuals likely bring a general familiarity with teaching and with the operation of schools. While previous research has suggested that a substantial proportion of new teachers may come from non-teaching, education-related jobs (e.g. Humphrey, Wechsler, & Hough, 2005; Shen, 1997), few certification programs and incentives explicitly target these professionals.

These findings regarding mid-career entrants' personal and professional characteristics have important implications for the staffing and functioning of U.S. public schools and suggest that some of policymakers' assumptions about this subgroup of new teachers are not accurate. First, the similar, large percentage of mid- and first-career entrants choosing to teach in elementary schools calls into question the common assumption that mid-career entrants' professional backgrounds will prompt them to seek jobs at secondary schools so they can continue to work closely with their subject area. This assumption has been the cornerstone of policymakers' assertion that mid-career entrants are a logical solution to filling hard-to-staff positions in secondary schools (e.g. *American Competitiveness Initiative*, 2006; *National Academies Press,* 2000). While there was a statistically significant difference ($p=0.0248$) in the average percentage of mid- and first-career entrants teaching in elementary schools (60% of mid-career entrants, as compared with 64% of first-career entrants), the modest size of this difference suggests that mid-career entrants, alone, are unlikely to solve secondary school staffing problems (See Paper 1, Appendix A for details related to the tests of this, and subsequent, statistical tests).

In addition, despite the recent creation of numerous programs aimed at drawing mid-career entrants to secondary school positions (e.g. The New York City Teaching Fellows Program, the Massachusetts Initiative for New Teachers, University of Texas' UTeach program, Harvard University's Midcareer Math and Science Program, etc.), the percentage of mid-career entrants teaching in elementary schools has remained stable. In other words, while these programs may have had local or regional effects that are not captured by this analysis, their creation has not been associated with a statistically significant negative trend in the percentage of mid-career entrants teaching in elementary schools nationally. There has been a slight observed increase in the percentage of first-year mid-career entrants holding secondary math and science positions, from about 6% in 1987-88 to about 10% in 2003-04, but this observed, positive linear trend is not statistically significant.

Interestingly, I did not find compelling evidence to support claims from previous studies that mid-career entrants were more likely to teach in urban communities than their first-career counterparts, either due to their preferences (Natriello and Zumwalt, 1993) or due to receiving more offers for hire from urban schools (Cannata, 2008). Over the period of observation, it became increasingly probable—at nearly identical rates of increase, about one-half of a percentage point per year—for mid- and first-career entrants to teach in urban schools. Furthermore, the difference in the average percentage of mid-career and first-career entrants teaching in urban schools (31.7% and 29.1%, respectively) was not statistically significant. That these percentages and trends closely mirror one another suggests that these changes were likely due to increasing levels of urbanicity rather than in response to the changing preferences of either mid- or first-career entrants.

Lastly, mid-career entrants' average age (36) suggests that many enter the teaching profession with at least a decade of prior work experience and at a point in their lives when they are likely to have children. This finding is further reinforced by the finding that the percentage of mid-career entrants who were well older than the average also grew over the period of observation. The percentage of mid-career entrants aged 41 or older grew steadily from approximately 21% in 1987-88 to nearly 38% by 2003-04. Although mid-career entrants' seniority may have certain benefits for schools, it may also present certain complications. For instance, mid-career entrants' advanced age may mean that those remain in teaching long-term may have shorter careers relative to the first-career entrants who choose teaching as their sole career. Thus, as the percentage of first-year teachers who are mid-career entrants grows, it is possible that the profession is being increasingly staffed by individuals with shorter career spans. Obviously, this "age effect" could be further altered if mid- and first-career entrants have differing rates of mobility between schools and/or attrition from teaching. Some studies (e.g. Boyd, Grossman, Lankford, Loeb, & Wykoff, 2006; Clewell & Villegas, 2001) suggest that mid-career entrants may be less likely than first-career entrants to change schools and leave teaching, however there is not currently a substantial body of research to support this finding.

The Percentage of Mid-career Entrants Among all First-year Teachers

To investigate mid-career entrants' historic role in staffing public schools, and to anticipate the role they might play in staffing public schools in the near future, I examined trends in both mid- and first-career entrants' enrollment into teaching over time. As Figure 2 depicts, I found that the total number of first-year teachers—including both mid- and first-career entrants—grew steadily from about 73,100 in 1987-88 to 121,000 teachers in 1999-2000, and

then decreased to approximately 111,100 by 2003-04. Throughout this period, the number of first- and mid-career teachers entering the profession also grew, on average. In 1987-88, about 58,800 of new teachers were first-career entrants. The number of first-career entrants then fluctuated between 1987-88 and 1999-00, growing to about 77,800 in 1999-00 before decreasing to about 67,300 by 2003-04. By comparison, in 1987-88 far fewer teachers in their first year were mid-career entrants, only about 14,300. However, the number of mid-career entrants grew steadily from one survey administration to the next, reaching approximately 43,800 by 2003-04.

The steady growth in mid-career entrants relative to their first-career counterparts resulted in a near doubling of the percentage of mid-career entrants among first-year, full-time teachers over the 16-year period of observation. As Figure 3 reveals, the percentage of mid-career entrants among all first-year teachers grew from approximately 20% in 1987-88 to more than 39% in 2003-04. By implication, the percentage of first-career entrants among all first-year teachers decreased over this time period, from about 80% in 1987-88 to about 61% in 2003-04.[7] The displayed trajectory for mid-career entrants exhibits a statistically significant positive linear trend ($p<0.0001$), indicating that, between 1987-88 and 2003-04, the probability that a first-year teacher was a mid-career entrant increased by approximately 1 percentage point (.9787%) per year, on average, or about 16 percentage points overall.

This finding provides the first nationally representative evidence that the percentage of mid-career teachers entering the workforce has grown substantially in the past two decades. Further, it suggests that the commonly held assumption among some policymakers—that mid-

[7] The only distinction being made among first-year teachers at this point in the analysis is whether they were first- or mid-career entrants. Thus, if 20% of all first-year teachers were mid-career entrants, the remaining 80% were first-career entrants. Therefore, an increase in the percentage of new teachers who are mid-career entrants implies a corresponding decrease in the percentage of new teachers who are first-career entrants.

career entrants remain a relatively untapped source of supply of public school teachers—is not accurate. Given the positive trend in the percentage of mid-career teachers entering the profession, it seems prudent to anticipate that mid-career entrants will continue to play a critical role in staffing public schools in the years ahead. Perhaps of even greater importance, this finding provides compelling evidence that, given the sheer number of mid-career entrants, teacher preparation and licensure programs need to thoughtfully tailor their curricula and pedagogy to take into account mid-career entrants' age, prior work experience, and personal and professional needs—something that research suggests few have done to date (see summary of research in Haselkorn & Hammerness, 2008).

After investigating the general trend in the percentage of mid-career entrants among all first-year teachers, I examined how this trend varied for new teachers from different gender and racial backgrounds. My objective in conducting these additional, exploratory analyses was to investigate whether it was more probable for new teachers from different backgrounds to be mid-career entrants. This would allow me to collect preliminary evidence about the likelihood that mid-career entrants might help reduce gender and racial imbalances among new teachers in the future, or whether they appeared to have played a role in reducing such imbalances already.

I found that it became increasing probable for both first-year male and female teachers to be mid-career entrants over the period of observation, but that it was more likely, on average, for a first-year male teacher to be a mid-career entrant than for a first-year female teacher to be a mid-career entrant. Similarly, the probability that first-year teachers from both White and non-White racial/ethnic backgrounds were mid-career entrants increased from 1987-88 to 2003-04. On average, it was more likely for a first-year non-White teacher to be a mid-career entrant than for a first-year White teacher. I describe the gender-related findings first.

As figure 4 depicts, over the period of observation, it was more probable for a first-year male teacher than for a first-year female teacher to be a mid-career entrant. On average, first-year male teachers were 9.29 percentage points more likely to be mid-career entrants than their female counterparts. This difference was statistically significant ($p<0.0001$) and was most pronounced in 2003-04, when first-year male teachers were 16 percentage points more likely to be mid-career entrants than were first-year female teachers. Figure 4 also reveals that it became increasingly probable that both first-year male and female teachers were mid-career entrants over the period of observation. The percentage of mid-career entrants among first-year male teachers increased from 26% in 1987-88 to 51% in 2003-04. The corresponding percentage of first-year female teachers who were mid-career entrants also increased over the period of observation, from 17% in 1987-88 to 35% in 2003-04. For both genders, these observed trends represented statistically significant, positive linear trends ($p<0.0001$ for both genders). The slight difference in the linear rates of increase for first-year male and female teachers (1.18 and .89 percentage points per year, respectively) was not statistically significant, indicating that the probability that a first-year teacher was a mid-career entrant increased at the same average rate for both male and female teachers alike—slightly more than 1 percentage point per year, or about 16.5 percentage points overall.

Figure 5 depicts differences in the percentage of mid-career entrants among White and non-White first-year teachers, as well as the rates at which the percentage of mid-career entrants within each group increased over time. First-year teachers from non-White backgrounds were 8 percentage points more likely to be mid-career entrants, on average over the period of observation, than their White counterparts ($p=0.0006$). In addition, there were positive linear trends in the percentage of mid-career entrants from both non-White and White backgrounds

over time. The percentage of mid-career entrants among non-White first-year teachers increased from about 19% in 1987-88 to almost 41% in 2003-04, representing a statistically significant ($p=0.0455$), positive linear trend of about 0.71 percentage points per year, on average, or 11.36 percentage points overall. The percentage of White first-year teachers who were mid-career entrants also grew over the time period, from slightly less than 20% in 1987-88 to nearly 39% by 2003-04, representing a statistically significant, positive linear trend of approximately 1 percentage point per year, on average, or 16 percentage points overall ($p<0.0001$). The slight difference between the linear rates of increase for non-White and White first-year teachers was not statistically significant, indicating that the percentage of mid-career entrants among White and non-White first-year teachers increased at roughly the same rate over time.

These exploratory analyses are revealing. The fact that there is a relatively large, and increasing, percentage of mid-career entrants among first-year male teachers and among teachers from non-White backgrounds lends merit to the expectation that mid-career entrants might help reduce the gender and racial imbalances that exist between teachers and students in U.S. public schools. However, several conditions must exist for any reductions in the gender and racial imbalances among first-year teachers to be attributed to mid-career entrants. First, the percentage of mid-career entrants among all first-year teachers must be increasing—a condition that is, in fact occurring, and which I have previously described and depicted in Figure 2. Second, *either* the percentages of male and non-White mid-career entrants must be substantially larger, on average, than the percentages of male and non-White first-career entrants *or* the percentages of male and non-White mid-career entrants must be increasing at substantially greater rates than the corresponding percentages among first-career entrants. To examine these hypotheses further, I conducted additional analyses of the trends in the gender and racial composition within the mid-

and first-career entrant subgroups and investigated whether statistically significant changes within these subgroups had reduced the gender and racial imbalances among all first-year teachers.

Mid-career Entrants and the Gender Imbalance

First, I examined the gender balance within the mid- and first-career entrant subgroups in order to discern whether one subgroup contained a larger percentage of male first-year teachers and whether the gender balances within the subgroups changed over time. Confirming the findings from previous studies (Feistritzer, 2005; Ruenzel, 2002; Shen, 1997, 1998), I found that there were more male first-year teachers among mid-career entrants than among first-career entrants, on average. As Figure 6 depicts, 32% of mid-career entrants were male as compared with 23.5% of first-career entrants, on average during the period of observation. This 8.5 percentage point difference was highly statistically significant ($p<0.0001$). Interestingly, I found that, while the gender balance within both the mid- and first-career entrant subgroups fluctuated from one survey year to the next, there were no statistically significant linear trends in the gender balance within either group over the study period. In other words, the gender balance within both groups remained relatively stable, and predominantly female, throughout the period of observation.

Because mid-career entrants were 8.5 percentage points more likely to be male than first-career entrants, one might imagine that the percentage of first-year male teachers increased in response to the growth of mid-career entrants among all first-year teachers from 20% to 39% between 1987-88 and 2003-04. Statistically speaking, this was not the case. As Figure 7 depicts, while there was a slight observed increase in the percentage of first-year teachers who were

male, from 25.22% in 1987-88 to 26.62% in 2003-04, this 1.4 percentage point increase was not statistically significant (p=0.3708). Therefore, while the percentage of mid-career entrants among all first-year teachers grew substantially from 1987-88 to 2003-04, and while it was more probable that a mid-career entrant was male than that a first-career entrant was male, these conditions did not result in a statistically significant reduction in the gender imbalance among all first-year teachers.

This finding suggests that, although mid-career entrants are more likely to be men than their first-career entrant counterparts, expectations that mid-career entrants will play a substantial role in reducing the gender imbalance in teaching will not likely be realized. If the gender-related trends presented in this analysis follow their historic trajectories, mid-career entrants might be responsible for a very slight reduction in the gender imbalance among first-year teachers in the future. However, this modest reduction would be even less discernible within the larger teacher workforce, as first-year teachers typically comprise about 10% of the entire teacher workforce and the current teacher workforce is approximately 75% female. If the gender imbalances are to be reduced, initiatives must attract more male mid- and first-career entrants, rather than simply recruiting more mid-career entrants and hoping that a substantial proportion of them will be men.

Mid-career Entrants and the Racial Imbalance

I conducted a similar series of analyses to investigate mid-career entrants' effect on the racial imbalances among first-year teachers. As with the gender scenario, one of the two following conditions must exist for mid-career entrants to reduce the racial imbalance among new teachers: 1) the percentage of mid-career entrants who are non-White must be substantially larger than the percentage of first-career entrants who are non-White; or 2) the percentage of

non-White mid-career entrants must be increasing at a greater rate than the corresponding percentage of non-White first-career entrants.

As Figure 8 depicts, I found that the average percentage of non-White mid-career entrants (about 22%) was 5.2 percentage points larger than the average percentage of non-White first-career entrants (about 17%). This average difference was statistically significant ($p=0.0012$). Interestingly, unlike the case with the stable gender balances, both the mid-career and first-career entrant subgroups were becoming increasingly non-White. The percentage of non-White mid-career entrants grew from 13.69% in 1987-88 to 24.26% in 2003-04, representing a statistically significant, positive linear trend of approximately 0.5 percentage points per year or 7.3 percentage points over the period of observation ($p=0.0417$). By comparison, the percentage of non-White first-career entrants increased from 14.26% in 1987-88 to 22.41% in 2003-04, representing a statistically significant, positive linear trend of approximately .6 percentage points per year or 9.5 percentage points overall ($p=0.0005$). The small difference in the linear growth rates of the percentage of non-White teachers within these two subgroups was not statistically significant, indicating that the rate of increase in the percentage of non-White teachers was the same for both the mid-career and first-career entrant subgroups—approximately one-half of a percentage point per year.

To explore whether teachers from particular minority racial backgrounds were responsible for the increases in the percentage of non-White mid-career and first-career entrants, I examined the racial composition within each subgroup in more detail. I found that the increase in the percentage of non-White mid-career entrants appeared to be associated with an increase in the percentage of mid-career entrants from Black racial backgrounds, from 5.83% in 1987-88 to 12.44% in 2003-04. This observed increase represented a statistically significant, positive linear

trend of approximately 0.44 percentage points per year, or 7 percentage points over the entire time period ($p=0.0158$). The percentages of Asian, Hispanic, and Native American mid-career entrants also increased, on average over the period of observation; however, these increases were not statistically significant, quite likely as a result of the small sample sizes for these teachers.

Next, I investigated the racial composition of the first-career subgroup over time and found that the increasing percentage of non-White first-career entrants appeared to be associated with an increase in the percentage of first-career entrants from Hispanic ethnic backgrounds, from 4.77% from 1987-88 to 11.84% in 2003-04. This observed increase represented a statistically significant, positive linear trend of approximately 0.44 percentage points per year, or 7 percentage points over the period of observation ($p=0.0014$). As was the case in the mid-career entrant subgroup, the percentages of Asian, Hispanic, and Native American first-career entrants all increased, on average, over the period of observation, but these rates of increase were not statistically significant.

Together, the increasing percentages of Black mid-career entrants and Hispanic first-career entrants appeared to contribute to a statistically significant reduction in the racial imbalance among all first-year teachers. As Figure 9 reveals, the percentage of White first-year teachers decreased from about 86% in 1987-88 to about 77% in 2003-04, representing a statistically significant, negative linear trend of approximately .55 percentage points per year, or about 8.8 percentage points over the entire time period ($p<0.0001$). However, because the percentage of first-year teachers from non-White backgrounds increased within both the mid-career and first-career entrants subgroups, this reduction in the racial imbalance among all first-year teachers appeared to be only partially attributable to the influence of mid-career entrants.

Conclusions and Implications

Perhaps the most notable finding from this study is that the percentage of mid-career entrants among first-year teachers nearly doubled—from 20% to 39%—between 1987-88 and 2003-04. This finding corroborates recent state-level studies, which have found that mid-career entrants constitute a large percentage of first- and second-year teachers (e.g. Johnson et al., 2004). If the percentage of mid-career teachers entering the profession follows its historic trajectory, I estimate that mid-career entrants will comprise approximately one-half of all first-year public school teachers by the 2014-2015 school year.

This sea change in the composition of the new teacher workforce may have profound implications for how schools support new teachers. Schools may find it necessary to tailor their induction programs to reflect the needs and preferences of both mid- and first-career entrants. Because mid-career teachers enter the profession as older, more experienced, and presumably more mature individuals, they may be undaunted by some of the challenges with which new teachers typically struggle, such as managing contentious parents (Johnson & Birkeland, 2003) or being held accountable for results (Costigan, 2002). By contrast, however, mid-career entrants may desire, or require, more frequent feedback on their teaching, given that many pursue fast-track alternative routes of entry into teaching, which often have abbreviated fieldwork components (Johnson, Birkeland, & Peske, 2005). Thus, mid-career entrants might need little help preparing for parent-teacher conferences or back-to-school nights, but might request that they be observed frequently by mentor teachers or released from duties to observe experienced teachers.

Mid-career entrants' increasing presence in teaching may affect many other aspects of how schools operate and how instruction is delivered in classrooms. For instance, if mid-career

entrants come from fields where a high level of interaction and frequent performance evaluations are the norm, they may welcome the critique of subject coaches or staff developers, or at least be less resistant to colleagues who perform roles that are designed to increase schools' instructional capacity (Donaldson et al., 2008). If mid-career entrants' former career entailed working closely with colleagues and clients, mid-career entrants might bring managerial skills and a commitment to collaboration that would infuse their departments, if not their schools, with the kinds of interactive cultures that have helped private sector corporations operate more efficiently (Cohen & Bailey, 1997). Lastly, if mid-career entrants bring extensive experience working with their subjects in industry, they may bring an enhanced understanding of how their subjects are applied in real-world settings. This experience might help mid-career entrants develop classroom activities that are more practical and engaging than those found in texts, as well as offer compelling, informed responses to students' frequent query: "but when are we ever going to *use* this after we graduate?" (Marinell, 2008). To date, research has not adequately identified the skills and knowledge that mid-career entrants bring from their former career, nor the needs and preferences with which they enter teaching. The sheer number of mid-career teachers entering schools in recent years suggests that these questions must be explored more thoroughly if these new teachers are to be adequately prepared and supported in their new career.

The trend in the percentage of mid-career entrants among all first-year teachers suggests that mid-career entrants will continue to play an important, and increasing, role in staffing public schools in the years to come. Ironically, while policymakers frequently point to mid-career entrants as being the solution to future shortages, if the proportions of mid- and first-career teachers entering the profession follow their historic trajectories, policymakers may soon need to turn their attention towards insuring that first-career teachers remain an active source of teacher

supply in order to avert teacher staffing shortages. However, there are a number of factors that might cause these trends to change in the future. First, it is unclear how the current economic situation will affect this mid-career entrant trend or the teacher workforce more generally. Certainly, it seems likely that many working professionals who are being laid-off in the private sector, or who fear losing their jobs, will be drawn to the job security of teaching, as was the case throughout much of the 1990s. If so, and if the demand for teachers increases as has been projected, this factor could certainly cause the percentage of mid-career entrants among all first-year teachers to rise at a greater rate than in recent years. However, this positive trend could be slowed, or possibly even reversed, if rates of retirement among senior teachers begin to fall or if new teachers become less likely to leave the profession—both of which would be logical responses given the current economic condition. In addition, while it would not be popular with the public, if towns and school districts begin to face severe budgetary constraints, they may be forced to lay-off teachers and to accommodate increases in student enrollment by increasing class size rather than by hiring more teachers. If this were to occur on a large scale, it is possible that the demand for teachers would fall and that there would be fewer teaching vacancies for both mid- and first-career entrants.

Mid-career entrants from education-related, non-teaching jobs may be a relatively overlooked source of supply of additional public school teachers. This research suggests that this class of mid-career entrant already represents between 10%-20% of mid-career entrants overall, despite there being few programs targeted specifically at drawing individuals from these backgrounds into teaching. While one would need to think carefully about the negative consequences of encouraging qualified librarians, school nurses, or administrators to leave their posts to become classroom teachers, there would quite likely also be some benefits to staffing the

profession with individuals already familiar with schools and experienced working with students. Schools and districts that struggle to fill vacancies should continue to think creatively about how they might attract working professionals into their classrooms. In addition, they may also want to think about whether there are current staff members who might excel as teachers. If so, it is possible that these schools might find it easier, for instance, to fill a vacant school nurse position than to recruit, train, and retain a qualified health teacher.

Another important finding to emerge from this study is that mid-career entrants have been entering teaching in increasing numbers since the late 1980s. The fact that the proportion of first-year teachers who were mid-career entrants grew from 20%-30% between 1987 and 1993, before many alternative certification programs or incentives targeted at mid-career entrants had been created, suggests that mid-career teachers' entry into teaching is influenced by a number of factors unrelated to the policies and programs aimed at recruiting them. It would be unfeasible to identify, in retrospect, the factors that prompted professionals to change careers in the late 1980s and early 1990s. However, collecting better data in the future about why career-changers enter teaching is crucial for understanding the incentives, certification options, and the aspects of teaching that mid-career entrants find most desirable.

One important question that this study does not address is the reason for the increase in the percentage of mid-career entrants among new teachers. Is this simply due to the combined effect of an increasing demand for teachers and a finite number of recent college graduates who are interested in entering teaching as a first career? Is teaching becoming more attractive to working professionals than other jobs? Are principals and district administrators becoming increasingly likely to hire older teachers who have experience working in other careers? To gain answers to these questions, future research must identify how administrators, department chairs,

and teacher colleagues describe the strengths and weaknesses of mid-career entrants relative to their first-career counterparts. In addition, researchers should investigate mid-career entrants' pedagogy and practice in order to determine whether there are distinct differences in their respective instructional approaches that might be attributable to their differing personal and professional characteristics or to their training.

Policymakers who have been looking to mid-career entrants to help increase the diversity of the teacher workforce will undoubtedly be disappointed by the findings from this study. While I do find that mid-career entrants are more likely than first-career entrants to be male and from minority backgrounds, both subgroups of new teachers are overwhelmingly female and White. Furthermore, the trend in the gender balance among mid-career entrants does not suggest that men are likely to comprise an increasing percentage of mid-career entrants in the years ahead, and the rate at which mid-career entrants are becoming increasingly non-White is very slight. Thus, to accomplish the important objective of reducing the gender and racial imbalances between teachers and students, policymakers must create policies that are aimed specifically at recruiting men and minorities—both first-career and mid-career entrants—rather than hoping to increase the diversity among teachers by recruiting working professionals. In addition, the profession should not rely on staffing solutions alone to reduce the detrimental effects of the current gender and racial imbalances on student outcomes. It is entirely possible that training teachers to become more aware of the role that gender and race play in their interactions with students could resolve a number of these concerns.

One interesting and somewhat surprising finding to emerge from this study is that a substantial portion of mid-career entrants appear to pursue teacher licensure at university-based graduate programs. While the percentage of mid-career entrants who pursued this route of entry

into the profession decreased over the period of observation, even in the last survey year (2003-04), a greater percentage of mid-career entrants were attending an institution of higher education (44% in 2003-04) than were working in careers outside of education (31%) in the year prior to becoming teachers. This suggests that, while many mid-career entrants do prefer faster-track alternative routes of entry to teaching, it appears that a substantial proportion opt for traditional, university-based instruction. This may be, in part, the result of many universities creating new programs that mirror the timeline of alternative programs. However, it may also be the case that a substantial proportion of mid-career entrants prefer some aspect of traditional preparation programs. It could be that mid-career entrants' age and financial situations lead them to explore different certification routes. Some, for instance, may find it impossible to continue supporting their family and paying their mortgage without pursuing faster, cheaper alternative programs. However, mid-career entrants who have working spouses or who have considerable savings, might find it easier to enroll in a traditional university-based program than first-career entrants, who may be emerging from their undergraduate studies with substantial debt. More research is needed to fully understand mid-career entrants' preferences with regard to preparation and certification.

On a national scale, mid-career entrants' personal and professional characteristics do not conform to a number of current assumptions. For instance, policymakers may be surprised to discover that, despite numerous programs aimed at getting mid-career entrants into high-need subjects (such as math and science) and urban schools districts, mid-career entrants typically pursue positions in suburban elementary schools, much like their first-career entrant counterparts. This similarity may be, in part, due to a recent increase in the number of programs and policies aimed at channeling first-career entrants into similar high-need vacancies (e.g.

University of Texas' UTeach program, University of California's "One Thousand Teacher, One Million Minds" program, Stafford loan forgiveness programs, the National Science Foundation's Noyce Scholarship program, etc.). However, it seems equally possible that policymakers have exaggerated mid-career entrants' interest in working with their subject and underestimated the incentives that it will take to lure professionals working in math and science industries into teaching. Research has explored mid-career entrants' reasons for entering teaching and found that they are influenced by other interests, such as engaging in work that has a meaningful, social purpose, working closely with children or adolescents, and working in a career that allows them to find a more desirable balance work and family commitments (Johnson et al., 2004; Marinell, 2008; U. S. Department of Education, 2007). This study suggests that, if policymakers are intent on recruiting the most talented individuals with math and science backgrounds into secondary schools, simply recruiting more mid-career entrants into the profession is not likely to be sufficient. It will be necessary to create more programs, with more attractive benefits and incentives, before this goal can be accomplished.

While this study provides a wealth of descriptive information about mid-career entrants' personal and professional characteristics and their rates of entry into teaching, much remains unknown about this important subgroup of teachers. Among the many subjects worth exploring, future researchers should investigate mid- and first-career entrants' relative rates of mobility and attrition and seek to understand whether mid-career entrants view teaching as a short- or long-term commitment at the outset of their career. Research on mobility and attrition is critical for further understanding the role mid-career entrants might play in staffing public schools in the future. In addition, researchers should explore mid-career entrants' experience in the profession over time in order to understand what kinds of supports and opportunities they need to find

teaching a rewarding career. Further, more research is needed to understand whether and how mid-career entrants are able to make use of the knowledge from their prior career in their schools and classrooms, and in what areas mid-career entrants feel most deficient. An enhanced understanding of the skills and needs that mid-career entrants bring to teaching can help schools anticipate how to support them, as well as how to capitalize on their expertise and knowledge.

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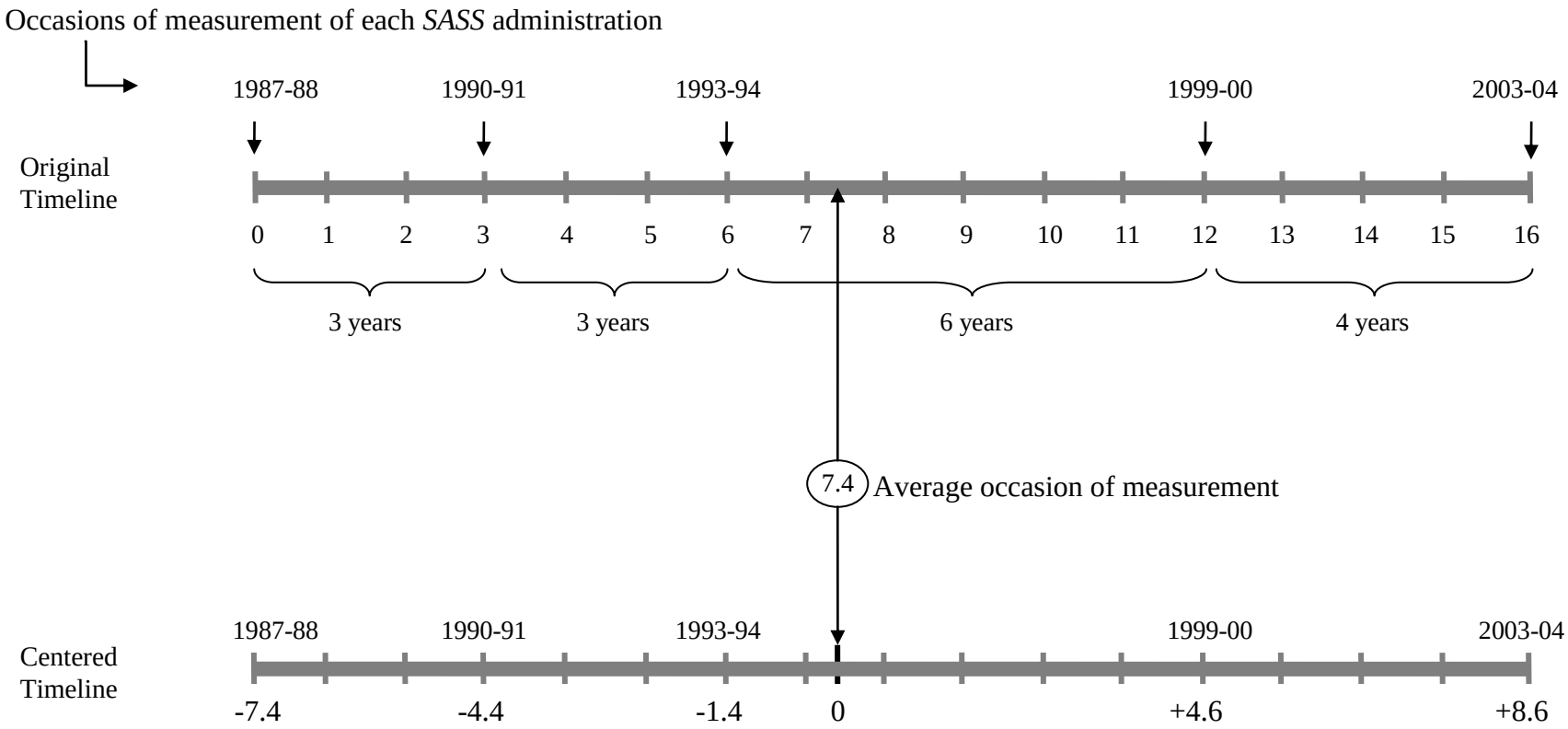
Figures

FIGURE 1: *Determining coefficients for obtaining a linear contrast to represent the slope of a linear trend line*



Assuming a linear growth trajectory:

$\bar{Y}_1 = \pi_0 - 7.4\pi_1$

$\bar{Y}_2 = \pi_0 - 4.4\pi_1$

$\bar{Y}_3 = \pi_0 - 1.4\pi_1$

$\bar{Y}_4 = \pi_0 + 4.6\pi_1$

$\bar{Y}_5 = \pi_0 + 8.6\pi_1$

where π_0 is the population intercept and π_1 is the population rate of change of the hypothesized trajectory.

Notice that:

$-7.4\bar{Y}_1 - 4.4\bar{Y}_2 - 1.4\bar{Y}_3 + 4.6\bar{Y}_4 + 8.6\bar{Y}_5$

equals

$[-7.4(\pi_0 - 7.4\pi_1)] + [-4.4(\pi_0 - 4.4\pi_1)] + [-1.4(\pi_0 - 1.4\pi_1)] + [4.6(\pi_0 + 4.6\pi_1)] + [$

and so

$L = [-7.4\mu_1 - 4.4\mu_2 - 1.4\mu_3 + 4.6\mu_4 + 8.6\mu_5] \,/\, 171.2$

or

$L = -0.04322\,\mu_1 - 0.0257\,\mu_2 - 0.00818\,\mu_3 + 0.026869\,\mu_4 + 0.050234\,\mu_5$

represents a linear contrast for the linear slope of the hypothesized trend line.

Figure 2: Sample estimates of the number of first-year teachers, total, and the number of first-year teachers who were first- and mid-career entrants, by survey year

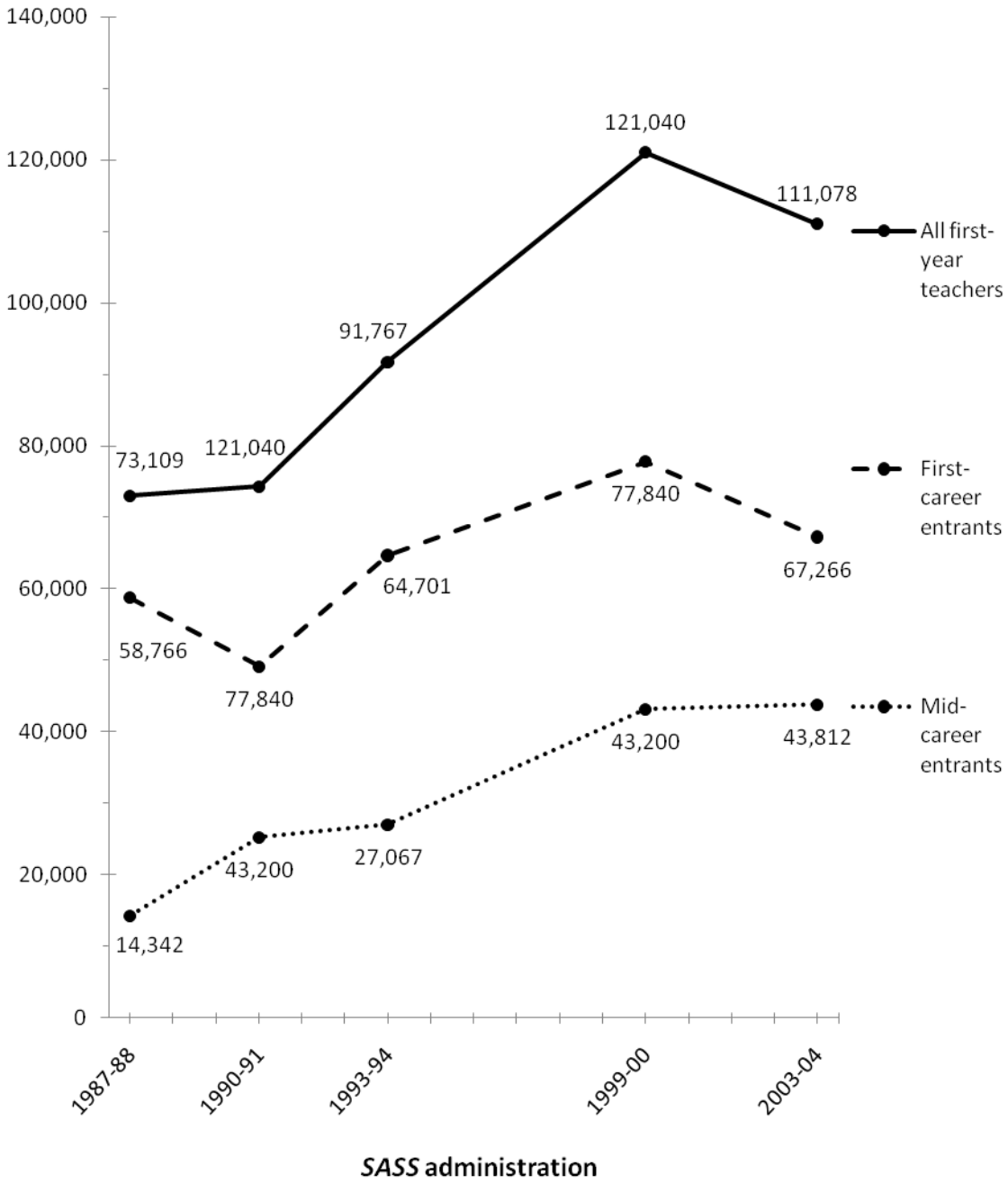


Figure 3: Sample mean values of the percentage of mid-career entrants among first-year teachers, by survey year

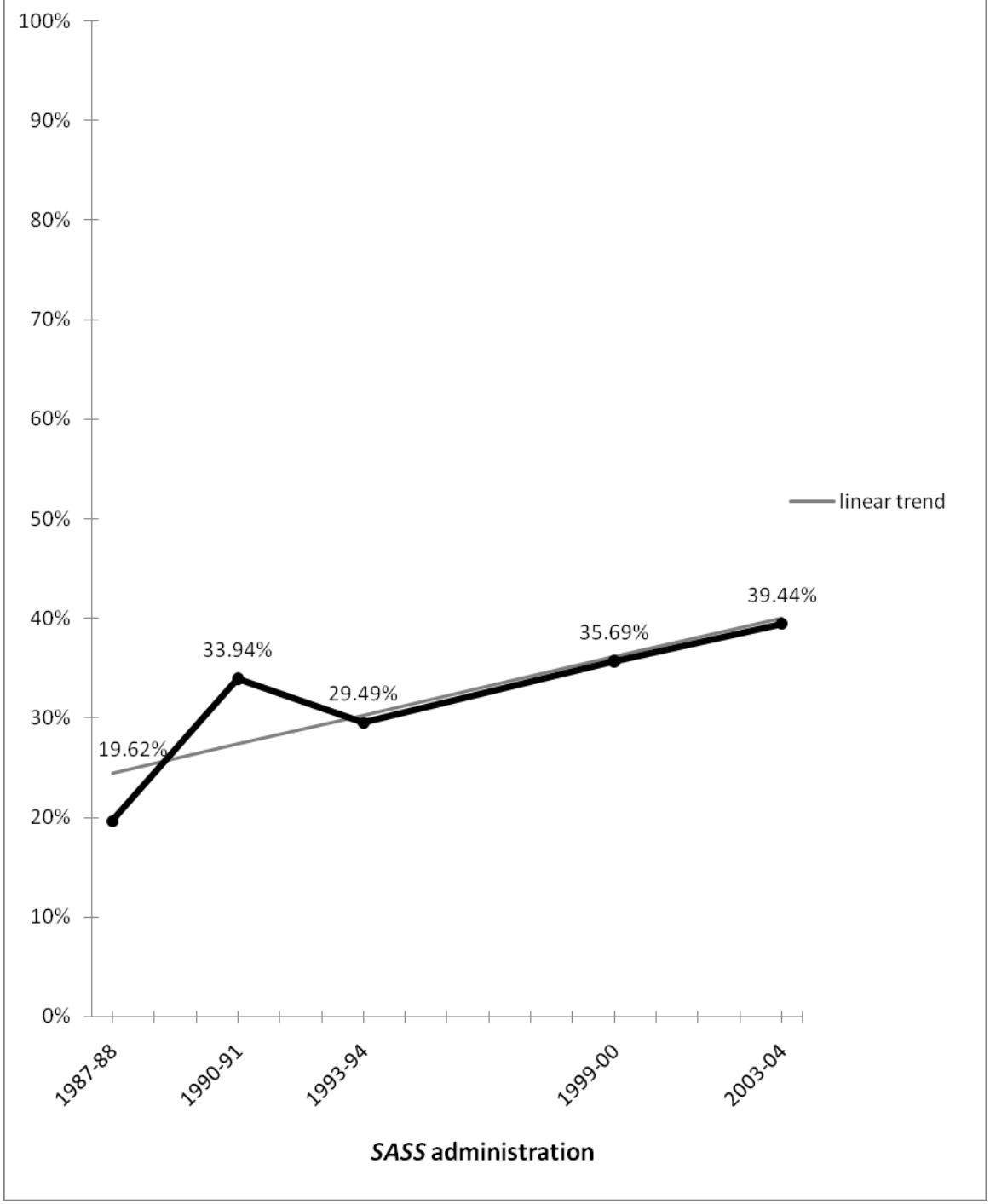


Figure 4: Sample mean values of the percentage of mid-career entrants among first-year teachers who are male and female, by survey year

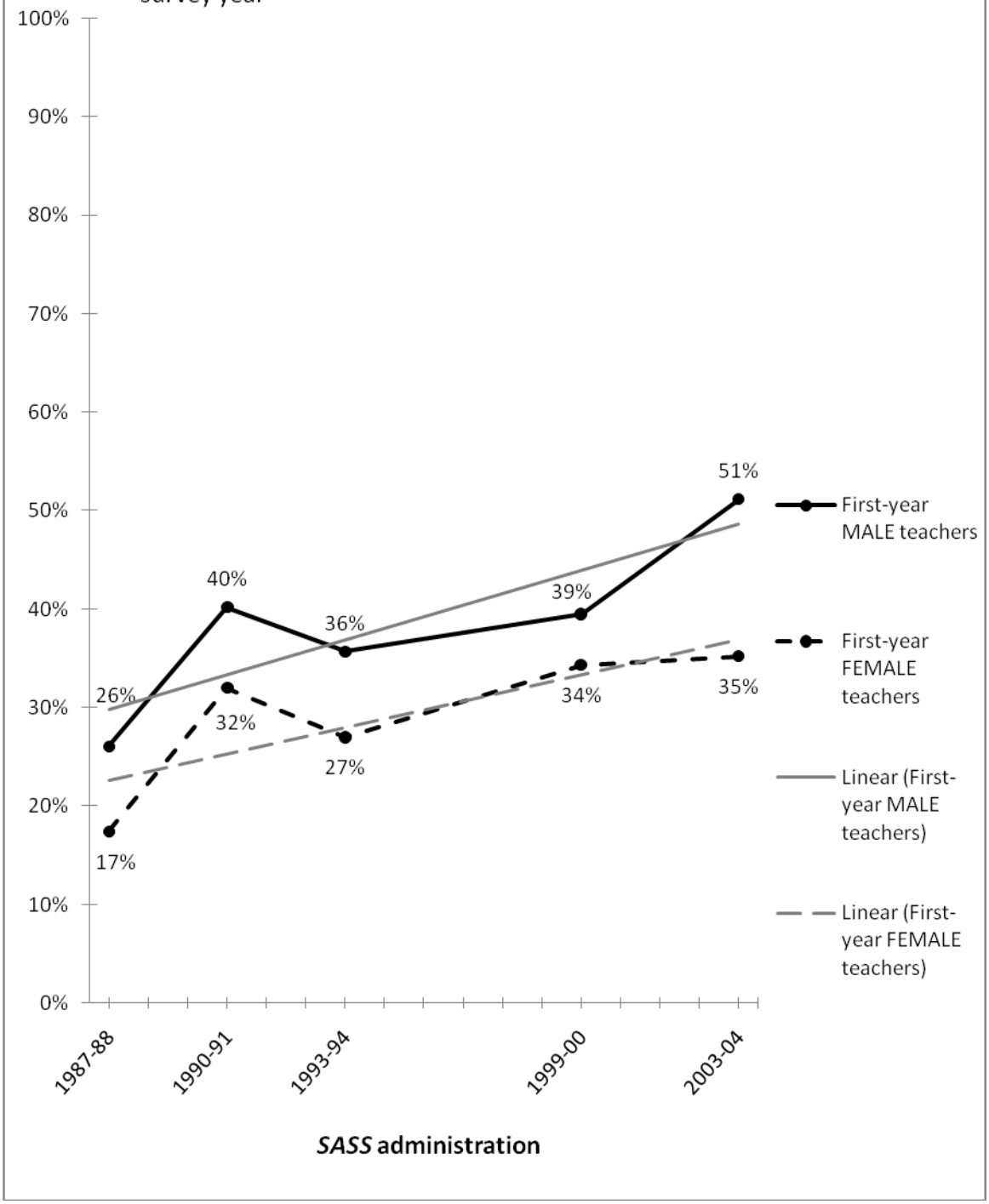


Figure 5: Sample mean values of the percentage of mid-career entrants among first-year teachers from White and non-White racial/ethnic backgrounds, by survey year

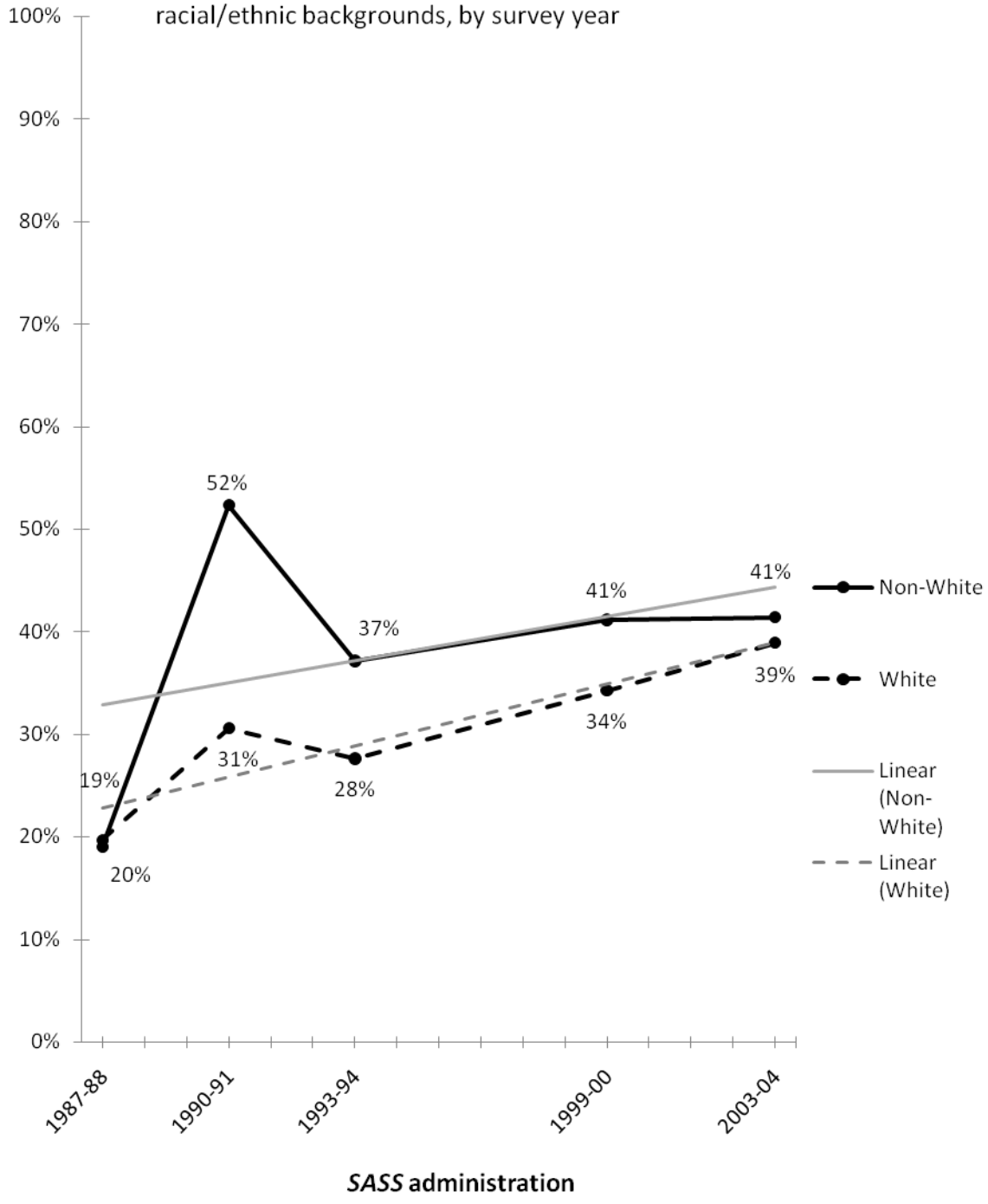


Figure 6: Sample mean values of the percentage of first- and mid-career entrants who are male, by survey year

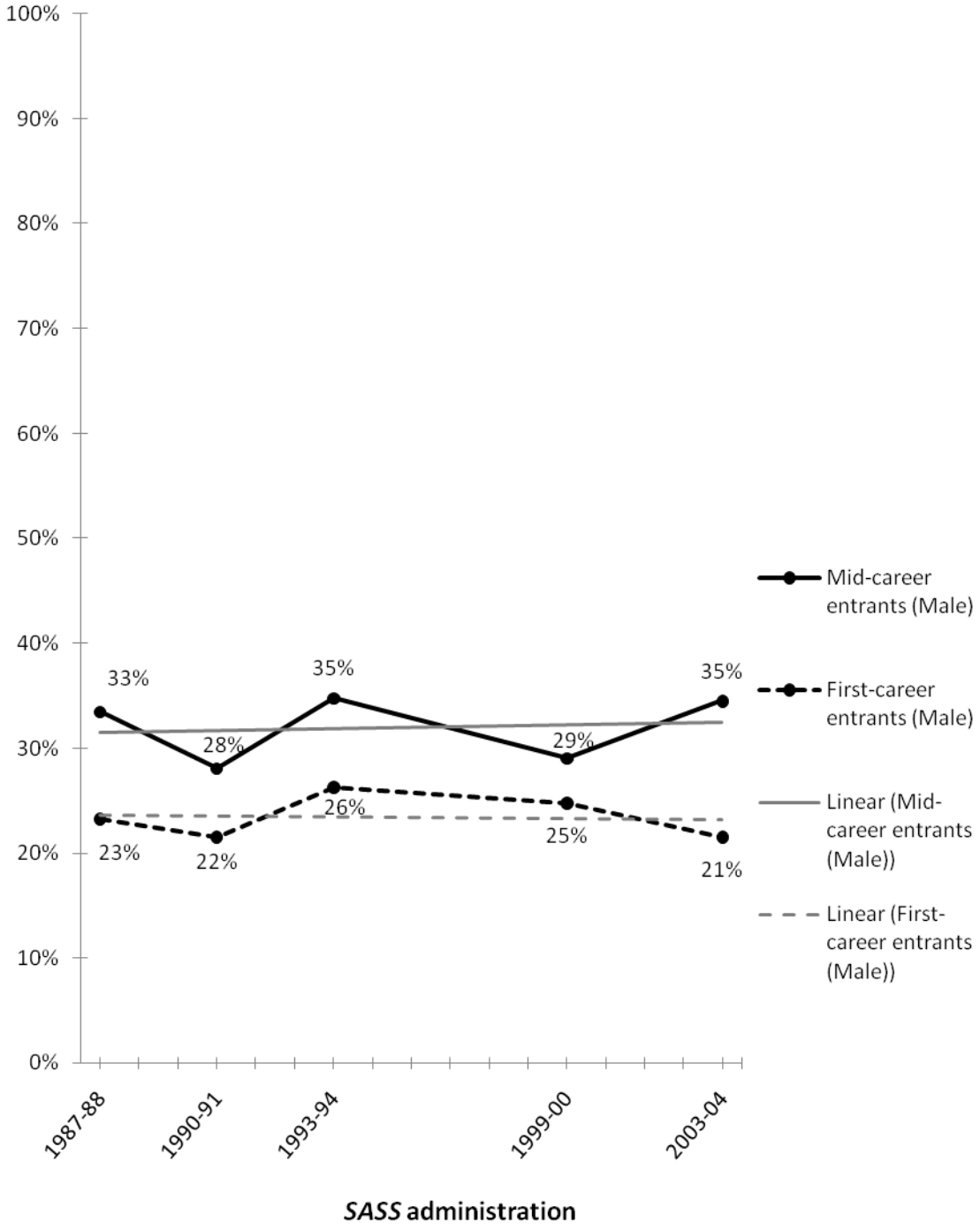


Figure 7: Sample mean values of the percentage of first-year teachers who are male and female, by survey year

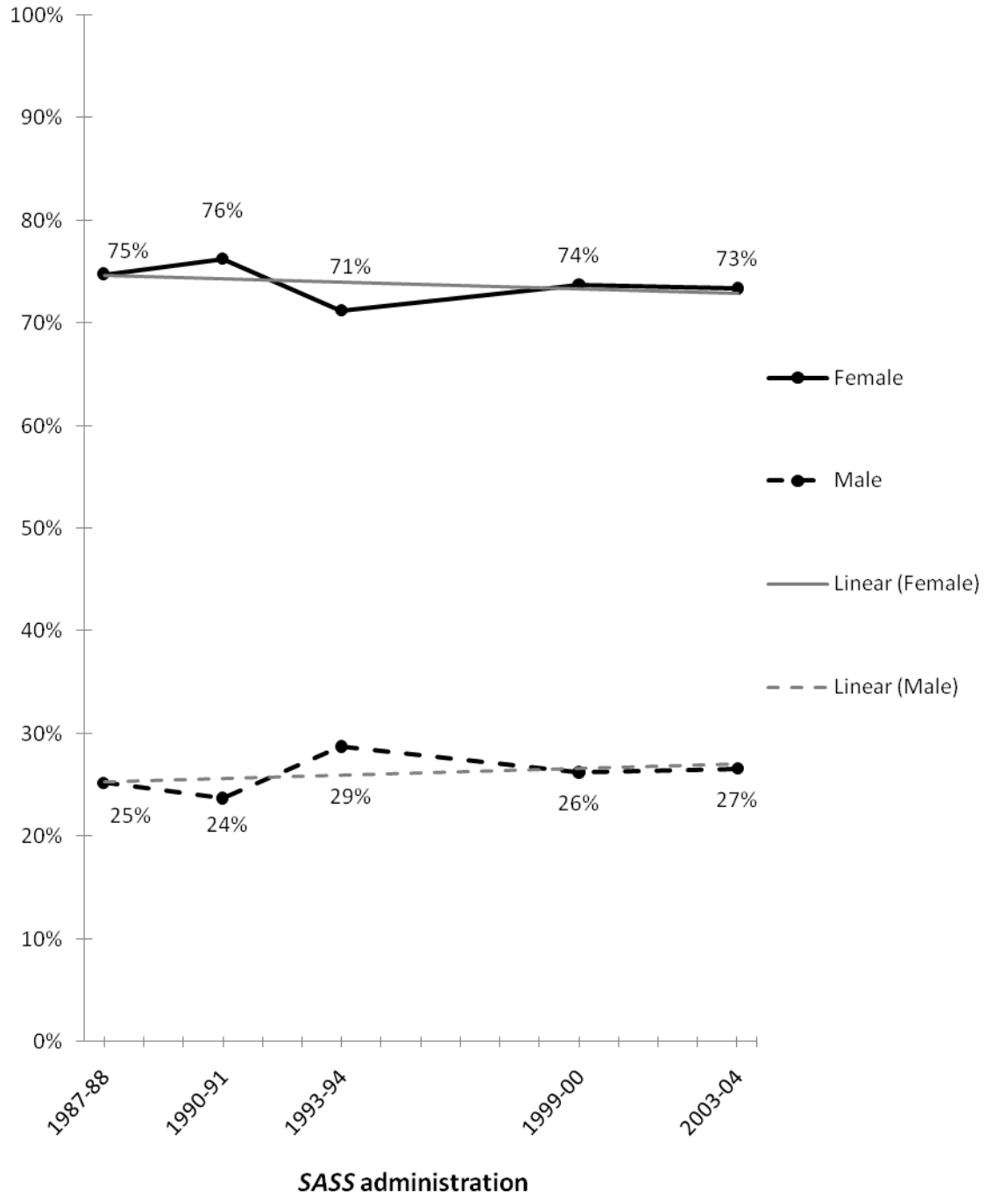


Figure 8: Sample mean values of the percentage of mid- and first-career entrants from non-White racial/ethnic backgrounds, by survey year

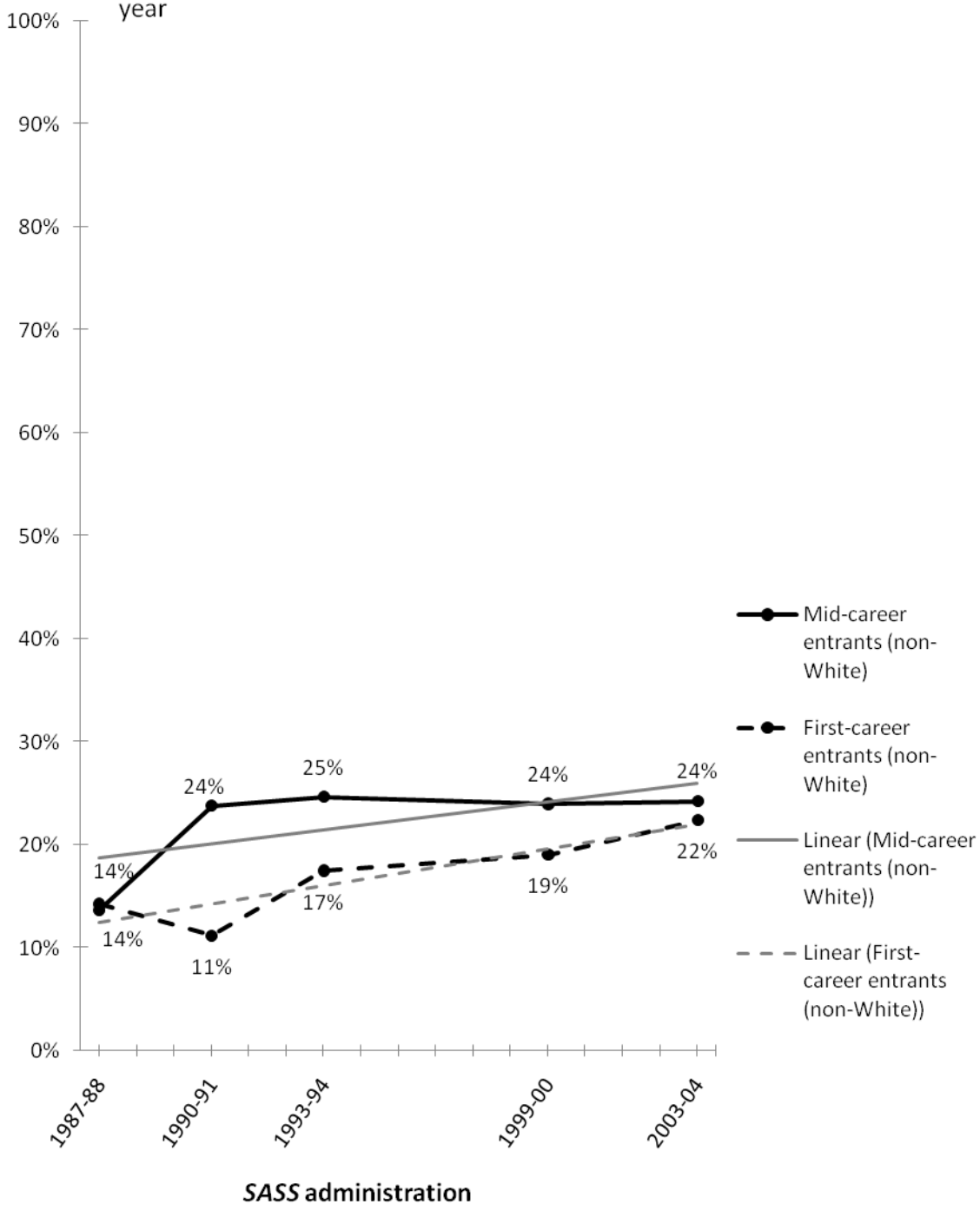
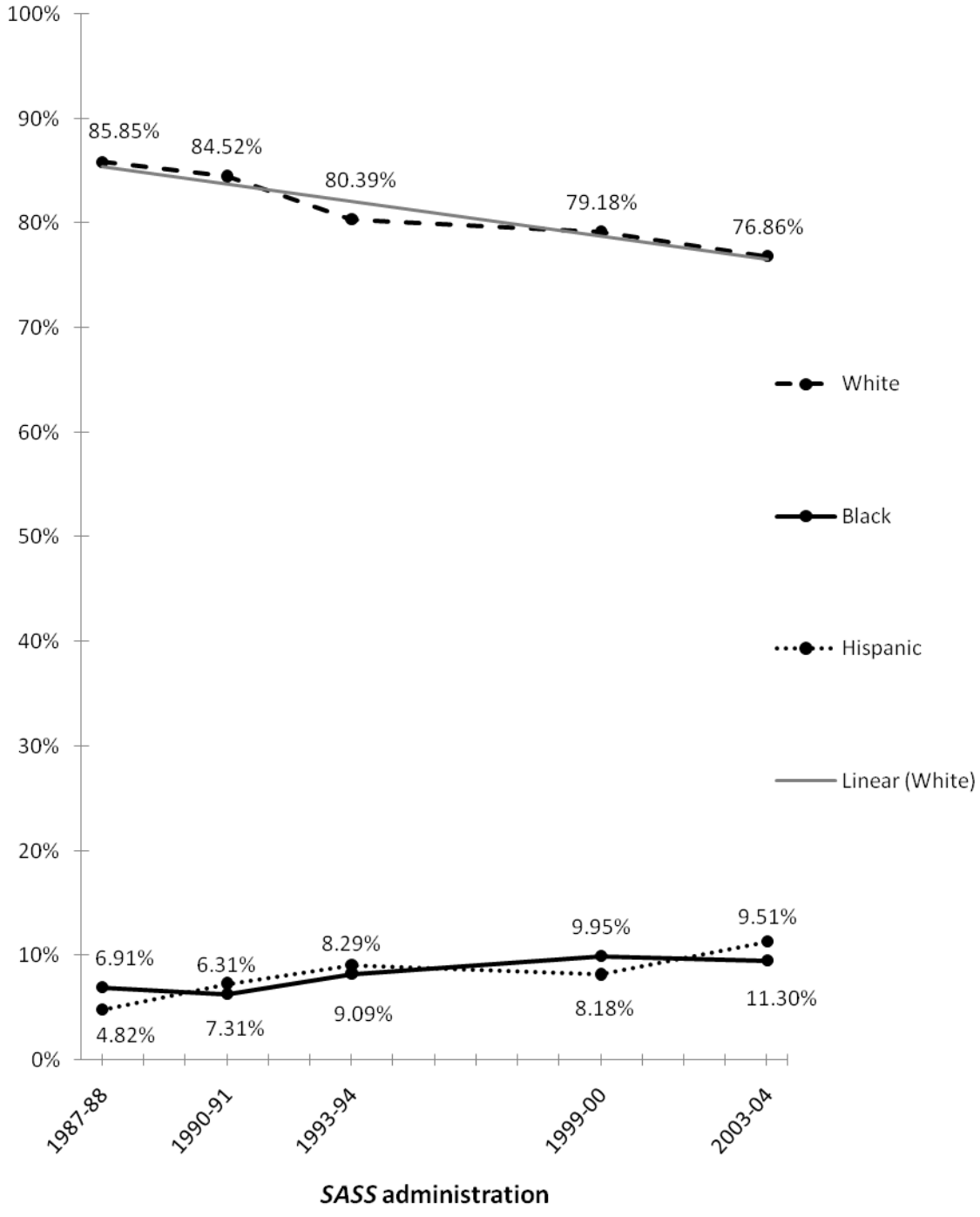


Figure 9: Sample mean values of the percentage of first-year teachers, by survey year and racial/ethnic background



1. Was it more probable for first-year mid-career entrants to teach in elementary schools than for first-year first-career entrants, on average over the period of observation?

Null hypothesis:

H_0: The observed average difference in the elevation of the linear trends for first-year mid- and first-career entrants who teach in elementary schools is zero, over time in the population

H_0: $L = 0.2\delta_1^{AB} + 0.2\delta^{AB} + 0.2\delta_3^{AB} + 0.2\delta_4^{AB} + 0.2\delta_5^{AB} = 0$

Sample statistics:

Mid-career entrants

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	52.72%	66.29%	57.08%	62.81%	58.82%
se	4.08%	3.09%	3.22%	2.93%	5.30%
n	269	541	589	623	582

First-career entrants

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	62.47%	66.08%	64.27%	65.54%	62.03%
se	1.80%	1.90%	2.11%	1.97%	3.69%
n	1017	980	1232	1085	874

Estimated linear slope contrast:

$\hat{L}$= 4.5330%

$se(\hat{L})$ = 2.0201%

Test statistics:

z_{obs} = $\hat{L} / se(\hat{L})$ = 2.2440 (p< 0.0248)

Test decision:

Reject H_o

2. Did the percentage of mid-career entrants among first-year teachers increase over the period of observation?

Null hypothesis:

Paper 1, Appendix A: Details of the Tests of Linear Contrasts

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	19.62%	33.94%	29.49%	35.69%	39.44%
se	1.43%	2.06%	1.45%	1.85%	2.55%
n	1,286	1,521	1,821	1,708	1,456

Estimated linear slope contrast:

$\hat{L}$= 0.9787%

$se(\hat{L}) =$ 0.1601%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L})$ = 6.1115 (p< 0.0001)

Test decision:

Reject H_o

3. Was it more probable for first-year male teachers than for first-year female teachers to be mid-career entrants, on average over the period of observation?

Null hypothesis:

H_0: The observed average difference in the elevation of the linear trends for first-year male and female teachers who are mid-career entrants is zero, over time in the population

H_0: $L = 0.2\delta_1^{AB} + 0.2\delta^{AB} + 0.2\delta_3^{AB} + 0.2\delta_4^{AB} + 0.2\delta_5^{AB} = 0$

Sample statistics:

First-year males

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	26.05%	40.16%	35.65%	39.47%	51.11%
se	2.37%	4.14%	2.05%	2.97%	4.37%
n	378	476	651	563	465

First-year females

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	17.45%	32.00%	27.01%	34.34%	35.21%
se	1.69%	2.51%	2.17%	2.42%	2.8%
n	908	1045	1170	1145	991

Estimated linear slope contrast:

$\hat{L}$= 9.2860%

$se(\hat{L})$ = 1.1859%

Test statistics:

z_{obs} = $\hat{L} / se(\hat{L})$ = 511.3687 (p< 0.0001)

Test decision:

Reject H_o

Paper 1, Appendix A: Details of the Tests of Linear Contrasts

4. Was it increasingly probable that first-year male teachers were mid-career entrants, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	26.05%	40.16%	35.65%	39.47%	51.11%
se	2.37%	4.14%	2.05%	2.97%	4.37%
n	378	476	651	563	465

Estimated linear slope contrast:

$\hat{L}$= 1.1783%

$se(\hat{L}) =$ 0.2769%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L})$ = 4.2558 (p< 0.0001)

Test decision:

Reject H_o

Paper 1, Appendix A: Details of the Tests of Linear Contrasts

5. Was it increasingly probable that first-year female teachers were mid-career entrants, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	17.45%	32.00%	27.01%	34.34%	35.21%
se	1.69%	2.51%	2.17%	2.42%	2.8%
n	908	1045	1170	1145	991

Estimated linear slope contrast:

$\hat{L}$= 0.8938%

$se(\hat{L}) =$ 0.1839%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L})$ = 4.8601 (p< 0.0001)

Test decision:

Reject H_o

6. Is the difference in the linear rates of increase in the percentage of first-year male and female teachers who are mid-career entrants statistically significant?

Null hypothesis:

H_0: The differences in the linear slopes is zero, over time in the population

H_0: $L = -0.04322\,\delta_1^{AB} - 0.0257\,\delta^{AB} - 0.00818\,\delta_3^{AB} + 0.026869\,\delta_4^{AB} + 0.050234\,\delta_5^{AB} = 0$

Sample statistics:

First-year males

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	26.05%	40.16%	35.65%	39.47%	51.11%
se	2.37%	4.14%	2.05%	2.97%	4.37%
n	378	476	651	563	465

First-year females

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	17.45%	32.00%	27.01%	34.34%	35.21%
se	1.69%	2.51%	2.17%	2.42%	2.8%
n	908	1045	1170	1145	991

Estimated linear slope contrast:

$\hat{L}$= 0.2845%

$se(\hat{L})$ = 0.3324%

Test statistics:

z_{obs} = $\hat{L} / se(\hat{L})$ = 0.8558 (p=0.3757)

Test decision:

Fail to reject H_o

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7. Was it more probable for White first-year teachers than for non-White first-year teachers to be mid-career entrants, on average over the period of observation?

Null hypothesis:

H_0: The observed average difference in the elevation of the linear trends for first-year White and non-White teachers who are mid-career entrants is zero, over time in the population

H_0: $L = 0.2\delta_1{}^{AB} + 0.2\delta^{AB} + 0.2\delta_3{}^{AB} + 0.2\delta_4{}^{AB} + 0.2\delta_5{}^{AB} = 0$

Sample statistics:

White first-year teachers

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	19.72%	30.58%	27.64%	34.27%	38.87%
se	1.45%	2.00%	1.71%	1.87%	2.76%
n	1112	1304	1475	1394	1166

Non-White first-year teachers

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	18.98%	52.28%	37.11%	41.11%	41.35%
se	3.54%	5.86%	4.86%	4.29%	5.13%
n	174	217	346	314	290

Estimated linear slope contrast:

$\hat{L}$= 7.9487%

$se(\hat{L})$ = 2.3282%

Test statistics:

z_{obs} = $\hat{L}/\ se(\hat{L})$ = 3.414 (p=0.0006)

Test decision:

Reject H_o

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8. Was it increasingly probable that non-White first-year teachers were mid-career entrants, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	18.98%	52.28%	37.11%	41.11%	41.35%
se	3.54%	5.87%	4.86%	4.29%	5.13%
n	174	217	346	314	290

Estimated linear slope contrast:

$\hat{L}$= 0.7143%

$se(\hat{L}) =$ 0.3571%

Test statistics:

$z_{obs} =$ $\hat{L} / se(\hat{L})$ = 2.0000 (p=0.0455)

Test decision:

Reject H_o

9. Was it increasingly probable that White first-year teachers were mid-career entrants, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	19.72%	30.58%	27.64%	34.27%	38.87%
se	1.45%	2.00%	1.71%	1.87%	2.76%
n	1112	1304	1475	1394	1166

Estimated linear slope contrast:

$\hat{L}$= 1.0090%

$se(\hat{L}) =$ 0.1689%

Test statistics:

$z_{obs} =$ $\hat{L} / se(\hat{L})$ = 5.9757 (p< 0.0001)

Test decision:

Reject H_o

10. Is the difference in the linear rates of increase in the percentage of first-year White and non-White teachers who are mid-career entrants statistically significant?

Null hypothesis:

H_0: The differences in the linear slopes is zero, over time in the population

H_0: $L = -0.04322\,\delta_1^{AB} - 0.0257\,\delta^{AB} - 0.00818\,\delta_3^{AB} + 0.026869\,\delta_4^{AB} + 0.050234\,\delta_5^{AB} = 0$

Sample statistics:

White first-year teachers

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	18.98%	52.28%	37.11%	41.11%	41.35%
se	3.54%	5.87%	4.86%	4.29%	5.13%
n	174	217	346	314	290

Non-White first-year teachers

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	19.72%	30.58%	27.64%	34.27%	38.87%
se	1.45%	2.00%	1.71%	1.87%	2.76%
n	1112	1304	1475	1394	1166

Estimated linear slope contrast:

$\hat{L}$= 0.6442%

$se(\hat{L}) =$ 0.5580%

Test statistics:

$z_{obs} =$ $\hat{L} / se(\hat{L})$ = 1.1546 (p=0.2483)

Test decision:

Fail to reject H_o

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11. Was it more probable for first-year mid- or first-career entrants to be male, on average over the period of observation?

Null hypothesis:

H_0: The observed average difference in the elevation of the linear trends for first-year mid- and first-career entrants who are male is zero, over time in the population

H_0: $L = 0.2\delta_1^{AB} + 0.2\delta^{AB} + 0.2\delta_3^{AB} + 0.2\delta_4^{AB} + 0.2\delta_5^{AB} = 0$

Sample statistics:

First-career entrants

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	23.21%	21.51%	26.25%	24.71%	21.49%
se	1.48%	1.88%	1.98%	2.02%	1.88%
n	1017	980	1232	1085	874

Mid-career entrants

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	33.49%	28.10%	34.76%	29.04%	34.50%
se	3.44%	3.39%	3.08%	2.40%	3.49%
n	269	541	589	623	582

Estimated linear slope contrast:

$\hat{L}$= 8.5440%

$se(\hat{L}) =$ 1.6494%

Test statistics:

$z_{obs} =$ $\hat{L} / se(\hat{L}) = 5.1801$ ($p < 0.0001$)

Test decision:

Reject H_o

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12. Was it increasingly probable for first-year teachers to be male, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	25.22%	23.74%	28.76%	26.26%	26.62%
se	1.45%	1.54%	1.69%	1.40%	1.70%
n	1,286	1,521	1,821	1,708	1,456

Estimated linear slope contrast:

$\hat{L}$= 0.1074%

$se(\hat{L}) =$ 0.1200%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L})$ = 0.8949 (p=0.3708)

Test decision:

Fail to reject H_o

13. Was it more probable for first-year mid- or first-career entrants to be from non-White racial/ethnic backgrounds, on average over the period of observation?

Null hypothesis:

H_0: The observed average difference in the elevation of the linear trends for first-year mid- and first-career entrants who were from non-White racial/ethnic backgrounds is zero, over time in the population

H_0: $L = 0.2\delta_1^{AB} + 0.2\delta^{AB} + 0.2\delta_3^{AB} + 0.2\delta_4^{AB} + 0.2\delta_5^{AB} = 0$

Sample statistics:

Mid-career entrants

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	13.69%	23.85%	24.67%	23.98%	24.26%
se	2.27%	2.99%	3.74%	2.58%	3.39%
n	269	541	589	623	582

First-career entrants

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	14.26%	11.19%	17.49%	19.07%	22.41%
se	1.67%	1.46%	1.79%	1.67%	2.81%
n	1017	980	1232	1085	874

Estimated linear slope contrast:

$\hat{L}$= 5.2066%

$se(\hat{L}) =$ 1.6125%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L}) = 3.229$ (p=0.0012)

Test decision:

Reject H_o

14. Was it increasingly probable for first-year mid-career entrants to come from non-White racial/ethnic backgrounds, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	13.69%	23.85%	24.67%	23.98%	24.26%
se	2.27%	2.99%	3.74%	2.58%	3.39%
n	269	541	589	623	582

Estimated linear slope contrast:

$\hat{L}$= 0.4566%

$se(\hat{L}) =$ 0.2242%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L})$ = 2.0367 (p=0.0417)

Test decision:

Reject H_o

15. Was it increasingly probable for first-year first-career entrants to come from non-White racial/ethnic backgrounds, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	14.26%	11.19%	17.49%	19.07%	22.41%
se	1.67%	1.46%	1.79%	1.67%	2.81%
n	1017	980	1232	1085	874

Estimated linear slope contrast:

$\hat{L}$= 0.5912%

$se(\hat{L}) =$ 0.1696%

Test statistics:

$z_{obs} =$ $\hat{L} / se(\hat{L})$ = 3.4861 (p=0.0005)

Test decision:

Reject H_o

16. Is the difference in the linear rates of increase in the percentage of mid- and first-career entrants who are from non-White racial/ethnic backgrounds statistically significant?

Null hypothesis:

H_0: The differences in the linear slopes is zero, over time in the population

H_0: $L = -0.04322\,\delta_1^{AB} - 0.0257\,\delta^{AB} - 0.00818\,\delta_3^{AB} + 0.026869\,\delta_4^{AB} + 0.050234\,\delta_5^{AB} = 0$

Sample statistics:

Mid-career entrants

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	13.69%	23.85%	24.67%	23.98%	24.26%
se	2.27%	2.99%	3.74%	2.58%	3.39%
n	269	541	589	623	582

First-career entrants

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	14.26%	11.19%	17.49%	19.07%	22.41%
se	1.67%	1.46%	1.79%	1.67%	2.81%
n	1017	980	1232	1085	874

Estimated linear slope contrast:

$\hat{L}$= -0.1346%

$se(\hat{L}) =$ 0.2811%

Test statistics:

$z_{obs} =$ $\hat{L} / se(\hat{L})$ = -0.4787 (p=0.6322)

Test decision:

Fail to reject H_o

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17. Was it increasingly probable for first-year mid-career entrants to come from Black racial/ethnic backgrounds, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	5.83%	10.01%	9.76%	14.50%	12.44%
se	1.77%	2.42%	1.73%	2.27%	2.77%
n	269	541	589	623	582

Estimated linear slope contrast:

$\hat{L}$= 0.4388%

$se(\hat{L}) =$ 0.1818%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L})$ = 2.4144 (p=0.0158)

Test decision:

Reject H_o

18. Was it increasingly probable for first-year first-career entrants to come from Hispanic racial/ethnic backgrounds, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	4.77%	4.77%	8.30%	8.88%	11.84%
se	0.65%	0.99%	1.56%	1.56%	2.46%
n	1017	980	1232	1085	874

Estimated linear slope contrast:

$\hat{L}$= 0.4367%

$se(\hat{L}) =$ 0.1364%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L})$ = 3.2010 (p=0.0014)

Test decision:

Reject H_o

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19. Was it decreasingly probable for first-year teachers to come from White racial/ethnic backgrounds, on average over the period of observation?

Null hypothesis:

H_0: The slope of the linear trend is zero, over time in the population

H_0: $L = -0.04322\mu_1 - 0.0257\mu_2 - 0.00818\mu_3 + 0.026869\mu_4 + 0.050234\mu_5 = 0$

Sample statistics:

SASS	**1987-88**	**1990-91**	**1993-94**	**1999-00**	**2003-04**
mean	85.85%	84.52%	80.39%	79.18%	76.86%
se	1.45%	1.31%	1.60%	1.39%	2.27%
n	1,286	1,521	1,821	1,708	1,456

Estimated linear slope contrast:

$\hat{L}$= -0.5520%

$se(\hat{L}) =$ 0.1403%

Test statistics:

$z_{obs} = \hat{L} / se(\hat{L})$ = -3.9352 (p< 0.0001)

Test decision:

Reject H_o