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Title:

The Extent of Late-Hiring and its Relationship with Teacher Turnover: Evidence from Michigan

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Background / Context:

In recent years, increasing attention has been paid to teacher hiring. By improving selection practices, districts are more likely to hire strong candidates, provide necessary staff development for new teachers prior to the start of school, and protect against teacher turnover by creating a better fit between applicants and schools (Behrstock & Coggshall, 2009; Levin & Quinn, 2003; Liu & Johnson, 2006). Several factors may impede schools' ability to attract and retain high quality teachers, but one is *late hiring:* hiring teachers in late summer or after the academic year has begun (Levin & Quinn, 2003; Liu & Johnson, 2006). Surprisingly, this topic has received virtually no attention from academic researchers.

Hiring teachers late is surprisingly common. Across four states, including Michigan, Liu and Johnson (2006) found that over 60 percent of teachers were hired the month before school started or later. Nationally, districts hired 11 percent of teachers after the first day of school (Engel, 2009).

Patterns of late hiring are especially pronounced in urban and low-income districts (Engel, 2009); in some large urban districts, the majority of new teachers are hired late, despite the fact that most applications were received before July (New Teacher Project, 2009c). Surprisingly, the primary cause of late hires is not lack of qualified candidates (Levin & Quinn, 2003; New Teacher Project 2007, 2009a, 2009b). Instead, there is evidence it most frequently occurs because of organizational or state-level impediments (Levin & Quinn, 2003). In many large urban districts, the combination of uncertainty over student enrollment and state budget decisions leave districts unsure about how many teachers they need or can financially support. Districts also typically have contractually-obligated transfer policies, incentivizing experienced teachers to indicate their plans for retirement or resignation late. Although suburban districts are more likely to have personnel policies better suited for timely hires (Levin & Quinn, 2003), state budget uncertainty contributes to late hiring in all types of schools.

While it is generally agreed that late hiring has detrimental effects, the exact consequences are not well understood. There is some evidence that principals believe the strongest candidates are hired early in the process, perceiving later hires as weaker candidates (Liu et al., 2008; Rutledge et al., 2008). Consistent with research across professions, a drawn-out hiring process results in many top candidates withdrawing from the applicant pool; most withdrawn applicants cited poor timeliness as a factor in this decision (Levin & Quinn, 2003).

Purpose / Objective / Research Question / Focus of Study:

This paper explores how late hiring impacts teachers' retention decisions. We situate our research questions at the teacher-level, distinguishing our current analyses from most existing studies of late hiring. This choice provides several methodological advantages. Most notably, teacher-level examination allows comparison of teachers hired on-time with those hired late within the same school, addressing the non-random nature of hiring, and providing a clearer picture of the relationship between late hiring and turnover.

We pursue four research questions:

1. How common is late hiring and how does the extent of late hiring change over time?
2. Where do late-hired teachers work?
3. What types of teachers are hired late?
4. What is the relationship between late-hiring and turnover?

Setting/Participants

We use teacher-level data from Michigan's Registry of Educational Personnel, plus publicly available school-level achievement data and the Common Core of Data for district and school characteristics. We restrict our sample to teachers hired between 2003-2004 and 2007-2008, providing five years of cross-sectional data, including only schools that hired at least one teacher. To increase generalizability, we restrict our sample to include regular[2], non-charter, existing public schools with at least five teachers. We include core academic teachers, excluding special education and art teachers.[3] Lastly, we only consider the teacher's primary assignment: the school in which a teacher is assigned the largest FTE. These restrictions provided us a sample of 9,306 teachers hired by 5,021 schools.[4]

Intervention / Program / Practice:

The *practice* we focus on in this analysis is late hiring, a common yet not well understood characteristic of school and district hiring processes. Given existing research, there is reason to believe that the practice of late hiring has deleterious consequences for teachers who are hired late. However, no large-scale quantitative studies have investigated this question, nor have they compared longitudinal outcomes for those teachers hired late versus those hired on time.

We treat late hiring as a dichotomous event: one is either hired late or on-time. We define a "late hire" as one made at least one week after Labor Day, when virtually all schools have begun the academic year. Teachers must be officially hired before beginning teaching, so this cutoff date captures only teachers hired after the academic year begins. We close the late hiring window at January 1st. Teachers are considered "on-time hires" if hired between May 1st and one week past Labor Day; this includes hires from the traditional summer window.

Our choice to dichotomize late hiring potentially masks nuances of hiring process timing. Most notably, we group teachers offered positions early in the summer with those not offered one until days before the academic year begins. These hiring experiences are surely different. Though we would prefer a late-hiring measure based on *job offer* date, we only have information regarding *formal hire* date. The distinction is important. In most districts, the School Board must approve new teachers before they become employees, even though selection activities could take place in spring or early summer. In our sample, teachers hired by the same district tended to have identical dates of hire[5], indicating that districts waited until late summer to seek Board approval; analysis based on actual job offer date was virtually impossible.

Research Design:

This study is designed as a secondary analysis of five years of administrative data from the state of Michigan. For obvious reasons, it would not have been appropriate to test the

[2] We use the CCD definition of "regular" schools.

[3] All analyses were repeated after including special education teachers. The results are qualitatively similar and in most situations the effects of late hiring are more severe. Future studies will focus on the difference between special education and core-academic teachers.

[4] The 5,021 schools in our sample do not represent unique schools. Each school that hired at least one teacher in one of the academic years in our sample counts toward the total. Thus, schools that hired teachers in multiple years are counted more than once. There are 2,280 unique schools.

[5] These "mass hire" dates were usually in mid- or late-August.

negative effects of late hiring using a randomized field trial. Similarly, an opportunity to use a quasi-experimental design (such as an instrumental variable approach or an regression discontinuity design) was not apparent. Therefore, we attempt to account for within-school, within-district, and within-labor market similarities by conducting a series of conditional fixed-effects models, with the probability of late hiring and the probability of attrition as outcomes of interest. We also test models interacting both school and district fixed effects with time, to compensate for within-school and within-district characteristics that vary across time (e.g., a change in administration). Lastly, the observational nature of our data limits our ability to make causal claims regarding our findings. We recognize that no matter how many statistical controls we employ there will be inevitable concerns about the validity of our inferences. Therefore we use Frank's (2000) method of calculating an impact threshold to determine how large the impact of an unobserved confound would need to be to invalidate our inferences regarding the consequences of late hiring.

Data Collection and Analysis:

We represent our model of the probability of late hiring formally as:

$$P(y_{ijkt} = 1 \mid \mathbf{x}_{ijkt}, \mathbf{z}_{jkt}, \mathbf{d}_{kt}, a_g) = \Lambda(\mu_t + \mathbf{x}_{ijkt}'\boldsymbol{\beta} + \mathbf{z}_{jkt}'\boldsymbol{\gamma} + \mathbf{d}_{kt}'\boldsymbol{\pi} + a_g) \quad (1)$$

where $P(y_{ijkt} = 1)$ represents the probability that teacher *i* in school *j* in district *k* in year *t* was hired late and Λ is the logistic function. μ_t is an intercept that is allowed to vary by year *t*; $\mathbf{x}_{ijkt}$ represents a vector of individual characteristics including a teacher's age, gender, subject taught, licensure level, highest degree earned, and whether the teacher's race/ethnicity matches the racial/ethnic composition of the majority of the school's faculty where he or she works; $\mathbf{z}_{jkt}$ is a vector of school characteristics including achievement, student and faculty composition, and location; and $\mathbf{d}_{kt}$ includes district size and student composition variables. Key to our model is a set of fixed effects, a_g, representing the combined effects of all unobservable characteristics of group *g* that do not vary over time (Allison, 2009; Wooldridge, 2002). We separately analyze several types of fixed effects models, each allowing us to draw different types of conclusions. These include labor-market fixed effects, district fixed effects, and school fixed effects.[6]

Similarly, we investigate the probability that late hiring predicts teacher turnover as:

$$P(y_{ijkt} = 1 \mid LH_{ijkt}, \mathbf{x}_{ijkt}, \mathbf{z}_{jkt}, \mathbf{d}_{kt}, a_g) = \Lambda(\mu_t + \lambda LH_{ijkt} + \mathbf{x}_{ijkt}'\boldsymbol{\beta} + \mathbf{z}_{jkt}'\boldsymbol{\gamma} + \mathbf{d}_{kt}'\boldsymbol{\pi} + a_g) \quad (2)$$

where $P(y_{ijkt} = 1)$ is now the probability that a teacher made a particular labor market move; μ_t, $\mathbf{x}_{ijkt}$, $\mathbf{z}_{jkt}$, and $\mathbf{d}_{kt}$ are defined similarly as in model (1); and LH_{ijkt} indicates whether teacher *i* was hired late in year *t*.

Analytically, we first estimated the *probability of late hiring* as a function of individual, school, and district characteristics, using conditional fixed effects logistic regression[7]. Because teachers likely first select a labor market and then search for jobs, labor-market fixed effects

[6] For the district and school fixed effects, $g = k$ and $g = j$ respectively.

[7] See Appendix A for our formal regression models.

allowed us to control for unobservable differences between markets, including differences in the pool of job-searching teachers as well as differences in availability of non-teaching jobs (Engel, 2009). District fixed effects compare teachers hired by the same district, allowing us to assess the probability that late hiring varies by school characteristic. Lastly, school fixed effects allowed us to see if certain types of teachers tend to be hired late when compared to others hired by the same school. With district and school fixed effects specifications, the relationships between changes in school- and district-level variables and the probability of having been hired late were estimated.[8]

We followed a similar approach when analyzing *the relationship between late hiring and turnover*. We separately estimated the probability that a teacher left teaching in Michigan or switched schools, using late hiring as our primary predictor. Including school fixed effects allowed us to restrict comparisons to teachers hired by the same school, controlling for unobservable school characteristics associated with turnover. This was important because it is likely that schools hiring late also have less desirable organizational characteristics associated with turnover (Loeb, Darling-Hammond, & Luczak, 2005).

Findings / Results:

How extensive is late hiring?

- Nearly 12% of teachers were hired late.
- At the school-level, late hiring was less common.
    - Approximately 93% of schools never hired late, or hired late only once.
    - Schools typically hired only one teacher late.

Where do late-hired teachers work?

- Secondary teachers were less likely to be late-hires than elementary teachers.
- Late-hired teachers worked in lower achieving schools, serving higher proportions of non-white and less affluent students.
- 30% of late-hires worked in urban schools, compared to 16% of on-time hires.
- Late-hires had older, less experienced, colleagues.
- Late hiring was more likely in districts with declining student enrollments.

Who is hired late?

- Late-hires were more likely to be non-white women.
- Late-hires tended to be older and experienced, not recent college graduates looking for their first job.
- About 5% of white teachers hired late worked in schools with majority non-white faculty, compared to about 1% of white teachers hired on-time.
- Late-hires were significantly more likely to hold part–time positions.

Labor market outcomes

- Late-hires were substantially less likely to remain in the original school after one year.
    - 6.8% of on-time hires left teaching, compared to 14.2% of late-hires.

[8] When district fixed effects are used, $\mathbf{z}_{jkt}$ only includes time-varying district characteristics. When school fixed effects are employed, $\mathbf{x}_{ijkt}$ and $\mathbf{z}_{jkt}$ include only time-varying school and district characteristics respectively.

    - 13.4% of on-time hires moved to a new school in Michigan, compared to 22.5% of late-hires.
    - Over 35% of *first-year* late-hires left their school before beginning a second year, compared to 20% of first-year, on-time hires.
- Within a single labor market, late hiring increases the probability of leaving teaching 8%.
- Within the same school, only part-time teaching is a stronger predictor of switching schools than late hiring.

We also tested an alternative explanation of these labor market outcomes. We hypothesized that late-hires are more likely view their school as a placeholder: somewhere to work for a year until finding a preferred school the following summer. Consequently, late-hires were expected to be more likely to switch schools. To test this hypothesis, we analyzed the relationship between late hiring and labor market outcomes for a sub-sample of teachers in higher-achieving, higher-income schools – schools which have traditionally been identified as more desirable places to teach. Analyses of this restricted sample showed that late-hires were still significantly more likely to move schools or leave teaching, even when they worked at theoretically desirable schools.

Conclusions:

Our study – because it includes the population of Michigan teachers and because it tracks employment status over five years – makes several noteworthy contributions to the literature on teacher hiring. First, while our descriptive results largely confirm previous findings, (i.e., Engel, 2009; Levin & Quinn, 2003; Liu & Johnson, 2006) they also extend this work in important ways. The longitudinal structure of our data allows us to follow labor market outcomes of late-hires in ways that previous studies have not. The effect of late hiring on retention is strong, regardless of whether we focus on leaving teaching in Michigan or transferring between schools in the state, and regardless of how we specify our model (i.e., whether we compare teachers within the same labor market, district, or school). Our findings hold even when comparing teachers in the same school; this last point is key because it decreases the likelihood that an unobserved, time-invariant variable drives the association between late hiring and attrition.

Moving forward, the probability of late hiring is likely to increase, as districts face substantial budget uncertainty, scrambling to replace recession-induced declines in state and local tax revenue. Many districts are preparing to reduce their teaching force; anywhere between 100,000 and 300,000 teachers may be laid off after the 2009-2010 academic year (Anderson, 2010). As these districts wait and hope for federal support (Lewin & Dillon, 2010), the number of teaching vacancies and districts' ability to fill them remains unclear.

Our results may provide useful lessons for policymakers and district officials. While late hiring may be necessary to fill gaps identified late in the summer or cover shortage areas when supporting a full-time employee is not financially feasible, these results should provide evidence that late-hires are much less likely to be retained than on-time hires. Given the costs of replacing an employee, this type of hiring may leave schools and districts in an expensive cycle of bringing on employees late, only to replace them again the following year.[9]

[9] Tziner & Birati (1996) estimate that direct and indirect costs of replacing a worker with a $60,000 salary- about the average salary for a Michigan teacher- approach $100,000.

Appendices

Not included in page count.

Appendix A. References

References are to be in APA version 6 format.

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Appendix B. Tables and Figures

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Appendix B
Complete Results

Table 1

Extent of Late Hiring by Year

	All Years		2003-2004		2004-2005		2005-2006		2006-2007		2007-2008	
	n	%	n	%	n	%	n	%	n	%	n	%
Number and percent of teachers hired late	1,104	11.86	205	12.62	189	10.37	201	8.66	227	11.82	282	17.45
Number and percent of schools making at least one late hire	946	18.84	183	19.32	169	18.11	178	15.37	187	17.73	229	24.68
Number and percent of schools making at least two late hires	127	2.52	20	2.11	15	1.61	21	1.81	31	2.94	40	4.30

Table 2

Means and Percentages of School and Teacher Characteristics for Teachers On Time and Teachers Hired Late

	Hired On-Time (N = *8,202*)		Hired Late (N = *1,104*)	
	Mean or %	(s.e.)	Mean or %	(s.e.)
School Characteristics				
Achievement				
% Proficient math	68.10	(0.55)	62.00 ***	(1.12)
% Proficient reading	77.00	(0.39)	71.53 ***	(0.86)
Student Characteristics				
% Non-white	19.99	(0.66)	34.57 ***	(1.60)
% Free/reduced lunch	29.09	(0.61)	40.23 ***	(1.07)
% Student attendance[a]	96.00	(0.08)	95.07 ***	(0.20)
% Student mobility[a]	1.72	(0.05)	2.03 **	(0.11)
Faculty Characteristics				
% Teachers w/ professional license	42.45	(0.27)	43.65 **	(0.46)
% Non-white teachers	5.35	(0.30)	12.91 ***	(1.01)
Age of teachers	41.06	(0.08)	42.36 ***	(0.15)
Number of teachers	26.18	(0.59)	25.73	(0.91)
School Level				
Primary	36.45%	(1.30)	40.49% *	(2.00)
Middle	20.50%	(1.06)	22.37%	(1.66)
High	40.31%	(1.55)	33.51% ***	(2.18)
Other	2.74%	(0.37)	3.62%	(0.81)
School Location				
City	16.34%	(1.11)	30.62% ***	(2.04)
Suburb	42.90%	(1.44)	40.94% *	(2.11)
Town	8.69%	(0.68)	6.97%	(0.91)
Rural	29.07%	(1.25)	21.47% ***	(1.58)
Teacher Characteristics				
Individual Characteristics				
Non-white	5.77%	(0.26)	9.69% ***	(0.89)
Female	71.74%	(0.50)	74.28% +	(1.32)
Age (mean)	29.26	(0.08)	31.26 ***	(0.27)

Table 2 Continued

Means and Percentages of School and Teacher Characteristics for Teachers Hired On-Time and Teachers Hired Late

	Hired On-Time (N = *8,202*)		Hired Late (N = *1,104*)	
	Mean or %	(s.e.)	Mean or %	(s.e.)
Instructional Assignment				
Fulltime	89.67%	(0.34)	83.24% ***	(1.12)
Multiple schools	6.94%	(0.28)	7.97%	(0.82)
Multiple subjects	18.09%	(0.43)	10.69% ***	(0.93)
Primary Subject				
Math	16.68%	(0.41)	16.85%	(1.13)
ELA	17.04%	(0.41)	18.30%	(1.16)
Science	13.09%	(0.37)	11.87%	(0.97)
Social Science	9.91%	(0.33)	8.79%	(0.85)
World Language	6.96%	(0.28)	4.89% **	(0.65)
Elementary	36.31%	(0.53)	39.31% $^{+}$	(1.47)
Non-match with faculty				
White teacher	1.06%	(0.11)	5.16% ***	(0.67)
Non-white teacher	4.12%	(0.22)	4.26%	(0.61)
License Level				
Provisional	85.39%	(0.39)	81.88% **	(1.16)
Provisional w/ renewal	4.75%	(0.23)	6.16% *	(0.72)
Professional	9.85%	(0.33)	11.96% *	(0.98)
Highest Degree				
Graduate Degree	15.33%	(0.40)	18.48% **	(1.17)

NOTE: All standard errors are adjusted for clustering at the school level. All mean differences were tested using a t-test statistic with Satterthwaite's approximation for unequal variances. Differences in proportions were tested using Pearson chi-square statistics. An asterisk on the Hired Late statistic indicates a statistically significant difference between teachers hired on time and teachers hired late for that particular characteristic.

$^{+}p<0.10$. $*p<0.05$. $**p<0.01$. $***p<0.001$

[a] Student attendance and mobility information are only available beginning in the 2005-2006 academic year. Results for these characteristics are thus based on a subsample of data.

Table 3
School, District, and Teacher Characteristic Estimates for Logit Models of Having Been Hired Late

	Labor Market Fixed Effects		District Fixed Effects		School Fixed Effects	
	Estimate	(s.e.)	Estimate	(s.e.)	Estimate	(s.e.)[a]
School Characteristics						
Mean of standardized achievement	– 0.087	(0.068)	– 0.023	(0.080)	0.123	(0.285)
Student Characteristics						
% Non-white (10s)	0.028	(0.021)	0.036	(0.052)	0.512 +	(0.266)
% Free/reduced lunch (10s)	– 0.033	(0.033)	– 0.023	(0.037)	0.045	(0.111)
Faculty Characteristics						
% Teachers w/ professional license (10s)	0.072 *	(0.032)	0.031	(0.040)	0.174 +	(0.103)
Average age of teachers in school	0.060 ***	(0.011)	0.064 ***	(0.014)	0.083 +	(0.050)
Number of teachers (10s)	0.006 *	(0.003)	0.008 *	(0.004)	– 0.030	(0.019)
School Level						
Middle	0.159	(0.152)	0.301	(0.171)	---	---
High	– 0.319 +	(0.170)	– 0.234	(0.193)	---	---
Other	0.335	(0.231)	0.480	(0.326)	---	---
School Location						
City	0.282 *	(0.132)	---	---	---	---
Suburb	0.086	(0.109)	---	---	---	---
Town	0.030	(0.145)	---	---	---	---
District Characteristics						
Number of students (1000s)	– 0.003 *	(0.001)	– 0.032 **	(0.009)	– 0.126 ***	(0.011)
% Students with free/reduced lunch (10s)	0.219 ***	(0.040)	0.032	(0.113)	– 0.175	(0.180)
Time						
2004 – 2005	0.053	(0.117)	0.030	(0.129)	– 0.093	(0.179)
2005 – 2006	– 0.284 *	(0.116)	– 0.314 *	(0.133)	– 0.527 *	(0.227)
2006 – 2007	– 0.018	(0.118)	– 0.050	(0.144)	– 0.221	(0.234)
2007 – 2008	0.370 **	(0.121)	0.502 **	(0.158)	0.161	(0.272)
Teacher Characteristics						
Individual Characteristics						
Female	0.046	(0.082)	0.030	(0.088)	0.037	(0.110)
Age (10s)	0.131 **	(0.046)	0.112 *	(0.049)	0.108 +	(0.073)

Table 3 Continued

School, District, and Teacher Characteristic Estimates for Logit Models of Having Been Hired Late

	Labor Market Fixed Effects		District Fixed Effects		School Fixed Effects	
	Estimate	(s.e.)	Estimate	(s.e.)	Estimate	(s.e.)[a]
Instructional Assignment						
Fulltime	– 0.753 ***	(0.097)	– 0.903 ***	(0.109)	– 1.200 ***	(0.164)
Multiple schools	0.102	(0.127)	0.163	(0.136)	0.291 +	(0.155)
Multiple subjects	– 0.447 ***	(0.112)	– 0.538 ***	(0.124)	– 0.552 **	(0.167)
Primary Subject						
Math	– 0.114	(0.149)	– 0.299	(0.185)	– 0.344	(0.266)
ELA	0.003	(0.160)	– 0.142	(0.177)	– 0.101	(0.246)
Science	– 0.126	(0.174)	– 0.288	(0.193)	– 0.251	(0.264)
Social Science	– 0.072	(0.187)	– 0.322	(0.206)	– 0.371	(0.278)
World Language	– 0.527 **	(0.198)	– 0.724 **	(0.216)	– 0.833 **	(0.299)
Non-match with faculty [b]						
White teacher	0.396 +	(0.208)	0.441 *	(0.222)	0.692	(0.523)
Non-white teacher	– 0.250	(0.171)	– 0.210	(0.179)	– 0.195	(0.207)
License Level						
Provisional	0.005	(0.124)	0.074	(0.139)	0.227	(0.180)
Provisional w/ renewal	– 0.026	(0.174)	0.076	(0.189)	0.313	(0.231)
Highest Degree						
Graduate Degree	– 0.067	(0.104)	– 0.046	(0.110)	0.118	(0.170)
Observations	9306		7563		3833	
Number of groups	14		311		606	
Psuedo R^2	0.0866		0.0546		0.0883	

NOTE: The reference group includes teachers who are part-time, teach only elementary in a single school, do not match their faculty's racial\ethnic composition, have a professional or permanent license, and do not have a graduate degree or higher. Asterisks indicate that the estimated coefficient is significantly different than zero.

$^{+}p<0.10$. $^{*}p<0.05$. $^{**}p<0.01$. $^{***}p<0.001$

[a] Standard errors adjusted for clustering at the district level.

Table 4

Selected Estimates for Logit Models of Having Left Teaching in Michigan or Moved Schools After One Year

	Left Teaching in Michigan				**Moved Schools**			
	Labor Market Fixed Effects		School Fixed Effects		Labor Market Fixed Effects		School Fixed Effects	
	Estimate	(s.e.)	Estimate	(s.e.) [a]	Estimate	(s.e.)	Estimate	(s.e.) [a]
Late Hiring	0.577 ***	(0.124)	0.573 **	(0.171)	0.399 ***	(0.100)	0.461 **	(0.149)
Teacher Characteristics								
Female	– 0.013	(0.109)	– 0.061	(0.126)	0.056	(0.087)	0.211	(0.110)
Age (10s)	0.380 ***	(0.057)	0.466 ***	(0.082)	– 0.054	(0.052)	– 0.146 *	(0.072)
Fulltime	– 0.577 ***	(0.133)	– 0.318 +	(0.189)	– 0.793 ***	(0.103)	– 1.002 ***	(0.181)
Multiple subjects	– 0.392 **	(0.142)	– 0.125	(0.183)	0.194 **	(0.106)	0.073	(0.153)
Non-match: White teacher	– 0.198	(0.309)	0.120	(0.264)	– 0.292	(0.254)	– 0.410 +	(0.221)
Non-match: Non-white teacher	– 0.154	(0.248)	0.031	(0.323)	– 0.115	(0.180)	0.107	(0.268)
School Characteristics								
Mean of standardized achievement	0.098	(0.095)	0.098	(0.343)	– 0.077	(0.073)	0.493 +	(0.258)
% Non-white (10s)	– 0.028	(0.031)	– 0.047	(0.222)	0.017	(0.023)	0.363 **	(0.113)
% Free/reduced lunch (10s)	0.117 **	(0.045)	– 0.007 **	(0.102)	0.055	(0.034)	– 0.333	(0.292)
% Teachers w/ professional license (10s)	0.066	(0.045)	0.189	(0.173)	0.091 **	(0.033)	0.049	(0.144)
Number of teachers	0.000	(0.004)	0.046 +	(0.027)	– 0.002	(0.004)	0.080 ***	(0.022)
Middle	0.458 *	(0.220)	---	---	– 0.071 *	(0.171)	---	---
High	0.715 **	(0.239)	---	---	– 0.637 **	(0.191)	---	---
Other	0.766 *	(0.313)	---	---	0.376	(0.283)	---	---
City	– 0.249	(0.184)	---	---	0.373 **	(0.138)	---	---
Suburb	– 0.164	(0.136)	---	---	0.215 *	(0.107)	---	---
Town	– 0.213	(0.188)	---	---	– 0.136	(0.152)	---	---
District Characteristics								
Number of students (1000s)	0.004 *	(0.002)	– 0.014 +	(0.008)	0.002 *	(0.002)	0.043 ***	(0.010)
% Students with free/reduced lunch (10s)	0.069	(0.057)	– 0.128	(0.264)	0.022	(0.043)	– 0.290 +	(0.175)
Observations	7183		2192		7183		3114	
Number of groups	14		371		14		574	
Psuedo R^2	0.0642		0.0725		0.0495		0.0664	

NOTE: Additional time, school, and teacher variables are included in all models when appropriate but not shown.

+p<0.10. *p<0.05. **p<0.01. ***p<0.001

[a] Standard errors adjusted for clustering at the district level.

Table 5

Estimates of Late Hire Status for Logit Models of Labor Market Outcomes After Two Years

	Labor Market Fixed Effects		School Fixed Effects	
	Estimate	(s.e.)	Estimate	(s.e.) [a]
Left Teaching in Michigan				
Teacher was hired late	0.115	(0.181)	– 0.159	(0.335)
Observations	5383		1205	
Number of groups	13		226	
Moved Schools in Michigan				
Teacher was hired late	– 0.228	(0.173)	– 0.255	(0.254)
Observations	5418		1421	
Number of groups	14		283	
Left Their School				
Teacher was hired late	– 0.081	(0.131)	– 0.287	(0.212)
Observations	5418		2239	
Number of groups	14		442	

NOTE: Additional time, school, and teacher variables are included in all models when appropriate but not shown. Asterisks indicate that the estimated coefficient is significantly different than zero.

$^{+}p<0.10$. $^{*}p<0.05$. $^{**}p<0.01$. $^{***}p<0.001$

[a] Standard errors adjusted for clustering at the district level.

Table 6

Estimates of Late Hire Status for Logit Models of Labor Market Outcomes After One Year: Restricted Sample

	Labor Market Fixed Effects		School Fixed Effects	
	Estimate	(s.e.)	Estimate	(s.e.) [a]
Left Teaching in Michigan				
Teacher was hired late	0.737 *	(0.284)	0.489	(0.353)
Observations	2376		740	
Number of groups	11		108	
Moved Schools in Michigan				
Teacher was hired late	0.855 ***	(0.208)	1.200 ***	(0.342)
Observations	2376		1010	
Number of groups	11		184	
Left Their School				
Teacher was hired late	0.961 ***	(0.183)	1.010 ***	(0.273)
Observations	2376		1402	
Number of groups	11		252	

NOTE: Additional time, school, and teacher variables are included in all models when appropriate but not shown. Asterisks indicate that the estimated coefficient is significantly different than zero.

$^{+}p<0.10$. $^{*}p<0.05$. $^{**}p<0.01$. $^{***}p<0.001$

[a] Standard errors adjusted for clustering at the district level.