

Jones, Michael D.

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ORIGINAL ARTICLE

Open Access

How do teachers respond to tenure?

Michael D Jones

Correspondence: m.jones@uc.edu
Department of Economics,
University of Cincinnati, 324 Lindner
Hall, 2925 Campus Green Drive,
Cincinnati, OH 45221, USA

Abstract

I use the 2007 Schools and Staffing Survey to estimate the effect of tenure on K-12 teacher behavior. Estimates are obtained by exploiting the cross-state variation in the probationary period length of novice teachers. I find that in the year that teachers are evaluated for tenure, they spend significantly more of their own money on classroom materials. The teachers also participate more in school committees and extracurricular activities during the evaluation year. After increased activity during the tenure evaluation year, behavior appears to return to the baseline established prior to evaluation.

JEL Classifications: I21; I28; J22; M5

Keywords: Teacher tenure; Employment protection legislation

1 Introduction

In most public school districts, teacher tenure is a time-honored element of teacher employment contracts. However, several states across the United States have recently introduced legislation to modify or eliminate teacher tenure. In 2011, the state of Florida passed a bill that any new teacher hired would receive a year-to-year contract, effectively eliminating tenure. In 2009, Ohio extended the probationary period before a teacher is eligible for tenure from three years to seven years. Proponents of tenure argue that once teachers demonstrate competency during a probationary time period, they should be protected from arbitrary dismissal. Opponents of tenure argue that the process of firing poor performing teachers is too time-consuming and expensive. Once a teacher receives tenure, school districts must follow a detailed and costly sequence of steps to fire a poor performing tenured teacher. As a consequence, few tenured teachers are fired for poor performance in the United States. According to *The Widget Effect*, from 2004–2008, Chicago Public Schools only formally dismissed 9 tenured teachers, or 0.01 percent of its workforce. Prior to receiving tenure, school districts can fire, or fail to renew the contract, of a probationary teacher for almost any reason – with the exception of discriminatory or other illegal reasons. Because tenure status increases a teacher's job security by reducing the likelihood of being fired, I investigate how teachers anticipate and respond to receiving tenure.

In this paper, I look at the change in a teacher's spending on classroom materials and explore whether teachers change their time allocation in activities outside of the classroom (e.g., club sponsorship, coaching, serving on school committees, etc.). Research has consistently found that teacher quality is one of the most important school-level variables affecting student performance (Rivkin et al. 2005; Aaronson et al.

2007; Chetty et al. 2011). Changes in teacher behavior during the tenure evaluation year may affect student performance. I also investigate how teacher work hours change once a teacher is granted tenure – where the number of work hours is measured as the total time a teacher spends on school-related activities during a given week. Relative to the year that teachers are evaluated for tenure, I examine how these measures change immediately before receiving tenure and in the years following tenure. To answer these questions, I use data from the 2007–2008 restricted use version of the Schools and Staffing Survey (SASS) and exploit the cross-state variation in the probationary period length of novice teachers. The majority of states require that teachers serve for three years in a district before tenure is granted. However, several states have shorter probationary periods of only one or two years, while others have longer periods of four or five years.

Teacher tenure is a specific application of employment protection legislation (EPL) which consists of the laws and regulations that govern the hiring and firing of workers. Once a teacher is granted tenure, dismissal or firing costs increase considerably. There is a sizable economics literature on the effects of EPL on various outcomes of interest. Autor et al. (2007) found that the adoption of wrongful discharge protection laws in the United States altered firms' production choices, causing employers to retain unproductive workers. Blanchard and Portugal (2001) found that the strict employment protection in Portugal profoundly affected the labor market relative to the United States and led to an increased duration of unemployment. Heckman and Pages (2000) showed that job security legislation in Latin America reduced employment and increased wage inequality across workers. Several other papers also found that EPL affects worker employment (Lazear 1990; Miles 2000; Kugler and Saint Paul 2004; Martins 2009).

There are also papers that investigate the impact of EPL on individual worker behavior. Ichino and Riphahn (2005) used data from a large Italian bank and found that employee absenteeism increased significantly once employees were no longer under a probationary period. Scoppa (2010) used the 1990 EPL reform act in Italy to investigate the effect on worker absenteeism in that country. Using a difference-in-difference approach, the author exploited the fact that the law drastically increased the firing costs for small firms and found that shirking increased once employees were granted firing protection. Despite this extensive literature, there is little research that looks at EPL in the context of K-12 education. Jacob (2010) used the 2004 new collective bargaining agreement in Chicago Public Schools (CPS) that gave principals the flexibility to dismiss probationary teachers for any reason and found that annual teacher absences were reduced by roughly 10 percent. Goldhaber and Hansen (2010) examine the implications of using value-added models as a criterion for granting tenure to teachers. *The Widget Effect*, published by The New Teacher Project, documents the relationship between tenure and the number of teachers who are fired. While not specifically addressing teacher tenure, Hansen (2010) used North Carolina administrative data and found that teacher absences increased dramatically in the year prior to teacher retirement or departure. While understanding teacher behavior under EPL is itself a worthwhile research question, this research is also an important first step in understanding how teacher tenure might affect student outcomes to the extent that teacher behavior changes under tenure.

I find that in the year that teachers are evaluated for tenure, they spend significantly more of their own money on classroom materials. The teachers also participate more in school committees and extracurricular activities during the evaluation year. I also

find evidence that these changes in behavior are temporary. After a spike in activity during the tenure evaluation year, behavior appears to return to the baseline established prior to being evaluated for tenure.

2 State variation in teacher tenure

The history of teacher tenure in the United States began in 1909 when New Jersey became the first state to pass comprehensive tenure legislation for K-12 teachers. By the 1940s, seventy percent of teachers were covered by tenure protection; and today, nearly every state has passed legislation granting some form of tenure. In some states, tenure status is also called a continuing contract or permanent employment status. Regardless of its name, tenure is a series of steps or due process that must be followed in order to dismiss a tenured teacher. In order to receive tenure, new teachers in a school district must be employed for a probationary period. During the 2007–2008 school year, the most common probationary period length was three years, but the probationary period length varied between one year and five years. Table 1 shows the probationary period for each state before a teacher was eligible to receive tenure.

The tenure process comprises at least the following four elements: time to tenure, criteria to earn tenure, process for conferring tenure, and tenure protections (Hassel et al. 2011). In this research, I exploit the variation in the time to tenure in order to understand the effect of tenure on teacher behavior. The other tenure elements do not vary substantially across the states. Incorporating student performance in the tenure decision is rare at the state level. According to the 2008 NCTQ State Teacher Policy Yearbook, only two states, Iowa and New Mexico, required that student academic performance be considered in the criteria for awarding teacher tenure. Even in those

Table 1 Number of years before a teacher earns tenure, by state, 2008

No policy (1)	(3)	2 years (7)	3 years (33)	4 years (5)	5 years (2)	
DC	Hawaii	California	Alabama	New Jersey	Connecticut	Indiana
	Mississippi	Maine	Alaska	New Mexico	Illinois	Missouri
	N. Dakota	Maryland	Arizona	New York	Kentucky	
		Nevada	Arkansas	Ohio	Michigan	
		S. Carolina	Colorado	Oklahoma	N. Carolina	
		Vermont	Delaware	Oregon		
		Washington	Florida	Pennsylvania		
			Georgia	Rhode Island		
			Idaho	S. Dakota		
			Iowa	Tennessee		
			Kansas	Texas		
			Louisiana	Utah		
			Massachusetts	Virginia		
			Minnesota	West Virginia		
			Montana	Wisconsin		
			Nebraska	Wyoming		
			N. Hampshire			

Source: NCTQ state teacher policy yearbook 2008.

states, student performance is not the predominant criterion for awarding tenure. Because states often leave tenure decisions to the discretion of the local school district, I also investigate to what extent student performance, specifically student growth, is discussed in school district contracts as a requirement for teacher tenure. Out of the 50 largest school districts in the United States, only three districts specifically require teachers to demonstrate objective student growth on standardized tests prior to being awarded tenure during the 2007–2008 school year, according to the NCTQ Teacher Contract Database.

Because of the increased intensity of performance reviews and in-class evaluations during the tenure evaluation year, as well as the saliency of the process, we might expect an increase or “spike” in teacher effort and activities during that year. Primary and secondary tenure operates differently than university tenure. For example, Singell and Lillydahl (1996) find that assistant professors spend more time on teaching and research compared to full professors, but there is no difference in time allocation within the rank of assistant professor. Link et al. (2008) find similar results. Earning tenure in a university environment requires consistent and persistent efforts over a five to seven year period of time.

While the systems for conferring tenure across states are procedurally different, the outcomes are not – few teachers who are eligible for tenure are denied this status. In the 2009 report, *The Widget Effect*, researchers find that in five of the six school districts they studied, less than one percent of probationary teachers were denied tenure. Since the time of the report, several states and districts have increased the standards required to receive tenure. For example, in the 2010–2011 school year, New York City introduced more stringent requirements in order for teachers to achieve tenure. Teachers are now rated under a four-point scale that must incorporate student test scores, classroom observations, and parental feedback (the previous rating system only measured two levels – unsatisfactory and satisfactory). The number of teachers who were denied tenure outright increased from 1 percent in 2006 (approximately the same time period of the data used in this research) to 3 percent in 2011.

In contrast, teachers outside of New York City but still in the state of New York are not always subject to these rigorous elements for tenure. New York state law only requires that teachers be granted tenure after a majority vote of the Board of Cooperative Educational Services upon the recommendation of the district superintendent. The district superintendent must write a report to the board of cooperative educational services indicating that the teacher is “competent, efficient and satisfactory.” There is no rubric or requirement that teachers meet student achievement benchmarks or undergo a certain number of observations from a principal or third-party observer. In reviewing tenure documents across the remaining states, I conclude that while the procedural nature of the tenure application varies, there is little substantive difference in the outcomes of the tenure process.

Finally, once a teacher receives tenure, every state provides a substantially higher degree of protection for a teacher’s employment contract. According to data from the 2007–2008 SASS, only two percent of teachers in the United States were dismissed or failed to have their contract renewed. Table 2 shows the wide variation in dismissal rates across states. South Dakota removed almost 12 percent of its teachers for poor performance, while Arkansas removed only 0.2 percent. In some school districts, that

Table 2 Teacher dismissal rates in the 2006–2007 year, 2007–2008 SASS data, all teachers

	Average number of teachers per district	Number of teachers who were dismissed or did not have their contracts renewed	Percentage of teachers who were dismissed or did not have their contracts renewed
United States	211.4	4.4	2.1%
Highest 5 States			
South Dakota	59.8	7.1	11.9%
Alaska	166.1	9.6	5.8%
Minnesota	128.8	4.8	3.7%
Alabama	384.7	14.1	3.7%
Oklahoma	75.7	2.7	3.6%
Lowest 5 States			
Nevada	1,527.4	8.6	0.6%
Delaware	227.5	1.2	0.5%
Pennsylvania	180.9	0.9	0.5%
North Dakota	46.2	0.2	0.4%
Arkansas	123.0	0.3	0.2%

Note: Of the ~3,780 districts, only 18% of districts fired a tenured teacher for poor performance.

Source: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School District Data File," 2007–08.

number is even lower. I tested whether the variation in firing percentages across states generated heterogeneity in teacher response. However, I could find no significant difference between states which fire a relatively higher percentage of teachers relative to those which fire a relatively lower percentage of teachers. This lack of heterogeneity could be due to the fact that outside of South Dakota and Alaska, every state fired less than four percent of teachers for poor performance.

3 Data

Details on state tenure laws come from the 2008 National Council on Teacher Quality (NCTQ) State Teacher Policy Yearbook. In the yearbook, NCTQ publishes each state's probationary period before a teacher may be granted tenure, as well as a citation for the relevant state law. In addition, prior to publication of the yearbook, the organization provides state officials with a draft copy of its findings in order to check the accuracy of its claims. Because some laws were written to permit school district administrators to have authority over teacher tenure under special circumstances, at times, discretion must be used to code a state's probationary period into a numerical value. For example, the state of Maryland has a probationary period of two years, but it may be extended to three years on an individual basis. NCTQ decided to code Maryland as having a two-year probationary period. In the four states where NCTQ notes that there are potentially different interpretations, I follow NCTQ's coding scheme.

I match the 2007 NCTQ data to teacher response data from the restricted-use version of the 2007–2008 Schools and Staffing Survey (SASS), conducted by the National Center for Education Statistics. Begun in 1987, the SASS is fielded every three to four years and surveys a stratified random sample of public schools, private schools, and schools funded by the Bureau of Indian Education (BIE). The SASS collects data on

teacher, administrator, and school characteristics, as well as school programs and general conditions in schools. In addition to restricting the sample to public school teachers only, teachers who indicated that they received no salary or did not work full time were dropped from the analysis. Teachers from career or vocational schools, alternative schools, and special education schools were also removed from the sample. These teachers were dropped because of the unique circumstances of these schools. Because I am only interested in looking at teacher behavior around tenure, I remove teachers who have been teaching for 8 or more years. Table 3 provides summary statistics for the 2007 SASS sample.

Table 3 describes overall characteristics of the teaching labor force in the 2007–2008 SASS. Teaching is a female-dominated profession with more than three-quarters of all teachers being female. Over one-half of teachers work in a district with a collective-bargaining agreement. Teachers are asked to provide the total amount of hours spent on all teaching and school-related activities during a typical full week, and the average for this variable is 53 hours per week. This self-reported number of work hours is higher than what is found in other well-known datasets like the CPS; however, the

Table 3 Summary statistics, data from 2007 SASS

Teacher demographics	Mean	Min	Max	Std. Dev.
Age	37.88	20	76	0.16
White	0.90	0	1	0.01
Male	0.23	0	1	0.01
Teaching Year	3.34	1	7	0.03
Salary	\$42,175	\$15,000	\$110,000	\$10,945
School Characteristics				
Student-Teacher Ratio	14.61	1	83.3	0.09
Free Lunch Percentage	0.43	0	1	0.01
District Characteristics				
Expenditures per Student	\$11,878	\$4,899	\$69,203	\$115
Collective Bargaining Agreement	0.53	0	1	0.01
Outcomes of Interest				
Work Hours	53.30	30	80	8.71
Own Money Spent	\$422.86	0	\$9000	\$8.44
Professional Development	0.88	0	1	0.01
Communication ¹	0.84	0	1	0.01
Job Security Worry ²	0.34	0	1	0.01
Coach a School Sport	0.18	0	1	0.01
Serve as a Curriculum Specialist	0.09	0	1	0.01
Serve on a School or District Committee	0.51	0	1	0.01
Sponsor a School Club	0.37	0	1	0.01
Total Observations	15,650			

Note: Sample sizes rounded to nearest 10 for NCES confidentiality purposes.

1) Dummy variable is defined as 1 if a teacher uses any of the following to communicate with parents or students outside of the regular school day: e-mail to send out group updates, e-mail to address individual questions or concerns, online bulletin board, course or teacher web page, course or teacher blog, instant messaging (IM).

2) Teachers are asked if they agree or strongly agree with the following statement "I worry about the security of my job because of the performance of my students on state and/or local tests."

SASS prompts the teacher to include hours spent during the school day, before and after school, and on the weekends.

Teachers indicate that they spend about \$420 of their own money on average on classroom supplies. The fact that teachers spend their own money in the classroom is so common that the IRS allows a tax deduction for these purchases called the Educator Expense Deduction. Teachers can deduct up to \$250 of any unreimbursed expenses incurred for books, supplies, computer equipment, and other supplementary materials. In addition, I look at teacher participation in school extra-curricular activities as a measure of teacher devotion. Approximately eighteen percent of teachers coach a sport at the school they teach, and one-third of teachers sponsor a school club. Over one-half of teachers indicate that they serve on a school or district wide committee, while only ten percent serve as a curriculum specialist. Almost ninety percent of teachers participate in some form of professional development.

In order for tenure to alter behavior, teachers must have flexibility to make changes around school and extracurricular activities. In the SASS, teachers are asked, "How many hours are you required to work to receive base pay during a typical full week at this school?" On average, school districts require teachers to work 38 hours a week. Since teachers indicate that they spend 53 hours on all teaching-related activities, there is still considerable flexibility for teachers to reduce participation rates in extracurricular activities. Likewise, if teachers are required to participate in professional development activities, teacher tenure could not affect any changes in professional development participation rates. While states do require teachers to participate in some form of professional development to maintain their certification, there is often a time window in which to complete these activities. For example, the state of Ohio requires a teacher to complete 18 continuing education units over a 5 year time period in order to maintain certification. Because a teacher has flexibility around scheduling these units, the possibility of strategic behavior in response to teacher tenure exists.

Previous literature has found a relationship between teacher behavior, attitudes, instructional practices, and other activities on student achievement. Palardy and Rumberger (2008) found positive effects on student achievement by teachers who use different curricula and approaches to instructional practices (e.g., journal writing, silent reading, geometric manipulations, etc.). Other literature has found similar effects of instructional practices on student achievement (Lee et al. 1997; Xue and Meisels 2004; Guarino and Hamilton 2006). In the SASS, teachers who serve as curriculum specialists may be willing to improve their curriculum and approach to teaching. Teachers' use of their own money also signals a desire to invest more in curriculum or instructional practices in order to positively affect student achievement. In addition, a teacher's attitude at work has been shown to influence student achievement (Rowan et al. 1991). Finally, a teacher's credentialing, as evidenced by investing in professional development, has been found to produce mixed results on student achievement. Some authors have found a positive effect, while others have found little or no effect (Goldhaber and Brewer 2001; Wayne and Youngs 2003).

4 Empirical methodology

To estimate the effects of teacher tenure on effort, I use a type of difference-in-difference framework to exploit the cross-state variation in the time required for a teacher to earn

tenure. I exclude Washington DC from the data since there is no required probationary period specified in the employment contract. Within the 50 states, I use the observations in the first year after a teacher receives tenure as the treatment group in the model. The control group consists of teachers who are in the same year of teaching as the treatment group but have not yet received tenure because of the state’s longer probationary period. I use this estimation method because simply comparing the differences in outcomes before and after tenure may be confounded by other factors that drive these differences. For example, teachers with one more year of experience may not need as much time to teach the material effectively. There could also be changes in expectations around school service activities for more experienced teachers. For these and other reasons, using states with a longer probationary period controls for the differences in teacher behavior that are not related to teacher tenure.

Figure 1 provides a visual description of the identification strategy by plotting the amount of unreimbursed money that teachers spend on classroom materials by the length of a state’s probationary period. For the states with either a two or three year probationary period, Figure 1 clearly shows a “spike” in classroom expenditures in the year that a teacher is being evaluated for tenure. Teachers in two year probationary period states spend more than \$100 of their own money in that year relative to the previous year or following year. This sharp increase in expenditures in the year of tenure evaluation motivates the following empirical specification.

For the empirical analysis, I estimate the following equation:

$$Y_{icdst} = \beta_0 + BeforeTenureEval_{icdst}\beta_1 + 1YrTenure_{icdst}\beta_2 + 2PlusYrTenure_{icdst}\beta_3 + I_{icdst}\beta_4 + C_{cdst}\beta_5 + D_{dst}\beta_6 + \mu_s + v_{icdst} + \varepsilon_{icdst}, \tag{1}$$

where Y_{icdst} is the outcome of interest for teacher i , in school c , in school district d , in state s , in teaching year t . $BeforeTenureEval$ is a dummy variable indicating if the

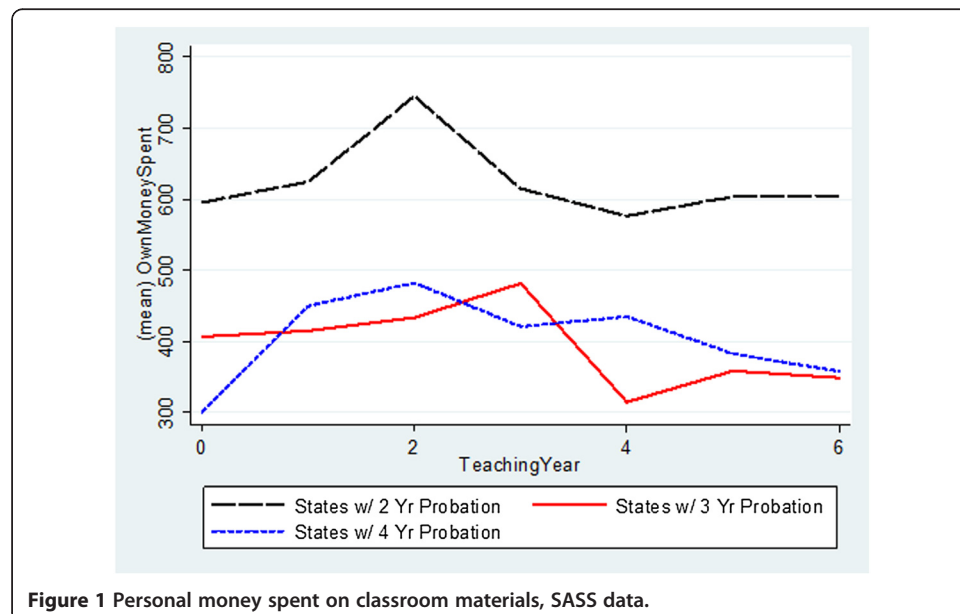


Figure 1 Personal money spent on classroom materials, SASS data.

teacher is in a year prior to the tenure evaluation year. *1YrTenure* is a dummy variable indicating if a teacher is in the first year of teaching with tenure, and *2PlusYrsTenure* is a dummy variable indicating if a teacher has two or more years of teaching with tenure. Finally, I is a vector of individual characteristics, S is a vector of school-level characteristics, and D is a vector of district-level characteristics, μ_s are state dummy variables, v_{icdst} are dummy variables for years of teaching experience, and ε_{icdst} is an idiosyncratic error term. Coefficients on the three tenure dummy variables are interpreted relative to the tenure evaluation year.

One potential concern is how to address the tenure status of veteran teachers who transfer school districts. There are a few examples where states have made it easier for veteran teachers to acquire tenure after transferring school districts. For example, in 2011, Illinois passed SB7, which allows previously tenured teachers who earned either a “Proficient” or “Excellent” rating to be eligible for tenure in 2 years if they earned an “Excellent” rating in each of the first two years in the new district. A new teacher in Illinois would be on probation for four years, rather than two. With the limitations of the data, I cannot calculate whether or not this type of condition would be applicable for a teacher in the dataset. Therefore, I treat all teachers as under the same tenure laws as specified in the NCTQ dataset. Including potentially tenured teachers in my estimation strategy would bias my results towards zero. One other concern is that teacher behavior after tenure may be partly driven by selection effects. If less efficient teachers are less likely to receive tenure, then the results may be biased. While there is some concern about selection effects, in 48 out of 50 states, less than four percent of teachers are fired for poor performance. To the extent that selection bias may exist, the effect is likely to be small.

5 Results

The estimate of the effect of teacher tenure on classroom expenditures is reported in column 1 of Table 4.

Relative to the tenure evaluation year, teachers spend approximately \$70 less on classroom materials in the years leading up to the evaluation. Likewise, they also spend approximately \$75 less in the first year of receiving tenure. This amount reflects an 18 percent decline from the average of \$420 spent on classroom materials. The coefficient of \$68 on the Tenure Evaluation Year dummy in Column 2 of Table 4 clearly shows the spike in expenditures in the tenure evaluation year. Column 3 of Table 4 shows the results using a simplified difference-in-difference specification with only using dummy variables for the first year of tenure as well as for two or more years with tenure. Relative to teachers without tenure, teachers in the first year of tenure spend \$73 less on classroom expenditures. However, even though the coefficient on the “Two or More Years with Tenure” dummy is negative, it is statistically insignificant, suggesting that the immediate drop in classroom expenditures may be temporary. Teachers may feel that they need to “take a break” after the tenure evaluation year, but behavior reverts back to trend after a one year pause. Column 4 of Table 4, which presents the baseline specification without any teacher or district controls, shows that the decline in classroom expenditures is not driven by changes in teacher or district characteristics. Regardless of whether teachers spend their own money as an investment in their

Table 4 Effect of teaching tenure on own money spent, SASS data

Sample restrictions	(1) Baseline	(2) Tenure evaluation year dummy	(3) Exclude "Before Tenure Evaluation" dummy	(4) No individual teacher or district controls
Before Tenure Evaluation	-68.068** (29.924)			-69.038** (29.881)
Tenure Evaluation Year		68.068** (29.924)		
First Year With Tenure	-75.567** (34.803)	-7.499 (45.906)	-72.582* (36.886)	-62.519** (27.533)
Two Or More Years With Tenure	-26.897 (44.233)	41.171 (62.679)	-38.842 (44.507)	-20.752 (41.629)
Black	-84.454*** (20.784)	-84.454*** (20.784)	-85.612*** (20.908)	
Hispanic	30.993 (23.033)	30.993 (23.033)	31.075 (22.555)	
Other Race	-91.581** (34.666)	-91.581** (34.666)	-91.120** (34.728)	
Male	-96.151*** (13.985)	-96.151*** (13.985)	-95.840*** (13.926)	
Age	2.561*** (0.917)	2.561*** (0.917)	2.560*** (0.918)	
Salary (\$1000s)	2.690*** (0.966)	2.690*** (0.966)	2.689*** (0.969)	
Student-Teacher Ratio	-3.127* (1.681)	-3.127* (1.681)	-3.111* (1.677)	
Free Lunch Percentage	84.657*** (24.353)	84.657*** (24.353)	85.726*** (24.352)	
Expenditures Per Student	-2.613** (1.196)	-2.613** (1.196)	-2.729** (1.184)	
Collective Bargaining	18.375 (19.784)	18.375 (19.784)	17.558 (19.970)	
Second Year of Teaching	64.957*** (18.742)	64.957*** (18.742)	66.058*** (18.627)	65.920*** (19.310)
Third Year of Teaching	24.848 (28.267)	24.848 (28.267)	36.029 (25.755)	32.846 (27.988)
Fourth Year of Teaching	-31.896 (34.405)	-31.896 (34.405)	25.074 (20.975)	-18.136 (34.777)
Fifth Year of Teaching	-37.237 (52.303)	-37.237 (52.303)	27.344 (39.033)	-28.892 (49.917)
Sixth Year of Teaching	-67.960 (64.568)	-67.960 (64.568)	9.762 (42.686)	-45.762 (66.013)
Seventh Year of Teaching	-74.371 (76.580)	-74.371 (76.580)	4.934 (53.745)	-53.010 (74.962)

Table 4 Effect of teaching tenure on own money spent, SASS data (Continued)

R-squared	0.051	0.051	0.051	0.034
Observations	15,120	15,120	15,120	15,650

Standard errors in parentheses, clustered by state.

State effects and teaching year effects are included in the above regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: Sample sizes rounded to nearest 10 for NCES confidentiality purposes.

students' academic performance or as a signal of commitment, teachers appear to perceive the return on their money to decline immediately after tenure.

Table 5 shows the effect of tenure on extra-curricular activities outside of the classroom. Column 1 shows that teachers are six percentage points less likely to serve on a school or district-wide committee immediately after receiving tenure. Columns 2 and 3 of Table 5 show a participation rate spike in coaching a sport and serving as a curriculum specialist during the tenure evaluation year. Teachers who temporarily coach a sport (or serve as an assistant coach) for one year may not be ideal for student development. In contrast to these declines, once teachers receive tenure, they are five percentage points more likely to sponsor a student organization, group, or club in the year following tenure. Teachers who would like to sponsor a club may feel that their time is better spent on more visible and/or more rewarded activities during the tenure evaluation year. Tenure may allow these teachers to pursue other student development activities. This reallocation of time between different extra-curricular activities may explain why tenure does not change the overall level of teacher work hours. Consistent with the findings on classroom expenditures, the participation rates in extracurricular activities appears to be a temporary phenomenon, or "spike", associated with the tenure evaluation year. All of these results still hold under a probit model.

Table 6 shows the effect of teacher tenure on other measures of teacher behavior. Teachers are asked if they communicate with students or parents outside of the classroom using any of the following: email, online bulletin board, course or teacher web page, blog, or instant messaging. In column 1 of Table 6, I find no evidence that teachers change the intensity of their communication with students and parents. In column 2 of Table 6, I find that teachers are 6 percentage points less likely to participate in professional development two or more years after receiving tenure. This is the only behavioral outcome which appears to change permanently. If professional development is only partially subsidized or not at all by the school district, teachers may not feel the need to pursue professional development for maintaining employment at the school district. In column 3 of Table 6, I find that overall teacher work hours do not change. If this measure were defined only as teacher work hours at the school, then there would obviously be no change in teacher work hours. However, the SASS defines teacher work hours more broadly as all school-related activities that take place during the week – including the weekends. Under this definition, there is potential for teacher work hour changes. Since I do not find an increase or decrease in teacher work hours during the tenure evaluation year, I conclude that the spike in certain activities during this year must reduce the amount of time spent on other school-related activities. In Column 4 of Table 6, I find that tenured teachers feel they have more job security relative to the tenure evaluation year. Immediately after receiving tenure, teachers are four percentage points less likely to agree or strongly agree with the statement, "I worry

Table 5 Estimates of teacher tenure on extracurricular activities, SASS data

Dependent variable	(1) Committee	(2) Curriculum	(3) Coach	(4) Sponsor
Before Tenure Evaluation	-0.002 (0.024)	-0.038*** (0.011)	-0.033** (0.013)	-0.021 (0.023)
First Year With Tenure	-0.055* (0.031)	-0.026* (0.014)	-0.025* (0.015)	0.053* (0.028)
Two Or More Years With Tenure	-0.061 (0.044)	-0.011 (0.016)	-0.001 (0.022)	0.041 (0.034)
Black	-0.040 (0.029)	-0.013 (0.015)	0.025 (0.017)	0.093*** (0.024)
Hispanic	-0.143*** (0.040)	-0.011 (0.009)	-0.009 (0.015)	-0.067*** (0.017)
Other Race	-0.140*** (0.038)	0.055*** (0.019)	-0.033 (0.024)	0.011 (0.030)
Male	-0.091*** (0.013)	0.000 (0.007)	0.343*** (0.016)	0.125*** (0.016)
Age	-0.001* (0.001)	0.001*** (0.000)	-0.006*** (0.001)	-0.002** (0.001)
Salary (\$1000s)	0.002** (0.001)	0.001*** (0.000)	-0.000 (0.000)	-0.002*** (0.001)
Student-Teacher Ratio	-0.010*** (0.002)	-0.002* (0.001)	0.002* (0.001)	0.006*** (0.002)
Free Lunch Percentage	-0.058** (0.026)	-0.008 (0.013)	-0.045** (0.022)	-0.096*** (0.027)
Expenditures Per Student	-0.003** (0.001)	0.003** (0.001)	0.000 (0.002)	0.001 (0.002)
Collective Bargaining	-0.001 (0.020)	0.006 (0.012)	-0.029** (0.014)	-0.019 (0.015)
Second Year of Teaching	0.106*** (0.017)	0.008 (0.010)	0.007 (0.020)	0.048*** (0.015)
Third Year of Teaching	0.135*** (0.019)	0.003 (0.011)	0.008 (0.014)	0.086*** (0.022)
Fourth Year of Teaching	0.184*** (0.036)	0.032* (0.017)	0.009 (0.021)	0.083*** (0.031)
Fifth Year of Teaching	0.207*** (0.048)	0.031 (0.020)	-0.010 (0.027)	0.001 (0.042)
Sixth Year of Teaching	0.216*** (0.057)	0.012 (0.024)	-0.005 (0.024)	0.006 (0.048)
Seventh Year of Teaching	0.235*** (0.053)	0.044* (0.026)	0.005 (0.022)	0.050 (0.037)
R-squared	0.057	0.034	0.184	0.043
Observations	15,120	15,120	15,120	15,120

Standard errors in parentheses, clustered by state.

State effects and teaching year effects are included in the above regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note 1: Sample sizes rounded to nearest 10 for NCES confidentiality purposes.

Note 2: Omitted tenure category variable is "evaluation year".

Table 6 Estimates of teacher tenure on other behaviors, SASS data

Dependent variable	(1) communication	(2) Professional development	(3) Work hours	(4) Job security worry
Before Tenure Evaluation	-0.023 (0.019)	-0.006 (0.014)	0.500 (0.545)	0.026 (0.028)
First Year With Tenure	-0.019 (0.017)	-0.012 (0.019)	0.522 (0.421)	-0.040** (0.018)
Two Or More Years With Tenure	-0.012 (0.030)	-0.058** (0.025)	0.057 (0.874)	-0.056** (0.023)
Black	-0.055* (0.030)	0.031 (0.021)	-0.094 (0.466)	-0.008 (0.040)
Hispanic	-0.023 (0.023)	-0.015 (0.025)	0.378 (0.278)	0.067*** (0.020)
Other Race	-0.041* (0.023)	0.040** (0.020)	-0.300 (0.484)	0.011 (0.041)
Male	0.019 (0.011)	-0.067*** (0.014)	0.800* (0.450)	-0.015 (0.014)
Age	-0.002*** (0.000)	0.001** (0.000)	0.012 (0.028)	0.003*** (0.001)
Salary (\$1000s)	0.000 (0.001)	0.001* (0.000)	-0.035* (0.020)	-0.002*** (0.001)
Student-Teacher Ratio	0.004** (0.002)	-0.002 (0.002)	0.027 (0.034)	0.002 (0.001)
Free Lunch Percentage	-0.387*** (0.061)	0.016 (0.015)	-2.190*** (0.455)	0.247*** (0.033)
Expenditures Per Student	-0.004* (0.002)	0.000 (0.001)	0.050* (0.025)	0.001 (0.001)
Collective Bargaining	-0.020 (0.019)	0.007 (0.016)	-0.042 (0.349)	-0.005 (0.019)
Second Year of Teaching	-0.002 (0.015)	0.025* (0.013)	-0.380 (0.528)	-0.001 (0.034)
Third Year of Teaching	0.019 (0.016)	0.041*** (0.012)	-0.187 (0.710)	-0.037 (0.034)
Fourth Year of Teaching	0.037 (0.025)	0.028 (0.024)	-0.844 (0.791)	-0.005 (0.040)
Fifth Year of Teaching	0.026 (0.031)	0.071*** (0.021)	-1.593* (0.932)	-0.001 (0.042)
Sixth Year of Teaching	0.018 (0.038)	0.076*** (0.028)	-1.471 (1.046)	0.000 (0.043)
Seventh Year of Teaching	0.000 (0.039)	0.068** (0.029)	-0.977 (1.534)	0.030 (0.051)
R-squared	0.143	0.028	0.032	0.044
Observations	15,120	15,120	15,120	15,120

Standard errors in parentheses, clustered by state.

State effects and teaching year effects are included in the above regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note 1: Sample sizes rounded to nearest 10 for NCES confidentiality purposes.

Note 2: Omitted tenure category variable is "evaluation year".

about the security of my job because of the performance of my students on state and/or local tests.” With two or more years of tenure, teachers are six percentage points less likely to agree with this statement relative to teachers in their tenure evaluation year. This result is evidence that the tenure definitions in equation 1 are consistent with the notion that tenure is effective in reducing concerns about job security.

Finally, Table 7 presents evidence that men and women may respond differently in the year of tenure evaluation. While column 1 shows that the difference in the amount of money spent in the classroom does not vary meaningfully, women are more likely to participate in school committees during the tenure evaluation year. They are also more likely to coach a school sport relative to the year before and the year after tenure evaluation. In contrast, men appear much less likely to sponsor a school club during their tenure evaluation year.

6 Threats to identification

The validity of the estimation strategy relies on the assumption that teachers in their tenure evaluation year are similar to teachers with the same years of experience but teach in a district with a longer probationary period. For example, third year teachers in districts that award tenure in the third year of teaching are similar to third year teachers in districts that award tenure in the fourth or fifth year of teaching. Said

Table 7 Estimates of teacher tenure, by gender

Dependent variable	(1) Own money spent	(2) Committee	(3) Coach	(4) Sponsor
Male				
Before Tenure Evaluation	−71.598 (47.735)	0.038 (0.055)	−0.003 (0.035)	0.133** (0.050)
First Year With Tenure	−99.419* (51.879)	0.035 (0.059)	0.029 (0.049)	0.120* (0.070)
Two Or More Years With Tenure	−53.149 (69.534)	−0.008 (0.054)	−0.003 (0.055)	0.136** (0.051)
All Other Control Variables				
R-squared	0.041	0.064	0.102	0.050
Observations	4540	4540	4540	4540
Female				
Before Tenure Evaluation	−65.714* (33.060)	−0.010 (0.037)	−0.038** (0.018)	−0.066** (0.030)
First Year With Tenure	−69.426 (46.556)	−0.082** (0.033)	−0.040** (0.017)	0.030 (0.032)
Two Or More Years With Tenure	−19.227 (53.599)	−0.076 (0.056)	0.001 (0.031)	0.012 (0.042)
All Other Control Variables				
R-squared	0.054	0.057	0.047	0.036
Observations	10,570	10,570	10,570	10,570

Standard errors in parentheses, clustered by state.

State effects and teaching year effects are included in the above regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note 1: Sample sizes rounded to nearest 10 for NCES confidentiality purposes.

Note 2: Omitted tenure category variable is “evaluation year”.

another way, there should not be cross-sectional variation in teacher or district characteristics unrelated to tenure that modify teacher behavior during this evaluation period.

The previous finding in column 4 of Table 4, which presents the baseline specification without any teacher or district controls, showed that the decline in classroom expenditures is not driven by changes in teacher or district characteristics. This finding suggests that there is not cross-sectional variation in teacher and district characteristics at the time of tenure evaluation. Including these characteristics in the estimating equation is done to improve efficiency and not to control for confounding factors. If the key findings only exist once these covariates are included, one might speculate that there are additional factors, outside of tenure, driving the results.

I will next present two tests to provide evidence that the cross-sectional variation in the treatment and control groups would not have changed in an environment without tenure. First, if the identification strategy for teacher tenure is working properly, I would not expect to see any changes in teacher behavior after the transition period from probation to tenure. Columns 1–4 in Table 8 show that there is no statistically significant difference in teacher extra-curricular activities (the same variables as in Table 5) between the second and third years after receiving tenure. Note that the difference-in-difference strategy may still causally identify the effect of teacher tenure even if there is a change in behavior moving from year 2 to year 3 in a three year probationary period district. For example, particularly forward-looking teachers may start to increase their teaching hours in advance of the tenure application process.

In the second test for the validity of the empirical methodology, I carry out a placebo test where I investigate if outcomes, which should be unaffected by tenure, change as a result of the identification strategy. Teachers are asked if any of the following are serious or moderate problems: student tardiness, students being unprepared, or students dropping out. We would not expect the coefficients of these variables in the estimating equation to be statistically different from zero as a result of tenure evaluation. Column 1–3 of Table 9 provide confirmation of this intuition. The coefficients on the dummies for *Period Before Tenure Evaluation*, *First Year with Tenure*, and *Two or More Years with Tenure* are all statistically insignificant. In addition to student behavior not changing as a result of tenure, column 4 of Table 9 shows that a teacher's base salary does not change either. In almost every school district, teacher salary is a function of experience and education. With no statistically significant coefficients on the tenure year variables, column 4 provides more evidence for the validity of the identification strategy.

7 Conclusion

This paper describes the change in teacher behavior during the tenure evaluation year. I find that in the year that teachers are evaluated for tenure, they spend significantly more of their own money on classroom materials. The teachers also participate more in school committees and extracurricular activities during the evaluation year. This paper does not make the larger and more ambitious claims about the welfare implications of this behavior. While certain activities are unlikely to benefit from a spike in activity around the tenure evaluation year (e.g., coaching a sport likely requires several years to master), tenure may also grant teachers the freedom to pursue club sponsorship and other activities that may not have been pursued under an annual evaluation.

Table 8 Falsification test, change in dependent variable between 2 and 3 years after tenure, SASS data

Dependent variable	(1) Committee	(2) Curriculum	(3) Coach	(4) Sponsor
Three Years After Tenure	-0.016 (0.025)	0.006 (0.011)	-0.004 (0.021)	-0.010 (0.023)
Black	-0.091 (0.057)	-0.021 (0.040)	0.033 (0.038)	0.135*** (0.049)
Hispanic	-0.195** (0.079)	0.008 (0.033)	-0.025 (0.036)	-0.051 (0.051)
Other Race	0.003 (0.104)	0.100 (0.066)	-0.103** (0.047)	0.051* (0.029)
Male	-0.103*** (0.022)	0.023 (0.033)	0.364*** (0.028)	0.153*** (0.042)
Age	-0.000 (0.001)	0.002 (0.001)	-0.007*** (0.001)	-0.002* (0.001)
Salary (\$1000s)	-0.000 (0.002)	0.003*** (0.001)	0.000 (0.001)	-0.001 (0.002)
Student-Teacher Ratio	-0.005 (0.007)	-0.005 (0.003)	0.001 (0.002)	0.008* (0.004)
Free Lunch Percentage	0.006 (0.058)	-0.048* (0.027)	-0.111*** (0.039)	-0.112*** (0.039)
Expenditures Per Student	-0.009 (0.008)	-0.000 (0.003)	-0.002 (0.002)	0.001 (0.005)
Collective Bargaining	-0.126*** (0.037)	-0.019 (0.022)	-0.008 (0.031)	-0.017 (0.052)
Second Year of Teaching	-0.125*** (0.037)	-0.019 (0.022)	-0.008 (0.031)	-0.017 (0.052)
Third Year of Teaching	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Fourth Year of Teaching	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Fifth Year of Teaching	-0.034 (0.054)	-0.002 (0.012)	-0.039 (0.032)	0.000 (0.032)
Sixth Year of Teaching	-0.078 (0.051)	-0.027 (0.022)	-0.021 (0.044)	-0.073 (0.049)
Seventh Year of Teaching	-0.057 (0.041)	-0.056*** (0.018)	0.001 (0.056)	-0.041 (0.047)
R-squared	0.084	0.062	0.234	0.065
Observations	2980	2980	2980	2980

Standard errors in parentheses, clustered by state.

State effects and teaching year effects are included in the above regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note 1: Sample sizes rounded to nearest 10 for NCES confidentiality purposes.

Note 2: Omitted tenure category variable is "evaluation year".

I also find evidence that these changes in behavior are temporary. Teachers may feel that they need to "take a break" after the tenure evaluation year, but then their behavior returns to the status quo after a one year pause. This finding should concern district

Table 9 Falsification test, effect of teacher tenure on placebo variables, SASS data

Dependent variable	(1) Student tardiness	(2) Students unprepared	(3) Students dropping out	(4) Teacher salary
Before Tenure Evaluation	0.016 (0.023)	0.014 (0.016)	0.021 (0.028)	0.461 (0.651)
First Year With Tenure	-0.022 (0.021)	0.006 (0.019)	0.007 (0.020)	-0.037 (0.357)
Two Or More Years With Tenure	-0.021 (0.027)	0.010 (0.023)	-0.024 (0.025)	0.200 (0.633)
Black	0.032* (0.017)	0.009 (0.015)	-0.045** (0.021)	1.341*** (0.378)
Hispanic	0.004 (0.014)	-0.014 (0.012)	-0.066*** (0.020)	1.231* (0.688)
Other Race	0.052** (0.026)	0.039 (0.032)	-0.079*** (0.025)	3.167** (1.295)
Male	-0.041*** (0.013)	-0.033*** (0.008)	-0.196*** (0.014)	-0.024 (0.341)
Age	0.001* (0.000)	-0.001 (0.000)	-0.002*** (0.000)	0.415*** (0.028)
Salary (\$1000s)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	
Student-Teacher Ratio	-0.005** (0.002)	-0.005** (0.002)	-0.018*** (0.004)	0.192*** (0.046)
Free Lunch Percentage	-0.202*** (0.024)	-0.277*** (0.022)	-0.028 (0.044)	-2.078*** (0.618)
Expenditures Per Student	0.001 (0.005)	0.002 (0.002)	-0.004* (0.002)	0.315** (0.155)
Collective Bargaining	-0.002 (0.023)	-0.002 (0.018)	-0.006 (0.027)	0.574 (0.557)
Second Year of Teaching	-0.038** (0.017)	-0.044*** (0.015)	0.011 (0.014)	0.652 (0.448)
Third Year of Teaching	-0.024 (0.029)	-0.043** (0.020)	-0.001 (0.030)	0.390 (0.774)
Fourth Year of Teaching	-0.042 (0.038)	-0.046** (0.023)	0.046 (0.029)	1.460 (1.021)
Fifth Year of Teaching	-0.050 (0.037)	-0.033 (0.023)	0.067* (0.033)	2.323** (0.955)
Sixth Year of Teaching	-0.053 (0.040)	-0.028 (0.026)	0.071 (0.044)	3.045*** (0.980)
Seventh Year of Teaching	-0.026 (0.038)	-0.032 (0.029)	0.064 (0.044)	3.931*** (1.139)
R-squared	0.045	0.080	0.065	0.453
Observations	15,120	15,120	15,120	15,120

Standard errors in parentheses, clustered by state.

State effects and teaching year effects are included in the above regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note 1: Sample sizes rounded to nearest 10 for NCES confidentiality purposes.

Note 2: For columns 1 – 3, teachers are asked if those issues are serious or moderate problems.

policymakers since it suggests that tenure is temporarily altering teacher behavior. District officials would hope that their policies have a permanent effect on teaching behavior; however, the only finding that appears to be permanent is a decrease in time spent on professional development after receiving tenure. In contrast, those states which have eliminated tenure should not see swings in teacher behavior around tenure evaluation. This consequence may make planning and staffing decisions easier for school district officials in these states.

The findings in this paper lead to interesting avenues of future research. If teachers behave strategically, the next step should be to investigate the impact of tenure on student achievement. The primary limitation to this study is that it does not establish the link between teacher behavior and student achievement. For example, does student achievement noticeably improve in the year that a teacher is being evaluated for tenure? If teachers are spending more of their own money on classroom materials and spending more time communicating with students and parents, then students' academic performance may improve. Consequently, does student performance decline in the year immediately following tenure? Since total work hours remain unchanged after tenure, a teacher's reallocation of time towards certain extracurricular activities may provide insight into the link between teacher activities and student achievement.

Competing interests

The IZA Journal of Labor Economics is committed to the IZA Guiding Principles of Research Integrity. The author declares that he has observed these principles.

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