Teacher Turnover in Wisconsin

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Abstract

Given the consistently-affirmed importance of teacher quality to student success, understanding teacher churn is crucial to formulating and evaluating teacher labor market policy. This paper replicates the analysis of Hanushek, Kain, and Rivkin (2004) over a longer and more recent time period in Wisconsin and confirms all of its major findings, namely that while pay is a inter-district pay differentials are a significant determinant of turnover, school quality measures are much better predictors of all three types of churn – within and between school districts and out of local public schools.

Introduction

Literature Review

Because the potential policy implications of turnover in the teaching profession (from human capital and equity/distributional perspectives both) are far-reaching and polypartisan, the literature on turnover-related topics in education is extensive. As relates to this paper, there are five broad (and often overlapping) categories of inquiry: the relationship between turnover and wages, which has tended to focus on "opportunity wages" outside of the field of education; the relationship between turnover, school demographics, and other nonpecuniary benefits, which has tended to focus on distributional inequalities–whether teachers with certain characteristics are more or less likely to be teaching certain disadvantaged groups; the relationship between turnover and teacher quality as measured by student performance, usually value added; collective bargaining agreements in education, focusing by and large on the implications (or lack thereof) of seniority-preferential clauses; and the recent phenomenon of specific retention incentives, the provisioning of wage bonuses to teachers willing to teach in high-needs schools.

One of the earliest papers attempting to rigorously investigate turnover was a panel study of teachers in Michigan by Murnane and Olsen (1990), who used college degree field wages outside of education as opportunity wages, finding the expected lower exit rate for teachers with higher wages in teaching relative to the authors' defined alternative. Dolton and Van der Klaauw (1999) use panel data on university graduates in the United Kingdom to estimate a competing risks model of the decision to leave teaching entirely, finding results in line with Murnane and Olsen (1990). Returning to panel studies in the US, Loeb and Page (2000) use PUMS data to get an idea of teacher relative wages in many states and find that dropout rates fall when teacher relative wages are high. Stinebrickner (2002) also uses panel data (this time NLS-72) to track both teachers and non-teachers, focusing in particular on young teachers who leave the profession for long stints, and finds that the best predictor of female exit is recent childbearing, which is an important consideration for all work related to teacher turnover because such a high percentage (76 nationwide) of teachers are female. Lastly, Hanushek, Kain, and Rivkin (2004) focuses on teachers in Texas and emphasizes that the characteristics of students are much stronger factors in predicting teacher exit than are wages (while also affirming the statistical significance of pay).

While wages have been found consistently to have some measurable effect on teacher turnover, it is impossible to explain within-district migration (which constitutes a large portion of switching–as much as 50%) through wage-only channels because contracts are fixed at the district level. As such, another strand of literature has chosen to focus on the nonpecuniary aspects of the decision to take a teaching job–school environment/rapport, student enthusiasm, neighborhood characteristics, etc.–usually by directing attention to a single district so that any wage-based considerations are stifled, as is the case for Boyd et al. (2005) and Engel, Jacob, and Curran (2014). Boyd et al. (2005) track early-career teachers in New York City as they quit or transfer out of

the city, and most importantly finds that commuting time is an important, often overlooked aspect of location preference. Engel, Jacob, and Curran (2014) leverages a unique data set from Chicago Public School job fairs which affords them a rather strong measure of teachers' demand for vacancies, neutralizing the influence of school administration's behavior on turnover (through poor match selection or other means). The authors contribute evidence that the school's neighborhood (perhaps due to ambient crime or other reputational effects good and bad) is a better predictor of teachers' preference than distance from home, going somewhat against the grain of Boyd et al. (2005). Scafidi, Sjoquist, and Stinebrickner (2007) examine statewide data from Georgia, but ignore wage effects, choosing instead to focus on disentangling the contributions of low student achievement and minority status to turnover; they find that minority status is the more salient associate of teacher exit.

The key element missing from all of the above studies is perhaps the most important consideration in the issue of teacher turnover–teacher quality. None of the studies above have student-teacher matched data, and so are unable to directly associate student outcomes with any given teacher. If, with respect to any measure of quality you would like, we find that transitioning teachers are identical to their replacements, the issue of teacher turnover is not, in fact, much of an issue–it leans closer to hot air and wasted ink. Thus, the recent trend in the literature to incorporate measures of teacher quality (in large part made possible by a trend towards administrative records allowing students to be linked to teachers and tracked over time) in considerations of teacher turnover has made big strides in addressing the most policy-relevant questions to be asked. The most common and widely accepted measure of teacher quality is value added[1] (in its various guises), and the literature has begun to incorporate such measures into studies of teacher turnover. Hanushek and Rivkin (2010) considers value added as a measure of teacher productivity, and ask if common results of labor search theory (namely that turnover falls with tenure and that turnover is negatively associated with match-specific productivity) continue to hold in the education labor market. In fact, the authors find that the teachers most likely to switch schools are those with low measured match quality, and especially that those who leave teaching entirely are those with the lowest match quality. The results are more pronounced for schools with high proportions of low-SES students, which has strong policy implications, as it appears the best teachers in high needs schools are the least likely to change jobs. Goldhaber, Gross, and Player (2007) performs a similar analysis with the longitudinal data of North Carolina and comes to similar conclusions, strengthening the robustness of the results. Lastly, Goldhaber, Lavery, and Theobald (2015) examine the inequity in the distribution of teacher quality by high-needs groups in Washington state, and find that for all three measures of quality (teacher experience, licensure exam score, and value added), the distribution of teachers favors the less needy (as measured by free/reduced-price lunch status, minority status, and low prior academic achievement).

The aforementioned papers have tended to keep the collective bargaining aspect of salary determination for teachers out of the spotlight, if largely for reasons of data restrictions. Nevertheless, it stands to reason to believe that the rigid structure of union-negotiated contracts could serve to contribute in a large way to teacher turnover. Ballou and Podgursky (2002) give much descriptive evidence of the shape of the wage-tenure profile, rooted in a data set collected by the Department of Defense and published by the AFT. They find that seniority premia in education largely mirror those in more traditional white collar professins, that steeper profiles are associated with less turnover, and that district financial and demographic conditions alone are insufficient to explain variation in contracts. Another common (and recently quite controversial, as evidenced by the contention in the ongoing contract negotiations in Philadelphia) feature of union-negotiated teacher contracts are seniority priviliges–preferential treatments granted to teachers in voluntary and involuntary transfers. Moe (2006) codes contracts from 158 districts in California according to the strength of seniority rights therein guaranteed to teachers and finds that such rights are associated with the distribution of teachers across schools (measuring quality as experience and certification) in a way that serves to harm minorities. Revisiting California with a slightly different sample and definition of the "determinacy" of the contracts with respect to seniority, Koski and Horng (2007) come to the opposite conclusion–that there is no such relationship. As a rebuttal, Anzia and Moe (2014) pin the difference in results on the exclusion in Moe (2006) of small school districts, where it appears that the entrenchment of bureaucracy falters and the rigidity of

[1]The most commonly cited expositions on value added, its validity, and so on are probably Rivkin, Hanushek, and Kain (2005), an extensive exploration of the predictive powers of empirical Bayes VA measures; and Chetty, Friedman, and Rockoff (2014a) and Chetty, Friedman, and Rockoff (2014b), the largest-scale study of long-term inferences based on value added.

contract language wane, a claim which they support by repeating their analysis with the inclusion of an interaction for district size–indeed, for small districts the result of Koski and Horng (2007) holds, while the insight of Moe (2006) holds in larger districts. Cohen-Vogel, Feng, and Osborne-Lampkin (2013) use data from Florida and their results align with those of Koski and Horng (2007) (though they neglect to nuance their results by district size).

Finally, an emerging but still immature strand of literature is beginning to look at the potential for transfer bonuses and retention incentives to positively affect student outcomes. Fulbeck (2014) analyzes a scheme in place in Denver whereby teachers who choose to transfer to high-needs schools (low-performing) are given recurring bonus pay, and those initially stationed there are given retention incentives. She concludes that recipients of incentives are significantly less likely to switch jobs, as driven by a reduction in district exit rates and especially by teachers whos incentive payments exceed $5,000. Glazerman et al. (2013) evaluate the Talent Transfer Initiative, a randomized controlled trial conducted in 10 districts whereby high-performance teachers were given $20,000 over the course of two years as reward for transferring the identified high-needs schools, and conclude that there were significant effects on teacher retention as well as on student outcomes.

Data

The State of Wisconsin's Department of Public Instruction (DPI) releases annual Salary, Position & Demographic reports through the WISEstaff data collection system, and these reports represent "a point-in-time collection of all staff members in public schools as of the 3rd Friday of September..." (Public Instruction 2017), which serve as the primary source of data on teachers in this paper. Data are available at the position-teacher level cross-sectionally, with each entry corresponding to one of possibly several positions held by each school district employee. Identifiers in each file permit unique identification of an employee within a given year, but this identifier does not follow teachers between years. To overcome this substantial hurdle to identifying teacher mobility, data are first fed through the matching algorithm described in further detail in the appendix. Essentially, we are aided by the presence of various imperfect identifiers which are more stable over time, most crucially teachers' first and last names and years of birth. By building on these covariates and incorporating some limited fuzzy matching techniques, we construct a panel of teachers spanning the 1994-95 academic year (AY) through AY2015-16.[2]

As noted in the companion paper, the introduction of Wisconsin Act 10 introduced a substantial structural break in the labor market for Wisconsin teachers, so we include only data from 2000-2008 to avoid conflating the effects of this policy on teacher turnover, a topic covered in more detail in the companion paper and elsewhere, with the earlier functioning of the labor market (i.e., we do not want to mix the results from distinct equilibria of the teacher labor market, but would prefer to analyze the pre- and post-Act-10 markets separately). We drop all employees who are not full-time, full-year regular teachers of a major core subject (all-purpose elementary teachers or English/Math) at a single regular public school with a Bachelor's or Master's degree and fewer than 50 years' recorded experience; taken together, these restrictions eliminate 77% of employees, the lion's share of which come from eliminating substitutes/support staff and teachers non-core subjects. We then eliminate teachers with missing information on their subsequent school or district and teachers with instability in their recorded ethnicity, as well as teachers not categorized as white, black, or Hispanic, eliminating a further 1% of all employees[3]. Finally, we drop teachers' multiple positions by keeping only the highest-intensity position for each teacher, as measured by full-time equivalency, resulting in a final count of 253,935 teacher-year observations.

[2]For brevity, we herein refer to academic years by the spring year, e.g., AY2003-04 will be simply 2004.

[3]Wisconsin teachers are overwhelmingly white (96%); only about 1% of teachers are eliminated by excluding, e.g., Asian teachers.

Results

Like Hanushek, Kain, and Rivkin (2004) (HKR) found in Texas, most turnover in Wisconsin is happening within districts and out of the profession. In Wisconsin, the fraction of teachers transitioning among districts is vanishingly small after a "burn-in" period of roughly 6 years – only 0.8 of such teachers do so (compared with 3.1% for the comparable group in HKR), but is still relatively higher among the youngest teachers – roughly twice as high for the "probationary" teachers (1-3 years' experience) as for teachers with 7-11 years' experience in both states. Movement patterns within districts in the two states are very similar, lending weight to teachers "earning their stripes" within a district to be able to choose the best schools.

	Percent of Teachers Who				
Teacher Experience	Remain in Same School	Change Schools Within District	Switch Districts	Exit Wisconsin Public Schools	Number of Teachers
1-3 years	85.2	9.4	5.4	7.3	37,044
4-6 years	88.9	8.0	3.1	4.6	33,972
7-11 years	91.1	7.2	1.7	2.8	48,047
12-30 years	94.2	5.3	0.5	3.0	113,334
>30 years	96.7	3.0	0.4	15.1	21,538
All	91.8	6.4	1.8	4.8	253,935

Table 1: Year-to-year Transitions of Teachers by Experience, 2000-08

Conclusion

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Origin Community	Percent of Teachers Who Move to				Number Teachers Changing Districts	Percent of Origin Teachers	Change in Share of Teachers 2000-06
	Large Urban	Small Urban	Suburban	Rural			
I. All teachers							
Large Urban	5.8	14.6	58.9	20.6	459	1.8	-0.3%
Small Urban	3.3	13.1	45.2	38.4	500	1.1	-0.2%
Suburban	3.7	15.2	45.0	36.1	1,210	1.7	4.1%
Rural	0.8	11.4	24.3	63.5	2,377	2.1	-3.5%
II. Probationary teachers (1-3 years experience)							
Large Urban	7.8	15.9	56.3	20.0	260	3.5	
Small Urban	4.4	12.4	46.9	36.3	230	3.5	
Suburban	4.5	16.1	41.6	37.7	495	5.2	
Rural	0.5	11.4	25.4	62.6	1,024	7.6	

Table 2: Destination Community Type for Teachers Changing Districts, by Origin Community Type and Teacher Experience Level

	Men by Experience Class			Women by Experience Class			All Teachers
	1-3 years	4-6 years	7-11 years	1-3 years	4-6 years	7-11 years	0-9 Years
Base year salary (log)	0.004	0.022	-0.021	0.010	0.002	-0.016	0.004
	(0.010)	(0.015)	(0.022)	(0.005)	(0.009)	(0.012)	(0.004)
Adjusted salary (log)	-0.012	0.007	0.031	0.001	0.018	0.023	0.007
	(0.007)	(0.011)	(0.016)	(0.004)	(0.007)	(0.009)	(0.003)
Percent proficient	2.9%	1.9%	1.6%	4.8%	3.9%	4.1%	3.9%
	(0.7%)	(0.8%)	(1.1%)	(0.4%)	(0.5%)	(0.6%)	(0.2%)
Percent Hispanic	-1.6%	-0.3%	-0.6%	-1.7%	-1.7%	-1.1%	-1.5%
	(0.3%)	(0.4%)	(0.5%)	(0.2%)	(0.2%)	(0.3%)	(0.1%)
Percent black	-3.4%	-1.1%	-3.2%	-5.1%	-3.3%	-4.8%	-4.1%
	(0.9%)	(1.0%)	(1.1%)	(0.5%)	(0.7%)	(0.8%)	(0.3%)
Percent subsidized lunch	-6.9%	-3.8%	-3.9%	-8.8%	-6.1%	-5.9%	-7.0%
	(1.1%)	(1.4%)	(1.6%)	(0.6%)	(0.8%)	(1.0%)	(0.4%)

Table 3: Average Change in Salary and District Student Characteristics (and Standard Deviations) for Teachers Changing Districts, by Gender and Experience

	District Average Characteristics		Campus Average Characteristics	
	Large Urban to Suburban	Suburban to Suburban	Large Urban to Suburban	Suburban to Suburban
Base year salary (log)	-0.014	0.019	—	—
	(0.013)	(0.008)		
Adjusted salary (log)	-0.037	0.015	—	—
	(0.011)	(0.006)		
Average Student Characteristics				
Percent proficient	37.1%	0.7%	33.4%	0.1%
	(0.5%)	(0.4%)	(1.3%)	(0.6%)
Percent Hispanic	-13.2%	-0.6%	-8.3%	-0.8%
	(0.3%)	(0.2%)	(1.3%)	(0.3%)
Percent black	-52.8%	-0.4%	-56.6%	-0.5%
	(0.5%)	(0.3%)	(1.9%)	(0.4%)
Percent subsidized lunch	-60.7%	-1.5%	-61.8%	-2.0%
	(0.7%)	(0.5%)	(1.2%)	(0.6%)

Table 4: Average Change in Salary and in District and Campus Student Characteristics (and Standard Deviations) for Teachers with 1-10 Years of Experience Who Change Districts, by Community Type of Origin and Destination District

	Between District Moves		Within District Moves	
	Black Teachers	Hispanic Teachers	Black Teachers	Hispanic Teachers
Percent proficient	16.5%	5.1%	3.2%	1.7%
	(4.9%)	(8.7%)	(0.9%)	(1.4%)
Percent Hispanic	-1.1%	-14.2%	0.0%	-7.2%
	(1.7%)	(7.8%)	(0.8%)	(2.3%)
Percent black	-22.9%	1.7%	-1.6%	0.3%
	(7.8%)	(5.8%)	(1.4%)	(2.0%)
Percent subsidized lunch	-59.0%	-12.7%	-2.6%	-3.7%
	(6.5%)	(9.4%)	(0.6%)	(1.3%)
Number of teachers	42	22	549	197

Table 5: Average Change in District and Campus Student Characteristics (and Standard Deviations) for Black and Hispanic Teachers with 1-10 Years of Experience who Change Campuses

Quartile of Distribution	Probability Teachers Move to New School within District	Probability Teachers Move to New District	Probability Teachers Exit Public Schools
Residual salary			
Highest	—	1.3%	4.8%
3rd	—	1.4%	5.1%
2nd	—	1.6%	5.0%
Lowest	—	1.9%	5.4%
Percent proficient			
Highest	5.6%	1.7%	4.7%
3rd	6.8%	1.9%	4.4%
2nd	6.2%	1.9%	5.4%
Lowest	6.9%	1.7%	4.8%
Percent eligible for reduced-price lunch			
Highest	7.7%	1.7%	5.6%
3rd	6.9%	1.6%	4.3%
2nd	6.2%	1.9%	4.5%
Lowest	4.9%	2.0%	4.8%
Percent Black			
Highest	6.7%	1.6%	6.2%
3rd	5.7%	1.5%	4.7%
2nd	6.6%	1.8%	4.5%
Lowest	6.7%	2.2%	3.9%
Percent Hispanic			
Highest	6.9%	1.5%	6.0%
3rd	5.6%	1.9%	4.8%
2nd	6.0%	1.8%	4.5%
Lowest	7.1%	1.9%	4.1%

Table 6: School Average Transition Rates by Distribution of Residual Teacher Salary and Student Demographic Characteristics (data weighted by number of teachers in school)

	Teacher Experience				
	1-3 years	4-6 years	7-11 years	12-30 years	>30 years
First year base salary (log)	−0.04	−0.05	−0.07*	0.00	−0.16*
	(0.05)	(0.04)	(0.03)	(0.02)	(0.07)
First year base salary (log) * female	−0.08	0.05	0.05	−0.02	0.10
	(0.05)	(0.04)	(0.03)	(0.02)	(0.08)
Campus average student characteristics					
Percent proficient	−0.06**	0.02	−0.01	−0.01	−0.01
	(0.02)	(0.02)	(0.01)	(0.01)	(0.03)
Percent eligible for subsidized lunch	−0.03*	−0.07***	−0.04***	−0.02**	0.10***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.03)
Percent Black	0.05**	0.11***	0.04***	0.05***	0.06
	(0.02)	(0.02)	(0.01)	(0.01)	(0.04)
Percent Hispanic	0.03	0.09***	0.04**	0.01	−0.05
	(0.02)	(0.02)	(0.01)	(0.01)	(0.05)
Interactions					
Black * percent Black	−0.09	−0.10**	−0.01	−0.00	−0.23**
	(0.05)	(0.03)	(0.02)	(0.02)	(0.08)
Hispanic * percent Black	−0.15*	−0.18**	−0.13**	−0.08	−0.22
	(0.06)	(0.06)	(0.05)	(0.05)	(0.32)
Black * percent Hispanic	−0.05	−0.03	−0.00	0.03	0.14
	(0.09)	(0.06)	(0.04)	(0.04)	(0.22)
Hispanic * percent Hispanic	−0.12*	−0.16***	−0.13***	−0.08**	−0.49
	(0.05)	(0.05)	(0.03)	(0.03)	(0.38)
Observations	28,287	25,609	35,946	81,801	14,773

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 7: Estimated Effects of Starting Teacher Salary and Student Demographic Characteristics on the Probability that Teachers Leave School Districts, by Experience (linear probability models; standard errors in parentheses)

	Teacher Experience				
	1-3 years	12-30 years	4-6 years	7-11 years	>30 years
First year base salary (log)	−0.09	−0.02	−0.10*	−0.12***	−0.31***
	(0.05)	(0.02)	(0.04)	(0.03)	(0.09)
First year base salary (log) * female	−0.08	−0.02	0.05	0.05	0.11
	(0.05)	(0.02)	(0.04)	(0.03)	(0.08)
Campus average student characteristics					
Percent proficient	−0.08***	−0.02**	0.00	−0.02*	−0.03
	(0.02)	(0.01)	(0.02)	(0.01)	(0.03)
Percent eligible for subsidized lunch	−0.01	−0.00	−0.03	−0.01	0.05
	(0.02)	(0.01)	(0.02)	(0.01)	(0.04)
Percent Black	0.02	0.03***	0.06**	0.00	0.09
	(0.02)	(0.01)	(0.02)	(0.01)	(0.05)
Percent Hispanic	−0.01	−0.00	0.03	−0.01	0.01
	(0.03)	(0.01)	(0.02)	(0.02)	(0.06)
Interactions					
Black * percent Black	−0.08	0.01	−0.09**	0.00	−0.23**
	(0.05)	(0.02)	(0.03)	(0.02)	(0.08)
Hispanic * percent Black	−0.14*	−0.08	−0.18**	−0.11*	−0.33
	(0.06)	(0.05)	(0.06)	(0.05)	(0.32)
Black * percent Hispanic	−0.03	0.04	−0.01	0.01	0.16
	(0.09)	(0.04)	(0.06)	(0.04)	(0.22)
Hispanic * percent Hispanic	−0.11*	−0.08**	−0.15**	−0.10**	−0.65
	(0.05)	(0.03)	(0.05)	(0.04)	(0.38)
Observations	28,287	81,801	25,609	35,946	14,773

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 8: Estimated Effects of Starting Teacher Salary and Student Demographic Characteristics on the Probability that Teachers Leave School Districts with District Fixed Effects, by Experience (linear probability models; standard errors in parentheses)