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Career Paths and Quit Decisions: Evidence from Teaching

Dominic J. Brewer, *RAND*

Conventional models predict that workers consider employment opportunities and monetary rewards expected over their lifetimes when making current period decisions such as whether to quit a job. This article tests the hypothesis that later career opportunities affect quit decisions by examining the relationship between teaching and school administration. Evidence on the extent to which administrative positions are available to teachers, and the salary premia associated with them, is presented. Discrete time logit-hazard models of teacher quits, estimated using data from New York State, provide some support for the hypothesis, though the magnitudes of the estimated effects are small.

I. Introduction

Following standard models of utility maximization over the life cycle, future career opportunities are expected to affect current period decisions

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such as whether to quit a job. However, while there are numerous studies of worker quit behavior, there are few (if any) direct tests of this proposition largely because it is not clear in most cases what the later opportunities are for individual workers. The purpose of this article is to provide some evidence on the effect of promotion prospects and rewards on the quit decisions of teachers. Teachers' salaries are closely tied to years of experience within a school district and accumulated degree credits; once tenure is granted there are few opportunities for additional compensation within teaching itself.¹ However, a sizable proportion of teachers move into administrative posts after a few years in the classroom, to become subject area coordinators, assistant principals and principals at school level, and eventually superintendents or other district-level administrators. In fact, teacher-administrator "careers" have all the features associated with an internal labor market: a well-defined career ladder, posts filled from the bottom of this ladder, and movement up the ladder (Doeringer and Piore 1971). In this article I argue that this view of "teaching" has important implications for understanding teacher behavior.

The issue of appropriate incentives for teachers is of major public policy interest. Concern about the existing reward structure in teaching has led to the development of formal career paths in some districts, experiments with merit pay, and systematic changes in the relative distribution of rewards among teachers of differing experience levels.² An increasing volume of research has shown that teacher quality (as measured by verbal aptitude or other measures) is important for student performance.³ It also seems clear that those entering teaching are drawn from lower-ability college graduates (Hanushek and Pace 1994) and that those quitting teaching are of systematically greater ability (Murnane et al. 1991). These two findings have motivated a substantial body of research into the appropriate incentives to attract and retain high-quality teachers. In line with economic theory, salaries have been found to be an important determinant of entry and quit decisions for teachers (Murnane and Olsen 1989; Murnane et al. 1991).

¹ Districts offer a few hundred dollars for additional responsibilities such as sports coaching, etc., and acquisition of additional college course credits. There is evidence that variation in working conditions (class sizes, types of students, etc.) serves as a form of compensating differential, with formal district rules and informal mechanisms rewarding experienced teachers with desirable assignments (Greenberg and McCall 1974; Antos and Rosen 1975; Murnane 1981). School-level administrators and teachers work in the same environment, but their duties differ. Differences in working conditions should be reflected in salaries as a compensating differential if labor markets are competitive.

² On career paths see Ebmeier and Hart (1992). Monk and Jacobson (1985) and Murnane, Singer, and Willett (1987) examine the implications of different internal salary distributions within teaching.

³ See Hanushek (1986), Ferguson (1991), Ehrenberg and Brewer (1994, 1995), and Hedges, Laine, and Greenwald (1994).

This article adds to this literature by providing further evidence on teachers' responsiveness to other incentives, in this case, to later career opportunities in school administration. I test the proposition that school administration affects teacher behavior via the estimation of discrete time logit-hazard models of teacher quits using a sample of newly hired New York teachers followed from 1978 to 1988. I include proxies for the monetary rewards and job opportunities in administration within a school district in these statistical models. The results provide limited support for the contention that later career prospects in administration are important to teachers.

The article is set out as follows. Section II lays out the central hypothesis of the article. In Section III I establish the quantitative importance of administration, the predominance of internal hiring for entry-level positions, and the salary differentials relative to teaching associated with administrative jobs. In Section IV, I proceed to test whether administration affects teacher quit behavior. Section V provides a conclusion.

II. Life Cycle Rewards, Teaching Careers, and Administration

Economists' conventional discrete choice model is based on the simple proposition that in deciding between two (or more) courses of action an individual compares the *lifetime expected utility* he or she would receive from each choice and selects that yielding the highest satisfaction. As an example, consider the analysis of worker quit behavior.⁴ Assume there are two alternatives facing a worker i , to continue in the current job ($j = 0$) or to quit ($j = 1$). Here a "job" is employer specific.⁵ The expected utility of each j from time t to T (retirement), is given by (1),

$$V_{ijt} = E_t \int_t^T \rho U_{ijt}(I, N, t) dt \simeq f(EPVI_{ijt}, EPVN_{ijt}), \quad (1)$$

where V_{ijt} is unobserved "indirect utility" for individual i from alternative j , E_t is an expectations operator, ρ is some internal discount rate, and $U_{ijt}(I, N, t)$ is a function of pecuniary (I) and nonpecuniary (N) attributes of j as perceived by individual i . Indirect utility V_{ijt} can be approximated by the expected present value of pecuniary income ($EPVI_{ijt}$) and nonpecuniary

⁴ This model underlies numerous previous empirical studies of quit behavior (e.g., Blau and Kahn 1981; Weiss 1984; Meitzen 1986), some of which relate to teaching (Eberts 1987; Murnane and Olsen 1989; Murnane et al. 1991; Rees 1991).

⁵ The decision analyzed is that of quitting the current employer. The model is set out in this form since the structuring of promotion opportunities within a firm is the major interest here. Sicherman and Galor (1990) present a more complete model in which quitting is a device by which workers realize an optimal career path.

income ($EPVN_{ijt}$). Individuals compare V_{ijts} and choose that alternative yielding the highest level of satisfaction. Let Y_{it} be the outcome observed for individual i at time t , such that $Y_{it} = 1$ if $j = 1$ is chosen, and $Y_{it} = 0$ otherwise. Then define Y_{it}^* as a latent variable representing the difference in expected utility between remaining in the current job ($j = 0$) and quitting ($j = 1$). Hence,

$$Y_{it} = 1 \quad \text{if } Y_{it}^* = (V_{i1t} - V_{i0t}) > 0. \quad (2)$$

This structural discrete choice model implies that the main explanatory variables in a worker's decision to quit his or her current job are the expected present value of pecuniary and nonpecuniary returns from remaining in the current job compared to the alternatives.⁶ Empirical research on turnover typically assumes that V_{ijt} can be represented by linear functions of state-specific characteristics, X_{ijt} (which may or may not vary across individuals), and observed personal characteristics (Z_{it}) as given by (3),

$$V_{ijt} = V_{ijt}(X_{ijt}, Z_{it}) = X_{ijt}\beta + Z_{it}\gamma. \quad (3)$$

The vectors X_{ijt} and Z_{it} should proxy $EPVI_{ijt}$ and $EPVN_{ijt}$, but it is rarely feasible to construct estimates of the expected present value of pecuniary returns. Calculation of $EPVI_{ijt}$ requires assumptions about expectations formation, appropriate internal rates of time preference, and time horizons.⁷ Given these difficulties, most quit studies conceptually collapse earnings profiles into a single salary measure, typically current salary (Murnane and Olsen 1989; Murnane et al. 1991) or starting salary (Meitzen 1986). This approach means that the underlying assumption of the model, that individuals consider returns they expect to receive over their entire working lives when making quit decisions, is not explicitly tested. More serious, omission of variables that capture rewards over the life cycle may bias the estimated coefficients of salary and other variables that are included in the model.

An alternative to using a single salary measure in quit models is to try to proxy the later career opportunities available to an individual worker. Most individuals face a hierarchy of job assignments both within their firms and within their profession. Movement up these ladders is typically competitive (i.e., the probability of promotion is less than one), but brings higher monetary (and/or nonpecuniary) rewards. In most cases it is difficult

⁶ For simplicity, this model ignores mobility costs. See Weiss (1984) and Meitzen (1986).

⁷ Boskin (1974) attempts to calculate $EPVIs$ in testing his model of occupational choice. Siow (1984) and Zarkin (1985) discuss models of expectations formation in this context.

to pinpoint the exact career opportunities available to individual workers. In the case of teaching, however, future prospects are easier to identify. This is because there are few prospects for advancement within “teaching” itself and salary increases are more or less automatic as experience rises; within school systems as a whole though there is a hierarchy of administrative posts typically filled by teachers.⁸ If teachers make decisions based on a lifetime expected-utility-maximizing approach, then administrative salaries and the likelihood of attaining an administrative position should affect observed teacher behavior.

Consider the case in which an individual can hold one of two positions in a school district—teacher or administrator. The expected present value of income from remaining in a school district ($EPVI_{i0t}$) can be viewed as the sum of the expected present value of income from continuing in teaching in the district ($EPVIT_{i0t}$), plus the expected present value of income from an administrative position in the district ($EPVIA_{i0t}$) as given by (4):

$$EPVI_{i0t} = EPVIT_{i0t} + EPVIA_{i0t}. \quad (4)$$

The expected payoff to an administrative position, $EPVIA_{ijt}$, depends on the probability of obtaining such a position and on the salary earned in that post. Similarly, the expected present value of income from quitting the district ($EPVI_{i1t}$) is the sum of the expected present value of income from teaching and administration in another district ($EPVIT_{i1t}$, $EPVIA_{i1t}$), plus the expected present value of income from employment outside of education ($EPVIO_{i1t}$). Combining (2) and (4) (and ignoring nonpecuniary factors) implies

$$Y_{it} = 1 \quad \text{if } (EPVIT_{i1t} - EPVIT_{i0t}) \\ + (EPVIA_{i1t} - EPVIA_{i0t}) + EPVIO_{i1t} > 0. \quad (5)$$

The quit decision depends on the rewards of teaching in the district relative to other districts (the first bracketed term), the returns from administration in the district relative to other districts (the second bracketed term), and opportunities outside of education ($EPVIO$). A teacher may quit the district to obtain an administrative position in another district directly or get another teaching position with the prospect of a subsequent administrative assignment. The expected present value of an administrative position depends in turn on the probability of attaining such a position and the monetary payoff for that position. Hence, a teacher’s decision to quit his or

⁸ The lack of salary incentives in schools is discussed by Grogger (1994) who similarly found very little evidence that measures of performance affected principals’ pay.

her current district now explicitly depends on the prospects of attaining an administrative position in the district versus other districts and on the salary premia associated with attainable administrative positions.

III. Administrative Opportunities and Salary Differentials: Evidence from New York

The simple model outlined in the previous section suggests that the empirical importance of administrative opportunities for teacher behavior will depend on (i) the likelihood of obtaining an administrative post and (ii) the monetary rewards of doing so. In this section, I provide some institutional background on these propositions, using data on the job assignments and personal characteristics of all professional staff employed in schools in New York State for 1975/76–1989/90. The data are based on 708 districts in New York (excluding New York City), in existence and reporting data continuously throughout this period.⁹ An appendix describes the data.

To what extent do school districts employ administrators? Despite media attention on big city school district “bureaucracies,” surprisingly little is known about the quantitative importance of administrative jobs within school districts or about the characteristics of those who fill them. Table 1 presents such evidence for New York. The first row of table 1 indicates that there is an average of one administrator for every seven teachers per district: 25 administrators and 170 full-time teachers. Most of these administrative positions are typically filled by ex-teachers, with around six principals and assistant principals per district and four subject area administrators. (The remainder consists of other administrators such as attendance officers, counselors, etc.) These figures have not changed much over time, although there is considerable variation between districts (as evidenced by large standard deviations). Since district enrollment fell rapidly (by over 20% in the average district) during this period, the number of personnel per pupil rose. Administrators are older, more qualified, higher paid, and have more experience than teachers. While women make up around half of all teachers and administrators, three-quarters of principals (and central office administrators) were men in 1989. For a more detailed analysis of these statistics, see Brewer (1994).

Table 2 provides evidence on the extent to which administrative posts become available, the degree of internal hiring, and the age and experience levels of *newly hired administrators*. Data are shown for major administrative assignments in 1978 and 1989. About 15% of all administrative positions are newly filled each year (there were 2,600 new hires in 1978 and 2,900 in 1989). A significant proportion of these new hires (945 of 2,617 in 1978,

⁹ School districts in New York City’s five boroughs are excluded from all analyses because they have a different institutional structure than the rest of the state.

Table 1
Characteristics of New York State Teachers and Administrators,
1975 and 1989

	Mean					
	Full-Time Teachers		All Full-Time Administrators		Principals and Assistant Principals	
	1975	1989	1975	1989	1975	1989
No. per district	170.5 (225.6)	166.1 (216.2)	25.2 (38.1)	24.3 (40.1)	6.2 (5.1)	6.1 (5.3)
Female	.45 (.50)	.56 (.50)	.44 (.50)	.49 (.50)	.12 (.32)	.26 (.44)
Age	36.5 (10.4)	42.4 (9.0)	44.2 (9.5)	46.1 (8.5)	44.8 (7.8)	46.8 (7.2)
District experience	9.1 (6.4)	14.5 (8.8)	12.4 (7.8)	13.8 (5.3)	14.9 (8.3)	16.1 (10.3)
Other experience	2.1 (3.4)	2.4 (3.7)	4.4 (5.5)	5.3 (6.9)	5.2 (5.8)	6.9 (7.2)
More than M.A.	.17 (.38)	.27 (.44)	.48 (.50)	.66 (.47)	.63 (.48)	.83 (.37)
Contract, in months	10.0 (.3)	10.0 (.4)	10.5 (.4)	10.6 (.9)	11.1 (.8)	11.2 (.8)
Annual salary (1980\$)	23,896 (6,619)	26,290 (7,540)	31,577 (10,070)	31,732 (11,364)	38,771 (7,736)	38,186 (7,959)
Monthly salary (1980\$)	2,392 (724)	2,632 (831)	2,995 (904)	2,975 (1,121)	3,518 (804)	3,428 (995)

NOTE.—See appendix for definitions and description of the data. Standard deviations are in parentheses.

Table 2
Characteristics of Newly Hired New York State Administrators,
1978 and 1989

	Central Office		Principals		Assistant Principals		Subject Area	
	1978	1989	1978	1989	1978	1989	1978	1989
No. of new hires	418	378	291	337	245	270	718	521
In district last year	.67	.62	.64	.58	.67	.61	.85	.78
Teacher last year	.12	.12	.09	.08	.37	.33	.26	.36
Teach in district last year	.08	.10	.05	.04	.21	.17	.21	.29
Mean years of district experience	6.6	5.1	7.0	3.7	7.8	6.6	11.3	11.6
Mean years of other district experience	.3	14.8	9.6	14.1	6.6	9.5	4.1	6.1
Median age	43	44	39.5	42	36	41	41	43

NOTE.—See appendix for definitions and description of the data.

1,465 of 2,971 in 1989) are in “other” (typically low-level) administrative positions which teachers tend not to fill. Entry-level administrative positions for teachers are subject area coordinators or assistant principals: at least a third of those hired to these positions were teachers the previous year. The table also shows (rows 3 and 4) the predominance of internal hiring, especially for these positions. Of the teachers appointed to subject area positions, for example, 80% came from within the district; 50%–57% of teachers promoted to principal and assistant principal were drawn from the same district. Even so, the number of positions opening up and available to teachers *in a given year* is small. For example, of all New York teachers only 445 men and 205 women moved to administrative posts within the state for the first time in 1978–79, or 1.4% and .7% of all teachers, respectively. Over the course of 5 or 10 years, however, the likelihood of moving to administration may be much larger for an individual teacher, and it is this probability that is most relevant for our purposes. Unfortunately, the available data do not permit a reliable estimate of such a probability.¹⁰

What types of teachers are “promoted” to administrative positions? Table 2 shows that about four-fifths of new administrators have more than a master’s degree. This is largely because districts typically require teachers to acquire a master’s degree in educational administration (and in some cases credits beyond this) in order to become certified for administrative posts.¹¹ The median age for all administrative appointees is around 40, with those appointed to very senior posts being slightly older. While those under 30 occasionally attain jobs in administration, the underlying age distribution reveals that 90% of central office administrators, principals, and assistant principals newly appointed in 1978 were over 30, and 90% of subject area administrators were over 28. More experienced teachers

¹⁰ Ideally, I would like to calculate the probability that an individual teacher becomes an administrator *at any point* in his or her career. The most reliable estimate would be obtained by following a cohort of new hires over the 30 or so years of a typical career, but only 10 years of data are available. Constructing “artificial” cohorts using information on tenure for a given cross section is subject to considerable error given movements into and out of teaching.

¹¹ Given these certification requirements, one indicator of teachers’ interest in future administrative posts might be the extent to which they accumulate degree credits. In fact there is *prima facie* evidence of considerable “queuing” for administrative posts in the sense that there are several suitably qualified teachers for such positions (with more credentials than are simply required for teaching). Nevertheless, there does not appear to be much evidence in the data used in this article of a systematic relationship between teachers’ credentials and measures of administrative opportunities in the district. For example, there is no significant correlation between the number of administrators per teacher or new administrators per teacher and the proportion of teachers with more than a master’s degree in the district. Similarly, when statistical models predicting the qualifications level of a teacher based on personal and district characteristics were estimated, proxies for administrative opportunities were rarely significant.

move into administration but the extent to which this experience consists of tenure within and outside the district differs between administrative positions.

What teacher characteristics have *independent* effects on the probability of becoming an administrator? It is possible to estimate directly the probability that a teacher is promoted to administration between academic years based on his or her human capital and other characteristics (such as subject specialty). However, when this was attempted for several cross-section samples, the results were not consistent across years (hence, I do not report these models here). To the extent that generalizations can be made, the strongest predictors of moves to administration were sex (female teachers were much less likely to move to administration) and degree level. Teachers with between 5 and 15 years of experience in the district and more than 5 years of experience in other districts appeared most likely to move to administration. Teachers at the beginning (less than 5 years of experience) and end (more than 20 years of experience) of their careers were less likely to move, though the pattern is not clearcut.¹²

What are the monetary rewards from attaining an administrative position?¹³ As table 1 shows, the mean annual salary for an administrator was about \$8,000 (in 1980\$) more than the mean annual salary for teachers in 1975, or about 25% higher; it was 21% higher in 1989. The gap between teachers and administrators is smaller if monthly salaries are examined since almost all teachers are on 10-month contracts rather than 10–12-month contracts that are more typical for administrators. To control for the experience and qualifications composition of a district's personnel, I estimated standard log salary equations for all teachers and administrators in New York, including a vector of dummy variables indicating if the

¹² Probit models of the probability a teacher moves to an administrative post between years were estimated that included subject specialty dummies, age, degree-level dummies, and various alternative experience measures (e.g., a set of dummy variables for various levels of experience, or experience and experience squared) as explanatory variables. These models tended to exhibit marked differences depending on the particular cross-section sample used, although there was some evidence for an "inverse U"-shaped tenure effect on the probability of moving to administration—teachers at the beginning and end of their careers were less likely to move. Grogger's (1994) finding that years of teaching experience are negatively associated with principal pay suggests that teachers should seek administrative positions relatively early in their careers.

¹³ In most New York districts benefits (health, pensions, etc.) do not vary much for different types of professional school personnel. Below superintendent level administrators generally receive fewer additional benefits (such as sabbaticals) than teachers. The biggest difference between teachers and administrators is in terms of contract length. Teachers generally have school year contracts that specify when they have to be in school (and the number of meetings they must attend after hours). Administrators typically have 11–12-month contracts with no specified hours of work.

Table 3
Estimated Percentage Salary Differentials, New York State Full-Time Administration versus Full-Time Teachers by Administrative Assignment and Sex—1975, 1981, and 1989

	Female			Male		
	1975	1981	1989	1975	1981	1989
Central office administrators	15.8	17.9	22.6	40.5	40.5	41.8
Principals	25.2	29.3	26.6	33.5	32.5	27.6
Assistant principals	14.1	10.5	11.9	19.0	18.4	15.8
Subject area administrators	1.2	1.4	4.6	8.3	7.6	11.5
Other administrators	.3	-1.9	-5.5	7.3	5.9	5.4

NOTE.—Differentials are calculated from coefficient estimates obtained from log salary equations; see text and n. 14 for methodology. See Brewer (1994) for complete model estimates.

individual was a central office administrator, principal, assistant principal, subject area coordinator, or other administrator. The coefficients of these dummy variables are then used to calculate the adjusted salary differential associated with each administrative assignment, relative to full-time teachers.¹⁴ Table 3 summarizes the estimated differentials for 1975, 1981, and 1989, separately for males and females.

Table 3 shows large salary premia (over full-time teachers) associated with administrative assignments. For males, the average pay differential is about 18% for assistant principals, 30% for principals, and 40% for central office administrators. These appear to have been fairly stable over the period. By 1989, female and male principals earned approximately the same differential relative to female and male teachers, respectively, although the absolute level of pay remained considerably lower for women. In all other cases the differentials for female administrators were lower than for males. (The considerably smaller differential associated with female central office administrators is due to the fact that women tend to hold more junior positions in district offices as compared to their male counterparts.) These differentials vary somewhat

¹⁴ The estimated equation is given by

$$\log(SALARY)_{it} = (DISTRICT)_{it}\beta_0 + X_{it}\beta_1 + (ADMIN)_{it}\beta_2 + v_{it}.$$

The vector X_{it} includes the educator's years of experience in the district, experience outside the district, and the quadratics of these variables, age, dummy variables indicating degree level, and log of the number of months of the contract. The vector $DISTRICT_{it}$ consists of a dummy variable for each district. The vector of dummy variables $ADMIN_{it}$ indicates whether i was a central office administrator, principal, assistant principal, or subject area or other administrator. The estimated coefficients (β_2) are used to calculate the salary differential associated with each assignment relative to teaching using $[\exp(\beta_2) - 1]$.

across districts but do not exhibit much systematic cross-sectional variation.¹⁵

IV. Does School Administration Affect Teacher Quits?

The central argument of Section II was that expected administrative rewards should affect teacher quit propensities. The evidence presented in Section III suggests that many teachers do move into administrative positions and that there are significant salary gains from doing so. In this section, I empirically test the hypothesis that career opportunities in administration affect a teacher's propensity to quit his or her current district. A panel of teachers newly hired in 1978 and followed through 1988/89 was constructed from the New York data. (Although data are available for 2 years before 1978/79 and 1 year after 1988/89, the identification of new hires and quits censors the data.) A description of the data is given in the appendix. Restricting the sample to new hires eliminates left censoring problems arising from the fact that the data begin with some teaching spells in progress.¹⁶ Discrete time hazard models of the probability that teacher i is observed to quit in period t , conditional on not having quit until that time, are estimated. The hazard, h_{it} , is given by

$$h_{it} = \text{prob}(T = t | T_i \geq t, X_{it}), \quad (6)$$

¹⁵ The log salary equation was reestimated with a vector of district characteristics (median household income, urban/rural dummies, and district enrollment) in place of district-specific effects, and interactions between these variables and each $ADMIN_{it}$ dummy. An increase of \$1,000 in median household income was associated with a statistically significant increased differential for male very senior administrators and principals in each year, but the magnitudes were very small (less than 0.5%). For females, and for urbanicity and district size, the effects were less systematic. Supplementary evidence on the extent to which estimated salary differentials vary across districts was obtained by estimating identical wage equations for *each district* on pooled samples of teachers and administrators. Due to small sample sizes in many districts (particularly for female administrators), these estimates are far less robust than those reported in table 3 but reveal considerable variation in the pay premia that administrators receive.

¹⁶ In principle, the hazard models could be estimated on a sample of all teachers given that tenure information is available. However, since tenure cannot be treated as exogenous (Weiss 1984), restricting the sample to new hires is preferred. In Brewer (1994) I also estimate cross-section logit models of the probability that a teacher quits between 1978/79 and 1979/80, and between 1986/87 and 1987/88, using a sample of all teachers. The results are stronger than, but consistent with, the results reported here from hazard specifications, in the sense that administrator salaries and opportunities within and outside the district affect teacher quit behavior in the predicted direction.

where X_{it} is a vector of predictors which may or may not vary over time. I specify a logistic reparameterization of h_{it} ,

$$h_{it} = \frac{1}{[1 + \exp - (D_{it}\alpha_t + X_{it}\beta)]}, \quad (7)$$

such that

$$\log\left(\frac{h_{it}}{1 - h_{it}}\right) = D_{it}\alpha_t + X_{it}\beta, \quad (8)$$

where the D_{it} 's are dummy variables representing each time period (and the model contains no separate intercept). This is a proportional hazard model with no unobserved heterogeneity.¹⁷ I drop the proportionality assumption in some specifications. The model is estimated by maximum likelihood.¹⁸

The data used here allow for the identification of *separations* rather than *quits*: it is possible to observe whether a teacher remains in a school district as a teacher or administrator, moves districts within the state, or exits the sample. It is not possible to distinguish voluntary and involuntary separations. McLaughlin (1991) has shown that, under certain assumptions, there may be no important distinction between "quits" and "layoffs," from a behavioral perspective. In addition, once tenure is granted the number of involuntary separations in teaching is small, at least in New York (Rees 1991). Below, I try to determine the extent to which this may be a problem. A quit between $t - 1$ and t is defined as occurring when a teacher changes district within the state or exits the sample.¹⁹ Teachers who are observed to become administrators in the period in the same district are defined as

¹⁷ While methods have been developed to add unobserved heterogeneity to this model, there is little consensus among econometricians as to the most reliable approach. Hence, the simplest model is used here.

¹⁸ The likelihood function is

$$L = \prod_{i=1}^n \prod_{t=1}^t h_{it}^{Y_{it}} (1 - h_{it})^{(1 - Y_{it})}.$$

For further discussion of this model see, e.g., Singer and Willett (1993).

¹⁹ An alternative definition of a quit, which excludes those who return in $t + 1$, was also adopted in order to exclude (1-year) sabbaticals (after which a teacher returns to the district). The results of the statistical models when this quit definition is used are comparable to those reported in the article. The estimated coefficients of interest are of similar magnitude and direction, although with larger standard errors.

nonquitters. In addition, those over 55 years of age are eliminated, in order to exclude retirements.

The main predictor of a teacher quit is the expected present value of staying within the school district compared to the alternatives. The value $EPVIA_{it}$ reflects both the probability of becoming an administrator and the monetary payoff to doing so. Following Murnane and Olsen (1989) and Murnane et al. (1991), I use teachers' current salary (TSAL) (in 1980\$) as the main indicator of rewards from teaching within the district.²⁰ Concern that use of this time-varying measure may lead to inconsistent coefficient estimates (because of the correlation between salary and job tenure; Meitzen 1986) does not appear to be warranted in these data.²¹ The coefficient of TSAL is expected to be negative: as a teacher's salary rises, he or she should be less likely to quit the district, other things being constant. The monetary rewards in administration in the district are proxied by the mean salary of newly appointed subject area administrators, assistant principals, principals, and central office administrators, relative to the teacher's own salary (DASS), in each year. I define DASS in this way because teachers are assumed to compare other monetary rewards to their own salaries and in order to reduce collinearity between the salary variables. This variable reflects the salaries that teachers could earn in new administrative positions they typically fill. If administration is as important to teachers as the model maintains, then higher administrative salaries in the district (holding all else, including the teacher's own salary, constant) should decrease the likelihood that a teacher quits that district. Various alternative salary measures were also constructed to determine the sensitivity of model estimates to variable definitions (see below).

²⁰ As noted above, calculation of $EPVIT$ directly requires a set of assumptions regarding discount rates and expectations formation but is particularly problematic because of data limitations (e.g., only 14 years of data are available). Estimated teacher starting salary and estimated rate of return to district experience were used in place of current salary (TSAL) in some specifications to better capture earnings profiles. These results yield similar conclusions with regard to the effects of administrative variables on teacher quit propensities to those reported in the article. Use of demographic characteristics alone to capture earnings profiles is unsuitable in this context because we are interested in the salary effects on quits for policy and because in teaching earnings are independent of productivity.

²¹ Since salary is correlated with job tenure, a spurious negative correlation between salary and quit propensity may arise when TSAL is used. This problem has been dealt with either by excluding salary measures altogether (Weiss 1984) or using starting salary in place of TSAL (Meitzen 1986). However, when teacher's starting salary (time-invariant) is used in place of TSAL, the coefficients of the key variables of interest in this study are very similar to those reported below. This remains the case if estimated starting salary *and* an estimate of the rate of return to district experience are included in the models. Furthermore, when job tenure is included as an explanatory variable with TSAL, the estimated negative coefficient of TSAL remains.

The probability of obtaining an administrative post is proxied in two different ways. First, I estimate some specifications in which the likelihood of moving to administration is captured by the teacher's human capital characteristics and two district-level variables. Controlling for district size (enrollment) (DENR), the number of administrative slots open to teachers depends on the number of administrators per teacher in the district (DAPT) and the number of new administrators per teacher in the district for each period (DNPT). The expectation is that the larger the number of jobs in administration, and the faster they open up, the smaller the probability that a teacher quits their current district, all else being constant. However, since the importance of these district-level variables may vary across teachers, I also attempt to utilize a more direct measure of an individual's promotion prospects: the predicted conditional probability of a promotion in each year (PPROM). This variable is obtained via the estimation of a hazard model of promotion for the sample of new hires.²² Definitions and means of all variables are in the appendix.

The statistical models also include variables to proxy rewards in teaching and administration in neighboring districts. County mean teacher salary relative to teacher's own salary (CTS) and county mean new administrator salary relative to teacher's own salary (CASS [defined similarly to DASS]) were constructed for each district (excluding each district's own salaries from the calculation of the means).²³ The higher are county-level teacher and administrator salaries relative to the teacher's current salary, the more likely teachers are to quit their current district. The county-level unemployment rate (CUNR) measures general labor market conditions. Dummies indicating if the district is predominantly urban or rural (URBAN, RURAL) and median household income in the district (MHINC) are included to control for locational attractiveness. All estimated statistical models include age (AGE) and degree level (represented by dummies for greater than a bachelor's degree but less than a master's degree [GBLM], a master's degree [MA], and greater than a master's degree [GMA]).²⁴ Given

²² The procedure was as follows. A hazard model of the conditional probability that a teacher moved to administration was estimated for the same sample of male teachers. Predictors comprised human capital characteristics and district characteristics, including the number of administrators and new administrators per teacher. The predicted conditional probabilities (PPROM) for each person-year obtained from this model were then used in the estimated quit models. In the event, it proved difficult to obtain reliable estimates of PPRM because of the very small number of teachers moving to administration in the sample, due to the fact that the teachers analyzed are at the very beginning of their careers.

²³ There are 56 counties in New York (excluding New York City), with a minimum of two school districts in a county and a maximum of 73 districts.

²⁴ Teachers' subject specialty has been included in previous models of teacher quits (see, e.g., Murnane et al. 1991) to control for differences in external job op-

previous evidence on differential quit patterns by sex (Viscusi 1980; Blau and Kahn 1981; Meitzen 1986), all models are estimated separately by sex.

Table 4 shows selected coefficient estimates for teachers newly hired in 1978 and the sensitivity of these estimates to changes in the sample of teachers used. Columns 1 and 5 show the results for all males and females, respectively. As predicted, own salary (TSAL) has a negative effect on the conditional probability of quitting the district but is statistically significant only for women. Higher alternative rewards, teacher salaries in the county relative to teacher's own salary (CTS), increase quit propensity. Complete model results are presented and discussed in Brewer (1994).

The effect of variables designed to test the hypothesis that administrative rewards affect teacher quit behavior (DASS, DNPT, DAPT, CASS) is mixed, though the addition of these variables as a group improves the fit of the model for men ($p < .1$).²⁵ The results for males indicate that the district mean salary of new administrators relative to the teacher's own salary (DASS) has the predicted negative significant sign; for females the estimated coefficient is statistically insignificant but also negative. The signs of DNPT, the number of new administrative positions in the district in each period, and CASS, the mean county salary of new administrators relative to teacher's own salary, are also as predicted but fail to reach conventional levels of statistical significance. The weaker results for female teachers, in the sense that they appear to be less sensitive to administrative variables, seem consistent with the fact that women both are less likely to be appointed to administrative positions and receive smaller salary premia than male administrators. Only male teachers are analyzed in the remainder of the article.

One potential difficulty with the sample of new hires is that it consists of two types of teacher: those in their first teaching spell, and those hired from the "reserve pool" of teachers with some experience. Columns 2 and 3 of table 4 present estimates for each group separately for male teachers. It appears that new entrants are less likely to quit the greater are district administrator salaries, while rehires are more likely to quit the district the greater are county administrator salaries. This seems consistent with the fact that rehires have been previously employed in other districts (and perhaps are more aware of alternative opportunities), as well as having

opportunities. Addition of subject dummies to the statistical models reported in this article did not yield systematic and interpretable differences by teacher discipline or affect the other estimated coefficients and hence are not shown.

²⁵ To test the hypothesis that the administrative variables are jointly equal to zero, I calculate chi-square statistics (the difference in -2 times log likelihood between the models shown and models excluding these variables). For col. 1 of table 4 the chi-square statistic is 11.5, and for col. 5 of table 4 it is 10.0, for 6 degrees (the four variables DASS, DAPT, DNPT, plus two dummies where DASS and CASS are missing) of freedom.

Table 4
Selected Coefficient Estimates from Logit-Hazard Models of Teacher Quits for 1978 New York State New Hires, by Sex

	Males				Females
	All New Hires (1)	Rehires (2)	New Entrants (3)	New Entrants/ Stable Enrollment (4)	All New Hire (5)
Teacher's current salary (TSAL)*	-.001 (.1)	.010 (.5)	-.039 (2.8)	-.041 (1.1)	-.019 (2.2)
District new administrators' salary/ teacher's salary (DASS)	-.218 (2.4)	-.121 (.8)	-.255 (2.2)	-.415 (2.7)	-.081 (1.4)
District new administrators per teacher (DNPT)	-.037 (.7)	-.015 (.2)	-.069 (.8)	-.022 (.2)	-.034 (.8)
District administrators per teacher (DAPT)	.001 (.1)	-.004 (.1)	-.032 (.7)	-.068 (.4)	.018 (1.3)
County teacher salary/teacher's salary (CTS)	.874 (4.4)	.776 (2.4)	.667 (2.6)	.514 (1.3)	.546 (5.3)
County new administrators' salary/ teacher's salary (CASS)	.174 (1.3)	.418 (1.9)	.128 (.7)	.351 (1.4)	-.055 (.7)
Log likelihood	-2,786.19	-1,352.49	-1,343.30	-727.01	-5,734.13
No. of observations	7,147	3,751	3,574	1,789	13,013
Quits	1,295	581	689	373	2,884

NOTE.—See appendix for variable definitions. All models include AGE, GBLM, MA, GMA, CUNR, DENR, URBAN, RURAL, MHINC, Y78–Y88, and dummy variable indicating if CASS and DASS are missing. See Brewer (1994) for complete model estimates. Absolute value *t*-statistics are in parentheses.

* The coefficient is multiplied by 1,000.

demonstrated a willingness to leave and reenter teaching (less attachment to the district). The new entrant sample is preferred since it likely reduces unobserved heterogeneity.

A further refinement of the sample is to restrict analysis to teachers in districts where student enrollment was relatively stable over the 1978–89 period. This is potentially important because most involuntary terminations of teachers during the late 1970s and 1980s occurred due to falling pupil numbers. District enrollment in New York fell an average of 25% in this period. It is possible that the full sample results reflect layoffs rather than the voluntary quit behavior on which the model's hypotheses are based. Column 3 of table 4 reports estimated quit model coefficients for the subsample of new entrants in districts where enrollment increased or fell by less than 20%. As expected there is some evidence that the impact of administrator salaries is stronger in these districts (presumably because there are fewer involuntary quits), although the proxies for administrative opportunities remain statistically insignificant. This interpretation is further supported by the sensitivity of the estimated coefficients to stratification at different enrollment changes.

Table 5 reports the results of three alternative model specifications for the sample of male new entrants. In column 1 the salary variables used in the model (TSAL, DASS, CASS, and CTS) are calculated using monthly rather than annual salaries. Since part of the salary differential between teachers and administrators reflects a longer contract length, it is possible that the empirical results reported in table 4 are due in part to use of annual salaries. In fact the estimated coefficients are similar to those obtained using annual salaries in column 2 of table 4. Further sensitivity analyses suggest the results are also fairly robust with respect to other changes in salary variable construction.²⁶ In column 2 the individual teacher's predicted probability of promotion to administration (PPROM) is used in place of the districtwide proxies for administrative opportunities (DNPT, DAPT). Note that PPR0M is of the predicted sign but is also statistically insignificant.

²⁶ Use of mean salaries alone yields results similar to those reported. If no new administrators were appointed in the district or the county such that DASS or CASS are missing, they are set equal to zero, and dummy variables equal to one for these observations are included in all models to preserve sample sizes. An attempt to estimate log starting salaries for administrators (by estimating salary schedules for each district using all administrators) and to use these estimates in place of DASS yielded similar substantive conclusions to those reported in the article, although unreliable estimates of the log administrator starting salary in some districts make interpretation of these results problematic. If DASS is replaced by the mean starting salary of *all* new administrators, the estimated coefficient remains negative as predicted but is not statistically significant. Since the mean salary of all new administrators includes counselors, psychologists, librarians, etc., positions that teachers typically do not fill, this result is consistent with the view that teachers consider the payoff only in assignments most relevant to them.

nificant. This is due in part to the difficulty of obtaining reliable estimates of each teacher's likelihood of promotion which arises because the teachers analyzed in the article are at the early stages of their careers. (Of all teachers newly hired in 1978, only 50 male teachers out of 1,732 had moved to administration by 1988/89, and 81 female teachers out of 3,726 had moved by that date.)

Column 3 of table 5 relaxes the proportionality assumption of the hazard specification in equation (8). Time (length of spell) is interacted with each of the variables of interest so that their effect may vary over time. The expectation is that the effect of administrative variables should increase the "closer" teachers become to administrative positions, that is, in the middle stage of their career. There is some weak evidence that this is the case, even with the relatively young teachers in the sample. For example, the effect of district administrative salaries (LDASS) becomes more negative as length of spell increases, as does the effect of the number of openings in administration in the district (LDNPT); county administrative salaries (LCASS) become more important too in the predicted positive direction. The effect of own salary (LTSAL) diminishes with job tenure, a finding similar to that elsewhere (Murnane et al. 1991). While each of these results is consistent with the idea that administrative variables increase in importance for teachers, large standard errors make firm conclusions problematic. Alternative parameterizations of the effect of time to those reported does not change this interpretation.

While there is some evidence in tables 4 and 5 that district and county salaries in administration affect teachers' quit propensity, the magnitude of these estimates is difficult to ascertain directly from the tables. To facilitate the interpretation of the results, I calculate the impact of various changes in administrative variables on the predicted probability of a quit for selected models. I compute h_{it} given by (7), the predicted hazard rate, holding all explanatory variables at their mean values. Simulated increases are 10% at the sample mean. Table 6 shows the results of this exercise. All predicted probabilities are multiplied by 100.

In general the results in columns 1 and 2 indicate that the magnitude of the estimated effects is small. Not surprisingly, they suggest that teachers are most responsive to their own salaries and to county teacher salaries. A 10% increase in county teacher salaries raises the conditional probability of a teacher quit by about 1%, and a 10% increase in county administrator salaries raises the conditional quit probability by a tenth of this. The predicted probability of a teacher quitting their district is decreased by about .3% when district administrator salaries are raised by 10%, all else being constant. The interaction specification in column 3 (based on table 5, col. 3) suggests that the effect of a 10% increase in district administrator salaries is negligible for teachers with a spell length of 1 year, but decreases quits by .7% for those in a 10-year spell. Similarly, the simulated effect of a 10%

Table 5
Selected Coefficient Estimates from Logit-Hazard Models
of Teacher Quits for 1978 New York State New Hires—
Male New Entrants to Teaching

	(1)	(2)	(3)
Teacher's current salary (TSAL)*	-.157 (.6)	-.044 (1.8)	-.096 (2.8)
District new administrators' salary/teacher's salary (DASS)	-.288 (2.0)	-.250 (2.2)	-.144 (1.1)
District new administrators per teacher (DNPT)	-.066 (.8)	...	.223 (1.3)
District administrators per teacher (DAPT)	-.036 (.7)	...	-.027 (.4)
Predicted probability of promotion to administration (PPROM)	...	-6.900 (.9)	...
County teacher salary/teacher's salary (CTS)	.670 (2.4)	.618 (2.4)	.517 (1.9)
County new administrators' salary/teacher's salary (CASS)	.078 (.3)	.139 (.7)	.137 (.7)
Length of job spell × TSAL (LTS)*	...	...	.008 (2.4)
Length of job spell × DASS (LDASS)	...	...	-.060 (2.1)
Length of job spell × DNPT (LDNPT)	...	...	-.221 (1.9)
Length of job spell × DAPT (LDAPT)	...	...	.008 (.4)
Length of job spell × CTS (LCTS)	...	...	-.074 (1.1)
Length of job spell × CASS (LCASS)	...	...	.046 (1.9)
Log likelihood	-1,347.92	-1,343.87	-1,334.00
No. of observations	3,274	3,274	3,274
Quits	689	689	689

NOTE.—See appendix for variable definitions. All models include AGE, GBLM, MA, GMA, CUNR, DENR, URBAN, RURAL, MHINC, Y78-Y88, and dummy variables indicating if CASS and DASS are missing. In col. 1, the salary variables (TSAL, DASS, CASS, and CTS) are calculated using *monthly* salaries. In cols. 2 and 3 (as in the rest of the article) these variables are based on *annual* salaries. Absolute value *t*-statistics are in parentheses.

* The coefficient is multiplied by 1,000.

Table 6
Predicted Probability ($\times 100$) of a Teacher Quit for Changes in
Administrative Variables—Males

	All New Hires (Table 4, Col. 1)	New Entrants (Table 4, Col. 3)	New Entrants (Table 5, Col. 3)
Predicted probability at sample means:			
Year 1	11.8318	12.7410	8.4474
Year 10			37.5764
Increase of 10% in teacher's salary:			6.6334
Year 1	11.8122	12.0522	7.7615
Year 10			34.3060
Increase of 10% in county teacher salaries:			5.9536
Year 1	12.9416	13.7430	8.6633
Year 10			38.9445
<i>Increase of 10% in district new administrator's salaries:</i>			6.4536
Year 1	11.5179	12.3075	7.9869
Year 10			36.8378
Increase of 10% in district new administrator appointments:			5.9536
Year 1	11.8245	12.7268	8.4898
Year 10			37.5773
Increase of 10% in county new administrator's salaries:			6.4081
Year 1	11.9394	12.8388	8.6251
Year 10			37.8700
			6.8886

NOTE.—All predicted probabilities are calculated at sample means. Explanatory variables shown are increased by 10% of their mean value, and all other variables are held at sample means, to simulate the effect of a 10% increase in that variable. For the hazard models the estimates are derived using b_{it} , estimates of the probability of a teacher quit, conditional on the teacher's not having quit until that time. Year 1 refers to the predicted probability for a teacher with a spell length of 1 year, year 10 refers to the predicted probability for a teacher with a spell length of 10 years.

increase in the number of administrative appointments is almost zero for 1-year-spell teachers, but implies a .2% decrease in the predicted hazard for those in a 10-year spell. Conversely, teacher's own salary is much more important for the former group than the latter.

V. Conclusion

Since many teachers move to positions in school administration later in their careers, usually at salaries greater than those that would be earned in teaching, any serious consideration of structuring incentives for teachers needs to take account of these opportunities. This article has provided some basic evidence on the quantitative importance of administrative positions and the characteristics of those who fill them. The article tests the hypothesis that later career opportunities in administration affect teachers'

decisions to quit their district. Hazard model estimates suggest that male teachers are somewhat sensitive to expected administrative rewards. Higher district salaries for new administrators in positions that teachers usually fill decrease the likelihood that a teacher will quit their district, *ceteris paribus*. Conversely, if salaries for new administrators rise in the surrounding districts in the county, teachers are more likely to quit their districts. There is less robust evidence that more new openings in administration in a district decrease teachers' quit propensity. Finally, there is no evidence that female teachers respond to administrative variables, consistent with fewer opportunities and lower monetary rewards for women in school administration.

Although the estimated effect of administrative opportunities on teachers' quit propensity is small, the issue is important for improving the nation's education system since this depends in part on attracting and retaining high-quality teachers and administrators.²⁷ A weakness of the data used in this article is that they do not allow identification of the effects of teacher-administrator moves on the *quality* of teachers and administrators remaining in or quitting their jobs, since there is no independent measure of an individual's ability. This is particularly important in light of the evidence presented here. If a good teacher is assumed to have a greater impact on educational productivity than a good administrator, then retention of high-quality teachers in teaching should be a priority. The finding that teachers' quit propensity depends partly on the administrative rewards and opportunities in their district suggests the need for careful attention to the entire structure of incentives for teachers, not just their own salaries. Further, in a regime of increasing or stable enrollments the effects estimated here may be somewhat larger.

Finally, there are broader implications of this research. Turnover is a significant feature of labor market behavior. It is also costly for employers in terms of lost specific human capital and new hiring costs. Understanding the determinants of quit decisions, and how turnover might be efficiently reduced, is clearly important. It is of interest whether appropriate structuring of career paths affects quit decisions in contexts other than teaching.

Appendix

Sources and Definitions

For full details see Brewer (1994).

²⁷ The importance of administrators, particularly principals, for student performance has been shown in "effective schools" research, and in the production function studies of Brewer (1993) for high schools and Eberts and Stone (1988) for elementary schools.

I. New York Data Sources

1. Personnel Master File, New York State Department of Education, published annually, 1975/76–1989/90 (PMF). *Permission of the New York State Department of Education is required before these data may be used.* Contains personal characteristics for each assignment for classroom and nonclassroom staff, identified by (scrambled) social security number that remains constant across years and by a school and district identification number.

2. Institutional Master File, New York State Department of Education, published annually, 1978/79–1990/91 (IMF). Contains data on enrollments and resources (both physical and human) for each school and district in the state.

3. Census of Population, School District Files, New York State, U.S. Bureau of the Census, 1980 (CEN). Contains data on the characteristics of the school district's population in 1979.

4. Local Area Unemployment Statistics (1975–83) and Info New York (1983–90) (UN). Annual county unemployment rates for New York.

II. Definition of General Terms

Professional staff.—Teachers and administrative personnel.

Teacher.—All classroom staff. *Full-time* refers to teachers with at least three classroom assignments. Unless otherwise stated, only full-time teachers are used in all analyses.

Administrator.—Nonclassroom staff whose assignment occupies at least 50% of their time.

Central office administrator.—New York State Assignment codes 1–10. Superintendents, assistant superintendents, associate superintendents, deputy superintendents, director/coordinator of grade levels/instruction/research, and so forth (at district level), and school business management officials.

Principal.—New York State Assignment code 11. School or building administration principal.

Assistant principal.—New York State Assignment codes 12–13. Assistant or vice principal.

Subject area administrator.—New York State Assignment codes 24–71. Director, coordinator, supervisor, departmental head, or other (nonclassroom) for subject areas.

Other administrator.—New York State Assignment codes 14, 16–23, 74. Research associates/assistants, instructional technology, communication services, data-processing services, community centers, library services, public information services, and pupil personnel services (attendance officers, psychologists, guidance counselors, and medical services).

New hire.—A teacher not listed in the PMF in $t - 2$ and $t - 1$ in the same district and appearing in year t .

Quit.—A teacher in the PMF in $t - 1$ but not in t in the same district. (Alternate definition: A teacher in $t - 1$ but not appearing in t or reappearing in $t + 1$.) Those moving to administration in the same

district are nonquitters. Those changing districts, as teacher or administrator, are defined as a quit.

New entrant.—A newly hired teacher with no prior district or other district teaching experience.

Rehire.—A newly hired teacher who has some years of district teaching experience prior to hiring.

III. Variable Definitions and Sample Means

A. Descriptive Statistics Sample, 1975–89

The base data consist of all personnel in each year's PMF. New York City and its boroughs are excluded. For the purposes of Section III, only those districts (708 in all) for which nonmissing data were available for each year in the sample were used to facilitate comparisons across time.

B. Sample of 1978 Newly Hired Full-Time Teachers

The data consist of 1,732 males and 3,726 females newly hired as full-time teachers in 1978, followed yearly until they quit or until 1988, whichever is earlier (a maximum of 11 years of data). After the exclusion of missing values, there are 7,147 person-period observations for males and 13,020 person-period observations for females in the basic estimating samples. Those over 55 years of age in 1978 are also excluded from the sample. Table A1 gives variable definitions and means for the sample of all new hires used in table 4. All variables are derived from the PMF unless otherwise noted.

IV. Picture of Hazard

Figure A1 shows the predicted hazard for the sample of newly hired male teachers (table 4, col. 1), with predictors at sample means. Figure A2 shows the survivor function for the same sample.

Table A1
Hazard Model Sample of 1978 New Hires: Variable Definitions and Sample Means

Variable	Definition	Males	Females
AGE	Teacher's age in years (TI)	34.51	35.76
GBLM	Teacher has more than B.A. but less than M.A. = 1 (TV)	.192	.186
MA	Teacher has M.A. = 1 (TV)	.344	.490
GMA	Teacher has more than M.A. = 1 (TV)	.214	.119
TSAL	Teacher's current salary (1980 \$) (TV)	18,570.48	17,743.69
DASS*	District mean new administrator salary (1980 \$)/TSAL (TV)	1.397	1.466
DNPT	No. of district new administrative appointees per teacher (TV)	.182	.182
DAPT	No. of district administrators per teacher (TV)	.388	.407
CTS	County mean teacher's salary (1980 \$)/TSAL (TV)	1.170	1.223

Table A1 (Continued)

Variable	Definition	Males	Females
CASS*	County mean new administrator's salary (1980 \$)/TSAL (TV)	.590	.584
LTSAL	Length of spell (= 1, 2, . . . , 11) × TSAL (TV)	91,304.36	83,313.12
LDASS	Length of spell (= 1, 2, . . . , 11) × DASS (TV)	6.045	5.771
LDNPT	Length of spell (= 1, 2, . . . , 11) × DNPT (TV)	.668	.666
LDAPT	Length of spell (= 1, 2, . . . , 11) × DAPT (TV)	1.645	1.591
LCTS	Length of spell (= 1, 2, . . . , 11) × CTS (TV)	5.013	4.809
LCASS	Length of spell (= 1, 2, . . . , 11) × CASS (TV)	2.623	2.403
CUNR	Annual county unemployment rate (%) (TV) (UN)	6.570	6.492
DENR	District K-12 enrollment (TV) (IMF)	5,891.64	7,038.25
URBAN	District population urban more than 90% in 1979 = 1 (TI) (CEN)	.474	.508
RURAL	District population urban less than 10% in 1979 = 1 (TI) (CEN)	.208	.170
MHINC	District median household income (1979 \$) (TI) (CEN)	19,776.26	20,366.07
Y78	Year dummy = 1 in 1978	.207	.249
Y79	Year dummy = 1 in 1979	.151	.159
Y80	Year dummy = 1 in 1980	.101	.100
Y81	Year dummy = 1 in 1981	.089	.086
Y82	Year dummy = 1 in 1982	.085	.080
Y83	Year dummy = 1 in 1983	.073	.065

Table A1 (Continued)

Variable	Definition	Males	Females
Y84	Year dummy = 1 in 1984	.071	.062
Y85	Year dummy = 1 in 1985	.070	.061
Y86	Year dummy = 1 in 1986	.066	.056
Y87	Year dummy = 1 in 1987	.058	.051
Y88	Year dummy = 1 in 1988	.032	.031
Obs.	No. of person-period observations	7,147	13,013
Quits	No. of quits	1,295	2,884

NOTE.—TV = time-varying variable; TI = time-invariant variable. New York data sources (see the appendix) are as follows: UN = Local Area Unemployment Statistics (1975-83) and info New York (1983-90); IMF = Institutional Master File (1978/79-1990/91); CEN = Census of Population, 1980. The county-level variables, CTS and CASS, are calculated for each district so as to exclude that district. CUNR is only available for the entire county. Salaries are converted to 1980 dollars using the consumer price index annual averages, from *Statistical Abstract of the United States*, 112th ed. (Washington, DC: U.S. Department of Commerce, 1992), p. 469, table 738.

* To maintain sample sizes, separate dummy variables are defined to equal one when each of these variables are missing. The original variables are then set equal to zero where they were previously missing. Hence, the sample means are reduced by this process.

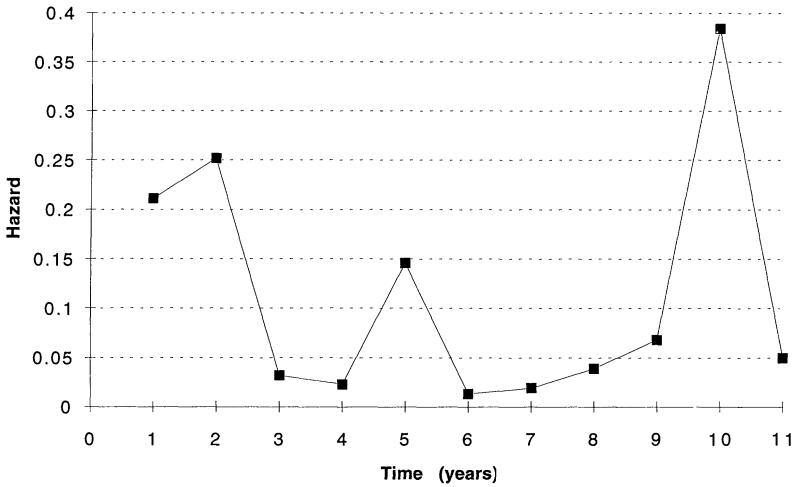


FIG. A1

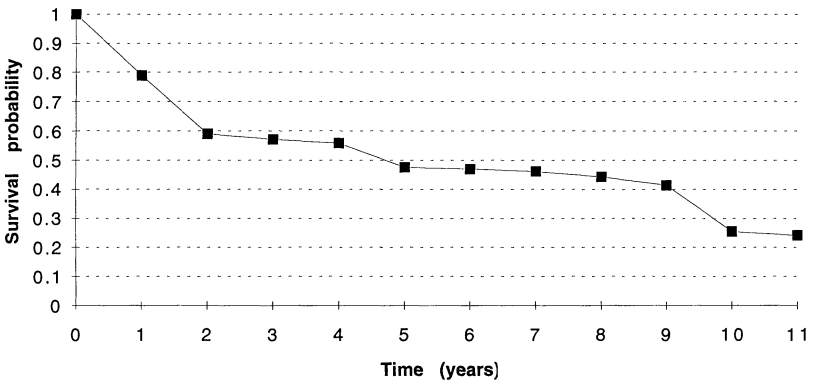


FIG. A2

References

Antos, Joseph R., and Rosen, Sherwin. "Discrimination in the Market for Public School Teachers." *Journal of Econometrics* 3 (1975): 123-50.

Blau, Francine D., and Kahn, Lawrence M. "Race and Sex Differences in Quitting by Young Workers." *Industrial and Labor Relations Review* 34 (July 1981): 563-77.

Boskin, Michael J. "A Conditional Logit Model of Occupational Choice." *Journal of Political Economy* 82 (1974): 389-98.

Brewer, Dominic J. "Principals and Student Outcomes: Evidence from U.S. High Schools." *Economics of Education Review* 12 (1993): 281-92.

- . “Teachers, Administrators, and Educational Productivity.” Ph.D. Dissertation, Cornell University, Department of Labor Economics, May 1994.
- Doeringer, Peter B., and Piore, Michael J. *Internal Labor Markets and Manpower Analysis*. Lexington, MA: D. C. Heath & Company, 1971.
- Eberts, Randall W. “Union Negotiated Employment Rules and Teacher Quits.” *Economics of Education Review* 6 (1987): 15–25.
- Eberts, Randall W., and Stone, Joe A. “Student Achievement in Public Schools: Do Principals Make a Difference?” *Economics of Education Review* 7 (1988): 291–99.
- Ebmeier, Howard, and Hart, Ann Weaver. “The Effects of a Career-Ladder Program on School Organizational Process.” *Educational Evaluation and Policy Analysis* 14 (Fall 1992): 261–81.
- Ehrenberg, Ronald G., and Brewer, Dominic J. “Do School and Teacher Characteristics Matter? Evidence from *High School and Beyond*.” *Economics of Education Review* 13 (1994): 1–17.
- . “Did Teacher Verbal Ability and Race Matter in the 1960s? *Coleman Revisited*.” *Economics of Education Review* 14 (1995): 1–21.
- Ferguson, Ronald F. “Paying for Public Education: New Evidence on How and Why Money Matters.” *Harvard Journal on Legislation* 28 (1991): 465–98.
- Greenberg, David, and McCall, John. “Teacher Mobility and Allocation.” *Journal of Human Resources* 9 (1974): 480–502.
- Grogger, Jeff. “Are Principals Better Paid?” Paper presented at Winter Meetings of the Econometric Society, Boston, 1994.
- Hanushek, Eric A. “The Economics of Schooling.” *Journal of Economic Literature* 24 (1986): 1141–78.
- Hanushek, Eric A., and Pace, Richard R. “Understanding Entry into the Teaching Profession.” In *Choices and Consequences: Contemporary Policy Issues in Education*, edited by Ronald G. Ehrenberg. Ithaca, NY: ILR Press, 1994.
- Hedges, Larry V.; Laine, Richard D.; and Greenwald, Rob. “Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes.” *Educational Researcher* 23 (March 1994): 5–14.
- McLaughlin, Kenneth J. “A Theory of Quits and Layoffs with Efficient Turnover.” *Journal of Political Economy* 99 (1991): 1–29.
- Meitzen, Mark E. “Differences in Male and Female Job-Quitting Behavior.” *Journal of Labor Economics* 4 (1986): 151–67.
- Monk, David H., and Jacobson, Stephen L. “The Distribution of Salary Increments between Veteran and Novice Teachers: Evidence from New York State.” *Journal of Education Finance* 11 (Fall 1985): 157–75.
- Murnane, Richard J. “Teacher Mobility Revisited.” *Journal of Human Resources* 16 (Winter 1981): 3–19.
- Murnane, Richard J., and Olsen, Randall J. “The Effects of Salaries and Opportunity Costs on Duration in Teaching: Evidence from Michigan.” *Review of Economic and Statistics* 71 (1989): 347–52.

- Murnane, Richard J.; Singer, Judith D.; and Willett, John B. "Changes in Teacher Salaries during the 1970s: The Role of School District Demographics." *Economics of Education Review* 6 (1987): 379-88.
- Murnane, Richard J., et al. *Who Will Teach? Policies That Matter*. Cambridge, MA: Harvard University Press, 1991.
- Rees, Daniel I. "Grievance Procedure Strength and Teacher Quits." *Industrial and Labor Relations Review* 45 (October 1991): 31-43.
- Sicherman, Nachum, and Galor, Oded. "A Theory of Career Mobility." *Journal of Political Economy* 98 (1990): 169-92.
- Singer, Judith D., and Willett, John B. "It's about Time: Using Discrete-Time Survival Analysis to Study Duration and the Timing of Events." *Journal of Educational Statistics* 18 (Summer 1993): 155-95.
- Siow, A. "Occupational Choice under Uncertainty." *Econometrica* 52 (1984): 631-45.
- Viscusi, W. Kip. "Sex Differences in Worker Quitting." *Review of Economics and Statistics* 62 (1980): 388-98.
- Weiss, Andrew. "Determinants of Quit Behavior." *Journal of Labor Economics* 2 (1984): 371-87.
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LINKED CITATIONS

- Page 1 of 7 -



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LINKED CITATIONS

- Page 2 of 7 -



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LINKED CITATIONS

- Page 3 of 7 -



⁶ **Determinants of Quit Behavior**

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Journal of Labor Economics, Vol. 2, No. 3. (Jul., 1984), pp. 371-387.

Stable URL:

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<http://links.jstor.org/sici?sici=0033-5533%28198505%29100%3A2%3C409%3AOCAATT%3E2.0.CO%3B2-5>

¹⁶ **Determinants of Quit Behavior**

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Journal of Labor Economics, Vol. 2, No. 3. (Jul., 1984), pp. 371-387.

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<http://links.jstor.org/sici?sici=0734-306X%28198407%292%3A3%3C371%3ADOQB%3E2.0.CO%3B2-F>

LINKED CITATIONS

- Page 4 of 7 -



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<http://links.jstor.org/sici?sici=0362-9791%28199322%2918%3A2%3C155%3AIATUDS%3E2.0.CO%3B2-1>

²¹ **Determinants of Quit Behavior**

Andrew Weiss

Journal of Labor Economics, Vol. 2, No. 3. (Jul., 1984), pp. 371-387.

Stable URL:

<http://links.jstor.org/sici?sici=0734-306X%28198407%292%3A3%3C371%3ADOQB%3E2.0.CO%3B2-F>

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References

Race and Sex Differences in Quits by Young Workers

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LINKED CITATIONS

- Page 5 of 7 -



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- Page 6 of 7 -



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