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Employee Turnover and Organizational Performance: Testing a Hypothesis from Classical Public Administration

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ABSTRACT

Empirical studies of public employee turnover, particularly using turnover as an independent variable, are rare; and most of the literature assumes turnover to have a negative impact on organizations. This study examines a provocative but little supported hypothesis that has recently emerged in the private sector literature—that turnover may provide positive benefits to the organization, at least up to a point. Using data from several hundred public organizations over a nine-year period, we test the proposition that moderate levels of turnover may positively affect organizational performance. We find that while turnover is indeed negatively related to performance for the organization's primary goal, it does have the hypothesized nonlinear relationship for a secondary output that is characterized by greater task difficulty.

Employee turnover is a neglected topic in public administration (Selden and Moynihan 2000, 74). One of the leading public personnel texts devotes only a single brief mention to turnover in reference to the Volcker Commission Report (Nigro, Nigro, and Kellough 2007, 43) and another does not mention it at all (Dresang 1999). A search of the JSTOR archives for *Public Administration Review* and the *Journal of Public Administration Research and Theory* finds a total of only five articles since 1980 (Clingermayer and Feiock 1997; Lewis 1991; Lewis and Durst 1995; Romzek 1990; Wilson 1994). Although an electronic search of the *Review of Public Personnel Administration* found 34 articles that mentioned the word “turnover” anywhere in the manuscript, most merely mentioned the term as an aside or in the bibliography (exceptions were Coursey 2005; Jamison 2003; Kellough and Nigro 2002; Lan, Riley, and Cayer 2005; Lewis and Hu 2005).

This relatively low level of attention is surprising because turnover requires organizations to devote substantial resources to replacing workers (Griffith and Horn 2001, 2; Wright and Kim 2004, 19) and because high levels of turnover might indicate a significant

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problem with low employee morale (Rainey 2003).¹ It is also surprising because turnover was considered extremely important in early public administration writing; a classic public personnel administration text (Mosher and Kingsley 1936) devoted an entire chapter to turnover and separations. In contrast, the private sector literature has seen a recent surge in turnover-related research, particularly research focused on the organizational level, rather than the individual level, and research that considers turnover as an *independent* variable. One provocative argument in that literature is that employee turnover is not necessarily bad for the organization—that in some situations, increased turnover may benefit the organization (see also Mosher and Kingsley 1936 and below).²

This manuscript will examine the linkage between employee turnover and organizational performance in public sector organizations. First, the recent private sector literature will be introduced to illustrate theoretical arguments about the nonlinear relationship of turnover to performance. A brief examination of some classic literature will reveal that these arguments were actually presented in the public sector literature several decades earlier. Second, using a larger and more complete data set than these private sector studies, this relationship will be examined using several hundred public sector organizations over a nine-year period. Third, by analyzing two different performance outcomes, one of significantly higher task difficulty, we will demonstrate for the first time some statistically significant support for the argument that not all turnover is bad. Finally, the manuscript concludes by noting implications for managers and future research topics that merit study.

TURNOVER AND PERFORMANCE: THEORY AND EMPIRICS

Most work on turnover starts with the conventionally accepted (but largely untested) assumption that turnover is bad, and then treats it as a dependent variable, as something to be minimized (e.g., Hayes 2004; Kim 2002; Perry 2004). Abelson and Baysinger (1984) proposed examining turnover as an independent variable and offered a theoretical challenge to the notion that all organizational turnover is dysfunctional (on the private sector see Dalton and Todor 1979; Mobley 1982; Staw 1980; Staw and Oldham 1978; on the public sector see Ban, Drahnik-Faller, and Towers 2003; Kellough and Osuna 1995; Lewis 1991; Lyden 1968). Abelson and Baysinger (1984, 332) rest their theory on a simple but crucial premise that organizational turnover should be evaluated on the costs that it imposes on the organization in relationship to the benefits that are gained (see also Bluedorn 1982).

For employees who are underperforming significantly, so that the costs of replacement and retaining can be quickly compensated by higher performance by a new employee, turnover benefits the organization. In addition to replacing low performers, benefits can come in two indirect ways: replacing poor performers can (a) serve as a motivational signal to others remaining in the organization and stimulate them to perform better (McElroy, Morrow, and Rude 2001, 1294), and (b) provide a source of new ideas for innovation and reform (Kellough and Osuna 1995, 58). Even for highly productive employees that the organization would like to retain, at some level of compensation a good employee returns less to the organization than his or her costs (Abelson and Baysinger 1984). In the public sector with its less flexible pay scales, this problem might be more

1 Turnover levels also reflect labor force conditions, economic cycles, and factors other than employee dissatisfaction. The key point is that turnover imposes costs on the organization.

2 Perhaps one reason why these studies have appeared on private sector rather than public sector organizations is that having an agreed upon output measure, profit, simplifies the research process.

acute (National Commission on the Public Service 1989). These trade-offs suggest that it might be more efficient for the organization to manage the turnover process than to try to minimize the level of turnover.

The empirical implication of the Abelson and Baysinger argument is that the relationship between turnover and organizational performance is that of an inverted U-shaped curve. Low to moderate levels of turnover generally benefit organizational performance by bringing in new blood and better-trained employees, but such benefits decline as turnover increases. Above some level of turnover, any additional turnover imposes more costs than benefits and thus detrimentally affects performance.

Although the private sector literature treats this hypothesis as a radically new perspective, the idea has its roots in classic public sector personnel administration. Stahl (1962, 387), writing well before the private sector literature, rejects the idea that turnover is “an unmitigated evil.” He contends that “the objective of reasonable mobility of certain professional and managerial employees among *public* jurisdictions suggests that the traditional abhorrence of turnover, at least as far as these classes of workers are concerned, may be misplaced” (p. 387, emphasis added). Turnover, he contends, can facilitate representation, generate fresh viewpoints, and broaden the experiences of key personnel. Stahl, however, was not the first to present this argument. His coauthors, Mosher and Kingsley (1936, 286) state, “There is no single desirable rate of turnover for all establishments, except that it should be (a) sufficiently large to prevent stagnation and (b) sufficiently small to reflect healthy working conditions.” The clear implication of this statement is that the relationship between turnover and organizational performance will be nonlinear or an inverted U-shaped curve.

Despite the logic of classical public administration and the intuitive appeal of Abelson and Baysinger’s argument, no study has been able to confirm the benefits of turnover, that is, find evidence supporting an inverted-U hypothesis. Glebbeek and Bax (2004) test the effect of employee turnover on firm performance using data from temporary employment offices in the Netherlands. Although Glebbeek and Bax (2004, 283) conclude they find a nonlinear relationship as specified, a positive linear term and a negative squared term, only one of the two coefficients is statistically significant, so they *cannot reject* the hypothesis that the relationship is strictly linear. Shaw, Gupta, and Delery (2005), using a somewhat different logic, find nonlinear relationships between turnover and organizational performance for both the concrete pipe industry and the trucking industry, but they do not find the hypothesized inverted-U relationship. Their finding is a nonlinear relationship whereby the negative relationship between turnover and performance gets less negative (diminishing damage) as turnover increases.

The early insight of Mosher, Kingsley, and Stahl not only points to what would be later identified as the “inverted-U hypothesis,” but also provides us the foundation to suggest a modification of the Abelson and Baysinger theory. This modification is based on recognizing task difficulty as the major contingency for the precise form and location of the curve. In their discussion of the differing effects of turnover, the authors point to differences among functions within the organization, placing emphasis on how the costs (or by extension, benefits) of turnover may be partially contingent on the types of tasks involved. Practically speaking, we know that all organizations set minimum standards for hiring new employees. If the organization is successful in recruiting, these new employees should be able to do, at least, the most basic tasks of the organization relatively quickly. For these most basic tasks, the turnover-performance relationship is

negative in practice because replacement costs are not likely to be offset by any productivity gains.

As tasks become more difficult to achieve or the skill levels and creativity of employees become more crucial, then differences in quality and experience of employees are likely to become more important to performance. Similarly, those with rare skills will contribute even more positive returns to the organization. To illustrate, within an insurance company, basic clerical personnel can be trained to fit within the organization relatively quickly; but actuaries, particularly those with experience in the lines offered by the company, are rare and gain value as they continue to work in specialized areas (for a related argument in nursing see Alexander, Bloom, and Nuchols 1994, 506; in public employment, Stahl 1962, 389). Similarly because clerical tasks are routine, a new idea by a clerical staffer is likely to have less of a positive impact on performance than the insight of a creative actuary who finds a better way to calculate hazard rates. Thus, for more difficult tasks and task environments, the basic costs and benefits of turnover correspond most strongly with the theoretical arguments of Abelson and Baysinger (1984). For tasks with high levels of difficulty that are important to the organization, therefore, the original inverted-U curve should predict quite well. This task difficulty explanation parallels an argument in the literature that extensive investments in human resources could generate a nonlinear turnover to performance curve (Arthur 1994; Shaw, Gupta, and Delery 2005, 53).

Failing to distinguish between levels of task difficulty might explain why the inverted-U curve so rarely has been observed in empirical research. The aim of this article is to demonstrate that differentiating levels of task difficulty reveals the underlying curve. Empirically assessing whether relationships are linear or not (i.e., the inverted-U curve) can be determined by merely including both turnover and the squared value of turnover in the same equation, along with various control variables. The inverted-U curve is represented by a positive coefficient for turnover and a negative coefficient for turnover squared. If other factors preclude the organization from gaining benefits from turnover, the coefficient for turnover will be negative and for turnover squared will either be negative or insignificant. If it is insignificant, the relationship can be adequately estimated with a linear relationship.

- H₁ At low levels of task difficulty, the relationship between organizational turnover and firm performance will be linear and negative.
- H₂ At high levels of task difficulty, the relationship between organizational turnover and firm performance has an inverted-U shape.

METHODS

As noted by Glebbeek and Bax (2004, 179), testing the Abelson and Baysinger curve requires data from different firms or departments with different turnover rates or data from a single firm over a period of time. Ideally, the different firms or departments would perform in the same industry with relatively similar production processes so that measures of performance would be comparable and an adequate set of control variables would be included. In addition, the estimation of quadratic models by definition creates a great deal of collinearity, making precise estimates of the turnover relationship more difficult; the

classic solution to collinearity is to have a large sample with sufficient variation (Gujarati 1995, 343).

Data

Our database is the 1000+ Texas school districts for the academic years 1994 through 2002. Having data for the same organizations over a period of time facilitates the process of determining the relationship between turnover and performance (McElroy, Morrow, and Rude 2001, 1295; Mobley 1982, 112). This set of organizations has been used extensively to examine questions of management and performance in the public sector (see Fernandez 2005; Hicklin 2004; Juenke 2005; Meier and O'Toole 2003; Pitts 2005). Texas school districts are independent units of local government charged with providing free public education in grades K-12. These districts, on average, raise approximately 50% of their budgets from local sources (both taxes and some limited private fund raising); the state of Texas provides about 45% of the funding with the federal government providing the remainder. Each school district is governed by a locally elected board of education that sets overall policies and budgets and hires a professionally trained superintendent to manage the district. Superintendents in Texas, the chief executive officers of these districts, have extensive powers to establish district and school-level policies. Individual districts set their own pay scales for teachers based on years of experience with some compensation for scarce skills (math teachers, bilingual teachers); a few districts such as Dallas ISD even provide some modest performance incentives. Teachers unions are weak to nonexistent in Texas, allowing teachers to be terminated for poor performance.

Even though these school districts operate in a single state, they are a highly diverse set of organizations. The average school district employs 516 full-time personnel, but the range is from 4 to 29,711. The districts run the full spectrum from rich to poor, urban to rural, and multiracial to monoracial as one might expect in a highly diverse state that contains approximately 8% of all school districts in the United States. The number of school districts has fluctuated modestly as some districts were consolidated and a few new ones were created, but well over 95% of all districts operated with essentially the same boundaries during the entire time period. At the same time, the composition of student bodies can change dramatically over a nine-year period. The overall database contains 9316 total cases. The large number of small districts, however, artificially inflates the variance of the key variables. A small district with only a few teachers is quite likely to have much more variation in terms of turnover and in terms of organizational performance because the turnover of one individual or the performance of only a few students can have a much larger impact on the organization. As a result, data from smaller school districts are less consistent from year to year and likely contain a fair amount of idiosyncratic variation. To limit the influence of this variation, we will present analysis from regressions that are restricted to school districts with at least 1000 students for a total of 4315 cases (see also Alexander, Bloom, and Nuchols 1994, 510 for a similar decision on organizational size). Missing values on one of the dependent variables reduce this number by a small amount in the analysis using that variable.

Turnover in these districts averaged 14.4% per year with a standard deviation of 5.2. Even these figures mask significant variation; annual turnover rates ranged from 39.8% to 2.5%. The interquartile range was from 10.9% to 17.1%. The average turnover for these organizations is slightly lower than that for the U.S. federal government (16.1% for the

12 months ending in July 2004; <http://www.opm.gov/feddata/html/2004/table16.asp>) and sits about in the middle of previously examined industries including U.S. steel minimills (5%; Arthur 1994, 681), Dutch temporary employment agencies (14.2% and 16.2%; Glebbeek and Bax 2004, 282), concrete pipe fabrication firms (17%), trucking (41%; Shaw, Gupta, and Delery 2005, 57, 61; and 31%; Shaw et al. 1998, 518), and nursing (40%; Alexander, Bloom, and Nuchols 1994, 512). In short, in terms of turnover rates, these organizations are relatively typical.

Although public sector organizations do not have the single bottom line feature of private organizations, performance measurement and performance evaluation are particularly well developed in the area of education. In the mid-1980s, a series of education reforms were adopted that created an accountability system for state schools (Wong 1999). That system required that students take a state-designed achievement test and mandated the collection of other performance data. Although these performance indicators do not have the singular focus that private sector profits do, they reflect the multiple goals that school districts have. The performance indicators also vary in how difficult they are to achieve, thus providing some leverage on our two hypotheses that propose relationships between turnover and performance contingent on task difficulty. All turnover data, as well as other data used in the analysis, are taken from the electronic files of the Texas Education Agency.

Measures

Turnover

Following prior research, we measure turnover using teachers rather than all organizational employees because teachers are the primary production employees of school districts. Although turnover of management or support personnel is also likely to have some relationship to organizational performance (see Hill 2005), the relationship between these individuals and the performance measures used is not as direct. This measure is consistent with that of Glebbeek and Bax (2004, 280) who excluded “[d]istrict managers, supporting staff at the district level, and all personnel not engaged in operational functions” and Shaw, Gupta, and Delery (2005) who used production-level workers.

Teachers work on annual contracts with minimal turnover during the school year due to serious illness or death. The official state measure of turnover is the percentage of teachers working for the district at the start of the previous year who are not working for the district at the start of the current year. This calculation prevents the measure from being distorted by growing districts that would need to hire a large number of new teachers and captures all those teachers who leave in the previous year regardless of reason. Although some literature distinguishes between voluntary and nonvoluntary turnover (see Cogburn 2006, 168; Selden and Moynihan 2000), that distinction is not always clear in the public sector where managers may encourage employees to leave rather than commencing termination procedures or where employees resign in lieu of being fired. Texas school districts do not report whether turnover is voluntary or not.

Performance

All organizations have multiple goals (Thompson 1967), and school districts are no exception. We select two measures—performance on state standardized tests and performance on college-ready criteria—to cover variations in task difficulty. Without

question, the primary goal of Texas school districts is performance on the statewide standardized test, known as the Texas Assessment of Academic Skills (or TAAS). (After our research period, the test was changed to the Texas Assessment of Knowledge and Skills in 2003.) In a 2002 survey of school superintendents, 69.5% ranked TAAS as their top goal; another 17.1% ranked it second among five possible goals (Meier 2002). The TAAS is the centerpiece of the state accountability system and is used by the state to grade the individual districts. TAAS scores are front-page news in virtually every newspaper in the state when released; superintendents often have incentive clauses in their contracts related to the TAAS, and students cannot graduate from high school without passing the exam. The measure used is the percentage of all students who pass all sections of the TAAS (math, reading, writing). The TAAS is considered a goal with modest task difficulty because it requires students to master a moderate level of skills and because it has been integrated into the curriculum with frequent practice exams and drills linked to the actual exam. Classroom instruction on TAAS-related materials is programmed into lesson plans so that all teachers regardless of quality will provide extensive focus on the TAAS. The implication is that existing variations in teacher quality do not matter much for the districts' results on the TAAS, and thus that the empirical relationship between turnover and performance is negative and linear.

The state of Texas has defined a standard for a college-ready student as one who scores above 1110 on the SAT (previously known as the Scholastic Aptitude Test) or its ACT (formerly the American College Test) equivalent. Although the ability to succeed in college entails much more than performance on what are known as the college boards, student scores on the SAT or ACT are used by colleges and universities to make admission decisions. In the 2002 survey, 21.8% of superintendents ranked college prep as the district's top goal and 53.0% as the second-ranked goal. Performance on this exam can be considered of higher task difficulty than the TAAS because the content of the exams is more advanced and because content from these tests is not systematically integrated into the curriculum. As an illustration, overall standardized test scores on the basic skills test (the TAAS) as well as the National Assessment of Educational Progress in Texas have improved over the past 20 years, but average student performance on the SAT and ACT has not. On such more difficult tasks, one expects the quality of teachers to matter more and the benefits of new insights and ideas to be greater. This logic suggests an inverted-U relationship between teacher turnover and school performance. The measure used is the percentage of high school seniors who have taken the SAT or ACT and scored above the 1110 criterion. The correlation between the two performance measures is .58.³

In both cases, performance is measured after the turnover measure. The turnover figure is measured in August, TAAS exams are taken in December, and ACT and SAT exams are for the academic year which runs from September to August of the year examined.

Nonspherical Errors

The current data set is a panel data set that includes nine years data on each school district. Panel data sets can be plagued by problems of serial correlation and heteroscedasticity (Baltagi 1995). The solutions to these problems are relatively straightforward. To deal with

3 Only 34% of shared variation suggests that preparing for the standardized tests and preparing for college boards are two separate tasks with modest overlap.

the serial correlation problem, a series of dummy variables were included for each of the years (minus one for estimation purposes). Joint F -tests in each situation showed that this set of variables was always significant. Heteroscedasticity tests showed only modest levels of heteroscedasticity and, thus, were not likely to affect the estimations. Estimations using Huber-White standard errors to correct for the slight heteroscedasticity did not change the results. We also estimated the equations with a full two-way fixed-effects model and produced results similar to those presented in tables 1 and 2.

One might also raise the issue of causality. It is possible that low performance might encourage employees to leave and thus performance is actually unaffected by turnover. To determine if this might be the case, we performed Granger (1969) causality analysis on the turnover and performance data. Granger causality is based on the logic that if A causes B, then A at time (t) will be correlated with B at time ($t + 1$) while controlling for B at time (t). In theory, one uses an infinite number of lags in Granger causality, but in practice one or two lags is usually sufficient. We performed Granger analysis for both two and three lags. For high-end performance, we could reject the hypothesis that performance causes turnover (turnover was causally related to performance). For TAAS performance, the causality tests suggested reciprocal causality. To go the extra mile on this question (given that performance is measured at a time later than turnover and given that one set of equations includes a lagged performance measure), we estimated the turnover TAAS equations using an instrumental variables technique designed to eliminate any reciprocal causation. That estimation produced results consistent with the findings in table 1 (a negative, linear relationship, see Appendix table A1).

Control Variables

Any assessment of the relationship between turnover and performance needs to consider the other influences on performance so that the results are not underspecified and possibly spurious. Fortunately, the education literature has a well-developed set of what are called “educational production functions” that are used in explaining education performance (Burtless 1996; Hanushek 1996). The independent variables in education production functions can basically be divided into resources and constraints.

Resources

Although there is some controversy about the role that resources play in educational performance (Hedges and Greenwald 1996; Hanushek 1996), most empirical work, as well as compelling logic, suggests that schools with greater resources face an easier task in terms of educating students. Seven different measures of resources will be used; this will generate some collinearity among these set of independent variables, but our objective is to make sure that adequate controls are in the model rather than providing precise estimates of the impact of variables that are not central to this analysis (i.e., class size) on student performance. The resource measures include average teacher salary (in thousands), per student instructional expenditures (in thousands), class size (ratio of students per teacher), per student state aid (in thousands), percentage of noncertified teachers, percentage of teachers with advanced degrees, and average years of teaching experience among teachers. In theory, student performance should be positively related to teacher pay, instructional expenditures, state aid, teachers with advanced degrees, and teacher experience. It should be negatively related to class size and noncertified teachers.

Constraints

School district performance is also likely to be affected by how challenging it is to educate the students. In the United States, both poverty and race are generally used as indicators of educational constraints (Jencks and Phillips 1998). Both are correlated with family incomes, educational support in the home, health consequences that can affect education, and similar factors. Three indicators will be used: the percentage of students who are eligible for free or reduced price school lunches (a federal poverty definition), the percentage of African-American students, and the percentage of Latino students. The literature consistently finds that each of these variables is negatively correlated with educational performance.

RESULTS

The regression results linking organizational turnover to performance for the TAAS scores are shown in table 1. The first two columns estimate both the linear and the nonlinear relationships between turnover and performance while controlling for the other factors likely to affect performance. The second column does not show the pattern predicted by Abelson and Baysinger of a positive linear term and negative squared term. Although both terms in column two are negative, the linear term fails to meet traditional levels of statistical significance. Because the number of cases is large, the conclusion from these first two regressions is that turnover is negatively and *linearly* related to overall student performance on the TAAS. All other things being equal, a one-percentage point increase in teacher turnover is associated with a decline of 0.285 points on the TAAS pass rate. The control variables all generally perform as expected, although four of the variables fail to attain statistical significance (teacher experience, advanced degrees, state aid, and expenditures). All other variables are statistically significant in the correct direction even with the relatively high intercorrelations between teacher salaries, class size, and the other resource variables. The model explains a relatively robust 81% of the variance in TAAS score performance.⁴

The third and fourth columns of table 1 seek to provide a more rigorous test of the relationship and to control for the likelihood that past performance is determining turnover rates and thus is the underlying cause of the lower levels of performance. These estimations contain a lagged TAAS pass rate variable for both the linear and the quadratic estimation and explain 94% of the total variation in TAAS performance. Although the quadratic estimation results are similar to Glebbeek and Bax's results with a positive slope for the linear term and negative slope for the squared term, the linear term is not statistically significant. With 3844 cases, statistical significance is low standard for proof, however, so the appropriate estimation is column three (without the squared term) where the relationship between organizational turnover and organizational performance is negative and linear. Autoregressive models are strong tests of hypotheses because the lagged dependent variable controls for any management or other factors that do not change from year to year. Finding a relationship with an autoregressive model that is consistent with

4 The level of prediction is relatively high for two reasons. Large organizations such as these have relatively stable personnel processes thus limiting erratic variation. The prediction levels also reflect that the models are well specified and do not omit any key variables.

Table 1
Turnover and its Influence of Low-End Performance (TAAS scores)

	Districts with 1000+ students autoregressive estimates			
	Linear	Nonlinear	Linear	Nonlinear
Turnover	-0.285 (12.78)	-0.124 (1.68)	-0.051 (4.28)	0.056 (1.43)
Turnover squared	—	-0.005 (2.28)	—	-0.003 (2.87)
Controls				
Black students	-0.164 (17.90)	-0.164 (17.85)	-0.026 (5.09)	-0.025 (5.01)
Latino students	-0.062 (8.61)	-0.063 (8.68)	-0.013 (3.32)	-0.013 (3.42)
Poor students	-0.213 (20.93)	-0.213 (20.95)	-0.008 (1.36)	-0.008 (1.40)
Teacher pay 000s	0.313 (4.31)	0.314 (4.32)	0.069 (1.79)	0.070 (1.83)
Class size	-0.312 (2.98)	-0.320 (3.06)	-0.030 (0.53)	-0.035 (0.63)
Noncertified	-0.205 (6.81)	-0.202 (6.69)	-0.058 (3.61)	-0.056 (3.50)
Experience	0.041 (0.59)	0.054 (0.78)	-0.053 (1.44)	-0.044 (1.20)
Advanced degrees	0.013 (1.13)	0.013 (1.12)	-0.004 (0.63)	-0.004 (0.66)
State aid	-0.106 (1.21)	-0.100 (1.14)	0.019 (0.40)	0.023 (0.51)
Expenditures 000s	0.372 (0.87)	0.383 (0.89)	0.081 (0.36)	0.090 (0.40)
Lagged performance	—	—	0.828 (102.76)	0.828 (102.78)
Standard error	5.87	5.86	2.95	2.95
R-square	.81	.81	.94	.94
F	962.54	915.56	3031.44	2885.73
N	4315	4315	3844	3844

Note: Coefficients for individual year dummy variables not reported. T-scores in parentheses, t-scores >1.96 are significant at 0.05.

a nonautoregressive model suggests that no relevant variables are omitted from the model and the results are unlikely to be spurious.⁵

The coefficients for similar tests for college-bound performance are shown in table 2. Recall that our contingency logic suggested that the inverted-U relationship would be found for indicators that reflect greater task difficulty. The results for the college preparation percentage show a clear nonlinear pattern with the inverted U-shaped relationship (both with and without a lagged dependent variable). Very low levels of turnover are detrimental to performance; as turnover increases so too does performance to a given level, but then even higher turnover reduces performance. This equation can be used to estimate the optimal level of turnover (all other things being equal) by taking the first derivative of this equation and setting it equal to zero. This shows the optimal turnover rate is approximately 16.2% per year. This is slightly higher than the mean turnover rate of 14.4% suggesting that the average school district is operating on the left side of the inverted U-shaped relationship. At the mean point, the slope of the curve is +.437, but this slope rapidly falls to zero as turnover increases to 16.2%; the net difference in performance as a result is relatively small. Only as school districts move some distance way from the midpoint, does the impact of turnover on performance become large.

5 With an autoregressive model, the interpretation of coefficients is based on change from the previous year. For the linear model, a one-percentage point increase in teacher turnover is associated with a .05% point drop in test scores the next year. While this might not seem like much, because the drop is now included in the performance term, it will affect test scores in future years also. The long-term impact of a one-percentage point increase in turnover is approximately .297% points or almost the same as the nonautoregressive coefficient (this can be determined by taking the slope and dividing it by 1.0 minus the autoregressive coefficient, see Hamilton 1994).

Table 2
Turnover and its Influence on High-End Performance (High SAT and ACT Scores)

	Autoregressive estimates			
	Linear	Nonlinear	Linear	Nonlinear
Turnover	-0.026 (0.94)	0.554 (6.06)	-0.019 (0.81)	0.340 (4.27)
Turnover squared	—	-0.017 (6.64)	—	-0.011 (4.72)
Controls				
Black students	0.031 (2.77)	0.033 (2.96)	0.012 (1.26)	0.014 (1.44)
Latino students	0.052 (5.94)	0.050 (5.57)	0.023 (3.04)	0.022 (2.90)
Poor students	-0.337 (27.09)	-0.338 (27.28)	-0.151 (12.95)	-0.153 (13.14)
Teacher pay 000s	0.328 (3.69)	0.335 (3.79)	0.055 (0.72)	0.066 (0.86)
Class size	-0.391 (3.07)	-0.420 (3.31)	-0.168 (1.52)	-0.189 (1.71)
Noncertified	-0.279 (7.48)	-0.269 (7.23)	-0.139 (4.26)	-0.136 (4.17)
Experience	-0.363 (4.23)	-0.318 (3.71)	-0.166 (2.22)	-0.140 (1.88)
Advanced degrees	0.147 (10.23)	0.146 (10.24)	0.067 (5.30)	0.067 (5.31)
State aid	-1.030 (9.55)	-0.997 (9.33)	-0.386 (4.18)	-0.372 (4.04)
Expenditures 000s	0.881 (1.69)	0.915 (1.77)	0.569 (1.28)	0.588 (1.32)
Lagged performance	—	—	0.598 (44.89)	0.593 (44.51)
Standard error	7.12	7.08	5.80	5.78
R-square	.56	.57	.71	.71
F	289.40	279.93	465.03	446.45
N	4271	4271	3776	3776

Note: Coefficients for individual year dummy variables not reported. T-scores in parentheses, t-scores >1.96 are significant at 0.05.

Tables 1 and 2 illustrate the immediate impacts of turnover, that is, in the first year of the turnover. Examining the longer term implications of turnover is valuable for two reasons. First, turnover in any given year might be too low or too high for idiosyncratic reasons and thus would not provide a true picture to managers in the organizations. Second, turnover and its problems might cumulate over time and in the process create larger problems; one can imagine an organization that essentially has a revolving door of personnel with little stability and rapidly diminishing levels of expertise.

To investigate the possibility of longer run impacts of turnover on performance, a regression was run with the current value of turnover, the previous year's value of turnover, and turnover two years earlier in the same equation along with all controls. Table 3 provides abridged results from these two equations. The first column shows that turnover's negative impact on TAAS performance continues in the second and third year (additional analysis including a fourth year of turnover found no additional impacts). A one-percentage point increase in teacher turnover is associated with a decline of 0.21 points on the TAAS the first year, a decline of 0.094 points the second year, and an additional 0.098 points the third year. The results for the college boards show no significant impacts for turnover, a pattern that would be consistent with a nonlinear relationship between turnover and college boards as found in table 2.

The longer term negative impact of turnover on performance raises the question of how chronically high turnover affects the performance of an organization. To provide another view on this problem, we summed the turnover measure for four years. The results were shocking. The average school district experienced 57.5% turnover in a four-year period (standard deviation 17.2) with the range from 18.5% to 143.5%. This, of course, does

Table 3
Does the Negative Impact of Turnover Cumulate Over Time?

	Dependent variable	
	TAAS scores	College boards
Turnover	-0.207 (7.72)	-0.029 (0.70)
Turnover prior year	-0.094 (3.42)	-0.067 (1.62)
Turnover two years earlier	-0.098 (3.66)	-0.054 (1.35)
Standard error	5.44	7.39
R-square	.72	.53
F	422.14	167.44
N	3368	2860

Note: All equations control for percent Latino, black, and poor students, teachers' salaries, class size, noncertified teachers, teacher experience, teachers with advanced degrees, state aid, instructional expenditures per student, and annual dummy variables.

not mean that the average organization loses 57% of its teachers every four years since some of the teaching slots turnover more than once but the level would still be considered high.

Table 4 uses this four-year turnover measure as an independent variable in both linear and nonlinear estimations (the sample size drops owing to the need for four years prior turnover data). For the TAAS, the common pattern of relationships occurs. The relationship between turnovers is negative and linear. The size of the regression coefficient is smaller simply because the turnover variable is now much larger. A district with average four-year turnover of 57.5% would expect to see its TAAS scores fall by 5.75 points, a statistically and substantively significant drop.

The relationship between the four-year turnover variable and the college board scores fits the now familiar inverted U-shaped relationship with a significant positive linear term and a significant negative squared term. Taking the first derivative of this equation and setting it equal to zero suggests that the optimal turnover rate for college board scores is 59.4%, a figure which if divided by four comes very close to the optimal rate for a single year (16.2%). The long-term relationship for turnover, therefore, resembles the short-term relationship although the size of the impact is much greater. Such findings are to be expected simply because an organization's ability to deal with problems (high turnover) is in part a function of how stressed the organization has been.

Table 4
Turnover and its Impact over a Four-Year Period

	TAAS		College boards	
	Linear	Nonlinear	Linear	Nonlinear
Turnover 4-year sum	-0.100 (12.48)	0.018 (0.62)	-0.032 (2.81)	0.214 (5.06)
Turnover squared	—	-0.00087 (4.15)	—	-0.0018 (6.05)
Standard error	5.28	5.26	7.38	7.34
R-square	.65	.65	.53	.53
F	333.65	316.80	198.73	191.53
N	2892	2892	2860	2860

Note: All equations control for percent Latino, black, and poor students, teachers' salaries, class size, noncertified teachers, teacher experience, teachers with advanced degrees, state aid, instructional expenditures per student, and annual dummy variables.

Because our theoretical argument on task difficulty suggested that turnover's positive aspects would only be apparent on more difficult tasks, the question is raised about whether or not turnover has a different impact on different grade levels of students. After all, the task difficulty of teaching high school should be more difficult than teaching elementary school in terms of both the subject matter and in terms of the distractions faced by students.⁶ To investigate this possibility, we examined the TAAS pass rates for grades 3, 7, and the exit exam (these are the only exam scores available by grade for the entire time period). The exit exam has been given in both grade 11 and in grade 10 in different years. When these different exam scores are used as dependent variables, the results are consistent with table 1 (results not shown). The relationship for all three sets of exams is negative and linear; in no case does the inverted U-shape curve show up. This analysis did, however, show a very interesting pattern. A one-percentage point increase in turnover resulted in a drop of 0.373 points on the third-grade exam ($t = 10.82$), 0.289 points on the seventh grade exam ($t = 9.79$), and 0.209 points on the exit exam ($t = 6.70$). Turnover has almost twice the negative impact on young children as it does on high school students. Such a pattern of relationships is consistent with the task difficulty argument. If high levels of task difficulty generate some positive benefits in regard to turnover, we would expect that even moderate increases in task difficulty to the organization's basic task would lessen the negative impact of turnover. Although there is no evidence that turnover benefits high school students on the TAAS, the negative impact is smaller than for other students.

MANAGEMENT IMPLICATIONS

The findings of this research have several implications for the practice of public management including strategic management, organizational design, and personnel recruitment and retention. First, not all employee turnover is necessarily bad. Some organizations might become rigid and fail to innovate, particularly on more difficult tasks, without the infusion of new personnel. Because turnover's impact varies by task difficulty, managers will need to make trade-offs between goals with different levels of task difficulty. In the present case the paradox is clear—holding turnover down to its lowest levels benefits students taking the TAAS but hurts those seeking high college boards. A strategic management choice is needed between such goals or concerning how much to emphasize one goal versus the other.

Second, turnover is like any other organizational process; it is a process that needs to be managed—and, in particular, managed in ways that take into account the balance required to sustain levels of turnover that are high enough to encourage healthy change

6 We thank an anonymous reviewer for suggesting this analysis by grades as well as the analysis in tables 3 and 4. It is possible that turnover for elementary teachers might be different from that for secondary teachers and thus confound this analysis. Reporting turnover statistics by level of teacher is rare (Texas does not do this). We were able to find one study of four large urban districts (Barnes, Crowe, and Schaefer 2007) that reported elementary teacher turnover at 17.0% and secondary teacher turnover at 19.2%, essentially no difference. We were able to aggregate the percentage of first year teachers for elementary and secondary schools in Texas. The percentage of first year teachers should be correlated with teacher turnover. For elementary teachers this figure was 7.77% and for secondary teachers the figure was 7.99%. Both sources suggest that teacher turnover is relatively similar for elementary and secondary school teachers.

but not so high as to place dysfunctional pressures on the organization. The management task of organization design becomes important.

Although many of the causes of turnover are outside the control of the manager (family relocations, health problems, retirements, etc.), the function of the manager is to lower the costs that such turnover imposes on the organization. One possibility is to redesign jobs or processes to lower transactions costs. The state of Wisconsin, for example, no longer has an examination for custodial workers but rather selects individuals randomly from an applications list. The logic is that virtually anyone with a few hours of training can perform such jobs. Hospitals faced with an annual turnover among nursing staff of 40% have redefined some jobs so that any registered nurse qualifies and can be immediately placed in an opening. A second way is that managers might substitute technology for high turnover positions. The expansion of e-government activities, as an example, could provide a solution to high turnover among first-line personnel who interact with the public.

Third, this study has direct implications for personnel recruitment and retention. Depending on the relative importance of various organizational goals, the manager might be less concerned with retention and more concerned with recruitment. How large the impact of turnover can be is likely to be a function of the quality of the current employees relative to the quality of the replacement employees. Management, in theory, can affect this ratio by either investing more resources in recruitment or more resources in development of current employees. Either strategy should affect the relative value of new employees to current employees and needs to be a conscious management strategy.

The type of information provided in this study could benefit organizations if similar studies are conducted for specific sets of organizations that share common characteristics (e.g., fire departments or welfare offices). Knowing that all turnover has negative consequences for the organization means a different response than if the turnover curve is an inverted U. In cases where the inverted-U curve is the correct one, then knowing the optimal turnover point could indicate to management when turnover should be on the management agenda. As Stahl (1962, 390) concluded over 40 years ago, "A sound analysis of causes and costs of turnover would be of inestimable value."

DISCUSSION AND CONCLUSION

Using an argument from classical public personnel administration and a theoretical idea from the private sector literature, this article estimated the relationship between turnover and performance at the organizational level using panel data from a large number of Texas school districts. The article made both theoretical and empirical contributions to the literature on turnover's effect on organizational performance.

Theoretically, the article extended recent work on nonlinear impacts of turnover by incorporating task difficulty into the basic argument. This incorporation was used to modify the inverted-U hypothesis of organizational turnover, a relationship with significant intuitive appeal but little empirical support. Because organizations set minimum standards for hiring and because many tasks can be routinized, the relationship between turnover and performance should be negative when tasks are not exceptionally difficult.

As task difficulty increases, however, skills in the organization become more specialized, talented employees become more difficult to replace, and new ideas have greater value. The reliance on high-end skills also means that as education and training programs improve over time, the cost of replacing workers is also likely to go up. The implication is that as organizations face high task demands, the inverted-U hypothesis will gain practical importance.

This study was the first to examine the relationship between turnover at the organization level and organization performance for public sector organizations. The theoretical logic for whether turnover might have positive or negative effects under different conditions was developed for the private sector, but the process of hiring, retaining, and managing workers in the public sector does not appear on its face to be so dramatically different that the theoretical logic should not apply.

Examining the relationship between turnover and performance at the organizational level is in its infancy. Theoretical arguments about nonlinear relationships, especially those about nonlinear relationships that are contingent on human resources investments or task difficulty, have moved the theoretical work a great deal beyond what most current data sets can accommodate. Combining multiple insights such as task difficulty and human resources investments within the same empirical assessment will put even greater stress on data sets. At the same time, these theoretical advances mean that future investments in data sets could be well rewarded.

Existing literature suggests numerous other studies that are needed on the relationships between turnover and performance at the organizational level. McElroy, Morrow, and Rude (2001) argue that reductions-in-force (RIFs) are the source of the negative relationship between turnover and performance. Although public sector RIFs are not common, they do occur with some frequency. With a panel data set of many organizations over time, one could not only separate out RIFs from regular turnover but also determine if both types of turnover generate nonlinear relationships and whether or not such relationships are conditioned by either human resources investments or task difficulty.

The literature could also benefit from greater attention to management. What can management do, other than encouraging investments in human resources, to affect the turnover-performance relationship? Can management invest in labor substitutes (teacher's aides, nurse's aides) to moderate the turnover-performance relationship for core production personnel? Could management buffer environmental threats to the organization and thus reduce turnover among key workers? The systematic incorporation of management into the macro turnover-performance relationship holds great promise.

All studies to date have been on the impact of turnover among core production workers on the organization's performance. Organizations also employ managers, support personnel, external relations specialists, and countless other types of employee. In addition to the basic question of whether or not turnover affects performance in the same way for these types of personnel, probing how turnover among the various groups interacts to affect organizational performance would also be worthwhile.

Finally, we know very little about how a wide range of organizational factors influence the relationships examined in this study. Such factors as organizational size, the relative distribution of production versus administrative personnel, organizational slack, organizational growth versus stability versus decline, and many other factors could affect the turnover-performance relationship. Such studies could integrate the turnover-performance agenda with broader agendas in organization theory.

APPENDIX

Table A1
Instrumental Variables Estimation of Impact on TAAS

	Linear	t score	Nonlinear	t score
Turnover	-0.622	10.27	-0.377	0.98
Turnover squared	—	—	-0.008	0.63
Controls				
Black students	-0.160	16.74	-0.160	16.73
Latino students	-0.059	7.83	-0.059	7.84
Poor students	-0.204	19.18	-0.204	19.19
Teacher pay	0.345	4.62	0.345	4.62
Class size	-0.305	2.81	-0.307	2.83
Noncertified	-0.233	7.55	-0.232	7.50
Experience	0.077	1.07	0.080	1.10
Advanced degrees	0.003	0.21	0.003	0.22
State aid	-0.079	0.88	-0.079	0.87
Expenditures	0.467	1.06	0.466	1.06
Standard error	5.76	—	5.76	—
R-square	.76	—	.76	—
F	648.67	—	616.16	—
N	3843	—	3843	—

Note: Coefficients for individual year dummy variables not reported. T-scores in parentheses, t-scores >1.96 are significant at 0.05.

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