Teachers' Grade-level Reassignments: Evidence from Michigan

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Abstract

Teacher churning likely harms student achievement. However, the phenomenon of within-school grade-level teacher reassignments is understudied. The current study provides descriptive evidence on the frequency and predictors of within-school teacher grade switching using both longitudinal administrative data from Michigan and nationally-representative survey data. About 7% of self-contained classroom teachers change grades following any given school year. Inexperienced teachers are relatively more likely to switch grades and grade-level reassignments are inequitably distributed across both schools and students. For example, urban schools experience significantly higher rates of grade switching. Charter schools experience significantly less grade switching than traditional public schools.

Key Words: Teacher retention; teaching assignments; school quality; teacher turnover

Teacher turnover, whether measured by attrition from the profession or mobility across schools, can disrupt the functioning of schools in a myriad of ways. For example, high rates of teacher turnover may reduce instructional quality, destabilize schools, and disrupt schools' curriculums and course offerings (Shields et al., 2001). Indeed, recent research finds empirical support for the claim that teacher turnover harms student achievement over and above its effect on the distribution of teacher quality (Ronfeldt, Loeb, & Wyckoff, 2013). Within-school teaching reassignments (i.e., grade-level and subject changes) have similar consequences, as evidence from New York City suggests that within-school teacher churning harms the academic achievement of middle school students (Atteberry, Loeb, & Wyckoff, 2014). Moreover, within-school grade-level reassignments potentially undermine student achievement by reducing teachers' grade-specific teaching experience, which has been shown to be relatively more important than general teaching experience (Ost, 2014). This evidence has led observers to argue that principals should think carefully about how to best allocate teachers to grades and subjects, as such decisions are typically non-controversial yet may have substantial effects on student achievement (Jacob & Rockoff, 2011).

However, the large literature on the distribution of teacher turnover generally ignores the within-school sorting of primary-school teachers into grade levels. This is a potentially important omission, as student achievement is affected not only by the number of teachers new to the school or profession, but also by the number of teachers who are teaching in a new assignment or grade level. Moreover, we show that within-school rates of grade switching are similar in magnitude to both rates of attrition from the profession and mobility across schools. Well-documented higher rates of teacher turnover in low-performing and high-poverty schools (e.g., Hanushek, Kain, & Rivkin, 2004; Ingersoll, 2001; Lankford, Loeb, & Wyckoff, 2002) suggest

that such schools may necessarily experience more shuffling of teachers across grade levels and subjects. An inequitable distribution of within-school churning in teaching assignments presents an additional challenge that students, teachers, and administrators in disadvantaged schools must overcome. The current study contributes to the literature on teacher turnover by documenting the prevalence of within-school grade switching, investigating the teacher- and school-level predictors of grade switching, and examining the relationship between grade switching and other types of teacher turnover.

The primary analysis utilizes rich longitudinal administrative data on the universe of self-contained kindergarten through fifth-grade Michigan public school teachers during the 2003-04 through 2008-09 school years. These data are well suited for the analysis, as Michigan is home to a large demographically and socioeconomically diverse student population, the longitudinal nature of the data allows individual teachers to be tracked over several years, and the large sample size provides sufficient power with which to identify the predictors of grade switching. We complement the primary analysis by providing descriptive statistics from the nationally-representative Schools and Staffing Survey (SASS) to verify that the phenomenon of grade switching is not unique to Michigan.

Grade switching is found to be more prevalent in schools in urban areas, schools serving minority student populations, and schools with higher rates of teacher attrition. In addition, less experienced teachers switch grades more often, particularly those teachers who are new to their school. Grade switching strongly predicts future grade switching, but not other types of turnover. Interestingly, there is significantly less grade switching in charter schools and no relationship between grade switching and schools' academic performance. These results imply that in addition to higher rates of teacher turnover, urban schools serving high concentrations of

minority students also experience significantly higher rates of grade-level reassignments. This is true even after conditioning on school-level turnover rates and suggests that policymakers concerned with problems of teacher turnover in disadvantaged schools should pay similar attention to the inequitable distribution of grade-level reassignments.

Literature Review

Two studies tangentially touch on the frequency of within-school grade-level reassignments of self-contained classroom teachers. Chingos and West (2011) use administrative data from Florida to show that teachers in tested grades who have low value-added scores are more likely to move to non-tested positions within their current school and exit teaching than their more-effective counterparts. Of Florida's 24,475 self-contained tested-grade (4^{th} – 8^{th} grade) teachers in 2001-02, 84% remained in a tested-grade classroom the following year and 52% remained in a similar position seven years later (excluding retirements). These figures represent a lower-bound estimate of the percentage of tested-grade teachers who changed grades, however, as the analysis does not consider switches between tested grades (and does not consider teachers initially teaching in non-tested grades). Notably, 7% of the 2001-02 cohort taught in self-contained, non-tested classrooms the following year. Multinomial logit estimates show that male, Hispanic, and experienced teachers were more likely to transition from tested to non-tested grades. Ost (2014) is primarily concerned with identifying grade-specific returns to teaching experience. Using longitudinal administrative data from North Carolina, the author finds that of teachers who taught in self-contained classrooms in consecutive years between 1995 and 2007, about 70% remained in the same grade. The author also reports transition matrices that show that most reassignments were to an adjacent grade and that moving to higher and lower grades was

equally likely. Finally, Ost reports estimates from linear probability models that show that within-school grade switching is weakly negatively correlated with students' current performance.

More generally, the current study is related to the literatures on teacher attrition and teacher sorting, as within-school grade-level reassignments are a type of teacher churning (Atteberry et al., 2014). Guarino et al. (2006) thoroughly review the literature on teacher attrition and mobility, which generally finds higher rates of teacher turnover in urban and low-performing schools, schools comprised of low-income or minority students, and amongst inexperienced, female, white, and highly-credentialed teachers. Loeb et al. (2005) find good working conditions and higher pay to be associated with reduced rates of turnover. However, the existing literature largely ignores within-school changes in teaching assignments as a type of teacher turnover.

An exception to this critique is Boyd et al. (2008), who investigate the effect of a newly-implemented fourth-grade test in New York State on fourth-grade teacher turnover, where turnover is defined as either leaving the fourth grade or leaving the public-school system. Using administrative data, the authors estimate difference-in-difference type models that compare tested and non-tested grades before and after the implementation of the new fourth grade test. The authors find that teachers were more likely to remain in the newly-tested fourth grade and that this change was primarily driven by a decrease in the grade-level reassignments of fourth-grade teachers (as opposed to attrition from the profession). The Boyd et al. (2008) study exemplifies the potential importance of grade-level reassignments in operationalized definitions of teacher turnover.

Similarly, Cohen-Vogel (2011) investigates the extent to which principals in ten Florida elementary schools use student-performance data to reassign teachers across grade levels and

make staffing decisions more generally. The author presents qualitative evidence that principals felt free to make grade-level reassignments and typically considered both teachers' preferences and performance when making such decisions. Cohen-Vogel and Osborne-Lampkin (2007) analyze the collective-bargaining agreements of 66 Florida school districts and find that while teachers' seniority matters, administrators retain a reasonable amount of discretion in changing teachers' assignments. Furthermore, the authors find that collective-bargaining agreements are not more rigid in low-performing, poor, or minority schools.

The current study contributes to the existing literature by examining patterns in the frequency of grade switching and documenting the distribution of grade switching across different types of schools, students, and teachers. We do so using both nationally-representative survey data and rich, longitudinal administrative data from Michigan to summarize the frequency of grade switching and estimate multivariate logistic regressions that identify the predictors of grade switching. We further test whether grade switching predicts other types of teacher turnover and compare the predictors of grade switching to those of other types of teacher turnover. By providing a more comprehensive picture of the distributions of different types of teacher turnover, the current analysis furthers our understanding of the functioning of teacher labor markets and the equity of the distribution of school effectiveness.

Data and Methods

The primary analysis examines teachers' grade-level assignments in the Registry of Educational Personnel (REP) database, which is an administrative employee-level panel data set maintained by Michigan's Center for Educational Performance & Information (CEPI). The REP contains information on all public-education employees in Michigan, but the analytic sample is

restricted to teachers in self-contained kindergarten through fifth-grade classrooms between the 2003-04 and 2008-09 school years. The baseline analytic sample is comprised of 113,978 teacher-year observations and 33,390 unique teachers for whom demographic and grade-level data are observed.

The REP data are augmented with publicly available school- and district-level information from two additional sources. First, data on school type, student demographics, and geographic locale are drawn from the National Center for Education Statistics' (NCES) Common Core of Data. Second, grade-level math proficiency rates, which are publicly provided by the Michigan Department of Education, are used to proxy for school performance.[1] Proficiency rates indicate the fraction of each school's students who tested as proficient on the Michigan Education Assessment Program (MEAP) standardized test.[2] Proficiency rates increased statewide throughout the sample period. Accordingly, to ensure comparability across years and grades, proficiency rates are standardized to have a mean of zero and a standard deviation of one within each year and grade.

Because the generalizability of state-level analyses is always a concern, we compute teacher turnover rates using data from the nationally-representative 1999 and 2003 Schools and Staffing Surveys (SASS) and corresponding Teacher Follow-Up Surveys (TFS).[3] The SASS and TFS are conducted by the NCES and are publicly available.[4] The SASS is a nationally-representative random sample of approximately 43,000 elementary and secondary public school teachers in each survey year. The TFS follows up with approximately 5,300 randomly sampled SASS respondents the following year to see if and where they are teaching. The SASS-TFS analysis is restricted to regular full-time kindergarten through fifth-grade self-contained classroom teachers who were surveyed by the TFS. The analytic sample excludes special

education teachers and teachers who taught more than one grade in the SASS survey year. These restrictions yield analytic samples of 760 and 1,070 teacher observations for the 1999-00 and 2003-04 school years, respectively.

We identify the predictors of grade switching and other types of turnover in Michigan by estimating logit models of the form

$$\Pr\left(y_{igst}=1|\cdot\right)=\Lambda\left(\beta_0+\boldsymbol{\beta}_1\mathbf{x}_{it}+\boldsymbol{\beta}_2\mathbf{z}_{st}+\eta_g+\tau_t\right), \quad (1)$$

where y is a binary indicator of teacher turnover between years t and $t + 1$, i indexes teachers, g indexes grades, s indexes schools, $\mathbf{x}$ is a vector of possibly time-varying teacher characteristics, $\mathbf{z}$ is a vector of possibly time-varying school characteristics, η is a grade fixed effect (FE), and τ is a year FE. Extensions of equation (1) are considered that condition on either school, district, or grade-by-year FE. The parameters of equation (1) are estimated by maximum likelihood, from which we compute average partial effects (APE) of each covariate on the conditional probability of turnover.[5] Subsequent analyses report APE standard errors that are adjusted for clustering at the district level, which makes statistical inference robust to the presence of serial correlation within districts *and* schools over time, as schools are nested in districts.[6]

Results

The Prevalence and Distribution of Grade Switching

Table 1 displays the prevalence of teacher grade reassignments in relation to other types of teacher turnover. In particular, the first panel of table 1 describes the overall and year-specific turnover of Michigan's self-contained kindergarten through fifth-grade classroom teachers between 2003-04 and 2008-09. Of teachers remaining in a self-contained classroom in the same school the following year, 76% remained in the same grade. The percentage of teachers who

changed grades but remained in a self-contained classroom in the same school is 6.7%. Notably, this figure is similar in magnitude to two commonly-used measures of turnover: the percentages who changed schools (6.1%) and who exited the Michigan public school system (5.3%). The frequency of within-school grade-level reassignments in Michigan is fairly constant across years, ranging from 6 to 7%. Not reported in table 1 is the finding that rates of grade switching are similar across grades, ranging from 5% to 8%, and that most grade changes are to an adjacent grade.[7] Other types of turnover are fairly constant over time and across grades as well. The second panel of table 1 reports similar average turnover rates derived from nationally representative SASS data. The SASS data suggest that grade switching is a national phenomenon and that national rates of teacher turnover, including grade switching, are similar in magnitude to those observed in Michigan.

Table 2 examines the distribution of switching across individual teachers in Michigan. Grade switching is not driven by a small number of serial switchers, as 63% of grade-level reassignments were experienced by teachers who changed grades only once and another 24% of reassignments involved teachers who changed grades twice. Overall, a non-trivial 18% of Michigan's self-contained classroom elementary-school teachers experienced at least one grade-level reassignment between the 2003-04 and 2008-09 school years.

The Correlates of Grade Switching

Table 3 reports average teacher and school characteristics both overall and separately by the number of grade-level reassignments. The first column reports overall averages for the six-year period covered by the analytic sample. Each subsequent column of table 3 reports the same average characteristics separately by the number of times that teachers changed grades between

2003-04 and 2008-09. A few differences emerge between the teachers who never changed grades and those who did. For example, non-switchers were more likely to hold a Master's degree and to have ten or more years of teaching experience. Similarly, teachers who experienced no grade-level reassignments were less likely to be in urban and charter schools, and were more likely to be in the highest-performing (top proficiency quartile) schools.[8] In addition, teachers who switch grades are more likely to teach in urban schools and in schools with high proportions of students eligible for free or reduced-price lunch. The following section examines the predictors of grade switching in more detail, by conditioning on teacher and school characteristics and by focusing on teacher-years as the unit of analysis.

Table 4 reports logit-model APE of teacher and school characteristics on the probability that self-contained classroom teachers made a within-school grade change between academic years. Column 1 of table 4 contains a baseline specification that conditions on teacher and school characteristics, grade taught, and a full set of year indicators. Teachers' race and education are not significant predictors of grade switching. A small, marginally significant effect of gender is found, suggesting that female teachers are about half of a percentage point more likely to be reassigned than male teachers. Teachers' age and experience are strongly statistically significant predictors of grade switching, although only the experience effects are practically significant: teachers with two to nine years of experience are between one and two percentage points less likely to change grades than new teachers, while those with ten or more years of experience are more than three percentage points less likely to do so. The APE of urban schools is 0.0115 and is significantly different from zero at the 5% confidence level, which indicates that teachers in urban schools are about one percentage point more likely to change grades than their counterparts in the omitted category of suburban schools. There is no statistically significant

difference in the likelihood of grade switching between teachers in rural schools and the omitted category of suburban schools. In terms of magnitude, teaching in a charter school has one of the largest effects on the likelihood of grade switching observed in column 1, as teachers in charter schools are more than four percentage points less likely to change grades than teachers in traditional public schools, and this difference is strongly statistically significant. This could be the result of charter school principals and administrators having more authority to hire and dismiss teachers than their counterparts in traditional public schools. Alternatively, keeping teachers in the same grade could be a strategy employed by effective charter schools. We further investigate this possibility below.

We include school-year measures of attrition from the school, district or Michigan public education system in the model to test whether grade switching occurs in response to teachers exiting the school, or if grade switching is a substitute for other types of teacher turnover. The former may result from principals shuffling teachers' grade-level assignments in an effort to fill the vacancies created by teacher attrition when the availability of external replacements is limited. Alternatively, the latter would occur if dissatisfied teachers change (or are asked to change) grades before changing schools or leaving the profession to see if a different grade provides a better fit. Attrition's positive and statistically significant APE suggests that grade switching is more common in high-attrition schools, although the effect is practically small.[9]

An interesting non-finding regards the relationship between school achievement levels and grade switching: the grade-level indicators of schools' math-proficiency quartiles are individually and jointly insignificant. In fact, the APE appear to be precisely-estimated zeros, which suggests that grade switching is not concentrated in either high- or low-performing schools. This non-finding is robust to instead measuring school quality by the school grades

assigned in Michigan's School Report Card (MDE, 2007). In general, these results indicate that school-level variables tend to be weakly correlated with patterns of gradeswitching.[10] Finally, note that first, second, third, and fourth-grade teachers are approximately equally likely to change grades and are all one to two percentage points more likely to change grades that kindergarten and fifth-grade teachers.[11] The year indicators, which are not reported in table 4, suggest that there are no statewide trends in the frequency of grade switching during the time period of the analytic sample.[12]

Estimates of an augmented version of the baseline model, which allows the effects of both school-level attrition and charter status to vary by performance quartile, are reported in Column 2. As discussed above, one possible explanation of the positive association between schools' attrition and grade-switching rates observed in column 1 is that high-turnover schools make more grade-level reassignments because their ability to hire same-grade replacements is limited. If this is the primary explanation, then it stands to reason that the observed relationship between grade switching and attrition should be stronger in low-performing schools, as such schools experience greater difficulty recruiting new teachers (Guarino et al., 2006). However, the quartile-attrition interaction effects are all positive, indicating that the association between school-level turnover rates and grade-switching rates is not significantly stronger in the lowest-performing schools.[13] This suggests that school-level teacher turnover is associated with grade switching in all schools, regardless of schools' abilities to recruit teachers, perhaps because schools' incumbent teachers are given the first chance to move to the grades vacated by exiting teachers. Accordingly, we investigate the importance of within-school seniority below.

Similarly, the charter school-performance quartile interactions test the hypothesis that the lower rates of grade switching observed in charter schools are driven by the behavior of

relatively high-performing charter schools. If so, limited grade switching may be one practice of effective charter schools that improves student achievement. The interaction effects reported in column 2 suggest that while all charter schools experience significantly lower rates of grade switching than observably similar traditional public schools, charter schools in the second through fourth quartiles of the proficiency distribution experience significantly less grade switching than charter schools in the bottom quartile of the proficiency distribution. While this does not imply a causal link between grade switching and academic achievement, it does suggest that the internal labor markets of high-performing charter schools are different from those of low-performing charter schools.

Columns 3 and 4 of table 4 add district and school FE to the baseline specification, respectively. The estimates in columns 3 and 4 are nearly identical to one another, suggesting that variation across schools is less important than variation across districts. The district and school FE do explain a nontrivial amount of variation in within-school grade-level reassignments, as the pseudo-R^2 increases by a factor of 3 when district FE are added to the baseline model and by a factor of 4 with the addition of school FE.[14]

With two exceptions, the estimates in columns 3 and 4 are remarkably similar to those of the baseline specification in column 1, suggesting that the main results are not driven by unobserved differences between schools or districts. First, when looking at within-district (or within-school) variation, teachers holding a master's degree become significantly less likely to change grades. This result is interesting despite the relatively small effect size, as it suggests that some combination of the distribution of teachers and the functioning of internal (within-school) teacher labor markets vary by unobserved district characteristics. Second, the estimated APEs of

the school's black population and school-level attrition rate lose statistical significance, which is likely due to these variables exhibiting little within-district variation between 2003 and 2008.

Finally, we attempt to better understand the relationship between teachers' experience and grade switching, as experience is consistently one of the most important predictors of grade switching in columns 1 through 4 of table 4. We distinguish between total teaching experience and tenure in the current school, as the predictive ability of experience may vary by type of experience. Such differences may arise because teachers' within-school seniority or relationships with school administrators matter more than general teaching experience, or because teachers with substantial teaching experience have identified their preferred grade level, regardless of their tenure at their current school. Specifically, the model estimated in column 5 of table 4 adds a "new to school" indicator to the school-FE specification of column 4.[15] The results suggest that all else equal, teachers in their first year in a school are about one percentage point more likely to change grades than teachers with more school-specific experience. The overall effect of experience diminishes slightly, but remains strongly statistically significant for teachers who have more than ten years of experience; estimated effects of the other teacher and school characteristics remain unchanged. This basic finding is robust to either removing the school FE or replacing them with district FE.

The Relationship between Grade Switching and Other Types of Teacher Turnover

We now consider the relationship between grade switching and other types of teacher turnover. We begin by testing grade switching's ability to predict future teacher turnover, as grade switching may be indicative of teachers' unease in the classroom or schools' instability. In table 5 we extend table 4's baseline specification (column 1) to include a year-specific count of

teachers' previous grade-level reassignments and examine the effect of previous grade changes on the probability of remaining in the same teaching assignment, changing grades, changing schools, and leaving Michigan public education in four separate logit models.[16] As in column 5 of table 4, one year of data is lost when creating this variable.

Column 1 of table 5 shows that past switches significantly lower the probability of teachers remaining in the same grade and school in consecutive years. Column 2 suggests that most of this decrease is due to the five percentage point increase in the probability of changing grades associated with each past grade change. However, columns 3 and 4 of table 5 suggest that grade switching is not a strong predictor of other types of teacher turnover.

It is also of interest to compare the predictors of grade switching reported in table 4 to the predictors of other types of teacher turnover, as the optimal design and targeting of policies aimed at decreasing teacher turnover may vary by turnover type. Accordingly, columns 1 and 2 of table 6 report logit-model APE of select covariates on the probability of changing schools and of leaving teaching, respectively. The specifications estimated in table 6 are otherwise identical to the baseline specification of column 1 in table 4. Again, adding district or school FE to the logit models estimated in table 6 does not change the qualitative results.

A comparison of the estimated APE in table 6 to those in column 1 of table 4 yields several similarities: teacher's experience and the racial composition of schools similarly influence the probability of all three types of teacher turnover. There are some notable differences, however, especially among the school characteristics. For example, teachers in charter schools are significantly less likely to change grades or schools, but are more likely to leave the teaching profession. Similarly, school performance (as measured by grade-level proficiency quartiles) is not associated with changing grades or leaving the profession, but is

significantly negatively correlated with changing schools. This may reflect the general result that teachers systematically move from lower- to higher-performing schools as their careers progress.

Discussion

This study examines the frequency and predictors of teachers' within-school grade-level reassignments using rich administrative data from Michigan between 2003-04 and 2008-09. This time period witnessed a nontrivial number of such grade changes, as following any given academic year about 7% of the state's self-contained kindergarten through fifth-grade teachers changed grades. The phenomenon of grade switching is not unique to Michigan, as a similar rate of about 9% is found in nationally representative data during a similar time period. In Michigan, and nationally, the rate of grade switching is similar in magnitude to rates of attrition from the profession and mobility across schools. However, the determinants and implications of within-school grade switching are understudied relative to those of other types of teacher turnover.

Grade switching is more common in schools with high attrition rates, which may be the result of principals filling vacancies created by teacher departures. Urban schools with higher fractions of minority students are found to have higher levels of grade switching, even conditional on the amount of teacher turnover in the school. While grade switching does not appear to vary by schools' achievement levels, charter schools have significantly fewer grade-level reassignments than traditional public schools, and such differences are even larger in higher-achieving charter schools. This may be a strategic practice of effective charter schools. Alternatively, charter school administrators may have more authority to dismiss ineffective teachers and thus have less need to make within-school grade-level reassignments.

Teachers with more experience, both overall and in the current school, are significantly less likely to change grades. The negative correlation between grade switching and teachers'

experience likely results from some combination of experienced teachers having relatively more input in their teaching assignments, having learned which grade(s) they are most comfortable in, and principals reassigning teachers who have developed the least grade-specific human capital. It is important to note that the last two of these reasons for less grade changing among experienced teachers are potentially beneficial to student achievement, though the existing evidence suggests that on average, grade switching harms student achievement (Atteberry et al., 2014). Importantly, grade switching predicts future grade switching but no other types of teacher turnover, suggesting that grade switching is of little use as an "early indicator" of teachers' dissatisfaction with, or attrition from, the profession.

Moving forward, education researchers can and should explore several facets of the grade-switching phenomenon. For example, a limitation of the current study is its inability to differentiate teacher- from principal-induced reassignments. While nearly 90% of teacher mobility across schools is at teachers,' as opposed to administrators,' discretion (Keigher 2010), it is difficult to determine the corresponding percentage of grade-level or subject reassignments initiated by teachers. Indeed, Cohen-Vogel (2011) suggests that such reassignments are initiated by both teachers and principals and Grissom et al. (2014) find that the reassignment of effective teachers to tested grades is more common in schools in which principals have greater control of teaching assignments. Furthermore, some reassignments may be determined by mutual agreement or compromise. Theoretically, there are several reasons that both teachers and principals might initiate grade-level reassignments. For example, teachers may wish to change grades due to accountability pressure in high-stakes (tested) grades, their perceived competencies in specific grades, a desire to try something new, or the mix of classroom teachers in a particular grade. Principals, meanwhile, might initiate grade-level reassignments in response to teacher

turnover, teacher performance, teacher morale, or the internal and external availability of teachers. Accordingly, future iterations of nationally-representative surveys of teachers and/or principals (e.g., SASS) might consider adding survey instruments that ask the reason for grade and subject reassignments. Similarly, qualitative research may seek to identify the specific reasons for grade-level reassignments and the contexts in which such reassignments are more or less likely to be made at teachers' behests.

Importantly, the potential reasons for both teacher- and principal-induced grade switching mentioned in the previous paragraph suggest that at least some grade-level reassignments might improve student outcomes and teacher morale. However, extant research also finds evidence that less effective and less qualified teachers are sometimes reassigned to low-stakes early grades, which has negative potential long-run implications for child development (Fuller & Ladd, 2013; Grissom et al., 2014). Accordingly, another area ripe for research is the study of heterogeneity in the effects of grade switching by reason for switch, context of switch, and outcome.

Nonetheless, the general finding that grade switching is not randomly distributed across schools and teachers has several implications for administrators, principals, and policy makers seeking to improve student outcomes. That the predictors of teacher turnover vary by turnover type suggests that principals, policymakers, and analysts must think carefully about the operationalized definition of teacher turnover and recognize grade (and potentially subject) reassignments as an important type of teacher churning when devising and implementing teacher-retention programs and investigating the impact of high-stakes accountability policies on teacher turnover (e.g., Boyd et al., 2008). Similarly, it is important that future research identifies how grade-level reassignments impact student achievement and whether such effects vary by the reason for such reassignments; to date, only two studies have begun to address this important

question (Atteberry et al., 2014; Grissom et al., 2014). The frequency and non-random distribution of grade switching may also have implications for value-added models (VAMs). For example, omitting grade-specific experience from VAMs may contribute to the time-instability observed in rankings of estimated teacher effects (e.g., McCaffrey et al., 2009).

Finally, the finding that teachers are more likely to change grades following their first year in a new school, even after controlling for total years of teaching experience, suggests that the within-school politics of seniority play an important role in determining grade-level reassignments. This is not to say that all schools should adjudicate teaching assignments in the same manner, as the optimal level of grade switching will depend on the specific school and district context. Rather, the results of the current analysis underscore the potential benefits of better understanding and paying greater attention to teachers' grade- and subject-specific experience as well as between-year reassignments. The relatively high rates of grade switching observed nationally and in Michigan suggest that there are potentially large benefits to future research that furthers our understanding of the reasons for, and implications of, teachers' within-school grade-level reassignments. Such research has the potential to inform education policy and the management of school and district personnel, and ultimately improve student outcomes.

Notes

1. See: http://www.michigan.gov/mde/0,4615,7-140-22709_31168_31530---,00.html.
2. See MDE (2005) for an overview of the MEAP tests.
3. We are unable to use the 2007 SASS, as the 2008 TFS does not record current grade.
4. See http://nces.ed.gov/surveys/sass/dataproducts.asp.
5. See Wooldridge (2010, p. 577) for the definitions and estimation of APE for both continuous and discrete explanatory variables in binary choice models such as logit.
6. See Angrist and Pischke (2009, p. 319) for a discussion of "clustering at the highest level." Technically, two-way standard errors that allow for correlation within both teachers and districts are appropriate, as teacher sometimes change districts (Cameron et al., 2011). Changing districts is rare in these data, however, and estimated two-way standard errors are marginally smaller than one-way district clustered standard errors in the current application. Thus we report the more conservative (i.e., larger) district-clustered standard errors.
7. Markov transition matrixes reported in online appendix table A.1 show that teachers are most likely to move to adjacent grades and that moving to lower grades is slightly more common. These patterns are similar to those documented by Ost (2014) using data from North Carolina and do not vary by year.
8. The practice of looping (i.e., teachers changing grades in lockstep with a student cohort) may cause certain schools to have multiple teachers who repeatedly change grades. However, we find no evidence of systematic looping in Michigan, and do not believe that this drives the results.
9. The results on teacher- and school-level predictors of grade switching are qualitatively similar when controlling for higher-order polynomials of turnover or quartiles of turnover.
10. In fact, only 3.1% of the variation in grade switching can be explained by time-invariant school-level factors and only 2.9% of the variation can be explained by time-invariant district-level factors.
11. This is likely because in the sample, kindergarten and fifth-grade teachers have only one adjacent grade switch to, and the majority of grade-level reassignments are to an adjacent grade.
12. Specifications that condition on grade-by-year fixed effects (i.e., grade-year interaction terms) yield qualitatively similar results, suggesting that the determinants of grade switching are similar in both tested and non-tested grades. More generally, we find no evidence that the high-stakes tests associated with the 2001 No Child Left Behind Act directly affected the frequency or distribution of within-school grade-level reassignments.
13. Care was taken to compute the interaction effects correctly. See Karaca-Mandic et al. (2012) for a discussion of interaction effects in nonlinear models (e.g., logistic regression).
14. It is also reasonable to condition on principal FE, as principals play an important role in making teaching assignments. Unfortunately, reliable principal data is missing for more than 20% of school-year observations, so we do not report these results. However, estimates of such models using observations for which principal data are available yield qualitatively similar results to those that condition on school FE.
15. We lose one year of data in the process, as the administrative data records total experience in the school district, but not in any particular school.
16. We estimate separate logits rather than a multinomial logit (MNL) to avoid making the strong Independence of Irrelevant Alternatives assumption, though MNL results are qualitatively similar.

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Table 1. Self-contained Teachers' Assignments the Following Year

Year(s)	Same self-contained grade 1	New self-contained grade 2	Changed school 3	Changed district 4	Left self-contained classroom 5	Left teaching 6	Left (MI) public education 7	N 8
	In Michigan (REP Administrative Data)							
2003/04	76.4%	6.0%	5.8%	0.9%	3.6%	0.5%	6.8%	22,933
2004/05	73.8%	7.0%	6.6%	1.2%	4.1%	1.5%	5.8%	22,250
2005/06	75.8%	6.3%	6.5%	1.0%	3.9%	1.5%	5.1%	23,018
2006/07	75.8%	7.3%	6.3%	0.9%	3.6%	1.3%	4.8%	22,905
2007/08	78.3%	6.8%	5.2%	1.0%	3.1%	1.5%	4.0%	22,872
All	76.0%	6.7%	6.1%	1.0%	3.6%	1.3%	5.3%	113,978
	In U.S. (SASS Nationally Representative Sample)							
1999/00	72.7%	8.2%	3.6%	3.0%	6.8%	.	5.6%	760
2003/04	70.8%	9.5%	3.5%	2.5%	8.0%	.	5.6%	1,070
Both	71.7%	8.9%	3.6%	2.7%	7.5%	.	5.6%	1,830

Notes: The definitions of columns 1 – 7 are mutually exclusive and sum to 100%. "By year" refers to the initial self-contained year (e.g., the 2003-04 row reports the 2004-05 destination of teachers who were self-contained in 2003-04). SASS means are weighted to account for unequal probabilities of sample selection. SASS sample sizes are unweighted and are rounded to nearest ten.

Table 2. Incidence of Grade-level Reassignments per Teacher

Switches per teacher	Teacher-year switches	% of switches	Teachers
1	4,761	62.6%	4,761
2	1,834	24.1%	917
3	660	8.7%	220
4	200	2.6%	50
5	150	2.0%	30
Total	7,605	100%	5,978

Notes: Michigan REP data. 5,978 teachers constitute 17.9% of the 33,390 teachers who taught in a self-contained kindergarten through fifth-grade classroom in Michigan between 2003-04 and 2007-08.

Table 3. Average Characteristics by Teacher-year

	All teachers	Switches per teacher		
		0	1	> 1
Teacher				
Black	4.0%	3.8%	4.8%	4.5%
Age	43.2	43.9	40.7	40.5
Female	89.6%	89.3%	90.5%	90.2%
Master's	51.9%	52.5%	50.2%	48.5%
No prev.	4.0%	4.1%	4.1%	3.2%
1 year	4.7%	4.5%	5.6%	4.8%
2 years	5.1%	4.8%	6.4%	5.7%
3-4 years	10.7%	9.9%	13.3%	13.9%
5-9 years	25.0%	23.5%	30.5%	31.7%
10+ years	50.5%	53.3%	40.3%	40.6%
New to	34.7%	36.2%	30.5%	25.8%
2nd Year in	24.5%	24.4%	25.1%	23.6%
3rd Year in	17.9%	17.4%	19.5%	20.8%
School				
Urban	21.1%	20.0%	24.7%	25.8%
Rural	32.4%	33.4%	28.8%	27.3%
Suburban	31.6%	31.1%	33.0%	34.6%
Title 1	37.2%	36.8%	38.7%	38.3%
%	14.1%	13.3%	17.1%	16.8%
% black	6.8%	6.9%	6.9%	4.7%
Charter	22.7%	22.5%	23.1%	26.4%
Proficiency				
1st (lowest)	24.5%	24.6%	24.2%	25.1%
2nd	25.8%	26.0%	25.2%	23.6%
3rd	21.1%	20.0%	24.7%	24.9%
4th (highest)	32.4%	33.4%	28.8%	25.8%
N	113,978	89,354	19,155	5,469

Notes: Michigan REP data. Grade-level reassignments refer to the total number of reassignments experienced by each teacher during the six-year period.

Table 4. Logit Average Partial Effects on Probability of Changing Grades

	1	2	3	4	5
Teacher					
Black	0.0014	0.0017	-0.0009	-0.0028	-0.0007
	(0.0045)	(0.0045)	(0.0041)	(0.0042)	(0.0052)
Age	-0.0011***	-0.0012***	-0.0011***	-0.0012***	-0.0012***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Female	0.0057*	0.0055	0.0055	0.0068*	0.0068
	(0.0034)	(0.0034)	(0.0035)	(0.0036)	(0.0043)
Master's degree	-0.0036	-0.0036	-0.0055**	-0.0053**	-0.0078***
	(0.0025)	(0.0025)	(0.0023)	(0.0024)	(0.0027)
1 year	-0.0060	-0.0066	-0.0062	-0.0055	0.0048
	(0.0044)	(0.0043)	(0.0046)	(0.0052)	(0.0064)
2 years exp.	-0.0129***	-0.0130***	-0.0139***	-0.0139**	-0.0070
	(0.0047)	(0.0046)	(0.0050)	(0.0055)	(0.0071)
3-4 years exp.	-0.0134***	-0.0134***	-0.0128***	-0.0122**	-0.0048
	(0.0044)	(0.0044)	(0.0047)	(0.0053)	(0.0065)
5-9 years exp.	-0.0170***	-0.0167***	-0.0171***	-0.0171***	-0.0050
	(0.0046)	(0.0046)	(0.0050)	(0.0053)	(0.0066)
10+ years exp.	-0.0322***	-0.0319***	-0.0337***	-0.0374***	-0.0269***
	(0.0056)	(0.0056)	(0.0059)	(0.0062)	(0.0074)
New to school	.	.	.	.	0.0117***
					(0.0031)
School					
Urban	0.0115**	0.0113**	0.0047	.	.
	(0.0055)	(0.0055)	(0.0065)		
Rural	-0.0033	-0.0035	-0.0041	.	.
	(0.0039)	(0.0038)	(0.0049)		
Title 1	0.0016	0.0015	0.0032	0.0072	0.0145**
	(0.0041)	(0.0041)	(0.0042)	(0.0055)	(0.0065)
% free/reduced	-0.0031	-0.0027	0.0048	-0.0076	-0.0011
	(0.0083)	(0.0083)	(0.0112)	(0.0219)	(0.0240)
% black	0.0261***	0.0262***	-0.0025	-0.0591	-0.0706
	(0.0080)	(0.0081)	(0.0111)	(0.0531)	(0.0676)
Charter	-0.0425***	-0.0370***	.	.	.
	(0.0066)	(0.0039)			
Attrition	0.0238**	0.0391***	0.0143	0.0240	0.0189
	(0.0110)	(0.0111)	(0.0125)	(0.0147)	(0.0188)
Proficiency Quartile					
2nd	0.0048	0.0055	-0.0017	-0.0049	-0.0041
	(0.0037)	(0.0040)	(0.0037)	(0.0050)	(0.0064)
3rd	0.0025	0.0022	-0.0015	-0.0055	-0.0028
	(0.0041)	(0.0042)	(0.0043)	(0.0056)	(0.0070)

Table 4, Continued

4th (highest)	-0.0007	0.0001	-0.0025	-0.0057	-0.0080
	(0.0048)	(0.0049)	(0.0046)	(0.0063)	(0.0080)
2nd×Attrition		0.0317			
		(0.0279)			
3rd×Attrition		0.0560**			
		(0.0267)			
4th× Attrition		0.0172			
		(0.0253)			
2nd×Charter		-0.0183*			
		(0.0097)			
3rd×Charter		-0.0440***			
		(0.0084)			
4th×Charter		-0.0223*			
		(0.0125)			
Classroom					
First grade	0.0152***	0.0146***	0.0165***	0.0163***	0.0207***
	(0.0035)	(0.0032)	(0.0035)	(0.0040)	(0.0047)
Second grade	0.0226***	0.0228***	0.0241***	0.0243***	0.0284***
	(0.0037)	(0.0035)	(0.0037)	(0.0041)	(0.0047)
Third grade	0.0156***	0.0150***	0.0167***	0.0161***	0.0189***
	(0.0034)	(0.0032)	(0.0035)	(0.0040)	(0.0046)
Fourth grade	0.0119***	0.0111***	0.0127***	0.0130***	0.0174***
	(0.0040)	(0.0037)	(0.0040)	(0.0046)	(0.0052)
Fifth grade	-0.0074*	-0.0060*	-0.0074*	-0.0021	0.0002
	(0.0040)	(0.0032)	(0.0040)	(0.0046)	(0.0054)
Fixed Effects	Year	Year	Year & District	Year & School	Year & School
Log likelihood	-27335	-27308	-25857	-24400	-19520
Pseudo R^2	0.0214	0.0224	0.0660	0.0941	0.0996
Districts	692	692	597	598	588
Schools	2158	2158	2029	1603	1513
Observations	113,978	113,978	110,406	100,408	77,317

Notes: Michigan REP data. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is an indicator of within-school grade switching. Parentheses contain standard errors that are robust to clustering at the district level. Omitted categories include 0 years of prior experience, suburban school, proficiency quartile 1, kindergarten teacher, and 2004. In column 3, each charter school is coded as a unique district and receives its own fixed effect. The sample size decreases in columns 3 and 4, as observations from districts/schools that experience no within-school grade-level reassignments are dropped from the logit likelihood function. In column 5, a year of data is lost in constructing the "new to school" indicator.

Table 5. Grade Switching as a Predictor of Teacher Turnover (Logit APE)

Outcome	Stay Put	Switch grades	Leave school, district, or self-cont. classroom	Leave teaching or state
	1	2	3	4
Previous Switches	-0.0697***	0.0506***	0.0009	-0.0044*
	(0.0060)	(0.0030)	(0.0030)	(0.0025)
N	91045	91045	91045	91045
Pseudo R-squared	0.0391	0.0457	0.0511	0.0748
Log-Likelihood	-48279	-21699	-29611	-20029

Notes: Michigan REP data. *** p<0.01, * p<0.1. Parentheses contain standard errors that are robust to clustering at the district level. In addition to the "number of previous switches," the logit models estimated in this table include the same set of covariates as the model estimated in column 1 of table 4. One year of data was lost in creating the "previous switches" variable. Adding school FE to the model produces qualitatively similar results.

Table 6. Logit Average Partial Effects on Teacher Turnover

Type of turnover:	Leave school/district	Leave teaching/state
	1	2
Teacher		
Master's degree	0.0058*	-0.0113***
	(0.0031)	(0.0017)
1 year experience	-0.0231***	-0.0177***
	(0.0057)	(0.0046)
2 years experience	-0.0344***	-0.0178***
	(0.0070)	(0.0049)
3-4 years exper.	-0.0428***	-0.0359***
	(0.0066)	(0.0051)
5-9 years exper.	-0.0586***	-0.0728***
	(0.0074)	(0.0050)
10+ years exper.	-0.0883***	-0.0606***
	(0.0082)	(0.0049)
School		
% free/red.lunch	0.0480***	0.0067
	(0.0146)	(0.0053)
% black	0.0379***	0.0117**
	(0.0102)	(0.0047)
Charter	-0.0551***	0.0620***
	(0.0084)	(0.0040)
Quartile 2	-0.0197***	-0.0042
	(0.0049)	(0.0026)
Quartile 3	-0.0289***	-0.0033
	(0.0059)	(0.0026)
Quartile 4 (highest)	-0.0395***	-0.0020
	(0.0069)	(0.0028)
Pseudo R^2	0.049	0.073
Log Likelihood	-36925	-25643

Notes: Michigan REP data. N = 113,978. *** p<0.01, ** p<0.05, * p<0.1. Parentheses contain standard errors that are robust to clustering at the district level. Only selected variables are reported; the specifications estimated in this table are identical to that estimated in column 1 of table 4, less attrition. Adding school FE to the models produces qualitatively similar results.