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Teacher Turnover: An Issue of Workgroup Racial Diversity¹

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Abstract

One neglected aspect of the teacher labor supply is a recent increase in the proportion of minority teachers. Using the Schools and Staffing Survey and the Teacher Follow-up Survey, one can estimate the relationship between workgroup racial diversity and the turnover of White teachers. This approach finds that young White teachers are more likely to stay in their original schools when the proportion of minority teachers is smaller. However, the opposite pattern emerges for older teachers. This poses a policy dilemma for recruiting and retaining teachers on the one hand and diversifying teaching staff on the other hand.

Keywords: teacher turnover; diversity (faculty); ethnic diversity.

Abandono docente: Una cuestión de diversidad étnica en los grupos laborales

Resumen

Un aspecto descuidado de los estudios sobre la oferta laboral docente es el reciente aumento en la proporción de profesores de minorías étnicas. Usando la Encuesta

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de Escuelas y Personal y de la Encuesta de Seguimiento Docente, se puede calcular la relación entre la diversidad étnica del grupo laboral y el volumen de abandono de los docentes blancos. Este estudio encontró que los docentes jóvenes blancos tienen más probabilidades de permanecer en sus escuelas de origen cuando la proporción de profesores de minorías raciales es pequeña. Sin embargo, la tendencia es opuesta entre los profesores de más edad. Esto plantea un dilema de política educativa, para contratar y retener a los docentes por un lado, y la diversificación racial del personal docente, por el otro.

Palabras clave: abandono de docentes; diversidad (profesores); diversidad étnica

Introduction

Teacher shortages are a perennial problem in the USA. Unfortunately, these shortages are expected to become more severe. The baby boom generation has just started to retire, and its echo is still reverberating. Class size reduction has been implemented in an impressive way. In California, for example, the reduction embarked upon in 1997 costs \$1.5 billion per year. In Florida, voters passed a class size reduction amendment in 2002, constitutionally limiting class sizes to 18, 22, and 25 students for K–3, 4–8, and 9–12 education, respectively. The federal Class-Size Reduction Program initiated in the Fiscal Year of 1999 may further aggravate teacher shortages. Problems persist not only in the quantity of teachers but also in the quality. Teacher quality as measured by standardized tests has deteriorated over the last half century (Corcoran, Evan, & Schwab, 2004a, 2004b). In addition, the more qualified teachers are, the more they tend to leave teaching (Murnane, Singer, Willett, Kemple, & Olsen, 1991). This trend seems to remain as decreased gender discrimination and occupational segregation open more remunerative alternatives to women (Temin, 2002).

All these factors present dismal prospects for the future supply of teachers. A critical understanding of the supply is necessary to eliminate or, less ambitiously, alleviate the quantitative and qualitative shortages. One neglected issue for the teacher supply is that more minorities have recently entered the teaching profession. Since the first report on teacher population by race in the Digest of Education Statistics in 1971, the proportion of White teachers had hovered around 90% in public elementary and secondary schools before dropping from 90.7 % in 1996 to 84.3 % in 1999–2000 and to 83.1% in 2003–04. Considering the long-held numerical dominance of White teachers, the consistent and fast increase in minority teachers is striking. The relative increase of minority teachers is advantageous if the racial matching helps minority students improve their achievement (Dee, 2005). On the other hand, if the increase is positively or negatively related to the attrition of White teachers, subtle implications for the teacher supply also need to be recognized.

This article estimates the relationship between workgroup racial diversity and turnover. This issue has not been addressed in the education literature, but considering the current demographic trends, it is too important to be neglected. In essence, this paper is exploratory, breaking new ground and opening a new research area. Although control is not perfect for all of the potential unobservable factors that affect turnover, I do make various efforts to demonstrate the relationship solidly. Also, other possible reasons for the relationship are discussed for future research.

Previous studies focus exclusively on teacher or school characteristics per se, neglecting interactions among teachers themselves. Their basic findings are as follows: young and female teachers are more likely to quit; better pecuniary incentives such as salaries or bonuses reduce their turnover rate. When interaction is considered, it is mostly between teachers and students not among teachers (see Table 1 for the relevant studies). However, teachers act on and react to other teachers.

They are in a workgroup. Empirical research in organizational behavior provides the general consensus that organizational diversity, including race, increases turnover (see Williams & O'Reilly, 1998, for a review).

The focus of this paper is on White teachers under age 30. White teachers are chosen because they account for a substantial body of the teaching staff in public K–12 schools, the relative increase of minority teachers notwithstanding. Also, small sample sizes for other races prevent meaningful analysis of them. The focal age group is under 30 because this group shows a high turnover rate compared to older age groups. Reducing turnover of this group should alleviate recruiting problems. Methodologically, analysis of turnover in this age group suffers little from survivorship bias. Older teachers (aged 30 or more) survive in the sense that teachers not suited to teaching have already left the profession. If the non-survived group is more strongly related to racial diversity, the estimation for the survived group alone biases the relationship downward. The small proportion of minority teachers is related to the reduced turnover of young White teachers. Although the size of the relationship is small, the opposite pattern emerges for older teachers. This study provides another point for policy makers to consider for recruiting and retaining teachers.

Literature

The organizational approach comes from the hypothesis that a White teacher tends to leave his school more often when he is surrounded by minority teachers rather than White teachers. The basic theories and models come from psychology and sociology. In social psychology, Byrne (1971) proposes a theory of similarity/attraction, arguing that individuals are attracted to others similar to themselves. However, this theory is only relevant to interpersonal interaction. Individuals do not necessarily need to interact with each other to be attracted. Even arbitrary grouping can elicit attraction. This is the basic thesis of social categorization (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). According to this theory, individuals are assumed to try to maintain high self-esteem. One way to do this is by comparing themselves to others. Individuals categorize themselves, and once they belong to one category, they tend to have a positive affection, evaluation, or judgment of in-group members even if they do not know them. In organizational psychology, some models produce similar results although the mechanisms are different. A model of supplement person-organization fit posits that an individual is more likely to stay when he “fits into some environmental context because he or she supplements, embellishes, or possesses characteristics that are similar to other individuals in this environment” (Munchinsky & Monahan, 1987, p. 269). Similarly, Schneider (1987) contends that an individual is “attracted to, selected by, and stayed in an organization” (p. 446) (an attraction-selection-attrition model).

Despite the different mechanisms, what all the theories and models have in common is summarized in the proverb, “Birds of a feather flock together.” This general pattern suggests that a White teacher is more likely to move or leave teaching when he teaches in a school where the race of teachers is diverse or where the proportion of White teachers is low. Turnover behavior is not simple, however. A model of information/decision making predicts the opposite. Individuals from various backgrounds bring in new information, which helps improve decision-making (Gruenfeld, Mannix, Williams, & Neale, 1996; Wittenbaum & Stasser, 1996). By extension, this positive side of diversity can reduce turnover. This is the benefit of diversity often praised in business and academia (Kochan et al., 2003; Murphy, Cronin, & Tam, 2003, item 21 in Table 2; Perloff, 2000).

Another twist of diversity is a theory of social contact (Blau, 1977). According to this theory, an individual may initially have a negative affection, evaluation, or judgment of others who differ from him. However, as contact increases, their attitudes or beliefs change. It is mathematically true

that the probability of contact with other groups is inversely related to the size of one's own group. So, the probability of contact with Black teachers is higher for White teachers when White is the minority race and vice versa. The theory predicts that responses to other races will differ depending on whether the focal race is the majority or minority. Hence, the relationship between racial diversity and turnover is an empirical question. Whether studies are experimental or field studies, they agree that racial diversity increases turnover. Participants in most experiments are selected on an ad hoc basis, the time frame is short, and the type of responses is simple. On the other hand, most field studies focus on one or two establishments within an occupation, which makes generalization difficult. The same criticism applies to the literature on teacher turnover. Most empirical studies focus on public schools in one state or city as listed in Table 1. The goal of this article is to overcome this problem by using nationally representative data.

Table 1

Selected studies on teacher turnover and the corresponding study areas

Author	Area
Greenberg and McCall (1974)	San Diego
Murnane and Olsen (1989)	Michigan
Murnane, Singer, Willett, Kemple, & Olsen (1991)	Michigan, North Carolina, USA (National Longitudinal Survey)
Hanushek, Kain, & Rivkin (2004)	Texas
Mont and Rees (1996), Brewer (1996), Lankford, Loeb, & Wyckoff (2002), Boyd, Lankford, Loeb, & Wyckoff (2005)	New York
Loeb, Darling-Hammond, and Luczak (2005)	California
Scadifi, Sjoquist, and Stinebrickner (2007)	Georgia
Theobald (1990), Gritz and Theobald (1996)	Washington
Clotfelter, Glennie, Ladd, and Vigdor (2006)	North Carolina
Baugh and Stone (1982)	USA (Current Population Survey)
Shen (1997), Ingersoll (2001)	USA (Schools and Staffing Survey and Teacher Follow-up Survey)

There are studies on teacher turnover outside the USA (for example, Donlton & van der Klaauw, 1995, 1999—the UK; Falch & Strøm, 2004, and Falch & Rønning, 2005—Norway; Bradely, Green, & Leeves, 2006—Queensland, Australia). As these results are similar to those regarding schools in the USA, I confine the attention to studies on US schools.

Data

The Schools and Staffing Survey (SASS) and Teacher Follow-up Survey (TFS) are specifically targeted to understand teacher turnover. The SASS was initiated in 1987–1988 and conducted irregularly. After one year of each cycle of the SASS, teachers who moved to other schools (mover) or left the occupation (leaver) were resurveyed along with representatively sampled teachers who stayed in their schools (stayer). The data are partially longitudinal in the sense that whereas all movers and leavers were followed-up, not all stayers were followed-up. I used the SASS

1993–94 and TFS 1994–95 for this paper. The data period is ideal because it closely coincides with the initial percentage decrease of White teachers.

The scope of the data is wide. Because the data are nationally representative, even if teachers moved out of their states or cities, it is possible to identify whether they changed schools or occupation. Also, the data provide information on private as well as public schools. Although private schools account for a small part of the school system, ignoring them is a mistake. Public school teachers also move in and out of private schools. Moreover, as the school choice movement gathers momentum, more students are expected to enroll in charter schools and voucher schools, both of which are similar to private schools in many characteristics.

Because the data are specifically designed to understand teacher turnover, the content is rich. The variable of interest is the racial diversity of teachers in each school. The survey distinguishes five races (American Indian, Asian or Pacific Islander, Hispanic, Black not of Hispanic origin, and White not of Hispanic origin) and records the percentage of each race in a given school. In addition to usual characteristics such as age, gender, race, education, experience, and tenure, the data contain a variety of non-pecuniary characteristics. These include 25 items on teachers' perceptions toward teaching, 24 items on student problems, nine items on compensation other than base salaries, six items on parties influential to school policy, six items on teachers' control over classrooms, among the broad range of available information. Administrative data usually used in the literature have neither this wide scope nor rich content because the data are not collected for studying turnover. Other data, such as the National Longitudinal Survey or the Current Population Survey, have the scope but lack the richness of the SASS and TFS.

The SASS and TFS have their limitations, however. The most notable one is the small sample size. In the TFS 1994–95, 4,528 and 1,751 teachers in public and private schools, respectively, were sampled (total of 6,279). The size is smaller than that of the Texas data used by Hanushek, Kain, and Rivkin (2004), which total more than 378,000 teachers. This is the trade-off between scope and depth. The advantage is that the sample size is much larger compared to other nationally representative data sets. For example, Stinebrickner uses only 341 and 551 observations for his 1998 and 2001 papers, respectively.

Another weakness of the data is that the follow-up period is rather short, one year. Usually, administrative data follow-up teachers from the time they begin teaching as long as they stay in their states or cities. In this case, left censoring is not a problem for turnover although the issue of right censoring remains. The SASS and TFS suffer from left and right censoring. I do not observe teachers who moved or left either before or after the survey year. If teachers have different turnover patterns in non-survey years, the following estimates are biased. The analysis for this article dropped observations from the bottom one percentile of the base salaries of teachers with bachelor's degrees and no teaching experience, and former teachers who became disabled and who did not report their highest degree attained. The final sample size is 4,664.

Methods

Multinomial Probit Model

Consider a teacher with three alternatives ($=3$): stay in the original school (stayer), move to another school (mover), or leave teaching (leaver). He or she chooses the alternative that yields the highest utility. Utility is represented as follows:

$$U_{is}^j = X_{is}'\beta_1^j + Z_s'\beta_2^j + DI_s'\beta_3^j + \varepsilon_{is}^j,$$

where U_{is}^j is the utility of teacher i in school s with alternative j , X is a vector of teacher i 's characteristics in school s , Z is a vector of school s 's characteristics, DI is a polynomial of order 3 of the racial diversity index of teachers in school s (the index is explained below), and ε is a mean zero, independent, and standard normal error term. I enter a polynomial of order 3 because there is neither theoretical nor empirical guidance for the relationship (linear or non-linear) and because it is uncertain whether White teachers respond in the same way when they are the majority as when they are not.

The independent variables are selected as parsimoniously as possible. Most of the variables such as teacher demographics, education, experience, salary, and census region are commonly used in the previous literature to explain teacher turnover (see Table 1). And yet, the advantages that the data offer are not lost. The summary variables of the following factors are included: pecuniary compensations besides salaries such as health insurance, and day care; and non-pecuniary compensations such as teachers' influence on school policy and the extent of student problems.

Moving and leaving are intentionally distinguished because of their different implications for policy makers and individual teachers. Moving does not aggravate overall teacher shortages and has redistributive implications for the current stock of teachers. On the other hand, leaving exacerbates the shortages and is closely related to increasing the (in-)flow of teachers. Also, moving implies a change of employers whereas leaving is involved in a change of occupations. In terms of specific training, its related opportunity costs, and the present value of future benefits, the latter is a more dramatic event for individual teachers. It can be expected that different age groups show different patterns of moving and leaving.

Although the focus group of this paper is White teachers under age 30, additional analysis extends the model to other age groups to check whether a meaningful comparison is possible across the groups. One can disaggregate teachers by age groups into those under age 30, between ages 30 and 49, and those 50 or older. The grouping has a theoretical and empirical advantage over pooling teachers with a variable of age. Importantly, different age groups show heterogeneous patterns in the labor market. Neal (1999) argues that whereas young workers tend to change not only occupations but also employers, old workers are more likely to change only employers. This means that young teachers are prone to leave the profession while old teachers tend to move. Topel and Ward (1992) describe how dramatic occupational changes are for young workers. For the first ten years in the labor market, a typical young worker holds seven occupations, which accounts for two thirds of the occupational changes in his whole career life. Moreover, Gielen and van Ours (2006) argue that in recession, the labor market for young workers is more like a revolving door in the sense that they exit but reenter employment. On the other hand, the old workers' door is one way—they exit, but it is difficult to reenter. The different turnover behavior and labor market conditions make pooling too restrictive.

Diversity Index

Another issue is how to measure diversity. The Shannon information entropy is a widely used measure (Shannon, 1948). This measure is essentially the expectation of uncertainty, where uncertainty is defined as $u = \log_b \frac{1}{p(x_i)}$, with $p(x_i)$ being the probability density function of x_i .

One problem with this measure is choosing the base b , which has a meaning in information theory but not in organizational diversity. Along with the Shannon information entropy, the Gini index can be used as in the analysis of hospital staff turnover by Pfeffer and O'Reilly (1987). Although the

index is familiar, it is sensitive to the distribution of the variable measured. In addition, it poses another problem, selection of the relevant unit size.

Tsui, Egan, and O'Reilly (1992) apply the relational demography score, $\sqrt{\frac{\sum_i^n (S_i - S_j)}{n}}$,

where $(S_i - S_j) = 1$ if individuals S_i and S_j are of the same race and 0 otherwise, and n is the total number of workers. Although the score appears complicated, it is nothing but the square root of the proportion of individuals of different races. However, there is no reason to take a square root in the first place, as Sorensen (2003) points out. As an alternative, Sorensen proposes a simple proportion of the same race for each individual. This measure is conceptually appealing for its simplicity, but it loses information on racial mix. For example, suppose the teaching staff in a school consists of 20% minority teachers and 80% White teachers. In this case, 0.8 is assigned to each White teacher. White teachers, however, might not perceive 10% Black teachers and 10% Asian teachers in the same way as they would perceive 20% Black teachers. For the same reason, the overall proportion of minority teachers is not adopted for this study.

The analysis in this article relies on the probability of having the same race from two random samplings (Blau, 1977, ch. 4). When p_i is the proportion of race i in a school, the index is defined

as $DI = 1 - \sum_{i=1}^5 p_i^2$. A possible weakness of the index is that it does not have a direction. For

example, the index is the same when the proportions of Black teachers and White teachers are 0.3 and 0.7 as when the corresponding proportions are 0.7 and 0.3. The two situations with the same DI could have a different relationship with the turnover of White teachers. This ambiguity is not a serious problem for this study. As shown in Figures 1 and 2, White teachers are the majority in almost all sample records. Because White teachers are the focal racial group and they are the majority, the direction is from White to minority. In this sense, the lack of direction causes little concern. 0 and 0.8 indicate the complete homogeneity and heterogeneity, respectively. The actual range in the data is from 0 to 0.725.²

Principal Component Analysis

For control variables, this analysis uses non-salary compensations, teachers' influence on school policy, and student problems in addition to the common covariates in the literature. As mentioned above, there are nine items on benefits. From a principal component analysis on the covariance matrix, the score of the first component became an entry in the model as a summary of the compensations. The same technique created other measures for the other types of factors. Summarizing many items in this fashion is not unusual in the literature. Ingersoll (2001) and Loeb, Darling-Hammond, and Luczak (2005) conduct factor analysis for a summary of closely related items.

This analysis used only principals' answers about teachers' influence and student problems, though SASS items on those issues were answered by the principal and teachers in each school. It is

² Entering dummy variables instead of a polynomial does not capture the subtle effects of racial diversity. Also, choice of cutoff points is arbitrary. Preliminary results agree that the results are sensitive to cutoff points and age groups.

possible that the perceptions of teachers are biased because teachers may exaggerate their lack of influence or the prevalence of student problems to justify their turnover. For this reason, the analysis for this article does not use other items regarding teachers' perceptions or attitudes, such as teachers' perceived control over classrooms.

Results

Descriptive Statistics

Descriptive statistics are provided in Tables 2 and 3. The figures for most variables are not surprising because the sample is nationally representative. The new statistic of interest in Table 2 is *DI*, the diversity index described in the prior section. The mean of *DI* is 0.151, indicating that teacher racial composition is highly homogeneous. And yet the standard deviation of *DI* is larger than the mean, implying that *DI* is widely spread or highly skewed. Figure 1 (on p. 10) confirms this conjecture. About 30% of schools consist of teachers of one race. A more specific portrait image is Figure 2, which shows that almost 35% of schools have only White teachers.

Table 2
Descriptive statistics, teacher and school characteristics

Variable	Mean	SD
Diversity Index	0.151	0.174
<i>Teacher Characteristics</i>		
Female	0.733	0.442
Master's degree or above	0.452	0.498
Married	0.734	0.442
Number of children ^a	1.13	1.19
Member of a union ^b	0.733	0.442
Years of tenure ^c	9.1	7.9
Years of teaching experience ^d	14.4	9.1
<i>School Characteristics</i>		
Salary for a novice teacher ^e	22,544	3773
Difference in salaries between senior ^f and novice teachers	15,805	6375
Public school	0.895	0.307

Sampling weights are applied. Questions in the survey are as follows:

^a "How many children do you have who are dependent on you (and your spouse) for more than half of their financial support?"

^b "Are you a member of a teachers' union or an employee association similar to a union?"

^c "In what year did you begin teaching in THIS school?": I subtract the answered year from 1994.

^d Total teaching experience is the sum of teaching years as part- or full-time teachers in private or public schools.

^e "According to the salary schedule, what is normal yearly base salary for a teacher with a bachelor's degree and no teaching experience?"

^f "According to the salary schedule, what is the normal yearly base salary for a teacher with a master's degree (or its equivalent in credit hours) and 20 years of teaching experience?"

Table 3
Descriptive statistics, categorical variables

Variable	Frequency
<i>Enrollment^a</i>	
1–149	0.047
150–299	0.117
300–499	0.240
500–749	0.262
750–1,499	0.258
1,500 and over	0.076
<i>Percentage of minority students^b</i>	
0–4%	0.268
5–19%	0.278
20–49%	0.228
50–100%	0.226
<i>Locale</i>	
Large central city	0.110
Mid-size central city	0.166
Urban fringe of large city	0.169
Urban fringe of mid-size city	0.107
Large town	0.034
Small town	0.226
Rural	0.188
<i>Region</i>	
Northeast	0.207
Midwest	0.245
South	0.378
West	0.171

Sampling weights are applied.

^a categorized total ungraded and K–12 enrollment at each school.

^b categorized % minority students at each school.

This finding indicates that informal racial segregation exists. Schools are not the only organization where racial segregation takes place. Bayard, Hellerstein, Neumark, and Troske (1999) report that racial segregation is pervasive. While it cannot be seen at the industrial or occupational level, it is apparent at the local level. For example, a typical Black female works in an occupation where 12.4% of workers are Black, similar to the Black representation in the national population. On the other hand, when the level moves down to the job cell level, the average Black woman works in an environment where 58.4% of coworkers are Black. A typical White female worker works in a job cell where only 3.6% and 1.3% of workers are Black and Hispanic, respectively. A similar segregation is observed for male workers. Speculative as it may be, the pervasive racial segregation in a range of North American work environments is an additional reason to investigate the possible relationship between workgroup racial diversity and turnover in schools.

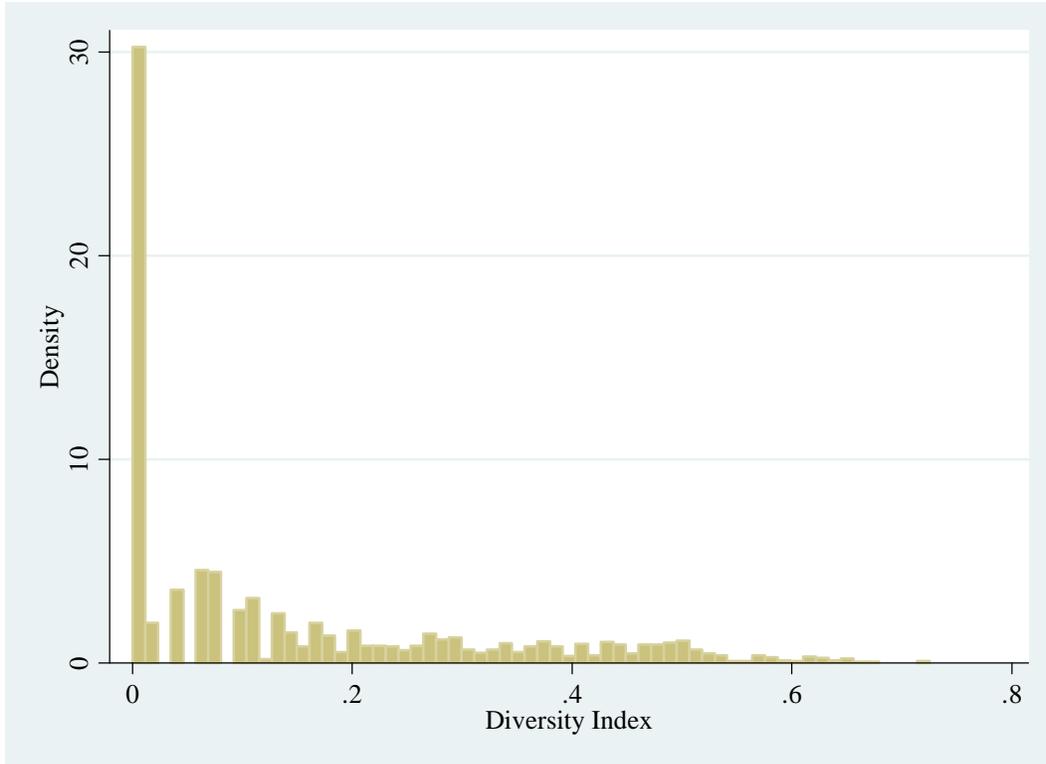


Figure 1. Density of the Diversity Index (*DI*)

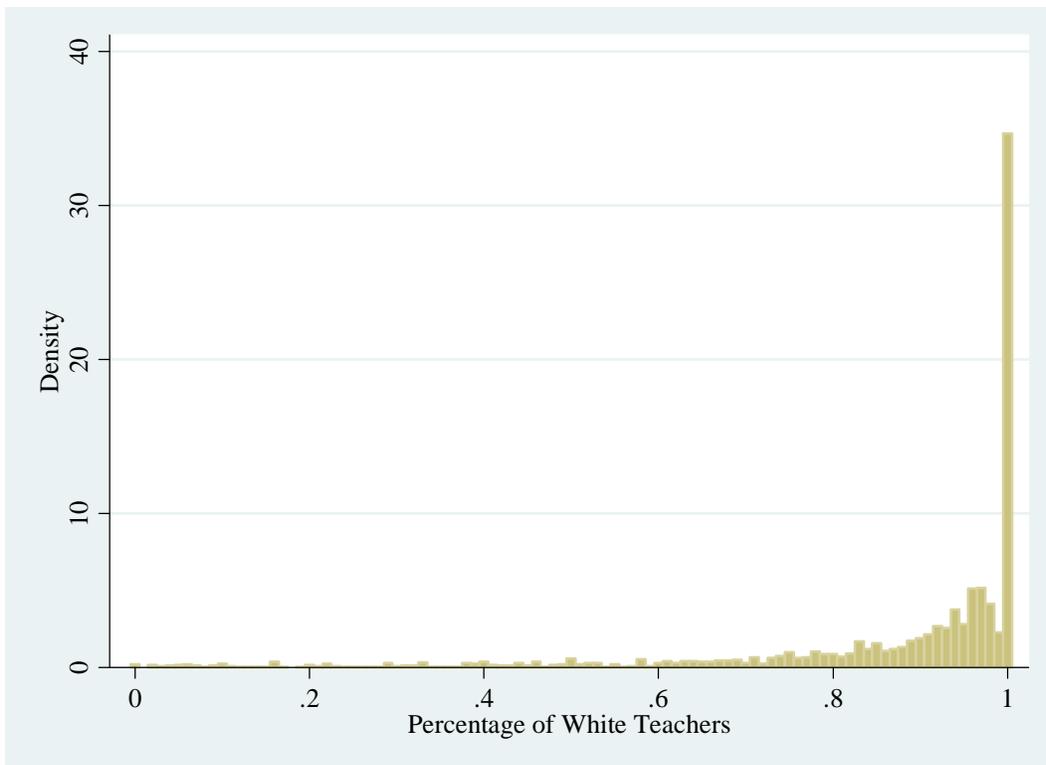


Figure 2. Density of the percentage of White teachers
Sampling weights are applied for both Figures 1 and 2.

Young White Teachers

Studies in organizational behavior are in general agreement that organizational diversity matters for substantive as well as affective results such as performance, innovation, decision quality, communication, productivity, absenteeism, satisfaction, and conflict (Williams & O'Reilly, 1998). Regarding racial diversity and turnover in particular, Sorensen (2003) finds that a decrease in one's own race is related to an increase in the probability of turnover. Zatzick, Elvira, and Cohen (2003) also demonstrate a positive relationship between one's own race and turnover.³ The analysis of teacher turnover obtains similar results for young White teachers. Table 4 lists the marginal effect of each independent variable. Because the effects of the other variables are extensively discussed in the previous literature (see Table 1), this subsection focuses on the estimates of the polynomial of *DI*.

The problem with a polynomial is how to determine its significance level. The problem becomes especially difficult with a polynomial of order 3 because a square or cubic term changes the shape of the function and its interpretation dramatically. For example, if only a linear term is statistically significant and positive, one possible interpretation is that the more diverse a workgroup, the more likely is White teacher turnover. If, however, the square term is also statistically significant and negative, the estimates would indicate the possibility that at some level of racial diversity, the relationship reverses itself. With the cubic term added, the interpretation becomes more complicated. When interpreting the results below, this uncertainty regarding the polynomial specification needs to be kept in mind. The *p*-value of some coefficients falls between 0.05 and 0.10. Considering the small sample size, this analysis uses a liberal cutoff point at 0.10 for statistical significance. The estimation strategy in this analyses added an increasing number of covariates to check the robustness of *DI* at least on the observational level. The results with only the polynomial of *DI* are listed in columns 1 and 2 of Table 4. Overall, *DI* is related to moving and leaving. The shape of the relationship is not apparent at first glance, but it will be described after additional checks.

The relationships shown in both columns can be spurious if racial diversity is related to school personnel policy, multicultural atmosphere, or student problems. To control partially for this problem, columns 3 and 4 show results with additional covariates, school and teacher characteristics.⁴ The coefficients on the polynomial of *DI* in columns 3 and 4 hardly change from those in columns 1 and 2, respectively. Moreover, the precision improves. It is also possible that *DI* is capturing the effect of minority students not minority teachers, or the effects of other school policy not related to the covariates included in columns 3 and 4 but related to minority students. For example, Jackson (2009) demonstrates that White teachers tend to leave schools that experience inflows of black students. In this case, the proportion of minority students affects *DI*, which is in turn related to turnover. To check this possibility, columns 5 and 6 show results when including the percentage of minority students.

³ Some studies such as Tsui et al. (1992) use the self-reported intent to stay as a dependent variable. Intent may be different from actual behavior. For example, Dworkin (1980) reports that the majority of teachers who had intended to leave teaching had not in fact quit teaching in the following year.

⁴ The substance of the main results is changed little by entering the raw score of each item in the three categories instead of the variables summarized by a principal component analysis.

Table 4
Marginal effects of independent variables on turnover for White teachers under age 30 (six models)

Variable	1 Move	2 Leave	3 Move	4 Leave	5 Move	6 Leave
<i>Diversity Index</i>						
DI	-1.015 (-2.72)‡	-0.859 (-2.14)†	-1.110 (-2.81)‡	-0.706 (-2.30)‡	-1.298 (-2.95)‡	-0.652 (-2.25)†
DI ²	5.265 (2.75)‡	2.574 (1.63)	5.730 (2.97)‡	2.005 (1.68)*	6.565 (3.18)‡	1.974 (1.83)*
DI ³	-6.046 (-2.49)†	-1.819 (-1.18)	-6.721 (-2.79)‡	-1.584 (-1.31)	-7.541 (-2.98)‡	-1.637 (-1.48)
<i>Teacher Characteristics</i>						
Female			-0.040 (-0.85)	0.068 (2.83)‡	-0.035 (-0.71)	0.069 (2.93)‡
Master's degree of above			-0.013 (-0.63)	-0.044 (-1.50)	-0.012 (-0.62)	-0.043 (-1.46)
Married			-0.018 (-0.46)	0.028 (0.91)	-0.011 (-0.19)	0.030 (1.07)
Number of children			0.018 (0.97)	0.031 (1.54)	0.016 (0.87)	0.030 (1.49)
Member of a union			-0.004 (-0.23)	-0.014 (-0.50)	<-0.000 (-0.09)	-0.012 (-0.43)
Years of tenure			-0.004 (-0.23)	-0.002 (-0.19)	-0.003 (-0.25)	-0.002 (-0.19)
Years of teaching experience			-0.014 (-1.49)	-0.011 (-1.12)	-0.014 (-1.45)	-0.010 (-1.10)
<i>School Characteristics</i>						
Salary for a novice teacher			-0.080 (-1.13)	-0.153 (-1.79)*	-0.100 (-1.35)	-0.155 (-1.80)*
Difference in salaries between senior and novice teachers			0.003 (0.47)	0.029 (1.43)	0.001 (0.27)	0.026 (1.31)
Non-salary compensation			-0.005 (-0.62)	-0.036 (-1.93)*	-0.003 (-0.49)	-0.036 (-1.90)*

Variable	1 Move	2 Leave	3 Move	4 Leave	5 Move	6 Leave
Teachers' influence on school policy	0.005 (0.60)	-0.005 (-0.71)	0.004 (0.52)	-0.005 (-0.70)	0.004 (0.52)	-0.005 (-0.70)
(Less) Student problem	-0.011 (-1.86)*	0.003 (0.18)	-0.011 (-1.88)*	0.002 (0.00)	-0.011 (-1.88)*	0.002 (0.00)
Public school status	0.034 (1.07)	0.047 (1.22)	0.033 (1.04)	0.048 (1.27)	0.033 (1.04)	0.048 (1.27)
<i>Characteristics of Students</i>						
Enrollment, 150-299	-0.035 (-1.04)	-0.033 (-1.08)	-0.034 (-1.05)	-0.033 (-1.08)	-0.034 (-1.05)	-0.033 (-1.08)
Enrollment, 300-499	-0.109 (-2.92)‡	-0.052 (-1.88)*	-0.104 (-2.87)‡	-0.051 (-1.88)*	-0.104 (-2.87)‡	-0.051 (-1.88)*
Enrollment, 500-749	-0.058 (-1.32)	-0.015 (-0.60)	-0.053 (-1.27)	-0.016 (-0.63)	-0.053 (-1.27)	-0.016 (-0.63)
Enrollment, 750-1,499	-0.047 (-1.05)	-0.013 (-0.46)	-0.042 (-1.00)	-0.016 (-0.50)	-0.042 (-1.00)	-0.016 (-0.50)
Enrollment, 1,500 and over	-0.002 (-0.17)	-0.047 (-1.00)	-0.001 (-0.15)	-0.048 (-1.03)	-0.001 (-0.15)	-0.048 (-1.03)
Percentage of minority students, 5-19 %			0.085 (2.44)†	0.039 (1.47)	0.085 (2.44)†	0.039 (1.47)
Percentage of minority students, 20-49 %			0.022 (0.78)	0.007 (-0.22)	0.022 (0.78)	0.007 (-0.22)
Percentage of minority students, 50-100 %			0.022 (0.46)	0.007 (0.24)	0.022 (0.46)	0.007 (0.24)
<i>Locale and region dummies</i>						
N	no	no	yes	yes	yes	yes
Log pseudolikelihood	-163663.2	-148615.9	988	-147239.3	-147239.3	-147239.3

The ‡-statistics on coefficients are in parentheses. Standard errors are clustered at the level of the school. The marginal effect is estimated at the mean of each independent variable. The marginal effect of a dummy variable is calculated from a discrete change from 0 to 1. Sampling weights are applied. ‡ $p < 0.01$; † $p < 0.05$; * $p < 0.10$

The results in column 5 agree with Jackson's (2009) results up to some point, showing a nonlinear relationship between moving and the proportion of minority students. More importantly, in this specification, the coefficients on the polynomial of *DI* change slightly, but the pattern is almost identical to the previous estimates. In addition, the precision improves again. This exercise provides some confidence in the finding that the relationship between workgroup racial diversity and turnover is not spurious.

Another concern is that the results may not be generalizable. Specifically, as seen in Figure 1, *DI* is small in most schools. Because more observations come from schools with low *DI*, the generalization of the results to schools with high *DI* is not guaranteed. Sample weights and the polynomial specification reduce the problem, but this is not likely to eliminate the problem completely. The opposite side of the argument is that the generalization is not crucial for the purpose of policy because schools with high *DI* are not numerically important. Hence, the range of *DI* is restricted to 0.2, and the following interpretations mostly focus on schools with low *DI*.

The left panel of Figure 3 depicts the marginal effect of *DI* on the predicted probability of moving as estimated in column 5 of Table 4. A negative probability indicates the probability of staying rather than moving, and the opposite interpretation applies to a positive probability. A small proportion of minority teachers raise the probability of staying up to some point although the probability of moving is still negative after that point. The local minimum takes place when *DI* is 0.126. To facilitate understanding what this number means, suppose that there are two races of teachers in a school. In this case, the minority accounts for 6.8% of the teaching staff. When there are 6.8% minority teachers in the school, the predicted probability of moving is -7.4% percentage points. The size of the relationship is significant considering the one year moving rate of 12.7% for young teachers. One can also observe the leaving pattern. The right panel of Figure 3 is strikingly similar to its left panel. As more minority teachers account more for the teaching staff, the probability of leaving continues to decrease up to the point when *DI* is 0.165.

One can argue that the estimated relationships can be mostly driven by the large number of teachers who worked in a racially homogeneous workgroup. If the turnover pattern of these teachers is different from that of other teachers who work with teachers of other races, the significance of the relationships discussed so far would not be as strong as otherwise. In other words, it is suspected that there is a discrete jump in a turnover pattern between teachers working in a racially homogeneous workgroup and teachers who work in a racially heterogeneous workgroup. To check this possibility, teachers with zero *DI* are excluded from the sample, and the remaining sample is reanalyzed. The two panels of Figure 4 closely agree with those of Figure 3. The only difference is that, without teachers with zero *DI*, the range of the probability is wider. This result suggests that teachers working in a racially homogeneous workgroup are different in that they are less responsive to the presence of minority teachers than teachers in a racially diverse workgroup. However, the difference is only in degree, not in kind.

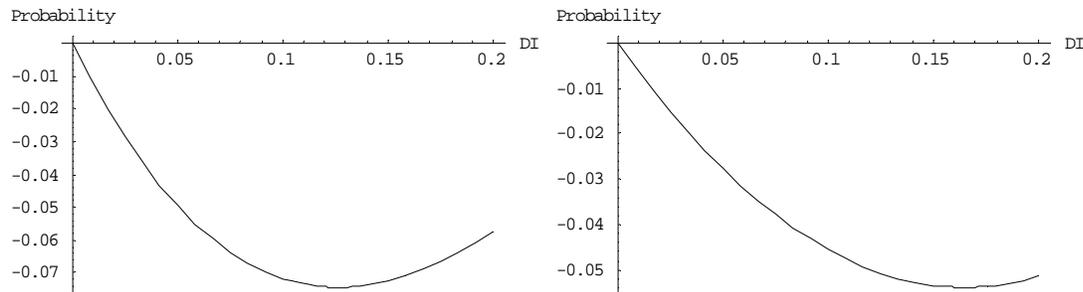


Figure 3. Marginal effect of workgroup racial diversity on the predicted probability of turnover, young mover and young leaver

The left panel represents young movers, and the right panel represents young leavers. Negative probabilities indicate a greater propensity to stay; positive (or less negative) probabilities indicate a greater propensity to move or leave. The graph is drawn from the estimation of columns 5 and 6 of Table 4.

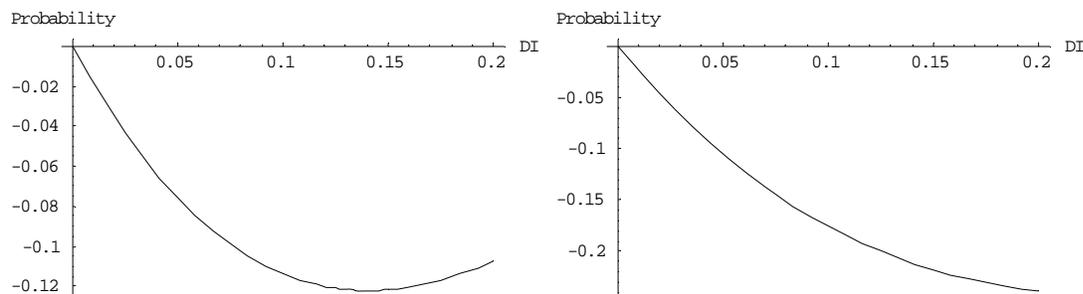


Figure 4. Marginal effect of workgroup racial diversity on the predicted probability of turnover without teachers in perfectly homogeneous schools, young mover and young leaver

The left panel represents young movers, and the right panel represents young leavers. Teachers with zero *DI* are excluded from the estimation. The estimation on which this graph is based can be provided on request.

Table 5

Marginal effects of workgroup racial diversity on turnover, older white teachers

	Teachers age 30-49		Teachers age 50 or more	
	Move	Leave	Move	Leave
<i>Diversity Index</i>				
<i>DI</i>	-0.195 (-1.16)	-0.244 (-1.61)	0.052 (0.48)	0.312 (2.35)†
<i>DI</i> ²	1.122 (1.55)	2.011 (2.52)†	0.322 (0.25)	-1.841 (-2.50)†
<i>DI</i> ³	-1.544* (-1.71)	-2.842 (-2.73)‡	-1.062 (-0.82)	2.360 (2.59)†
<i>N</i>	2076		615	
Log pseudolikelihood	-523215.4		-117339.1	

The covariates for the estimation in columns 5 and 6 of Table 4 are included; z -statistics on coefficients are in parentheses. Standard errors are clustered at the level of the school. Marginal effects are estimated at the mean of each independent variable. The marginal effect of each dummy variable is calculated from a discrete change from 0 to 1. Sampling weights are applied. ‡ $p < 0.01$; † $p < 0.05$; * $p < 0.10$.

Older Teachers

A separate analysis applied the same multinomial probit model for teachers age 30 and above. As reported in Table 5, the statistically significant relationship between racial diversity and turnover exists for older teachers. However, there are some noticeable differences between young and older teachers. Although the estimates of racial diversity are statistically significant for both moving and leaving in the case of young teachers, in general, this represents only leaving for older teachers. In addition, the marginal effect becomes smaller as the age groups grow older, partly reflecting a lower rate of turnover among older teachers than young teachers. In the right panel of Figure 5, the relationship is precisely measured, but the marginal effect of *DI* fluctuates within a narrow range. The magnitude is larger for teachers, as shown in the left panel of Figure 5, yet it is still smaller compared to young teachers. The relatively small size, however, should not be dismissed as unimportant. The numerical representation of older teachers requires a more careful interpretation. They constitute almost 90% of the sample. Another interesting point is the difference in leaving. The initial response to the presence of a few minority teachers shows a transitional pattern. The probability of leaving decreases for young teachers, it is modest for teachers aged 30 to 49, and it increases for teachers age 50 and over.

It is uncertain why the age groups show different patterns. Some possible reasons include age effects, cohort effects, and survivorship bias. As teachers age, they feel differently about racial diversity or some factors related to racial diversity. Alternatively, each generation experiences different cultural, social, and economic environments, differences which may induce heterogeneous patterns. Young teachers were more exposed to multicultural education and environments conducive to racial diversity during the period of their behavioral or attitudinal formation, which may be related to the increased probability at a small increase in *DI*. It is possible that teachers who would have shown a large relationship have already been weeded out from the teaching occupation. There is no definite answer about the mechanism that generates the distinct but consistent patterns across age groups, and no theory or model helps explain them. Racial diversity is related to turnover, but the relationship is not simple. It is non-linear and differs depending on the age groups.

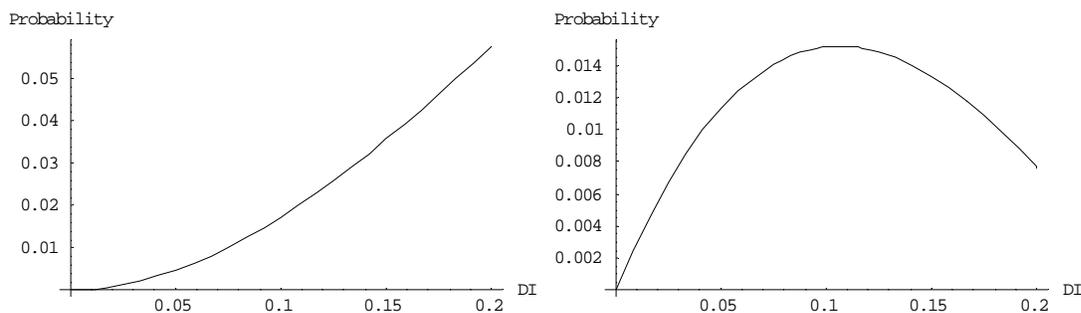


Figure 5. The marginal effect of workgroup racial diversity on the predicted probability of turnover for older teachers

The left panel represents the probability of leaving for teachers 30 to 49, and the right panel represents the probability of leaving for teachers age 50 and over. The graph is drawn from the estimation of Table 5.

As mentioned above, another noticeable point is that although older workers are less likely to change their occupations, the diversity is related not to school change but to occupational change for older teachers. This is the case even when tenure and total experience are included as covariates. Diversity seems to be a significant factor for leaving the profession. One question naturally arises—why do teachers leave the occupation rather than move to other schools? One reason may be that the teacher labor market is localized. Boyd, Lankford, Loeb, and Wyckoff (2005) document that teachers in New York tend to teach in their hometowns. Feistritzer and Haar (2005) find the same result from a national survey. If teachers face similar racial diversity or some factors related to it in their hometowns, this would make occupational change more likely.

Another possible reason is that teaching may become devalued as there are proportionately more minority teachers, although this possibility may not apply to young teachers. The intuition is similar to occupational devaluation by feminization. Reskin and Roos (1990) offer some evidence for this phenomenon in general. Strober (1984) and Strober and Lanford (1986) support the argument specifically for public school teachers. If this is the case, the recent increase in the proportion of minority teachers could trigger a “tipping” à la Schelling (1971)—an exodus of White teachers. Card, Mas, and Rothstein (2008) causally estimate the phenomenon in the context of neighborhood segregation. This possibility can be thought too dramatic considering the opposite relationship that young teachers show, but it needs to be kept in mind that the vast majority of teachers are still older teachers.

Initial Matching

Another robustness check is justified by the possibility that White teachers may be initially attracted to their schools for reasons related to both turnover and racial diversity. In this case, some third factor is responsible for the relationship between turnover and racial diversity. For example, if racially diverse schools provide unobserved short-term benefits but demand great effort, then White teachers may join the schools, reap the benefits, and leave soon thereafter. An indirect way to verify this possibility is to see whether racial diversity is a factor to consider when teachers initially join the schools. The following probit analysis can examine this point. Consider the model

$$P(Y_{is} = 1 | X_{is}, Z_s, DI_s) = \Phi(X'_{is}\pi_1^j + Z'_s\pi_2^j + DI'_s\pi_3^j) = \int_{-\infty}^{X'_{is}\pi_1^j + Z'_s\pi_2^j + DI'_s\pi_3^j} \phi(t)dt,$$

where $\Phi(\cdot)$ and $\phi(\cdot)$ are the standard normal distribution and its probability density function, respectively. Y_{is} is 1 when teacher i in school s is White and otherwise 0. All the variables in X , Z , and DI are the same as before except that there is no variable for tenure in X .

The sample for this probit analysis is restricted to White teachers who started teaching in their schools in 1993 or 1994 when the survey was conducted. The probit regression was run separately for each age group and also pooled teachers in a single model, with age group dummies added. Because senior teachers have priority in school choice, a more restricted model included older teachers (over 30) only, with one age dummy added. In no case are coefficients on the polynomial of DI statistically significant at conventional levels. (Detailed results are available on request.) This nonsignificant outcome implies that while racial diversity is not related to the initial choice of schools, its relationship becomes established once teachers start working in the schools. This job characteristic is familiar in labor economics. A job is an experience good in Nelson's (1970) terminology. Jovanovic (1979) offers theoretical support for this, and Farber (1994, 1999) provides empirical evidence.

Conclusion

As quantitative and qualitative shortages of teachers are expected to become more severe in the near future, it is important to understand the teacher supply. A recent increase in the proportion of minority teachers necessitates a study of the relationship between workgroup racial diversity and turnover. I draw on the SASS and TFS data sets to evaluate this relationship for White teachers younger than 30 and find that the relationship is statistically significant, robust to various specifications, non-linear, and heterogeneous across the age groups. Also, the probability of leaving but not of moving rises for older White teachers as the proportion of minority teachers increases. The combined effect of workgroup racial diversity is significant. When all the age groups are considered separately for their own relationship with racial diversity and the effects are summed, a 0.1 increase in the diversity index raises the rate of leaving by 0.94 percentage points, which is 13.4% of the one-year leaving rate of all the age groups combined.⁵ This poses a serious policy dilemma. Racial diversity has been officially encouraged since Title VII of the Civil Rights Act of 1964 was enacted, but the diversity is positively or negatively related to the turnover of White teachers depending on the proportion of minority teachers and ages.

This paper is exploratory, so I did not attempt to test any causality of racial diversity on turnover or to find the mechanism of the relationship. Nor am I aware of studies in organizational behavior that have shown either the causality or the mechanism. This study, however, provides a motivation for future research to search for them. Some exogenous shock will definitely help to tease out the causality. New and sudden policies on school staffing are a promising source to tap into. Also, because of the small sample size of minority teachers, this study discusses only White teachers. As the proportion of minority teachers increases, more research is needed on the supply of minority teachers in relation to White or other minority teachers. Administrative data with a large sample size can be utilized for this purpose. Future research in this direction will hopefully reduce shortages of teachers and resolve the policy dilemma.

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⁵ For example, when all the teachers in a school are White, a 0.1 increase in diversity index means that teachers of one minority race who newly join the school account for five percent of the teaching body. The rate of leaving, 0.93, is the weighted average of the probability of leaving of each age group, where the weight is the sample proportion of each age group. The probability for each age group comes from the full specification, i.e., column 6 of Table 4 and the “leave” columns of Table 5.

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