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A Bad Commute: Does Travel Time to Work Predict Teacher and Leader Turnover and Other Workplace Outcomes?

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Research suggests that longer commute times can increase employee turnover probabilities by increasing job stress and reducing job attachment and embeddedness. Using administrative data from a midsized urban school district, we test whether teachers and school leaders with longer commute times are more likely to transfer schools or exit the school system. We find that transfer probability increases roughly monotonically through most of the commute time distribution. Teachers who commute 45 minutes or more to work are 10 percentage points more likely to transfer than another teacher in the same school commuting only 5 minutes. They are also 3 percentage points more likely to leave the district. Consistent with turnover patterns, we find that teachers with longer commute times are more likely to be absent from work. Their observation scores are also lower. These results suggest that schools may benefit from hiring teachers who live relatively close by, at least in the absence of supports or resources to compensate teachers with longer commutes. In contrast, we find no consistent evidence that principals' or assistant principals' likelihood of turning over, absence rates, or performance ratings are a function of their travel time from home to work.

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Research suggests that longer commute times can increase employee turnover probabilities by increasing job stress and reducing job attachment and embeddedness. Using administrative data from a midsized urban school district, we test whether teachers and school leaders with longer commute times are more likely to transfer schools or exit the school system. We find that transfer probability increases roughly monotonically through most of the commute time distribution. Teachers who commute 45 minutes or more to work are 10 percentage points more likely to transfer than another teacher in the same school commuting only 5 minutes. They are also 3 percentage points more likely to leave the district. Consistent with turnover patterns, we find that teachers with longer commute times are more likely to be absent from work. Their observation scores are also lower. These results suggest that schools may benefit from hiring teachers who live relatively close by, at least in the absence of supports or resources to compensate teachers with longer commutes. In contrast, we find no consistent evidence that principals' or assistant principals' likelihood of turning over, absence rates, or performance ratings are a function of their travel time from home to work.

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Educator turnover can harm school and student outcomes. Researchers have documented negative impacts on student achievement outcomes of turnover of both teachers (Ronfeldt, Loeb, & Wyckoff, 2013) and principals (Bartanen, Grissom, & Rogers, 2019). These impacts have fueled decades of research on the drivers of teacher turnover (see Grissom, Viano, & Selin, 2016, and Guarino, Santibañez, & Daley, 2006, for reviews), with a smaller but growing body of research examining the causes of leader turnover as well (e.g., Snodgrass Rangel, 2018; Grissom & Bartanen, 2019). This research has established that working conditions play a major role in educators' decisions to stay in their schools.

One understudied facet of educators' working conditions is the length of their commutes to work. Research outside education links longer commutes to multiple negative work-related

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and personal outcomes for workers. Workers with longer commutes experience diminished subjective well-being than similar workers with shorter commutes, including more psychological stress and burnout (Kluger, 1998; Amponsah-Tawiah, Annor, & Arthur, 2016; Mouratidis, 2020), higher levels of family conflict (Roberts, Hodgson, & Dolan, 2011; Bai, Gopalan, Ren, 2021), less time dedicated to social activities (Besser, Marcus, & Frumkin, 2008; Hilbrecht, Smale, & Mock, 2014), and lower job-embeddedness (Krauz, Koslowski, & Eiser, 1998; Purba, 2015). These consequences of longer commute times may push workers to leave their workplaces. They may also affect other job outcomes that are a function of working conditions, such as absenteeism, which have consequences for students (e.g., Herrmann & Rockoff, 2012).

While studies have highlighted that commute times can factor into teachers' work decisions (e.g., Marinell & Coca, 2013; Engel et al., 2014; Horng, 2009), few studies have directly examined the potential connection between teachers' travel time from work to home and their likelihood of turning over. One exception is Gershenson (2012), who examines how commute time is associated with substitute teachers' probability of taking an assignment. Others have examined whether commute time changes the probability of applying for a teaching position (Engel et al., 2014) and the extent to which commute time is associated with turnover intentions (Marinell & Coca, 2013), but research has not linked commute time and observed turnover across a population of fulltime teachers. Furthermore, we know of no studies that have examined travel time and turnover for school leaders.

Filling these gaps in the literature, this study tests whether commute times predict teachers', assistant principals' (APs), and principals' likelihood of leaving their jobs. Secondarily, we also examine whether longer commutes predict being absent from work and job performance, as measured by classroom observations.

Specifically, we ask: first, to what extent does travel time for teachers, assistant principals, and principals vary by school and educator characteristics? Second, to what extent does travel time predict an educator's likelihood of transferring schools or exiting the district? And finally, to what extent is increased travel time associated with educator absences and effectiveness?

To answer these questions, we draw on human resources and other administrative data from Metropolitan Nashville Public Schools, a countywide urban school district in the southeastern United States that serves approximately 85,000 students. The data include home and work addresses for teachers and school leaders, which we use to estimate commute times with traffic mapping software. The data permit us to observe teacher turnover and contain direct measures of teacher absences and performance. We then estimate models of teacher turnover, absences, and job performance as functions of commute time and other observable factors, employing school fixed effects to compare teachers in the same school environment.

We find that teachers' likelihood of transferring to another school in the district and of exiting the district increases substantially as their commute time increases. Predicted transfer probabilities are twice as large for teachers with one-way commutes of more than 45 minutes than for teachers with five-minute commutes in the same school, and their exit probabilities are about 40% higher. They also are absent two days more per year, on average, and receive somewhat lower classroom observation ratings. In contrast, we find little evidence that commute time predicts turnover, absences, or performance ratings for APs or principals, perhaps pointing to differences in job availability or other dynamics in the school leadership labor market.

How Commutes Can Drive Workplace Satisfaction and Turnover

In this section, we explore potential mechanisms through which commutes can affect worker turnover. We adapt a conceptual framework from Calderwood and Mitropoulous's (2019) review of *commuting spillover*, which posits that stress and strain caused by characteristics of a worker's commute can spill over into the workplace and home life (see Figure 1). In this framework, characteristics of the commute can result in *commute stressors* that then lead to *commuting strain* for the worker. That is, elements of the commute can be stressful for workers, leading to a strained physiological or emotional response. This strain can affect their workplace and home life, influencing workers' decisions to turn over (or change residence) to mitigate negative workplace and home life outcomes associated with commuting strain. In the following subsections we will review each element of this framework in more detail.

The Commute

Our framework highlights how characteristics of the commute can result in adverse outcomes. Following Calderwood and Mitropoulous (2019), we distinguish among the characteristics of the commute, commuting stressors, and commuting strain. *Characteristics of the commute* are, simply, objective factors that describe the commute, such as the time, length, and mode of the commute. Some of these characteristics can be *commuting stressors*, to the extent that they are subjectively perceived by commuters to be stressful experiences (Kosolowsky, 1997). These stressors can lead to *commuting strain*: the physiological and emotional responses to commuting stress (Novaco et al., 1979).

One obvious element of the commute that can lead to stress is distance. Intuitively, a longer commute is more stressful than a shorter commute. This pattern bears out empirically. Workers with longer commutes more often experience familial conflict and stress due to less time flexibility for family activities and household labor (Roberts, Hodgson, & Dolan, 2011; Bai,

Gopalan, & Ren, 2021). They also can devote less time to recreational activities that improve well-being (Hillbrecht, Smale, & Mock, 2014; Besser, Marcus, & Frumkin, 2008; Susilo & Dijst, 2008).

A commute's distance alone does not mechanically result in increased stress for workers. Novaco and colleagues (1979) claim that the *impedance* of a commute increases stress; that is, that commuting stress is a function of a commute's time. For example, a clear commute that is long in distance will be less stressful than one that is short in distance but for which traffic intensity increases its time. The authors theorize that impedance leads to commute stress because commuters on high-impedance commutes experience a loss of personal control, a predictor of increased stress. Time-intensive commutes thus may be especially stressful when work start (or end) times are inflexible, forcing workers to commute at high-traffic times of day (Lucas & Heady, 2002).

The mode of commute can also impact commute stress Active commute types, such as walking and biking, lead to less stress than driving, which is both physically inactive and mentally demanding (Hillbrecht, Smale, & Mock, 2014; Besser, Marcus, & Frumkin, 2008; Susilo & Dijst, 2008). Public transportation is similarly less stressful than driving, as it allows riders to devote attention to other activities (Lyons & Chatterjee, 2008; Smith, 2017; Olsson et al., 2013; Redmond & Mokhtarian, 2001).

Commuting Spillover

Commuting strain can spill over into the workplace. That is, the physiological and emotional responses to commuting stress can affect workplace performance and satisfaction (Calderwood & Mitropoulis, 2019). One mechanism identified in other research is diminished embeddedness, or feelings of fit with and connection and commitment to the workplace (e.g.,

Mathieu et al., 2016). Lower organizational embeddedness is associated with higher absence rates and a higher probability of turnover (Krausz, Kosolowsky, & Eiser, 1998). More specifically, a longer commute may leave workers less time to establish social connections with colleagues, perhaps because employees with longer commutes have less flexibility in their time use at work (Purba, 2015). This pattern has been examined phenomenologically among rural teachers; those who lived further away from the schools where they work had fewer ties to the school's surrounding community and felt less connected with students and colleagues (Nitta, Holley, & Wrobel, 2010).

Another way commuting strain can lead to lower performance is through burnout—prolonged exhaustion associated with stress—which is an important predictor of turnover (Amponash-Tawiah et al., 2016; Mouratidis, 2020). Consistent with this view, Golden (2006) found that regular telecommuters, who often had no physical commute to work, felt less work exhaustion and were less likely to turn over than those with a physical commute. This pattern may occur because workers trade off time they would prefer to spend on personal activities towards a commute, which may impact satisfaction with their home lives. For example, during the COVID-19 pandemic, telecommuters reallocated much of their commute time to personal activities (Kun, Sadun, Shaer, & Teodorovicz, 2020).

Commuting strain can also spill over into home life. Roberts, Hodgson, and Dolan (2011) examined data from a longitudinal survey of British households and found that longer commutes resulted in poorer psychological health for women but not men. They conjectured that women's higher share of household labor explained the difference. In a similar vein, researchers have found that higher commute times may be associated with more family conflict and less time spent and connection with family (Bai, Gopalan, Beutell, & Ren, 2021; Purba, 2015).

Voluntary or Involuntary Turnover

As shown in Figure 1, existing research suggests that the workplace and non-workplace spillovers of commuting strain increases the likelihood that workers with long commutes turn over. The idea is simple. In a labor market, workers choose, among jobs available to them, opportunities that maximize their utility, which is a function of compensation and various other characteristics that affect the enjoyment or satisfaction they experience from the work (Blumenberg & Ong, 2016; Morris & Zhou, 2018). The spillovers of longer commutes reduce the overall utility of the job, making it more likely that an alternative job opportunity becomes more desirable (Grissom, Viano, & Selin, 2016). In other words, holding other factors constant, a lengthy commute may increase the likelihood of voluntary turnover. Alternatively, if the strain of a long commute impacts a worker's job performance—for example, if they are absent more often or if they become more disconnected from the workplace (e.g., Mathieu et al., 2016, Purba, 2015)—involuntary turnover, or turnover driven by employer decisions, may become more likely as well.

Consistent with this view, numerous studies from other fields have linked commute length to turnover intentions (e.g., Amponsah-Tawiah, et al., 2016; Krausz, Koslowsky, & Eiser, 1998). In a few cases, commute time has been linked to observed turnover as well (e.g., Connor et al., 2003).

Applying this Framework to Teachers and School Leaders

Given existing research from other fields and the conceptual framework this research suggests, we hypothesize that educators with longer commutes will be more likely to turn over. The connection between commuting and turnover may be stronger for teachers, in fact, than for other workers. With few exceptions, educators do not have work-from-home options, so their

jobs necessarily entail a commute. Their work has inflexible start times that mean that educators often are commuting to work during peak morning traffic hours; this inflexibility may mean higher commute-to-work stress than other professionals experience (Lucas & Heady, 2002). Moreover, the vast majority of educators are women (80% in our study context), who may be especially prone to commute spillovers in the household because they have responsibility for a higher proportion of household labor than men (Roberts et al., 2011).

Some evidence suggests that commute times factor into teachers' decisions about where they work. For example, using conjoint analysis, Horng (2009) shows that long commutes make schools less attractive workplaces for teachers and that teachers are more responsive to commute time than workplace factors such as student characteristics that often are considered in teacher turnover studies (see Grissom, Viano, & Selin, 2016; Guarino, Santibañez, & Daley, 2006). Other studies have linked longer commutes to lower likelihoods that a teacher pursues a teaching job or to greater expressed turnover intentions on surveys (Engel et al., 2014; Marinell & Coca, 2013). Yet we uncovered no studies that connect longer commutes to teacher turnover decisions in administrative data. Similarly, we found no studies that consider commuting in the work decisions of school leaders, though we might expect relationships to be attenuated given that fewer administrative positions mean fewer opportunities to transfer and that workplace conditions in general have less clear relationships with turnover for leaders than for teachers (Snodgrass Rangel, 2018; Grissom & Bartanen, 2019).

Data and Measures

The setting for this study is Metropolitan Nashville Public Schools (MNPS) in Tennessee, the 38th largest district in the United States. MNPS educates 85,000 students per year across 162 schools. The student population is demographically diverse, with 40% students

identifying as Black, 28% identifying as Hispanic, and 32% identifying as another racial or ethnic identity. Thirty-eight percent are classified as economically disadvantaged. Although the city of Nashville makes up most of MNPS, the district covers all of Davidson County, including some smaller municipalities.

As important context for our analysis, Davidson County has relatively meager public transportation options. Among Nashville workers who work away from home, 84% travel to work alone by car, and another 11% carpool. Just 2% use public transportation, while only another 2% walk or bike (US Census Bureau, 2020). Nashville regularly ranks poorly in studies of traffic congestion and driver experiences, especially among cities of its size (e.g., Hall, 2019; Sauter, 2019). Moreover, MNPS school start times nearly all range from 7:05 am to 8:00 am, mapping closely onto American Community Survey (ACS) estimates placing the nexus of the morning commute in Nashville between 6:30 and 7:59 am (US Census Bureau, 2020).

We use longitudinal, deidentified administrative personnel records provided by the MNPS research and human resources teams spanning 2008-09 to 2019-20 that we link to ACS data from the United States Census Bureau. Table 1 shows descriptive statistics for our analytical sample, disaggregated by teacher (Column 1), AP (Column 2), or principal (Column 3) role. Personnel data show each educator's job assignment—that is, their role and the school in which they work—alongside other educator characteristics, including gender (recorded as binary), race/ethnicity, education level, and years of experience. For educator race/ethnicity, we simplify categorization to *Black, Hispanic, white,* or *other*, given than 99% of MNPS educators come from the first three groups. The district also records work absences and, after 2011-12, observation or practice ratings from the statewide educator evaluation system. Crucially, the data

also include home addresses for teachers, APs, and principals employed in the school district between the 2008-09 and the 2019-20 school years.

In addition, the data contain information on school characteristics (e.g., school tier or level, student demographics, average standardized test scores, and charter status). We use directory information to record the address of each school. From ACS data, we capture median income in the educator's home zip code, which we use as a proxy for family wealth or economic advantage.

Measuring Commute Time

Pairing home and school addresses, we calculated commute time using the community-contributed *georoute* Stata extension, which accesses the HERE API to calculate travel times between two addresses or coordinates. The HERE API uses historical street and traffic data to estimate the typical travel distance and travel time between two addresses or coordinates specific time of day, which provides a better approximation of distance and time commuters experience than straight-line distance calculations (Weber & Peclat, 2017). We estimated typical commute times from each educator's home to their school address at 7:00 am and between their school and home address at 3:00 pm. We averaged the commute times to estimate each educator's average one-way daily commute.[1] The mean one-way commute time was 21.8 minutes for teachers, 26.0 minutes for APs, and 24.9 minutes for principals.

The travel time measure this procedure creates is continuous; however, in most analyses we convert this continuous variable to a categorical one using 5-minute increments, with 45+ minutes as the highest category, to look for nonlinearities in relationships between travel time and educator outcomes. We exclude educators whose addresses are outside of the state or who

[1] Travel time to and from work were highly correlated (r=0.996), as were travel time and travel distance (r=0.95).

have commute times of longer than two hours because conversations with district human resources personnel suggested such travel times would indicate incorrect addresses. Overall, we can calculate commute times for 48,429 teacher-years, 1,480 AP-years, and 1,196 principal-years between the 2008-09 and 2019-20 school years.

Dependent Variables

Turnover. We use longitudinal personnel files to infer two types of turnover among educators in the district. We observe a *transfer* if an educator works in one school in year *t* and works at another school within the district in year *t+1*. About 12% of teacher-year and principal-year observations, and 22% of AP-year observations, transferred. We observe an *exit* if an educator in the data in year *t* is not present in the data in year *t*+1, which could include a move to another school district or an exit from education altogether. Exit rates were 7% for teachers, 5% for APs, and 6% for principals.[2]

Absences. Personnel records include a count of the number of days each educator was absent from school during a given school year, though we cannot distinguish among different types of absences (e.g., personal, sick, vacation days). The average teacher in our sample was absent 11.3 days. APs were absent an average of 9.4 days, and principals were absent an average of 21.9 days. In MNPS, teachers are on nine-month contracts that correspond to the school year, so absences generally correspond to lost instructional time for that teacher. Administrators, in contrast, are on eleven- or twelve-month contracts, so absences—such as those associated with a vacation—can occur during summer months when school is out of session. Because we do not

[2] We define transfers only for educators who stay within the same role. Educators who change roles (e.g., teachers who become APs) are excluded from the analysis in the year of the role change.

have information on the timing of absences, we cannot separate absences occurring within and outside the school year when students are present.

***Observation Scores*.** Tennessee law requires all school districts to rate educators' effectiveness each year using an approved set of rubrics. MNPS uses the TEAM system, which is employed by most districts in the state.[3] We use observation or practice scores from the district's implementation of TEAM to measure educator effectiveness. For teachers, observation scores are given by trained observers—usually a principal or AP—multiple times per year using the TEAM teacher observation rubric. The number of observations depends on the teacher's experience level and past effectiveness; we take the average over all observations conducted that year. For supplemental analysis, we separately examine scores from the four domains of the teacher rubric that constitute the overall score: preparation, environment, instruction, and professionalism.

For school leaders, we use a parallel measure, which is the practice rating assigned by the leader's supervisor using the TEAM administrator rubric. For APs, this supervisor is the building principal; for principals, it is the executive director who supports that principal's school. Leaders are rated twice per year, though we again take the average rating.

For both teachers and leaders, ratings are assigned on a five-point scale across multiple indicators of teacher or leader effectiveness, with five representing the highest level of effectiveness. The mean observation rating was 3.9 for teachers, 3.6 for APs, and 3.6 for principals.

Methods

[3] See https://team-tn.org for more information on TEAM.

We begin by describing commute times for teachers, APs, and principals by their individual characteristics and the characteristics of their workplaces. We then estimate a multinomial model of turnover as a function of commute time and conditioning on educator and school characteristics. Equation 1 describes our primary specification, which is a linear probability model:

$$Y_{ist} = \beta_o + \beta_1 C_{ist} + \beta_2 S_{st} + \beta_3 T_{it} + \tau + \sigma + \epsilon_{ist} \quad (1)$$

Y_{ist} is our dependent variable of interest—exit or transfer—for educator *i* in school *s* during year *t*. We estimate separate linear probability models to predict exits or transfers, where the outcome is the probability of exiting or transferring compared to staying.[4] C_{ist} is a vector of a series of indicator variables for travel time in five-minute increments, concluding with an indicator for 45+ minutes; 0–5 minutes is the excluded category. S_{st} is a vector of school characteristics (e.g., school tier, proportion of students who are Black, proportion of students who are Hispanic). T_{it} is a vector of educator characteristics, which include gender, race/ethnicity, years of experience, years of experience-squared, natural log of home zip code median income, and an indicator for whether the educator lives outside the district. τ is a year fixed effect, which accounts for factors that affect all schools equally in year *t*, such as a change in district compensation policy or the local economy. Our preferred models also include school fixed effects (σ), which account for all time-invariant characteristics of a school, such as its location. ϵ_{ist} is a random error term. β_1 is the parameter of interest, representing the difference in the dependent variable between educators with 0–5 minutes of travel time and educators at each other category of travel time. We estimate

[4] In other words, exiters are excluded from the models predicting transfers, and transferring educators are excluded from the models predicting exits.

models separately for teachers, assistant principals, and principals. Standard errors are clustered at the school level.

We run supplemental analyses predicting two intermediary outcomes in our conceptual framework: absences and observation ratings. These models are structured similarly to Equation 1, with these measures as the dependent variables.

Finally, we investigate how educator commute times change when educators change schools. This simple model takes a form shown in equation 2:

$$TIME_{it} = \beta_0 + \beta_1 YEAR_{t+1} + \gamma + \epsilon_{it} \quad (2)$$

This model includes observations for each transferring educator in time *t* (the year prior to transferring) and time *t*+1 (the year after transferring). The model predicts commute time ($TIME_{it}$) for transferring educators. β_1 is the parameter of interest, indicating the difference in travel time between each educator's prior school and their current school, accounting for teacher fixed effects (γ).

Educator Commute Times by Role

We begin by describing one-way commute times for MNPS teachers, APs, and principals. As shown in Table 1, teachers have the shortest commutes, with an average of 21.9 minutes each way, while principals have slightly longer commutes at 24.8 minutes, and APs have the longest commutes, at 26 minutes.

Figure 2 shows the distribution of commutes by role. Teacher commutes are slightly right skewed, with the modal teacher belonging to the 15–20-minute category. Principals have the same modal travel time, while APs' modal time is five minutes longer. Both administrative positions have larger fractions of educators in the right tail of the commute distribution. While

only 19% of teachers travel 30 or more minutes to work, 29% of principals and 34% of APs have one-way commutes of at least 30 minutes.

Commutes by Educator and School Characteristics

Table 2 describes one-way commute times by characteristics of educators and the schools in which they work. More experienced teachers' one-way commutes are shorter than less experienced teachers, but the differences are slight—approximately 1 minute shorter between the least and most experienced teachers.[5] Male teachers, APs, and principals all have commutes that are approximately 2 minutes longer than their female colleagues. White teachers generally have similar commutes to their Hispanic and Black colleagues, though white APs and principals have longer one-way commutes than Hispanic and Black leaders. Unsurprisingly, teachers and leaders who live outside the countywide school district have significantly longer commutes. Specifically, teachers who live out of county have commutes that are 13.8 longer than those who live inside the county. For APs and principals, these difference are 13.9 and 15.1 minutes, respectively.

There also are some notable differences in commute times by school characteristics. First, high school teachers, APs, and principals all have longer commutes (3–4 minutes) than their elementary and middle school counterparts. These differences may reflect that there are many fewer high schools in MNPS than other school types, making average commuting distances longer. Second, teachers working in schools with the highest achievement and the fewest students from low-income households have the shortest commutes (patterns are less stark for leaders). Teachers working at schools in the highest math and ELA achievement quartiles have one-way commutes that are approximately 3 minutes shorter than those who work in schools in

[5] Given that these values are based on (essentially) population data, we do not test for differences among groups within categories.

the other three quartiles; teachers are not clearly trading off shorter commutes to work in schools with more advantaged students. Similarly, teachers and leaders in schools in the lowest quartiles of proportion Black or proportion Hispanic generally have lower commutes than teachers in the highest quartiles (APs in the highest quartile of Black enrollment are an exception).

Predicting Teacher Turnover as a Function of Commute Time

Table 3 shows estimates from a series of linear probability models estimating the probability of teacher turnover. Odd-numbered columns show results without school fixed effects, while even-numbered columns add school fixed effects. Full results are suppressed in the main tables for parsimony but are available in Appendix Table 1. Figure 3 displays marginal plots from the school fixed effect models predicting the probability of transfer (Panel A) and exit (Panel B), with all covariates held at their mean. These plots provide a visual representation of the relationships depicted in the models.

Columns 1 and 2 show the results for models predicting teacher transfer. The patterns are virtually identical across the two models, so we focus on the school fixed effects model in column 2. For teachers, there is a roughly linear relationship between travel time and the probability of transferring schools, which is visible in the marginal plot for this model (Figure 3, Panel A). There is a statistically significant and slightly increasing difference between each other category and the 0–5-minute category. The difference in turnover probability between the 0–5 minute and 5–10-minute groups is statistically significant at the $p<.10$ level, while all other relationships are significant at the $p<.01$ level. At the high end, teachers who have commutes that are 45 minutes or longer each way are 10 percentage points more likely to transfer than teachers in the same school who commute for 0-5 minutes. This is a substantial increase in turnover probability, given the overall transfer rate of 12% across our analytic sample.

Columns 3 and 4 show results for models predicting teacher exit from the district. We again focus on the model including school fixed effects, as the results across the two models are substantially similar. Conditional on other factors, teachers have similar exit probabilities across the commute time distribution except for teachers with 30–35-minute-long commutes and teachers with 45+ minute commutes. Teachers with commutes longer than 45 minutes each way are 3 percentage points more likely to exit the data than teachers in the same school with commutes between 0 and 5 minutes—a difference that is statistically significant at the $p<.05$ level. Teachers with 30–35-minute commutes are 2 percentage points more likely to exit than teachers with 0–5-minute commutes. Indeed, though not shown, teachers with a commute of more than 45 minutes have statistically higher (at the .05 level) exit probabilities than teachers whose commute lengths fall into the 10–15, 15–20, 20–25, and 25–30-minute ranges as well. A difference of 3 percentage points is substantively meaningful, given that the overall exit rate among MNPS teachers in the sample is just 7%.

While relationships between covariates and transfer probability are not the focus of our analyses, a few results concerning teachers' home locations are worth noting (see Appendix Table 1). Teachers who live outside of the school district are 3 percentage points *less* likely to transfer schools than those who live inside the district and who work in their same school, holding commute time and all other covariates constant. There is no statistically or substantively significant difference in exit probability between teachers (working in the same school) who live in vs. outside of the school district, conditional on commute time.[6] Additionally, a one percent

[6] These conclusions are different from those we would draw if commute time was not included. In models omitting commute time, living outside the county has a much smaller association with transfer probability that is not statistically distinguishable from zero (β = -0.006, p = 0.16). The associate with exit probability, in contrast, is relatively large and positive (β = 0.013, p < 0.001). This result is consistent with the interpretation that teachers who live outside the county are 1.3 percentage points more likely than Davidson County residents to turn over but that this association is driven by the fact that out-of-county teachers have systematically longer commutes. Given

increase in median income in a teacher's home zip code is associated with a 1 percentage point increase in probability of transfer but is not associated with a statistical or substantive difference in exit probability.[7]

Predicting AP and Principal Turnover as a Function of Commute Time

Table 4 shows results from models predicting AP and principal turnover as a function of commute time.[8] As with the last set of results, the odd-numbered columns show results without school fixed effects while the even-numbered columns show results with fixed effects. Columns 1 and 2 and Columns 5 and 6 show results for models predicting transfer for APs and principals, respectively. Columns 3 and 4 and Columns 7 and 8 show results for models predicting exit for APs and principals, respectively. Figure 4 shows marginal plots that illustrate predicted probabilities for each kind of turnover, using each of the models that include school fixed effects.

Table 3 shows no evidence that APs or principals at any commute length have a probability of either exit or transfer that is statistically different from those with the shortest commutes.[9] Visually, Figure 4 shows no clear patterns in predicted values, with the exception of transfer probabilities for APs; Panel A shows that, if anything, APs with longer commutes are

concern that most teachers with 45+ minute commutes live in other counties, we also compared models of commute time and transfer or exit that excluded the out-of-county residence variable. The results for commute time were substantively very similar to those shown in Table 3.

[7] Given research that women may see harsher consequences of long commutes than men (e.g., Roberts, Hodgson, and Dolan, 2011), we also tested for an interaction between sex and commute time (not shown). Estimates are imprecise but provide suggestive evidence that women and men have very similar transfer probabilities throughout the commute time distribution except above 40 minutes, where women's transfer probabilities increase more than men's. There is no corresponding pattern for exits.

[8] Full results can be found in Appendix Table 2.

[9] Tests of differences in the coefficients show some statistically significant differences between categories when controlling for school fixed effects. In the school fixed effects models, for example, for APs, there are statistically significant differences in transfer probability between APs with a 5–10-minute commute and those with 30–35, 35–40, 40–45, and 45+ minute commutes, with the longer commutes corresponding to lower transfer rates. Similarly, APs with 5–10-minute commutes are more likely to exit than APs with 10–15, 20–25, 25–30, and 45+ minute commutes—results that are statistically significant at the $p<.05$ level. But there is no clear visual pattern in the commute time and exit relationship after the probability of exit jumps between 5–10 and 10–15 minutes (Figure 4, Panel C), suggesting this finding may be an idiosyncratically low probability of exit for APs with 5–10-minute commutes compared to all other groups.

less likely to transfer, meaning the association is not in the expected direction. For principals, there appears to be no substantively important connection between commute times and either transfers or exits once other factors are taken into account.[10]

Predicting Changes in Commute Time After Transfer

If commute times factor into educators' transfer decisions, we expect that the schools to which transferring teachers move are closer to home than the schools they left. Table 5 shows results from analyses predicting the difference in commute time for transferring teachers (Column 1) and, for completeness, transferring APs (Column 2) and principals (Column 3). Teachers who transfer moved to schools that were 0.93 minutes closer to their homes on average. This difference amounts to approximately 4% of the average (pre-transfer) teacher commute length. Similarly, transferring principals move 2.2 minutes closer to home, on average, or 8% of their prior commute length. Both differences are statistically significant at conventional levels. In contrast, APs who transfer schools have commutes that appear substantively similar pre- and post-transfer, and the difference is not statistically significant.

Predicting Absences from Work

We now move on to intermediary outcomes, beginning with absences from work. Table 6 shows estimates from models predicting the number of absences for teachers (Columns 1 and 2), APs (Columns 3 and 4) and principals (Columns 5 and 6).[11] The odd-numbered columns do not include school fixed effects, while the even-numbered columns include them. In Figure 5, we also show margins plots predicting the number of absences for teachers (Panel A), APs (Panel

[10] Leaders with long commutes are more likely to live outside the county, but conclusions are similar if the out-of-county residence variable is excluded from the model.
[11] Full results can be found in Appendix Table 3.

B), and principals (Panel C) with different commute times, including school fixed effects and holding other factors in the model at their mean.

Again, we focus our discussion on the models including school fixed effects. Column 2 shows that absences generally increase as commute times increase. For example, teachers who have 10–15-minute commutes each way are absent 0.7 more days than teachers with 0–5-minute commutes, while teachers with 45+ minute commutes are absent 1.8 more days than teachers with 0–5-minute commutes. Panel A of Figure 5 shows that the association between the number of absences and commute time is roughly linear.

Column 4 shows results from models predicting absences for APs. There are no statistically significant differences between APs with 0–5-minute commutes and any other group, and tests for differences among other coefficients show no statistically differences among any commute times. Figure 5, Panel B similarly evinces no relationship. Column 6 shows that principals with 15–20-minute commutes are absent more often (by about 10 days) than principals with 0–5-minute commutes, and in fact, other tests show that this group is absent statistically more often than those with 10–15, 25–30, 30–45, and 35-30-minute commutes as well. Yet looking across groups in Figure 5, Panel C reveals no clear visual pattern; omitting the 15–20-minute group, the association appears mostly flat. As noted previously, however, the absences results for APs and principals are limited by our inability to distinguish between absences during the school year and those during the summer contract months that may not affect the day-to-day functioning of schools.

Predicting Observation Ratings

Table 7 shows estimates from models predicting educator observation or practice ratings and, again, are similarly structured to the tables from our other analyses.[12] Figure 6 shows margins plots from models with school fixed effects, holding covariates at their mean values.

Column 2 shows that, compared to other teachers in the same school, teachers with commutes longer than 30 minutes generally receive lower observation ratings than those with the shortest commutes. Teachers with 30–35-minute one-way commutes have observation ratings that are 0.05 points lower than those with 0–5-minute commutes ($p<.05$), and teachers with 40–45 and 45+ minute commutes have observation ratings that are 0.07 and 0.08 points lower, respectively ($p<.01$). Visually (Figure 6, Panel A), there appears to be some thresholds in commute time at which observation scores decrease for teachers: moving from a 10–15 minute commute to a 15–20 minute commute is associated with a 0.03 point drop in observation ratings ($p<.01$), and a move from a 25–30 minute commute to a 30–35 minute commute is associated with a 0.08 point drop in observation ratings ($p<.01$). This latter difference appears substantively meaningful; 0.08 points represents a 0.15 standard deviation difference in observation scores.[13]

There are no statistically significant differences in practice ratings among APs with different commute lengths in the model shown in Column 4, and the differences in groups illustrated in margins plots exhibit no clear pattern (Figure 6, Panel B). Relationships between ratings and commute times for principals generally are similarly flat, though there is evidence in Column 6 that principals with the shortest commutes in fact receive lower ratings than those with the longest commutes, counter to expectations (see also Figure 6, Panel C).

[12] Full results can be found in Appendix Table 4.

[13] To determine whether teacher practice ratings in the specific domains that constitute the overall score are sensitive to teacher commute time, we fit models predicting instruction, environment, planning, and professionalism ratings separately as a function of commute time. Results are shown in Appendix Table 5, and predicted observation scores are illustrated in Figure 10. Commute time is negatively associated with ratings in all four areas, which makes sense given the high inter-correlations among the domains.

Discussion and Conclusions

Our main results show that MNPS teachers' likelihood of transferring to another district school increases as their commutes become longer and that teachers with very long commutes are more likely to exit the district. Substantively, the relationship between commute length and turnover is large. A teacher with a commute of five minutes has a predicted probability of transferring of about 8%, while a teacher in the same school commuting more than 45 minutes has a predicted transfer probability of 18%. For exits from the district, the difference for these two teachers is 8% and 11%, on average. Moreover, teachers with longer commutes are absent from school more often—nearly two workdays between those with 5-minute commutes and those with more than 45-minute commutes—and are rated less effective in their classroom observations than other teachers in their schools.

These results are consistent with our conceptual framework: longer commutes create stresses at work and home that reduce job satisfaction and connection to the workplace, which, in turn, hurts retention and other work outcomes. Interpreting our estimates as causal, however, requires ruling out other possibilities. Making a statistical comparison among teachers with similar observable characteristics in the same school, for example, rules out the possibility that teachers with longer commutes systematically are beginning teachers who have higher turnover propensities, or that the results are driven by the fact that some schools—perhaps ones in very low-income neighborhoods where turnover rates often are higher—simply are further away from the neighborhoods where teachers tend to live. Other threats to a causal interpretation remain, however. We cannot rule out, for example, that the types of teachers who are more likely to turn over also have characteristics we cannot observe that make it harder for them to find (presumably preferred) jobs close to home. Estimation strategies that leverage other sources of

variation—for example, road construction that affects commute times for some educators—might provide additional evidence regarding the appropriateness of causal interpretation.

Even if the results are not causal, however, they still have policy and practical relevance for schools and districts. Teachers who live further away from a school are absent more often and are less likely to stay. A human resources official or school principal making a teacher hiring decision might take this descriptive fact into account. Given the choice between two otherwise-identical candidates for a teaching position, our results suggest a higher payoff from choosing the candidate who lives closer to the school. Relatedly, teachers may not anticipate the strains that accepting a job with a longer commute may create. Making teachers aware of commute-related consequences as they are choosing among multiple teaching opportunities may result in a better long-term fit.

Relatedly, leaders might evaluate whether additional supports or accommodations are needed for teachers with long travel times to work to mitigate the challenges teachers' long commutes bring. Schools could allow for more flexible start times for teachers with long commutes by reducing the number of morning meetings or other morning responsibilities, or by giving those teachers planning periods to start the day, reducing the stress associated with the morning commute (Lucas & Heady, 2002). Remote options for meetings, professional development, and other non-instructional tasks may also reduce commute-related stress. Schools may also increase opportunities during work hours for community-building within the school to improve organizational embeddedness among those whose long commutes decrease their after-work availability. Finally, schools and districts could encourage educators to commute by bicycle or public transportation to the extent possible; such options are associated with higher

commute satisfaction and lower psychological stress (Lyons & Chatterjee, 2008; Smith, 2017; Olsson et al., 2012; Redmond & Mokhtarian, 2001).

Results for APs and principals suggest that the connection between commute time and work outcomes are much different for leaders than for teachers. We do not find evidence that principals' likelihood of transferring or exiting is a function of commute time. AP exit appears similarly insensitive to commute length, and transfer likelihoods may even be declining in commute time. Moreover, we find no consistent evidence that APs or principals with longer commutes are more likely to be absent or have different observation ratings, though measurement challenges for absences prevent us from drawing strong conclusions for this outcome in particular.

We have no firm explanation for the difference in these results relative to the much clearer results for teachers. One possibility is a lack of statistical power in estimating models for leaders, given their vastly lower numbers in our sample. Another is that the labor market dynamics for leaders are different in important ways. School districts have many fewer administrative vacancies than teaching vacancies, and competition for administrative positions mean that prospective leaders have fewer choices in where they work than teachers have. To be able to accept and maintain a school leadership opportunity, a principal or AP may have to be willing to commute further. Future research into principals' and APs' decisions about where to work (and districts' decisions about where they work) may help illuminate why commute length appears less relevant for their outcomes than for teachers'.

Our study faces several limitations. First, it takes place in a single urban district with low public transportation availability and utilization. Future research investigating the role of commuting for educators' work outcomes in other contexts, including those in non-urban areas

and in areas with different transportation options, would help establish the degree to which the results we find here generalize. Second, the study offers but does not directly test theoretical linkages between commuting and workplace outcomes such as turnover and absences. Studies, including qualitative studies, documenting whether and how commute length affects intermediate outcomes such as job embeddedness and job commitment and linking those constructs to turnover, absences, and job performance would be valuable, as would studies exploring other potential mediators.

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Figure 1. Conceptual Framework

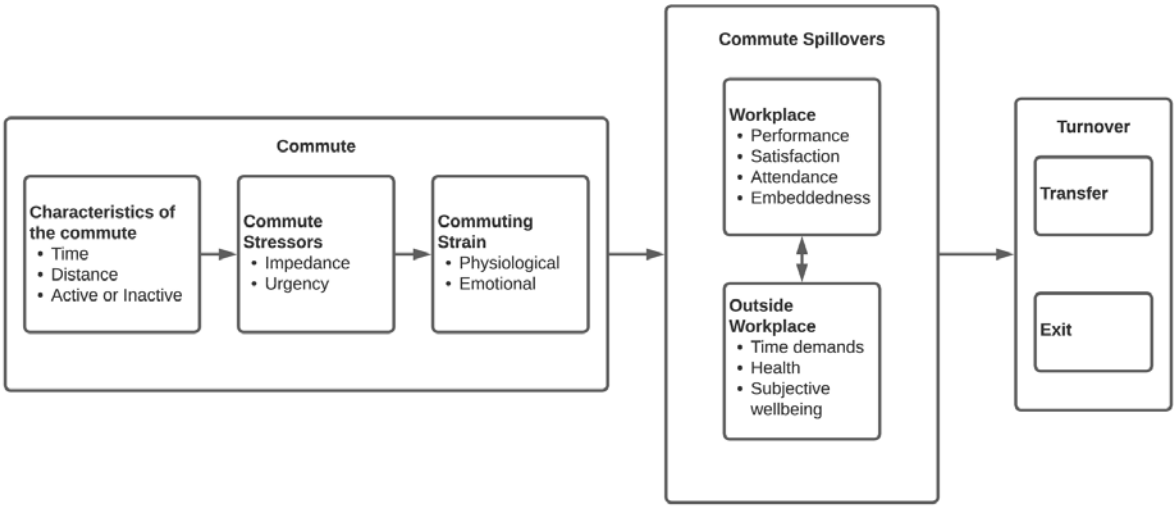


Figure 2. Distribution of One-Way Commute Times by Role

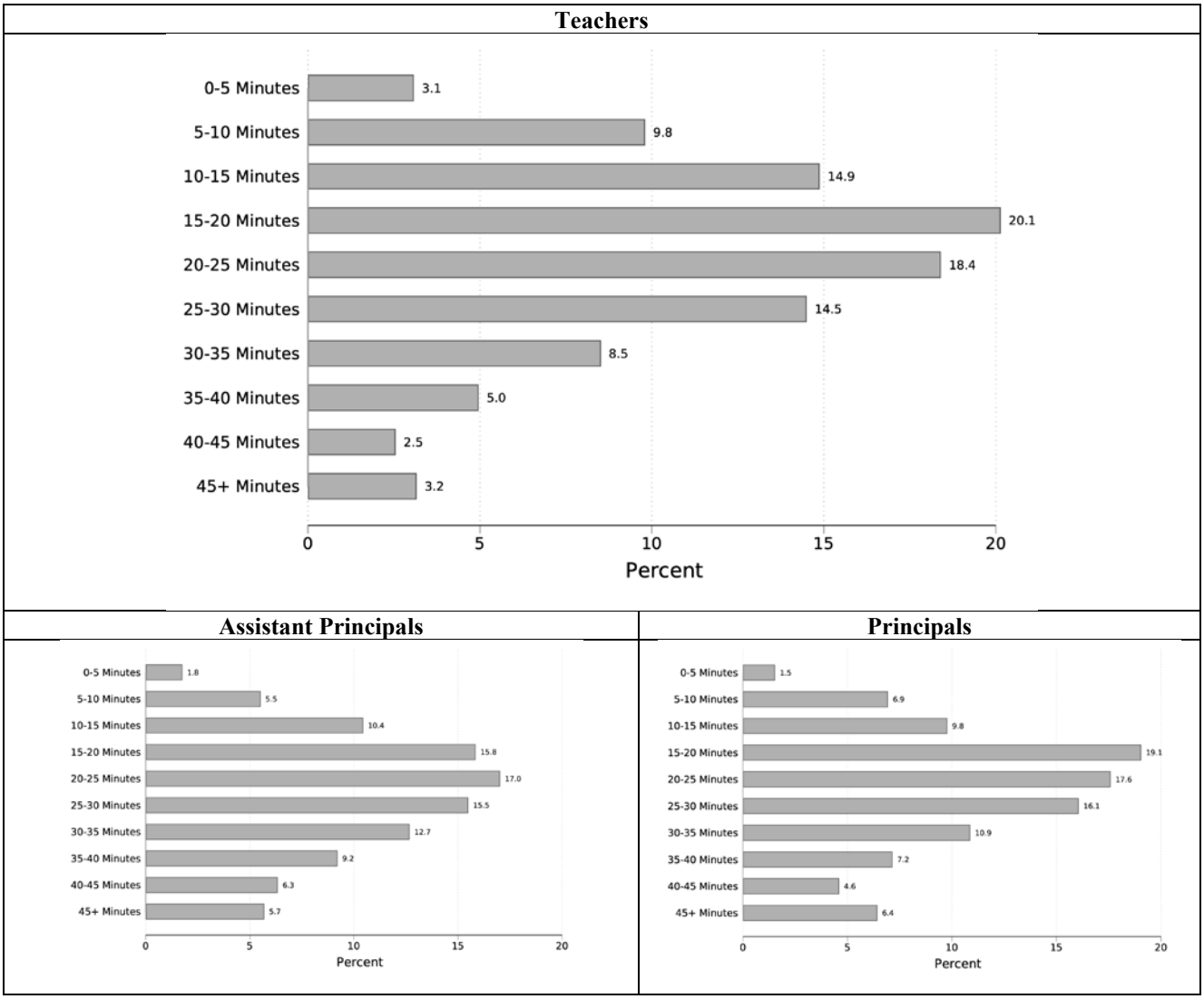
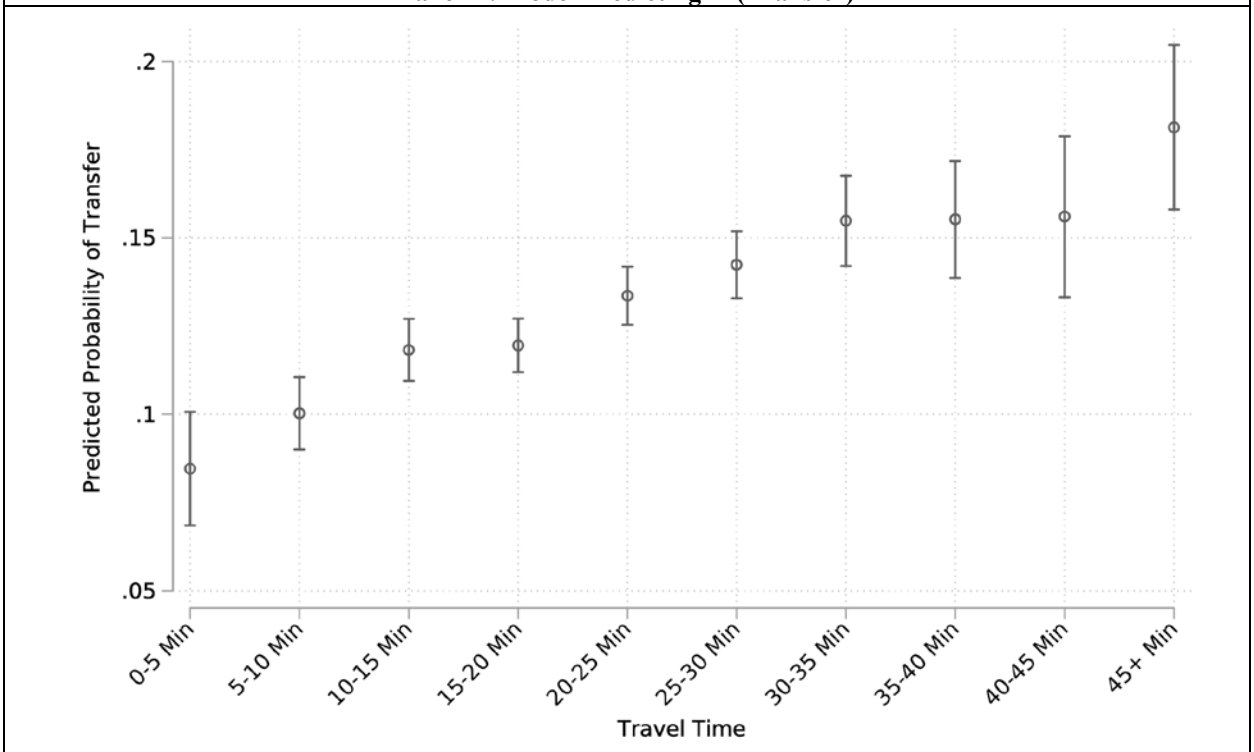
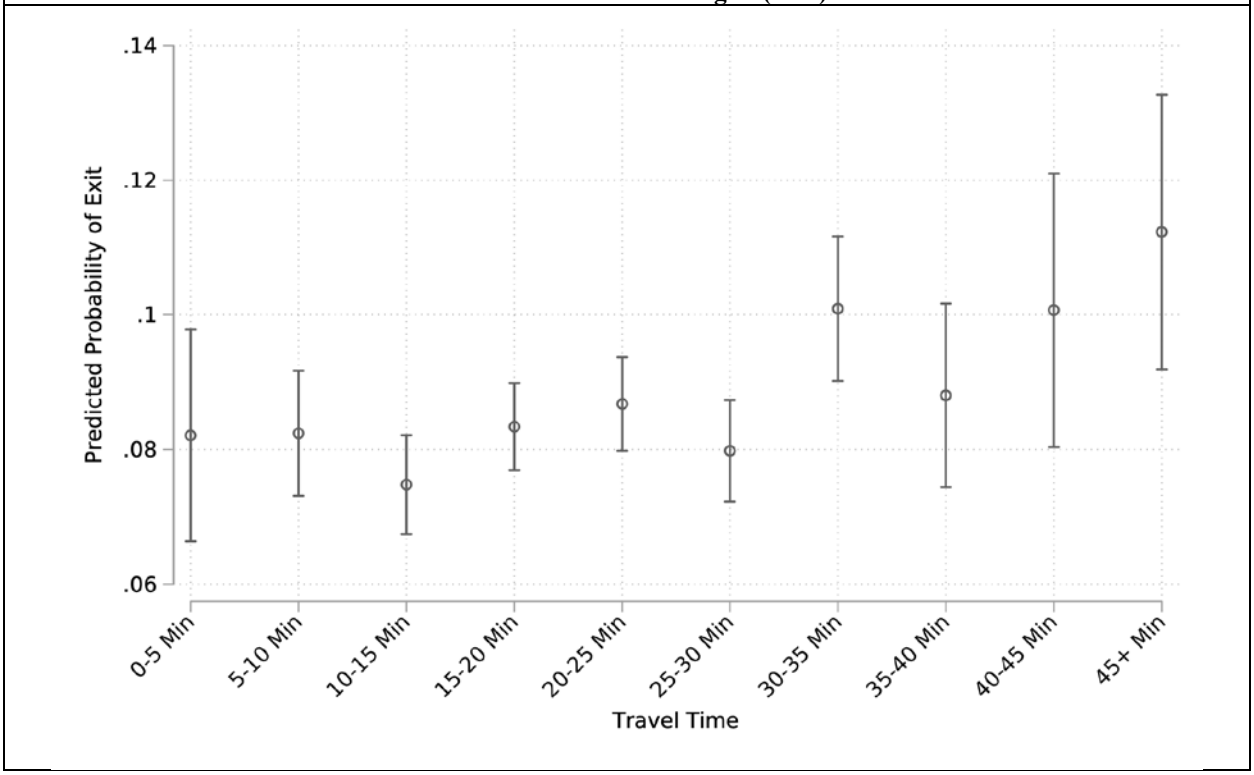


Figure 3. One-Way Commute Time Predicts Teacher Transfer and Exits

Panel A: Model Predicting Pr(Transfer)

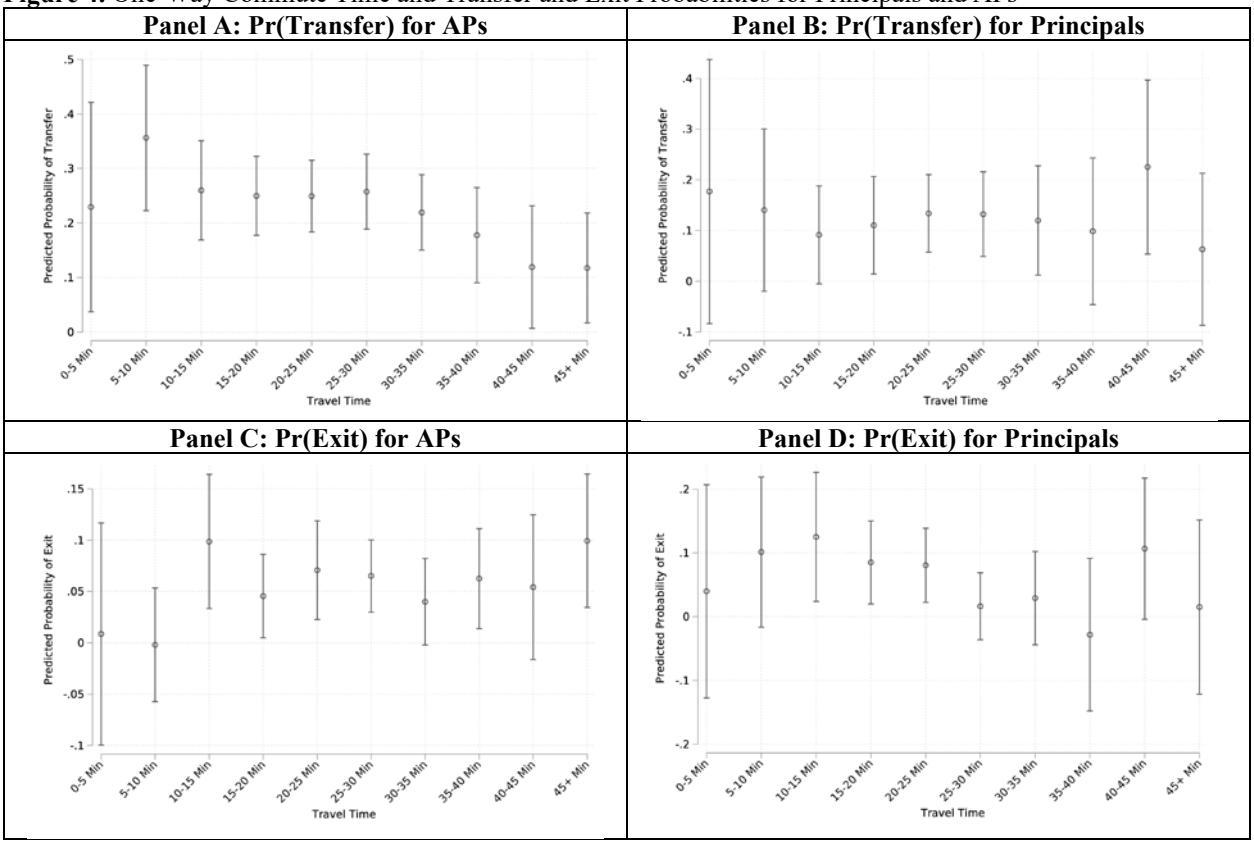


Panel B: Model Predicting Pr(Exit)



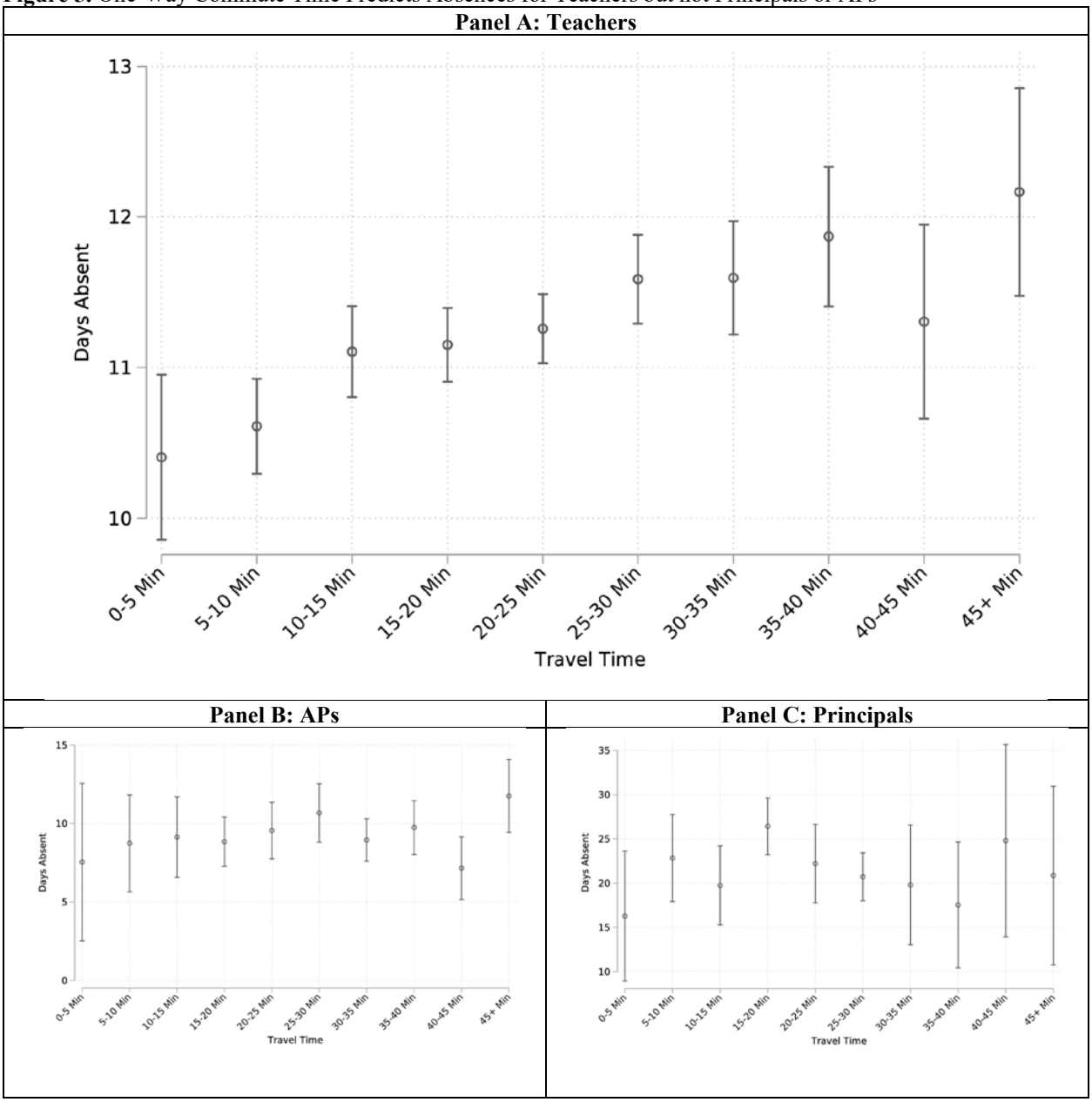
Note. Models include educator and school characteristics and school and year fixed effects.

Figure 4. One-Way Commute Time and Transfer and Exit Probabilities for Principals and APs



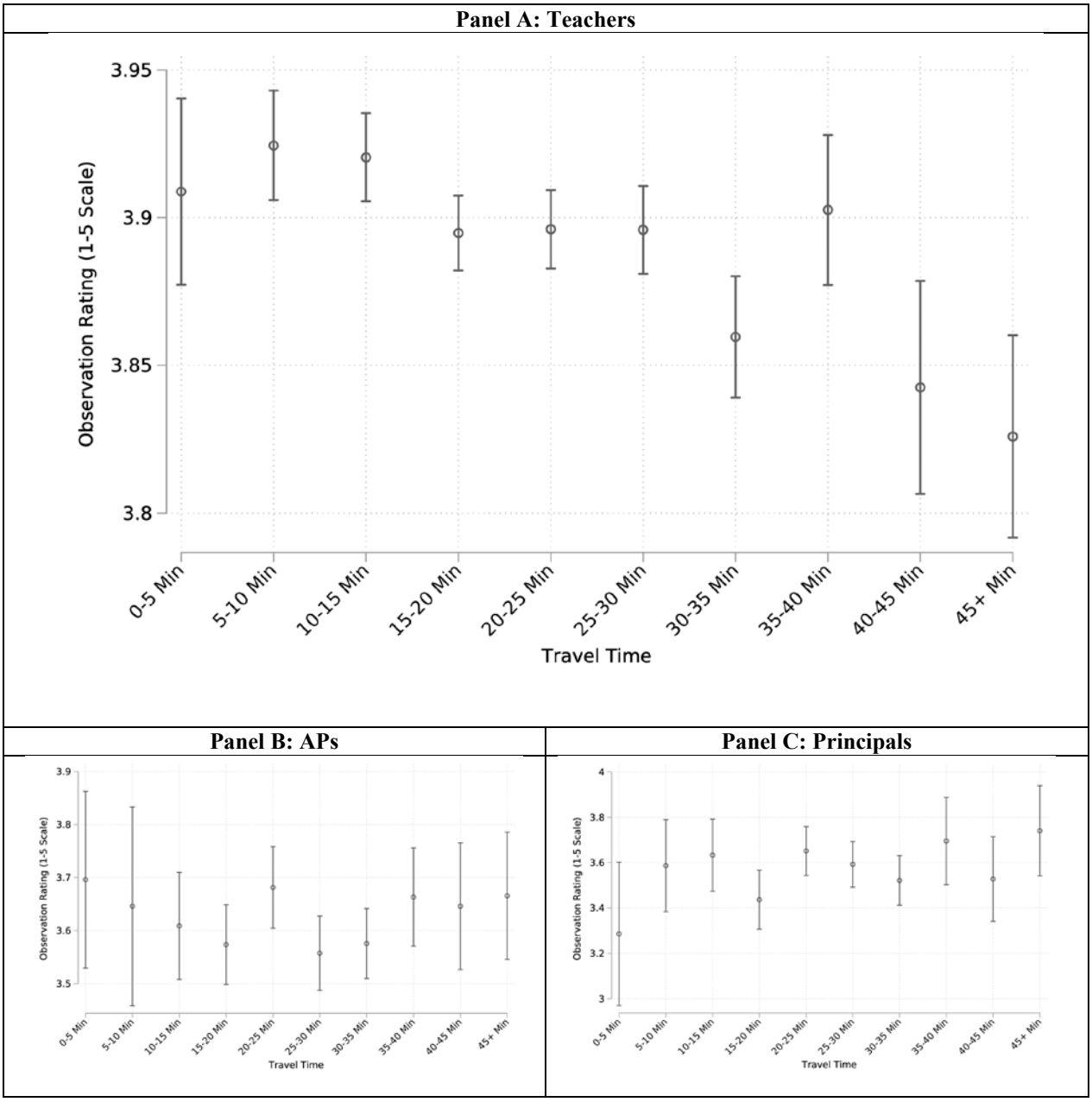
Note. Models include educator and school characteristics and school and year fixed effects.

Figure 5. One-Way Commute Time Predicts Absences for Teachers but not Principals or APs



Note. Models include educator and school characteristics and school and year fixed effects.

Figure 6. One-Way Commute Time and Educator Observation Ratings



Note. Models include educator and school characteristics and school and year fixed effects.

Table 1. Descriptive Statistics for Analytic Sample

	(1) Teachers	(2) Assistant Principals	(3) Principals
Commute Time, in Minutes	21.83	26.01	24.89
	(11.24)	(11.84)	(11.44)
Transferred Schools at End of the Year	0.12	0.22	0.12
Left District at End of the Year	0.07	0.05	0.06
Female	0.80	0.61	0.65
White	0.64	0.45	0.50
Black	0.24	0.42	0.39
Hispanic	0.11	0.13	0.11
Other Race	0.01	0.00	0.00
Total Years of Experience in Tennessee Public Schools	10.99	14.89	19.59
	(9.29)	(7.48)	(8.71)
Median Zip Code Home Value (in 1,000s)	219.78	198.77	218.94
	(111.31)	(91.34)	(109.64)
Home is Out of County	0.25	0.31	0.31
Elementary	0.54	0.32	0.56
Middle	0.23	0.29	0.24
High	0.22	0.39	0.18
Other	0.01	0.00	0.02
Charter School	0.03	0.03	0.05
Days Absent	11.27	9.44	21.87
	(9.03)	(9.08)	(15.61)
Observation Rating (1-5 Scale)	3.89	3.62	3.59
	(0.57)	(0.52)	(0.48)
Educator-by-Year Observations	38429	1480	1193

Standard Deviations in Parentheses

Table 2. Educator's One-Way Commute Times by Educator and School Characteristics

	Teacher		Assistant Principal		Principal	
	Mean	SD	Mean	SD	Mean	SD
Educator Characteristics						
Total Experience in Tennessee public schools						
1st Year	22.5	12.3	[a]	[a]	[a]	[a]
2-5 Years	22.2	11.8	23.8	11.0	25.3	13.0
6-15 Years	21.7	10.8	25.8	12.1	24.8	10.7
16+ Years	21.6	11.1	26.3	11.8	25.0	11.6
Female	21.5	11.1	24.9	11.1	24.4	10.8
Male	23.4	12.0	27.5	12.9	25.9	12.3
White	22.0	11.6	27.4	13.3	26.8	13.0
Black	21.3	10.2	24.3	9.7	22.5	8.3
Hispanic	21.9	11.4	26.1	12.3	25.6	12.0
Live In County	18.4	8.2	21.6	9.3	20.2	8.2
Live Out of County	32.1	12.9	35.5	11.4	35.3	10.5
School Characteristics						
Elementary School	20.9	10.9	24.9	11.3	24.2	11.6
Middle School	22.0	11.6	24.4	11.0	25.0	11.2
High School	23.8	11.5	28.2	12.6	27.3	11.6
Math Scores						
First Quartile	23.0	11.3	25.0	11.6	24.9	11.3
Second Quartile	22.6	11.2	26.6	12.4	25.6	11.2
Third Quartile	21.8	11.2	27.5	12.3	25.4	11.9
Fourth Quartile	20.1	11.2	23.7	9.7	23.2	11.2
ELA Scores						
First Quartile	23.0	11.4	24.1	11.6	25.4	10.2
Second Quartile	22.3	10.9	27.0	11.9	24.7	11.4
Third Quartile	22.4	11.5	27.3	12.4	24.5	12.2
Fourth Quartile	19.8	10.9	24.4	10.8	24.8	11.4
Black Enrollment						
First Quartile	21.0	11.0	25.7	12.5	24.4	11.9
Second Quartile	22.1	11.6	26.5	11.5	26.6	10.8
Third Quartile	22.6	11.5	26.8	12.4	23.4	10.9
Fourth Quartile	22.0	10.9	23.7	10.6	25.2	11.6
Hispanic Enrollment						
First Quartile	21.4	11.2	24.7	9.9	23.2	11.4
Second Quartile	21.5	11.2	26.3	12.2	26.2	12.6
Third Quartile	22.2	11.6	27.1	12.4	25.2	11.1
Fourth Quartile	22.2	11.1	25.2	12.2	25.1	9.7
Economically Disadvantaged						
First Quartile	20.7	11.3	26.5	11.7	24.9	12.0
Second Quartile	22.4	11.7	27.4	13.2	25.8	12.6
Third Quartile	22.4	11.3	25.7	11.7	24.7	10.6
Fourth Quartile	22.0	10.6	23.0	9.4	24.2	9.7

[a] Output suppressed due to small cell sizes.

Table 3. Teachers' One-Way Commute Times and Transfer and Exit Probabilities

	Pr(Transfer)		Pr(Exit Data)	
	(1)	(2)	(3)	(4)
5-10 Minutes	0.012	0.016*	0.003	0.000
	(0.009)	(0.009)	(0.009)	(0.009)
10-15 Minutes	0.031***	0.034***	-0.003	-0.007
	(0.009)	(0.009)	(0.009)	(0.009)
15-20 Minutes	0.037***	0.035***	0.004	0.001
	(0.009)	(0.009)	(0.008)	(0.009)
20-25 Minutes	0.050***	0.049***	0.006	0.005
	(0.009)	(0.009)	(0.009)	(0.009)
25-30 Minutes	0.059***	0.058***	-0.000	-0.002
	(0.009)	(0.010)	(0.009)	(0.009)
30-35 Minutes	0.074***	0.070***	0.019*	0.019*
	(0.010)	(0.011)	(0.010)	(0.010)
35-40 Minutes	0.069***	0.071***	0.009	0.006
	(0.012)	(0.012)	(0.011)	(0.011)
40-45 Minutes	0.075***	0.071***	0.022	0.019
	(0.014)	(0.015)	(0.013)	(0.013)
45+ Minutes	0.104***	0.097***	0.035***	0.030**
	(0.015)	(0.015)	(0.013)	(0.013)
Educator Characteristics	Yes	Yes	Yes	Yes
Time-Varying School Characteristics	Yes	Yes	Yes	Yes
Time-Invariant School Characteristics	Yes	No	Yes	No
Fixed Effects	Year	Year and School	Year	Year and School
Observations	35490	35490	33755	33755
R^2	0.04	0.07	0.06	0.08

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 4. Principals' and APs' One-Way Commute Times and Transfer and Exit Probabilities

	Assistant Principals				Principals			
	Pr(Transfer)		Pr(Exit Data)		Pr(Transfer)		Pr(Exit Data)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
5-10 Minutes	0.108	0.127	-0.076	-0.011	-0.037	-0.037	-0.014	0.062
	(0.091)	(0.118)	(0.053)	(0.061)	(0.109)	(0.160)	(0.057)	(0.103)
10-15 Minutes	0.113	0.030	0.031	0.090	-0.051	-0.086	-0.004	0.085
	(0.084)	(0.109)	(0.055)	(0.065)	(0.106)	(0.143)	(0.056)	(0.101)
15-20 Minutes	0.070	0.020	-0.012	0.037	-0.010	-0.067	-0.057	0.045
	(0.081)	(0.105)	(0.052)	(0.059)	(0.107)	(0.143)	(0.052)	(0.088)
20-25 Minutes	0.035	0.020	-0.018	0.062	-0.028	-0.043	-0.039	0.041
	(0.080)	(0.103)	(0.052)	(0.062)	(0.104)	(0.140)	(0.050)	(0.089)
25-30 Minutes	0.065	0.028	-0.031	0.057	0.009	-0.045	-0.063	-0.023
	(0.081)	(0.104)	(0.052)	(0.061)	(0.107)	(0.140)	(0.053)	(0.089)
30-35 Minutes	0.058	-0.010	-0.057	0.031	0.027	-0.057	-0.029	-0.011
	(0.082)	(0.105)	(0.051)	(0.059)	(0.109)	(0.143)	(0.053)	(0.095)
35-40 Minutes	0.030	-0.052	-0.017	0.054	-0.024	-0.079	-0.055	-0.068
	(0.084)	(0.110)	(0.052)	(0.062)	(0.109)	(0.158)	(0.055)	(0.115)
40-45 Minutes	-0.049	-0.110	-0.030	0.046	0.074	0.048	0.042	0.067
	(0.088)	(0.117)	(0.056)	(0.064)	(0.118)	(0.159)	(0.071)	(0.106)
45+ Minutes	-0.025	-0.112	0.004	0.091	-0.017	-0.114	-0.030	-0.025
	(0.088)	(0.113)	(0.056)	(0.067)	(0.111)	(0.146)	(0.059)	(0.107)
Educator Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-Varying School Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-Invariant School Characteristics	Yes	No	Yes	No	Yes	No	Yes	No
Fixed Effects	Year	Year and School	Year	Year and School	Year	Year and School	Year	Year and School
Observations	1404	1384	1151	1135	1112	1106	1045	1031
R^2	0.04	0.13	0.14	0.21	0.04	0.20	0.15	0.25

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 5. Change in One-Way Commute Time for Educators Who Transfer

	(1) Teachers	(2) Assistant Principals	(3) Principals
Change in Commute Time, in Minutes	-0.93***	0.18	-2.16**
	(0.17)	(0.76)	(0.83)
Commute During Year Before Transfer	23.17***	24.53***	25.43***
	(0.12)	(0.56)	(0.60)
Observations	7906	472	197
R^2	0.71	0.63	0.79

* $p < .10$, ** $p < .05$, *** $p < .01$

Note. Heteroskedasticity robust standard errors in parentheses.

Table 6. Educators' One-Way Commute Times and Days Absent from Work

	Teachers		APs		Principals	
	(1)	(2)	(3)	(4)	(5)	(6)
5-10 Minutes	0.228	0.205	1.195	1.198	6.603**	6.552
	(0.313)	(0.311)	(2.333)	(3.028)	(2.937)	(4.609)
10-15 Minutes	0.850***	0.701**	2.009	1.588	6.244**	3.457
	(0.315)	(0.315)	(2.038)	(2.875)	(2.866)	(4.146)
15-20 Minutes	0.885***	0.746**	1.834	1.293	9.773***	10.140**
	(0.302)	(0.303)	(1.921)	(2.697)	(2.766)	(4.165)
20-25 Minutes	0.963***	0.853***	2.335	2.007	10.079***	5.923
	(0.301)	(0.304)	(1.947)	(2.748)	(2.607)	(4.618)
25-30 Minutes	1.338***	1.181***	1.837	3.128	5.559**	4.433
	(0.319)	(0.322)	(1.939)	(2.717)	(2.559)	(3.707)
30-35 Minutes	1.225***	1.190***	0.183	1.403	5.479*	3.516
	(0.345)	(0.347)	(1.901)	(2.702)	(3.084)	(5.256)
35-40 Minutes	1.685***	1.465***	0.950	2.197	5.590*	1.260
	(0.374)	(0.377)	(1.983)	(2.717)	(3.109)	(5.188)
40-45 Minutes	1.206***	0.900**	-1.295	-0.391	9.622	8.515
	(0.444)	(0.445)	(1.980)	(2.846)	(6.870)	(6.450)
45+ Minutes	1.945***	1.761***	2.239	4.213	4.113	4.582
	(0.456)	(0.462)	(2.014)	(2.794)	(3.263)	(6.138)
Educator Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Time-Varying School Characteristics	Yes	No	Yes	No	Yes	No
Time-Invariant School Characteristics	Yes	No	Yes	No	Yes	No
Fixed Effects	Year	Year and School	Year	Year and School	Year	Year and School
Observations	27462	27455	1151	1139	851	844
R^2	0.03	0.05	0.04	0.17	0.08	0.35

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 7. Educators' One-Way Commute Times and Observation Ratings (0-5 Scale)

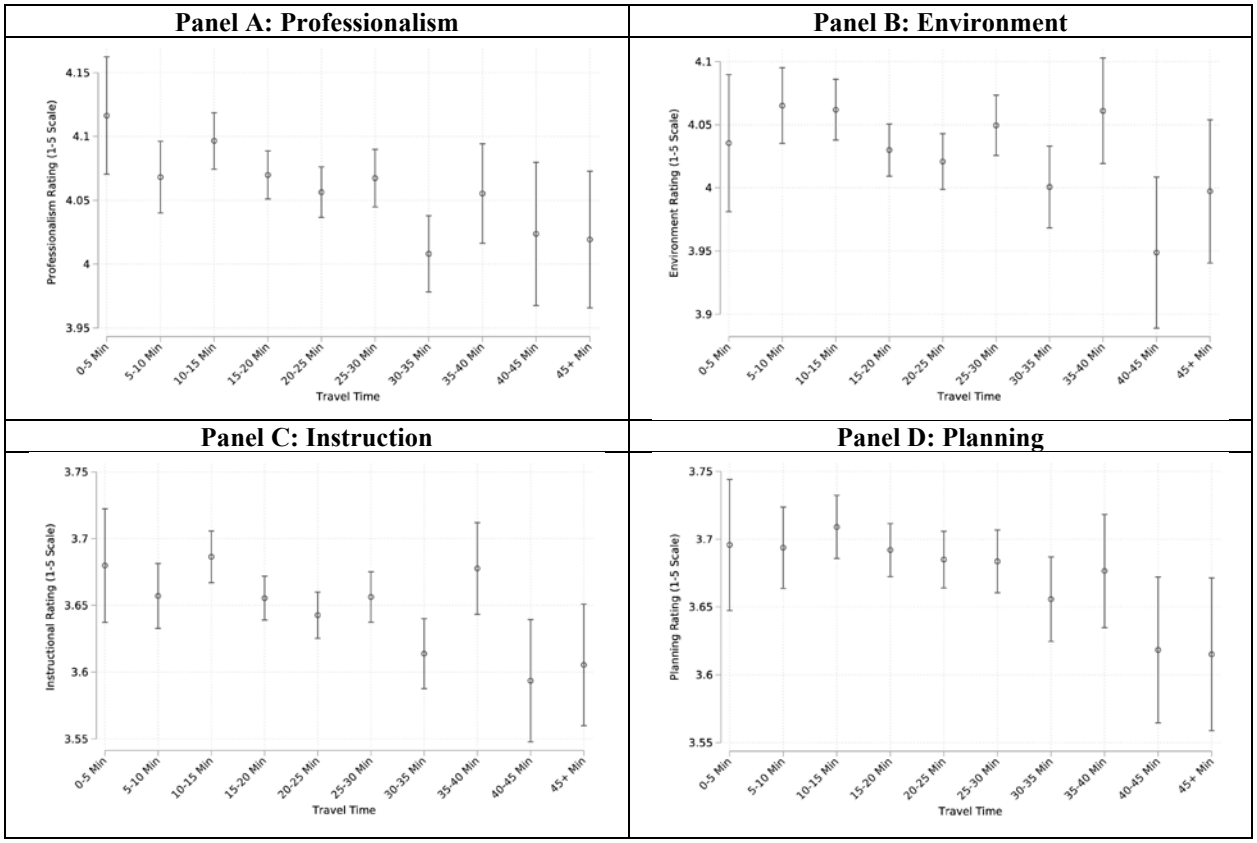
	Teachers		Assistant Principals		Principals	
	(1)	(2)	(3)	(4)	(5)	(6)
5-10 Minutes	0.027	0.016	-0.143	-0.050	0.224**	0.301
	(0.019)	(0.018)	(0.134)	(0.124)	(0.107)	(0.199)
10-15 Minutes	0.027	0.012	-0.186*	-0.087	0.322***	0.347**
	(0.019)	(0.018)	(0.107)	(0.098)	(0.103)	(0.175)
15-20 Minutes	0.015	-0.014	-0.138	-0.122	0.269***	0.151
	(0.018)	(0.017)	(0.101)	(0.092)	(0.098)	(0.171)
20-25 Minutes	0.000	-0.013	-0.120	-0.015	0.311***	0.365**
	(0.019)	(0.017)	(0.102)	(0.092)	(0.093)	(0.168)
25-30 Minutes	-0.005	-0.013	-0.203**	-0.138	0.273***	0.306*
	(0.019)	(0.018)	(0.101)	(0.094)	(0.093)	(0.161)
30-35 Minutes	-0.047**	-0.049**	-0.131	-0.120	0.284***	0.235
	(0.021)	(0.020)	(0.104)	(0.094)	(0.100)	(0.174)
35-40 Minutes	-0.006	-0.006	-0.039	-0.033	0.436***	0.409**
	(0.022)	(0.021)	(0.105)	(0.100)	(0.106)	(0.204)
40-45 Minutes	-0.084***	-0.066***	-0.132	-0.050	0.152	0.242
	(0.026)	(0.025)	(0.108)	(0.108)	(0.109)	(0.199)
45+ Minutes	-0.090***	-0.083***	-0.068	-0.030	0.346***	0.455**
	(0.026)	(0.024)	(0.111)	(0.109)	(0.115)	(0.190)
Educator Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Time-Varying School Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Time-Invariant School Characteristics	Yes	No	Yes	No	Yes	No
Fixed Effects	Year	Year and School	Year	Year and School	Year	Year and School
Observations	32777	32773	1324	1315	1027	1017
R^2	0.11	0.21	0.05	0.36	0.15	0.43

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.

* $p < .10$, ** $p < .05$, *** $p < .01$

APPENDIX MATERIAL

Appendix Figure 1. Marginal Plots Predicting TEAM Rubric Domain Scores for Teachers



Appendix Table 1. Linear Probability Models Predicting Multinomial Teacher Turnover as a Function of Commute Time

	Pr(Transfer)		Pr(Exit Data)	
	(1)	(2)	(3)	(4)
5-10 Minutes	0.012	0.016*	0.003	0.000
	(0.009)	(0.009)	(0.009)	(0.009)
10-15 Minutes	0.031***	0.034***	-0.003	-0.007
	(0.009)	(0.009)	(0.009)	(0.009)
15-20 Minutes	0.037***	0.035***	0.004	0.001
	(0.009)	(0.009)	(0.008)	(0.009)
20-25 Minutes	0.050***	0.049***	0.006	0.005
	(0.009)	(0.009)	(0.009)	(0.009)
25-30 Minutes	0.059***	0.058***	-0.000	-0.002
	(0.009)	(0.010)	(0.009)	(0.009)
30-35 Minutes	0.074***	0.070***	0.019*	0.019*
	(0.010)	(0.011)	(0.010)	(0.010)
35-40 Minutes	0.069***	0.071***	0.009	0.006
	(0.012)	(0.012)	(0.011)	(0.011)
40-45 Minutes	0.075***	0.071***	0.022	0.019
	(0.014)	(0.015)	(0.013)	(0.013)
45+ Minutes	0.104***	0.097***	0.035***	0.030**
	(0.015)	(0.015)	(0.013)	(0.013)
Educator Characteristics				
Female	0.011**	0.010**	0.015***	0.013***
	(0.005)	(0.005)	(0.004)	(0.004)
Black	0.020***	0.016***	-0.009**	-0.011***
	(0.005)	(0.005)	(0.004)	(0.004)
Hispanic	0.065***	0.057***	0.056***	0.033***
	(0.007)	(0.007)	(0.007)	(0.007)
Other Race	0.029	0.035*	0.052***	0.053***
	(0.021)	(0.021)	(0.020)	(0.020)
Years of Experience	-0.003***	-0.002***	-0.009***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Years of Experience^2	0.000	-0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Home is Out of County	-0.036***	-0.031***	0.001	0.003
	(0.005)	(0.005)	(0.004)	(0.004)
Median Income in Home	0.019***	0.013**	0.011**	0.003
Zip (log)	(0.006)	(0.006)	(0.005)	(0.005)
School Characteristics				
% Black Enrollment	0.002***	0.001**	0.002***	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)
% Hispanic Enrollment	0.001***	0.002***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
% Native Enrollment	0.003	0.030***	0.019***	0.011
	(0.008)	(0.010)	(0.007)	(0.008)
% AAPI Enrollment	-0.003	0.008	0.023***	0.013
	(0.009)	(0.012)	(0.009)	(0.011)
Percent ED or FRPL	0.000***	-0.000	-0.002***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
School Tier				
Middle	0.033***		0.008**	
	(0.005)		(0.004)	
High	-0.019***		-0.009**	
	(0.005)		(0.004)	
Other	0.029		-0.001	
	(0.019)		(0.014)	

Charter School	0.056***		0.203***	
	(0.016)		(0.015)	
Fixed Effects	Year	Year and School	Year	Year and School
Observations	35490	35489	33755	33754
R^2	0.04	0.07	0.06	0.08

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.

* $p < .10$, ** $p < .05$, *** $p < .01$

Appendix Table 2. Linear Probability Models Predicting Multinomial AP and Principal Turnover as a Function of Commute Time

	Assistant Principals				Principals			
	Pr(Transfer)		Pr(Exit Data)		Pr(Transfer)		Pr(Exit Data)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
5-10 Minutes	0.108	0.127	-0.076	-0.011	-0.037	-0.037	-0.014	0.062
	(0.091)	(0.118)	(0.053)	(0.061)	(0.109)	(0.160)	(0.057)	(0.103)
10-15 Minutes	0.113	0.030	0.031	0.090	-0.051	-0.086	-0.004	0.085
	(0.084)	(0.109)	(0.055)	(0.065)	(0.106)	(0.143)	(0.056)	(0.101)
15-20 Minutes	0.070	0.020	-0.012	0.037	-0.010	-0.067	-0.057	0.045
	(0.081)	(0.105)	(0.052)	(0.059)	(0.107)	(0.143)	(0.052)	(0.088)
20-25 Minutes	0.035	0.020	-0.018	0.062	-0.028	-0.043	-0.039	0.041
	(0.080)	(0.103)	(0.052)	(0.062)	(0.104)	(0.140)	(0.050)	(0.089)
25-30 Minutes	0.065	0.028	-0.031	0.057	0.009	-0.045	-0.063	-0.023
	(0.081)	(0.104)	(0.052)	(0.061)	(0.107)	(0.140)	(0.053)	(0.089)
30-35 Minutes	0.058	-0.010	-0.057	0.031	0.027	-0.057	-0.029	-0.011
	(0.082)	(0.105)	(0.051)	(0.059)	(0.109)	(0.143)	(0.053)	(0.095)
35-40 Minutes	0.030	-0.052	-0.017	0.054	-0.024	-0.079	-0.055	-0.068
	(0.084)	(0.110)	(0.052)	(0.062)	(0.109)	(0.158)	(0.055)	(0.115)
40-45 Minutes	-0.049	-0.110	-0.030	0.046	0.074	0.048	0.042	0.067
	(0.088)	(0.117)	(0.056)	(0.064)	(0.118)	(0.159)	(0.071)	(0.106)
45+ Minutes	-0.025	-0.112	0.004	0.091	-0.017	-0.114	-0.030	-0.025
	(0.088)	(0.113)	(0.056)	(0.067)	(0.111)	(0.146)	(0.059)	(0.107)
Teacher Characteristics								
Female	-0.009	-0.012	0.002	0.007	0.004	-0.001	0.007	-0.002
	(0.025)	(0.030)	(0.015)	(0.019)	(0.023)	(0.046)	(0.017)	(0.035)
Black	0.006	0.014	0.028*	0.032*	0.021	0.031	-0.022	-0.033
	(0.027)	(0.031)	(0.017)	(0.019)	(0.028)	(0.044)	(0.022)	(0.032)
Hispanic	-0.012	-0.010	0.071***	0.037	-0.040	-0.045	0.024	-0.020
	(0.037)	(0.038)	(0.025)	(0.026)	(0.030)	(0.035)	(0.027)	(0.031)
Other Race	-0.161***	-0.198**	-0.158	-0.209	0.421	0.435	-0.037	-0.248
	(0.045)	(0.084)	(0.098)	(0.147)	(0.365)	(0.277)	(0.032)	(0.151)
Years of Experience	0.003	0.007	-0.012***	-0.011*	0.003	0.009	-0.016***	-0.016**
	(0.006)	(0.008)	(0.004)	(0.006)	(0.005)	(0.007)	(0.005)	(0.006)
Years of Experience^2	-0.000	-0.000	0.000***	0.000**	-0.000	-0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Home is Out of County	0.026	0.033	-0.017	-0.023	-0.032	-0.081	-0.017	0.006
	(0.031)	(0.037)	(0.016)	(0.020)	(0.031)	(0.058)	(0.023)	(0.038)
Median Income in Home Zip (log)	0.035	0.069	0.008	0.015	-0.025	0.008	0.031	0.041
	(0.044)	(0.052)	(0.026)	(0.026)	(0.030)	(0.066)	(0.024)	(0.050)
School Characteristics								
% Black Enrollment	0.002*	-0.000	0.001	-0.000	0.001*	-0.000	0.001**	-0.001
	(0.001)	(0.004)	(0.001)	(0.003)	(0.001)	(0.002)	(0.001)	(0.002)
% Hispanic Enrollment	-0.001	-0.001	0.001	-0.001	0.000	0.000	0.002***	0.004*
	(0.001)	(0.004)	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)	(0.002)
% Native Enrollment	-0.078	-0.063	0.044	0.024	0.018	0.016	-0.045**	-0.059***
	(0.059)	(0.072)	(0.046)	(0.049)	(0.041)	(0.049)	(0.023)	(0.021)
% AAPI Enrollment	0.031	-0.035	-0.008	-0.025	0.016	0.011	0.006	-0.000
	(0.084)	(0.106)	(0.053)	(0.060)	(0.052)	(0.056)	(0.040)	(0.046)
Percent ED or FRPL	0.002*	0.002	-0.000	-0.001	0.000	-0.000	-0.001***	-0.002**
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Middle	-0.052*		0.005		0.057**		0.044**	
	(0.031)		(0.017)		(0.029)		(0.022)	
High	-0.109***		0.027		-0.036		-0.027	
	(0.031)		(0.018)		(0.027)		(0.020)	

Other					0.063		-0.066***	
					(0.076)		(0.025)	
Charter School	-0.065		0.427***		0.031		0.266***	
	(0.095)		(0.086)		(0.074)		(0.072)	
Fixed Effects	Year	Year and School	Year	Year and School	Year	Year and School	Year	Year and School
Observations	1404	1384	1151	1135	1112	1106	1045	1031
R^2	0.04	0.13	0.14	0.21	0.04	0.20	0.15	0.25

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.

* $p < .10$, ** $p < .05$, *** $p < .01$

Appendix Table 3. Linear Probability Models Predicting Days Absent as a Function of Commute Time

	Teachers		Assistant Principals		Principals	
	(1)	(2)	(3)	(4)	(5)	(6)
5-10 Minutes	0.228	0.205	1.195	1.198	6.603**	6.552
	(0.313)	(0.311)	(2.333)	(3.028)	(2.937)	(4.609)
10-15 Minutes	0.850***	0.701**	2.009	1.588	6.244**	3.457
	(0.315)	(0.315)	(2.038)	(2.875)	(2.866)	(4.146)
15-20 Minutes	0.885***	0.746**	1.834	1.293	9.773***	10.140**
	(0.302)	(0.303)	(1.921)	(2.697)	(2.766)	(4.165)
20-25 Minutes	0.963***	0.853***	2.335	2.007	10.079***	5.923
	(0.301)	(0.304)	(1.947)	(2.748)	(2.607)	(4.618)
25-30 Minutes	1.338***	1.181***	1.837	3.128	5.559**	4.433
	(0.319)	(0.322)	(1.939)	(2.717)	(2.559)	(3.707)
30-35 Minutes	1.225***	1.190***	0.183	1.403	5.479*	3.516
	(0.345)	(0.347)	(1.901)	(2.702)	(3.084)	(5.256)
35-40 Minutes	1.685***	1.465***	0.950	2.197	5.590*	1.260
	(0.374)	(0.377)	(1.983)	(2.717)	(3.109)	(5.188)
40-45 Minutes	1.206***	0.900**	-1.295	-0.391	9.622	8.515
	(0.444)	(0.445)	(1.980)	(2.846)	(6.870)	(6.450)
45+ Minutes	1.945***	1.761***	2.239	4.213	4.113	4.582
	(0.456)	(0.462)	(2.014)	(2.794)	(3.263)	(6.138)
Educator Characteristics						
Female	1.510***	1.482***	0.957*	1.486**	1.279	4.448**
	(0.130)	(0.131)	(0.551)	(0.697)	(1.398)	(2.111)
Black	0.216	0.244*	0.893	0.338	-2.717*	-1.749
	(0.144)	(0.147)	(0.640)	(0.788)	(1.476)	(1.920)
Hispanic	0.283	0.093	-0.874	-1.229	-0.402	-0.454
	(0.181)	(0.188)	(0.821)	(0.873)	(1.928)	(2.030)
Other Race	-0.865*	-1.017**	-4.610***	-6.872***	1.793	2.509
	(0.515)	(0.513)	(1.663)	(2.295)	(7.428)	(10.636)
Years of Experience	0.328***	0.317***	0.259*	0.221	1.179***	0.635**
	(0.017)	(0.017)	(0.142)	(0.175)	(0.232)	(0.321)
Years of Experience^2	-0.009***	-0.008***	-0.005	-0.006	-0.024***	-0.008
	(0.001)	(0.001)	(0.004)	(0.005)	(0.006)	(0.009)
Home is Out of County	0.149	0.141	1.614***	0.535	1.374	0.185
	(0.162)	(0.165)	(0.623)	(0.753)	(1.435)	(2.649)
Median Income in Home	-0.844***	-0.727***	-1.698*	-2.517**	3.176*	2.318
Zip (log)	(0.176)	(0.181)	(0.938)	(1.107)	(1.915)	(2.287)
School Characteristics						
% Black Enrollment	0.024***	-0.005	0.070***	0.149*	0.104**	0.073
	(0.004)	(0.019)	(0.020)	(0.090)	(0.043)	(0.125)
% Hispanic Enrollment	0.028***	-0.051***	0.071***	0.079	0.127***	0.375**
	(0.005)	(0.018)	(0.025)	(0.100)	(0.044)	(0.158)
% Native American	0.138	-0.008	1.057	2.270	3.912**	4.997***
Enrollment	(0.240)	(0.303)	(1.606)	(1.798)	(1.523)	(1.637)
% AAPI Enrollment	-0.109	-0.080	-0.794	0.308	0.328	2.312
	(0.321)	(0.402)	(1.496)	(2.017)	(2.731)	(4.401)
% ED or FRPL	0.002	-0.017***	-0.071***	-0.087***	-0.065**	-0.063
	(0.003)	(0.006)	(0.018)	(0.030)	(0.026)	(0.041)
Middle	0.414***		-1.429**		-1.995	
	(0.140)		(0.629)		(1.577)	
High	0.509***		-0.337		-1.536	
	(0.146)		(0.659)		(1.423)	
Other	0.866*				3.212	
	(0.519)				(2.522)	
Charter School	-8.954***				1.835	

	(0.467)				(6.180)	
Fixed Effects	Year	Year and School	Year	Year and School	Year	Year and School
Observations	27462	27455	1151	1139	851	844
R^2	0.03	0.05	0.04	0.17	0.08	0.35

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.

* $p < .10$, ** $p < .05$, *** $p < .01$

Appendix Table 4. Linear Probability Models Predicting Observation Ratings (0-5 Scale) as a Function of Commute Time

	Teachers		Assistant Principals		Principals	
	(1)	(2)	(3)	(4)	(5)	(6)
5-10 Minutes	0.027	0.016	-0.143	-0.050	0.224**	0.301
	(0.019)	(0.018)	(0.134)	(0.124)	(0.107)	(0.199)
10-15 Minutes	0.027	0.012	-0.186*	-0.087	0.322***	0.347**
	(0.019)	(0.018)	(0.107)	(0.098)	(0.103)	(0.175)
15-20 Minutes	0.015	-0.014	-0.138	-0.122	0.269***	0.151
	(0.018)	(0.017)	(0.101)	(0.092)	(0.098)	(0.171)
20-25 Minutes	0.000	-0.013	-0.120	-0.015	0.311***	0.365**
	(0.019)	(0.017)	(0.102)	(0.092)	(0.093)	(0.168)
25-30 Minutes	-0.005	-0.013	-0.203**	-0.138	0.273***	0.306*
	(0.019)	(0.018)	(0.101)	(0.094)	(0.093)	(0.161)
30-35 Minutes	-0.047**	-0.049**	-0.131	-0.120	0.284***	0.235
	(0.021)	(0.020)	(0.104)	(0.094)	(0.100)	(0.174)
35-40 Minutes	-0.006	-0.006	-0.039	-0.033	0.436***	0.409**
	(0.022)	(0.021)	(0.105)	(0.100)	(0.106)	(0.204)
40-45 Minutes	-0.084***	-0.066***	-0.132	-0.050	0.152	0.242
	(0.026)	(0.025)	(0.108)	(0.108)	(0.109)	(0.199)
45+ Minutes	-0.090***	-0.083***	-0.068	-0.030	0.346***	0.455**
	(0.026)	(0.024)	(0.111)	(0.109)	(0.115)	(0.190)
Educator Characteristics						
Female	0.162***	0.159***	0.083***	0.082**	-0.069**	-0.048
	(0.008)	(0.008)	(0.032)	(0.032)	(0.032)	(0.056)
Black	-0.102***	-0.095***	0.032	-0.017	0.016	-0.027
	(0.008)	(0.008)	(0.033)	(0.034)	(0.039)	(0.054)
Hispanic	-0.013	-0.012	0.075	0.060	0.040	0.060
	(0.010)	(0.009)	(0.048)	(0.046)	(0.048)	(0.047)
Other Race	0.034	0.028	-0.049	0.193	0.827***	0.552***
	(0.032)	(0.031)	(0.175)	(0.196)	(0.066)	(0.208)
Years of Experience	0.023***	0.022***	-0.021***	-0.016**	0.004	0.002
	(0.001)	(0.001)	(0.007)	(0.008)	(0.007)	(0.009)
Years of Experience^2	-0.001***	-0.001***	0.001***	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Home is Out of County	-0.010	-0.021**	0.006	-0.048	0.037	-0.003
	(0.009)	(0.009)	(0.039)	(0.044)	(0.049)	(0.083)
Median Income in Home Zip (log)	0.040***	0.044***	-0.007	0.062	-0.086*	0.112
	(0.010)	(0.010)	(0.065)	(0.068)	(0.048)	(0.079)
School Characteristics						
% Black Enrollment	-0.002***	-0.000	-0.001	0.008	-0.008***	-0.011***
	(0.000)	(0.001)	(0.001)	(0.005)	(0.001)	(0.003)
% Hispanic Enrollment	-0.002***	-0.002*	-0.004***	0.002	-0.009***	-0.002
	(0.000)	(0.001)	(0.001)	(0.005)	(0.001)	(0.004)
% Native American Enrollment	0.059***	-0.018	-0.080	-0.188**	-0.093	-0.032
	(0.013)	(0.015)	(0.090)	(0.096)	(0.057)	(0.056)
% AAPI Enrollment	-0.071***	0.062***	-0.208**	0.040	-0.052	0.117
	(0.018)	(0.022)	(0.090)	(0.104)	(0.065)	(0.075)
% ED or FRPL	-0.004***	-0.004***	-0.002*	0.000	0.002***	0.008***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Middle	-0.041***		-0.111***		-0.180***	
	(0.008)		(0.041)		(0.041)	
High	-0.056***		-0.005		0.120***	
	(0.008)		(0.038)		(0.044)	
Other	0.461***				0.136	
	(0.026)				(0.086)	

Charter School	-0.013		1.050***		0.494***	
	(0.030)		(0.185)		(0.105)	
Fixed Effects	Year	Year and School	Year	Year and School	Year	Year and School
Observations	31874	31870	1298	1288	999	991
R^2	0.12	0.22	0.05	0.37	0.16	0.44

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.

* $p < .10$, ** $p < .05$, *** $p < .01$

Appendix Table 5. Linear Probability Models Predicting Observation Ratings by Rubric Domain (0-5 Scale) as a Function of Commute Time

	Professionalism		Environment		Instruction		Planning	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
5-10 Minutes	-0.053*	-0.048*	0.023	0.030	-0.018	-0.023	-0.023	-0.002
	(0.029)	(0.027)	(0.032)	(0.031)	(0.026)	(0.024)	(0.031)	(0.028)
10-15 Minutes	-0.028	-0.020	0.027	0.026	0.025	0.007	0.007	0.013
	(0.028)	(0.026)	(0.031)	(0.030)	(0.025)	(0.024)	(0.029)	(0.027)
15-20 Minutes	-0.043	-0.047*	0.000	-0.006	0.007	-0.024	-0.013	-0.004
	(0.027)	(0.025)	(0.030)	(0.029)	(0.024)	(0.023)	(0.029)	(0.027)
20-25 Minutes	-0.061**	-0.060**	-0.018	-0.015	-0.016	-0.037	-0.024	-0.011
	(0.027)	(0.026)	(0.031)	(0.030)	(0.024)	(0.023)	(0.029)	(0.027)
25-30 Minutes	-0.059**	-0.049*	-0.004	0.014	-0.016	-0.024	-0.039	-0.012
	(0.028)	(0.026)	(0.031)	(0.030)	(0.025)	(0.024)	(0.030)	(0.028)
30-35 Minutes	-0.112***	-0.108***	-0.060*	-0.035	-0.067**	-0.066**	-0.083**	-0.040
	(0.031)	(0.028)	(0.034)	(0.033)	(0.027)	(0.026)	(0.032)	(0.030)
35-40 Minutes	-0.066*	-0.061*	-0.020	0.026	-0.010	-0.002	-0.060*	-0.019
	(0.034)	(0.031)	(0.037)	(0.036)	(0.030)	(0.029)	(0.035)	(0.033)
40-45 Minutes	-0.095**	-0.093**	-0.123***	-0.087**	-0.105***	-0.086***	-0.123***	-0.077**
	(0.040)	(0.038)	(0.044)	(0.042)	(0.034)	(0.032)	(0.041)	(0.038)
45+ Minutes	-0.103***	-0.097***	-0.103**	-0.038	-0.097***	-0.074**	-0.124***	-0.081**
	(0.039)	(0.037)	(0.043)	(0.041)	(0.034)	(0.033)	(0.041)	(0.039)
Educator Characteristics								
Female	0.195***	0.191***	0.164***	0.155***	0.127***	0.121***	0.184***	0.181***
	(0.012)	(0.012)	(0.013)	(0.013)	(0.011)	(0.010)	(0.013)	(0.012)
Black	-0.141***	-0.134***	-0.049***	-0.039***	-0.101***	-0.095***	-0.117***	-0.118***
	(0.013)	(0.012)	(0.014)	(0.013)	(0.011)	(0.011)	(0.013)	(0.013)
Hispanic	-0.120***	-0.073**	-0.065***	0.041	-0.042***	0.005	0.074***	-0.007
	(0.016)	(0.034)	(0.017)	(0.038)	(0.014)	(0.030)	(0.017)	(0.035)
Other Race	-0.034	-0.049	0.011	0.038	0.008	0.019	0.021	-0.020
	(0.050)	(0.048)	(0.056)	(0.057)	(0.045)	(0.045)	(0.051)	(0.051)
Years of Experience	0.018***	0.018***	0.019***	0.019***	0.021***	0.021***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Years of Experience^2	-0.000***	-0.000***	-0.000***	-0.000***	-0.001***	-0.001***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Home is Out of County	-0.025*	-0.022*	0.014	-0.011	0.006	-0.012	0.004	-0.007
	(0.013)	(0.013)	(0.014)	(0.014)	(0.012)	(0.011)	(0.014)	(0.014)
Median Income in Home Zip (log)	0.040***	0.037**	0.026	0.016	0.030**	0.029**	0.045***	0.021
	(0.015)	(0.015)	(0.016)	(0.016)	(0.013)	(0.013)	(0.016)	(0.015)
School Characteristics								
% Black Enrollment	0.001***	0.003*	-0.002***	0.004**	-0.001**	0.004***	-0.001	0.000
	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)	(0.001)	(0.000)	(0.002)

% Hispanic Enrollment	0.003***	0.001	-0.000	-0.002	-0.001*	0.003	0.001	-0.000
	(0.001)	(0.002)	(0.001)	(0.002)	(0.000)	(0.002)	(0.001)	(0.002)
% Native Enrollment	0.115***	0.003	0.107***	-0.054**	0.094***	-0.026	0.066***	-0.108***
	(0.020)	(0.024)	(0.021)	(0.026)	(0.018)	(0.022)	(0.022)	(0.026)
% AAPI Enrollment	-0.052**	0.010	-0.053*	0.050	-0.041*	0.073**	0.045	0.034
	(0.026)	(0.035)	(0.028)	(0.039)	(0.024)	(0.032)	(0.029)	(0.039)
Percent ED or FRPL	-0.007***	-0.006***	-0.006***	-0.007***	-0.005***	-0.004***	-0.005***	-0.006***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
School Type								
Middle	0.027**		-0.070***		-0.013		-0.036***	
	(0.012)		(0.013)		(0.011)		(0.013)	
High	-0.054***		-0.162***		-0.035***		0.004	
	(0.013)		(0.013)		(0.011)		(0.013)	
Other	0.255***		0.421***		0.451***		0.320***	
	(0.053)		(0.045)		(0.039)		(0.052)	
Charter School	0.080		0.131**		0.032		-0.038	
	(0.052)		(0.053)		(0.043)		(0.049)	
Fixed Effects	Year	Year and School	Year	Year and School	Year	Year and School	Year	Year and School
Observations	19691	19688	19563	19560	19762	19759	19572	19569
R^2	0.08	0.20	0.09	0.20	0.10	0.22	0.07	0.20

Standard errors in parentheses. Standard errors clustered at school level. Educator characteristics include teacher race/ethnicity (Black, Hispanic/Latino, Other Race, white is excluded), Years of experience with a quadratic term, and indicator for female educators, an indicator for whether the educator's home is outside of the district and the natural log of the median income in the educators' home zip code. Time-varying school characteristics include share of Black, Hispanic, Native American, and Asian/Pacific Islander enrollment (white enrollment is excluded for collinearity) and share of economically disadvantaged students. Time-invariant school characteristics include indicators for middle, high, and other schools (elementary excluded), and an indicator for whether a school is a charter school.
* $p < .10$, ** $p < .05$, *** $p < .01$