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Teacher Turnover During the COVID-19 Pandemic

Andrew Camp
University of Arkansas, Fayetteville, ac103@uark.edu

Gema Zamarro
University of Arkansas, Fayetteville, gzamarro@uark.edu

Josh B. McGee
University of Arkansas, Fayetteville

UNIVERSITY OF ARKANSAS | College of Education & Health Professions
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Andrew Camp, Gema Zamarro, and Josh McGee

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Andrew Camp*, Gema Zamarro & Josh McGee

University of Arkansas

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Abstract

Teachers' levels of stress and burnout have been high throughout the COVID-19 pandemic, raising concerns about a potential increase in teacher turnover and future teacher shortages. We examine how the COVID-19 pandemic affected teacher turnover in Arkansas from 2018-19 to 2022-23 using administrative data. We find no major changes in turnover entering the first two pandemic years, but a large increase of 5.3 percentage points (26%) entering the third year, with variation by teacher and student characteristics. We also find that increases in teacher turnover are related to instructional mode and that this turnover may partially be explained by the use of COVID-19 relief funds. Additionally, we find evidence that more effective teachers became more likely to leave the education sector after the pandemic as compared to before the pandemic. Our results suggest increased strain and reduced diversity and quality in the Arkansas teacher workforce and raise concerns about the long-term impacts that COVID-19 may have on its stability and quality.

Keywords: Teacher turnover, teacher retention, COVID-19

JEL Codes: I20, J28, J18

* **Corresponding Author:** Andrew Camp, Department of Education Reform, University of Arkansas, Fayetteville, AR 72701. ac103@uark.edu

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1 Introduction

The COVID-19 pandemic was a trying period for teachers. After nationwide school closures during the spring of 2020, schools reopened in the fall using combinations of in-person, hybrid, and remote learning models. Teachers had to adapt to unexpected conditions, teaching in unprecedented ways, using synchronous and asynchronous instruction, while also being challenged to establish connections with students, families, and colleagues. Health concerns added to the mix as some teachers went back to in-person education despite the lack of a vaccine and uncertainty surrounding COVID-19 transmission in schools.

Unsurprisingly, teachers' levels of stress and burnout were high at the beginning of the pandemic, raising concerns about a potential increase in teacher turnover and future teacher shortages (Goldberg, 2021; Lavery, 2020). Kraft et al., (2021) document how teachers' sense of success dramatically declined in the initial months of the pandemic, especially for teachers in schools with less supportive working environments. Diliberti et al., (2021) use nationally representative data from the RAND American Teacher Panel and note that most teachers who left the profession after March 2020 and before their scheduled retirement cited COVID-19 as a major reason why. Similarly, Zamarro et al., (2021) use data from the RAND American Teacher Panel and document how teachers' considerations of leaving the profession increased during the first year of the pandemic. Zamarro and coauthors find that approaching retirement age (i.e., being 55 or more years old), having to change instructional modes, COVID-19 related health concerns, and high levels of job-related burnout all were significantly associated with a higher probability of considering leaving or retiring. Hybrid teaching was also associated with increased consideration of leaving because of COVID. However, teacher considerations to leave might not necessarily match actual teacher turnover (Nguyen et al., 2022).

As state-level administrative data becomes available, an emerging literature has begun to document actual teacher turnover changes during the pandemic. Analyses of statewide data from Arkansas, Massachusetts, North Carolina, South Carolina, and Washington State indicate that teacher turnover was slightly lower entering the 2020-21 school year than in previous years

(Bacher-Hicks et al., 2023; Bastian & Fuller, 2023; Camp et al., 2022; CERRA, 2022; Goldhaber & Theobald, 2022b). This decrease in teacher turnover during the early pandemic period is consistent with research finding that teacher turnover tends to be lower when unemployment is high (Goldhaber & Theobald, 2022a). As the national economy began to recover, however, teacher turnover began to increase. Entering the 2021-22 school year, overall teacher turnover increased by 2 percentage points (10%) in Arkansas, 2.7 percentage points (18%) in Massachusetts, 2.3 percentage points (23%) in North Carolina, and 2.5 percentage points (16%) in Washington State relative to the previous school year (Bacher-Hicks et al., 2023; Bastian & Fuller, 2023; Camp et al., 2022; Goldhaber & Theobald, 2022b).

These changes in teacher turnover, however, did not affect all schools, and all students, equally. While turnover at schools serving high proportions of economically disadvantaged students has historically been higher than at schools serving more affluent students (Ingersoll, 2001; Papay et al., 2017), turnover in high-poverty schools decreased more than in affluent schools entering the 2020-21 school year before returning to levels in line with (Bastian & Fuller, 2021; Goldhaber & Theobald, 2022b) or slightly lower than (Bacher-Hicks et al., 2023) pre-pandemic turnover. Similarly, turnover at schools serving high proportions of minoritized students initially declined entering the 2020-21 school year before rebounding to pre-pandemic levels at the beginning of the 2021-22 school year (Bacher-Hicks et al., 2023; Bastian & Fuller, 2021). These changes appear to be driven both by teachers moving between schools within states and by teachers leaving the state teacher labor market, although it is unknown if they return to teaching in another state.

When compared with pre-pandemic trends, there are notable differences in terms of who is leaving the teacher workforce. In both Massachusetts and North Carolina, the turnover rate among minoritized teachers decreased entering the 2020-21 school year before increasing to levels higher than pre-pandemic at the start of the 2021-22 school year (Bacher-Hicks et al., 2023; Bastian & Fuller, 2021). In contrast, turnover for Black teachers increased entering both the 2020-21 and 2021-22 school years in Arkansas (Camp et al., 2022). These sharp increases, if continued,

could lead to a loss of diversity in the teaching workforce which, given the evidence supporting teacher-student race match effects (Gershenson et al., 2022), would disproportionately harm minoritized students. Similarly, in Massachusetts and Washington State, turnover among early career teachers appears to have rebounded to levels higher than pre-pandemic after modest declines entering the 2020-21 school year (Bacher-Hicks et al., 2023; Goldhaber & Theobald, 2022b), raising concerns about the long-term stability of the teacher workforce. However, there is important variation between states. While teachers near retirement were 4 percentage points more likely to exit the North Carolina teacher workforce entering 2021-22, there does not seem to be a substantial increase in attrition for these more experienced teachers in Massachusetts (Bacher-Hicks et al., 2023; Bastian & Fuller, 2021).

Recent analyses of administrative data for the current school year (2022-23) raise even more concerns. In North Carolina, teacher turnover increased by 4.4 percentage points (39%) relative to the 2019-20 school year and much of this increase appears to be driven by teachers leaving mid-year (Bastian & Fuller, 2023), potentially due to high levels of job-related stress (Diliberti et al., 2021; Zamarro et al., 2021). Similarly, teacher turnover in Washington State is at its highest level in nearly forty years with turnover most pronounced in high-poverty schools (Goldhaber & Theobald, 2023). Using a nationally representative survey of district leaders, Diliberti and Schwartz (2023) find that principals' reported levels of teacher turnover has increased by approximately 4 percentage points relative to pre-pandemic levels and that leaders in high-poverty districts, urban, and districts serving a high proportion of minoritized students reported the highest levels of turnover.

The uncertainty surrounding the stability of the teacher workforce is concerning, particularly in the context of COVID learning loss. American students experienced significant losses relative to what they would have been expected to learn during the COVID-19 pandemic with the most severe losses incurred by minoritized students (Goldhaber et al., 2022). The estimated lifetime impact of these losses, if not addressed, is estimated to result in a 5.6 percent reduction in students' lifetime earnings and 100 billion dollars in lost GDP for Arkansas alone

(Hanushek, 2023). While districts throughout the nation are working to address these learning losses with innovative and ambitious educational interventions, the implementation of these interventions has been marred by significant challenges including limited staff capacity (Carbonari et al., 2022). Not only are teachers the largest school-based factor contributing to students' academic success (Gershenson, 2021), but teachers are often the individuals responsible for implementing the interventions that will be needed to address COVID related learning losses.

Our paper contributes to this emerging literature on teacher turnover during the pandemic in several important ways. First, we provide additional evidence for a state that stressed in-person learning during the pandemic. In contrast with previously discussed states where turnover has been documented, Arkansas required school districts to offer five days of in-person learning at the beginning of the 2020-21 school year. As a result, in-person instruction in Arkansas was more prevalent than in other states, although remote and hybrid options were offered by nearly all districts. Arkansas is not unique in this respect. Governors in three other states (Florida, Iowa, and Texas) issued similar orders by September 2020[1]. Together, these states account for nearly 1 in 5 public school students and teachers in the US. Additionally, Arkansas differs from states like Massachusetts and Washington in that it had a robust system of alternative preparation and licensure waivers before the pandemic. Arkansas then offers a different context to evaluate the effects of the pandemic on teacher turnover and the differential impacts the pandemic may have had on the composition of the state's workforce.

Second, our rich statewide administrative data allow us to further study the specific roles that teachers take when they leave the classroom but remain employed within the public

[1] See https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2020-2021_academic_year

education sector. Distinguishing these transitions separately is important not only to more accurately depict turnover but because teachers who are still working within the education sector might be more likely to return to the classroom in the future. Third, in comparison with the available literature, we more thoroughly study the factors associated with teacher turnover and how their influence changed during the pandemic, including transitory pandemic specific drivers like the effects of instruction modality and changes in modality during the pandemic. While prior research has documented the consequences of remote and hybrid learning during the pandemic on student outcomes, less attention has been paid to understanding how teachers responded to these unexpected job demands. Documenting the relationship between these changes in instructional modality and teacher retention is important as teacher turnover often harms students' academic achievement (Hanushek et al., 2016) and staffing challenges may hamper districts' efforts to help students recover from pandemic learning losses.

Fourth, we are among the first to investigate changes in the teacher labor-force that could lead to challenges in the future. In particular, we investigate how teacher turnover relates to teacher quality as measured by value-added models. Differential attrition of high-quality teachers during the pandemic could result in significant shifts in aggregate teacher quality so, identifying changes in the retention of high- and low-value-added teachers is crucial to developing policy aimed at promoting access to effective teachers. Similarly, we are among the first to examine mid-year turnover which may be a proxy for teacher dissatisfaction or burnout.

Finally, we also explore how transitions to non-instructional roles might be related to the differential use by school districts of Elementary and Secondary School Emergency Relief (ESSER) funds for student support programs that could lead to the creation of new positions such as instructional coaches. This is of special policy relevance given the temporary nature of the ESSER funds. Overall, we believe our paper contributes with a more in-depth analysis of teacher labor market transitions during the pandemic and factors associated with such transitions.

Our results show that, despite little evidence of increases in teacher turnover outside of normal levels entering the 2020-21 or 2021-22 school years, teacher turnover in Arkansas increased

by 5.3 percentage points entering the 2022-23 school year. This increase can largely be explained by an increase in the proportion of teachers switching to non-instructional roles and leaving the Arkansas education workforce entirely. However, these increases are not uniformly distributed across teacher and school characteristics. We find evidence that more experienced teachers and Black teachers have been more likely to exit the Arkansas education workforce during the pandemic. We also find that increases in turnover can be partially explained by instructional mode during the 2020-21 school year, indicating that job stressors during the pandemic may have contributed to teachers' decisions to leave. Additionally, we find evidence of more permanent changes to the teacher labor force that may have lasting implications for student's academic progress. Our results suggest that higher-quality teachers became more likely to exit the workforce during the pandemic and that increases in turnover are partially explained using ESSER relief funds.

1.1 The Arkansas Context

Located in the South-Central United States and with a population of just over 3 million, Arkansas is a mid-size state in the country. From 2017-18 through 2022-23, there have been approximately 31,500 teachers and 490,000 students in the state's public school system each year[2]. Like national trends, most teachers in the state are female (77%) and white (87%). The proportion of teachers using some form of licensure waiver[3] has increased from 6% in 2017-18 to 8% during the 2021-22 academic year. Teacher turnover averaged 22% from 2018-19 through the 2020-21 school year but increased to 23% entering the 2021-22 and 26% entering the 2022-23 school years. The Arkansas

[2] Own calculations based on Arkansas administrative data provided to us.

[3] Licensure waivers include emergency teaching permits, long-term substitute waivers, alternative licensure plans, and waivers for charter schools and schools of innovation under Arkansas Act 1240.

Department of Education identifies teacher shortage areas based on the number of uncertified teachers[4] filling true vacancies. According to this classification, most geographical teacher shortage areas in the state are in the Lower Delta region (Southeast), followed by the Southwest and Upper Delta regions (Northeast)[5].

As in most other states across the United States, in March 2020 schools in Arkansas closed for in-person attendance, and students moved to remote learning for the rest of the academic year with the hope of containing the pandemic. Schools started to reopen in the fall of 2020 using different combinations of in-person, remote learning, and hybrid models. In contrast with many other states in the country, Arkansas' secretary of education issued guidance on August 5th, 2020, requiring all school districts in the state to offer in-person learning instruction five days a week when classes resumed later in August. Decisions about whether a school could close for in-person learning and pivot to remote learning options had to be made in collaboration with the Arkansas Department of Health and Education[6]. As a result, most districts in Arkansas (84%) offered fully in-person learning for all students in mid-September 2020. No districts were fully remote at that time[7]. However, changes in teaching modality were frequent with 45% of Arkansas teachers teaching in a district that changed modalities at least once during the 2020-21 academic year.[8]

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[4] Uncertified teacher is defined as a teacher employed under an Act 1240 wavier, a teacher employed under an emergency teaching permit, or a long-term substitute filling a true vacancy for a full year.
[5] https://static.ark.org/eeuploads/adhe-financial/Shortage_Areas_for_ADHE_8.26.2020.pdf
[6] See https://ballotpedia.org/School_responses_in_Arkansas_to_the_coronavirus_(COVID-19)_pandemic#cite_note-AR8241-14
[7] Data provided by the Arkansas Department of Education's Data Center and https://myschoolinfo.arkansas.gov/.
[8] Own calculations based on Arkansas administrative data and information from https://www.returntolearntracker.net/instructional_status/

2 Data

To examine teachers' mobility and attrition in Arkansas we use administrative data maintained by the Office of Education Policy and the Department of Education Reform at the University of Arkansas. These data cover the universe of traditional public and charter schoolteachers for the 2013-14 through the 2022-23 school years and allow us to track individual teachers throughout their time in the Arkansas teacher workforce.

We identify teacher turnover using these longitudinal data. We define an individual as a teacher in an Arkansas school if they serve as a teacher of record for one or more classes at that school. For teachers assigned to multiple schools (e.g., music teachers who may split time between buildings), we associate these teachers with up to four separate schools within a district each school year. We then construct a categorical variable representing employment decisions for each teacher at the start of each school year. We distinguish between four possible employment decisions. If a teacher remains in an instructional role at their current school(s), we consider them a "Stayer." If a teacher begins teaching at a school within the same district or in a different district but remains in the Arkansas teacher labor force, we categorize the teacher as a "Mover." If an individual ceases to teach in an Arkansas school but continues to be employed in the public education workforce (e.g., as a principal or instructional coach), we classify them as a "Switcher" while if the teacher exits the state's public education workforce entirely they are considered an "Exiter." Teacher turnover is measured by aggregating Movers, Switchers, and Exiters within the Arkansas teacher labor force.

As labor transitions may vary for teachers in STEM subjects (Nguyen et al., 2020), we identify STEM based upon the subject area of courses they serve as teacher of record for. These administrative data also include the teacher's date of birth, race, gender, years of teaching experience, and if they hold an advanced degree (master's, specialists' degree, etc.) as recorded by district personnel for pre-pandemic years 2018-19 and 2019-20 and for pandemic years 2020-2021 to 2022-2023. We merge our data with information from the Arkansas Department of Education's

Data Center[9] and the National Center for Education Statistic's Common Core of Data (CCD) to create variables representing the demographic composition of each school's student body, enrollment, grade levels served, discipline rates, average teacher experience, and urbanicity.

For our supplemental analyses, described below, we also merge these data with several other sources. To examine changes in the quality of the Arkansas teacher workforce, we merge teacher-level test-based value-added scores as provided by the Arkansas Department of Education through their partnership with the Office of Innovation for Education[10]. These value-added scores were obtained using a mixed model approach controlling for up to four prior achievement scores and student's English-language proficiency level. Due to testing cancelations in the 2019-20 school year, we match value-added scores only for the 2017-18, 2018-19, and 2020-21 school years, which are then used to study teacher labor market transitions entering the 2018-19, 2019-20 and 2021-2022 school years.

Changing instructional mode (e.g., switching to remote or hybrid learning) and teaching via hybrid instruction have been associated with increased intentions to leave current teaching positions (Zamarro et al., 2021). To explore the association between these factors and actual turnover, we use a measure of effective in-person learning (EIPL) created by Kurmann and Lalé (2021) which is constructed using both information on reported school learning modes (from surveys and official websites) as well as cell phone data. The EIPL measure represents the proportion of the 2020-21 school year that students were exposed to in-person learning and allows us to identify correlations between teacher turnover and the rate of "in-personness" during the 2020-21 school year.

[9] https://myschoolinfo.arkansas.gov/
[10] https://www.innovativeed.org/wpsite/

Abrupt but infrequent school closures may also contribute to teachers' dissatisfaction and intentions to leave. These closures would not be well captured by the yearlong EIPL average. To explore the relationship between changes in the mode of instruction and turnover, we use data from the American Enterprise Institute's Return to Learn (R2L) tracker[11] which contains a weekly record of the primary instructional mode used by districts. Using these data, we construct a variable[12] indicating if the district changed the mode of instruction (i.e., switched to remote or hybrid learning[13]) at any point during the 2020-21 school year.

Lastly, a potential outcome we identify in the data is shifts to non-instructional roles, such as principal or instructional coaching roles. As evidence from a district-level study of pandemic turnover has found that increases in teacher attrition are at least partially explained by these transitions (Donohue et al., 2022), we hypothesize that the share of Elementary and Secondary School Emergency Relief (ESSER) funds directed towards student support, instead of spending on activities unlikely to create new positions, may be associated with increased turnover caused by switchers. To examine this, we use data from the Arkansas Department of Education's ESSER Transparency Dashboard[14]. We construct a measure of ESSER "soft" costs as the proportion of funds spent on student support programs divided by the total ESSER expenditures in a district. Importantly, ESSER expenditures are reported in five categories of which only student support would be appropriate for funding new positions such as instructional coaches.

[11] https://www.returntolearntracker.net/

[12] For more detail on the construction of these and other variables, see Appendix A: Variable Construction.

[13] As Arkansas schools were required to offer full in-person learning, these shifts would be caused by increasing COVID-19 cases or in response to staffing challenges.

[14] https://esser-insight.ade.arkansas.gov/

3 Analytic Strategy

Using the data described above, we first study patterns of teacher turnover during the 2014-15 to 2022-23 academic years to see how teachers' mobility and attrition might have changed during the pandemic. To gain further insight into the factors related to teacher turnover and how their relationship might have been affected by the pandemic, we use discrete-time hazard models. For this analysis, we focus on the years 2018-19 to 2022-23 where, as explained above, we have information on all explanatory variables used in the analysis.

Our primary analysis explores factors relating to the possible employment decisions, defined above, using a multinomial logit discrete time hazard following (1), below. In this specification, Y_{ikt} is the employment decision made by teacher i in school k entering year t. The vector γ_{ikt} includes individual characteristics of teacher i in year t at school k that may relate to labor transitions such as race, gender[15], indicator variables for different age groups, indicator variables for levels of experience (less than 5 years and more than 24 years), an indicator for holding an advanced degree (MA or higher), and an indicator for serving as teacher of record for one or more STEM courses.

$$\Pr(Y_{ikt} = j|\gamma_{ikt}, \theta_{ikt}, \ln(s_{ikt})) = \frac{\exp\left([\gamma'_{ikt}\beta^{j}_{0P_t} + \theta'_{ikt-1}\beta^{j}_{1P_t} + \beta^{j}_{3P_t}\ln(s_{ikt})]\right)}{\sum_{l=1}^{4}\exp\left([\gamma'_{ikt}\beta^{l}_{0P_t} + \theta'_{ikt-1}\beta^{l}_{1P_t} + \beta^{l}_{3P_t}\ln(s_{ikt})]\right)} \quad (1)$$

[15] To account for potential gender effects in turnover due to childcare needs, we estimate an alternative specification that includes age as a continuous variable and the interaction of age and gender. While results (available upon request from the author) were largely similar, using age as a continuous variable resulted in collinearity issues with experience variables.

$$\text{where } j = \begin{cases} 1 & Stayer \\ 2 & Mover \\ 3 & Switcher \\ 4 & Exiter \end{cases}$$

School and district characteristics for teacher i in school k during year $t-1$ are captured by the vector θ_{ikt-1} which includes the demographic composition of the student body (i.e., the percentage of the school that is non-white and percent qualifying for free- or reduced-price lunch), the number of discipline infractions per student, average teacher experience in the school last year, urbanicity, and grade level span (i.e., elementary school, middle school, and secondary school). As teacher retention may be directly related to changes in student enrollment, we also include the percentage point change in enrollment at school k from year $t-1$ to t. We additionally include as $\ln(s_{ikt})$ the natural log of the length of time (in years) that teacher i has taught at school k entering year t.

Lastly, to study how the influence of these factors might have changed during the pandemic we estimate separate effects by time period (P_t) by fully interacting all variables with indicators for three time periods – pre-COVID (2018-19 and 2019-20 school years), and the 2020-21, 2021-22, and 2022-23 school years. We report our results as group-average marginal effects (G-AMEs)[16] which help us avoid issues of interpreting estimates in our fully interacted models (Ai & Norton, 2003). We test for statistically significant differences between marginal effects estimated for the pre-COVID period and during-COVID periods using estimated standard errors obtained via the delta method.

[16] G-AMEs were computed using the marginaleffects package in R (Arel-Bundock, 2023).

4 Results

4.1 Trends in teacher turnover before and during the pandemic.

<< Figure 1 - Arkansas Teacher Turnover: All Teachers >>

Figure 1 shows Arkansas teacher turnover and retention from the 2014-15 to 2022-23 school year. Before the pandemic, on average, 22% of teachers either moved schools, switched to a non-instructional role, or exited the Arkansas public school workforce entirely. This turnover rate is somewhat variable, however, and ranges from a low of 20.3% in 2019-20 to a high of 25.3% in 2015-16. Among those that left their teaching positions, nearly half would transfer to teach in another school or district in the state and approximately half would exit the Arkansas education workforce entirely. A small percentage (between 2% and 2.8% of teachers) would transition into a non-instructional role within the Arkansas education sector. We see that moving between schools and switching to non-instructional roles were the most stable form of turnover during the pre-pandemic period and that higher or lower turnover in any given year was largely driven by exits from the Arkansas public education workforce.

During the first two years of the COVID-19 pandemic, the overall turnover rate among Arkansas teachers remained within these historic bounds. However, the composition of turnover does appear to have changed. Interestingly, as compared to the pre-pandemic average, a smaller proportion of individuals appear to be exiting the public school workforce and a higher proportion appear to be moving between schools or districts. While the proportion of teachers switching to non-instructional roles in the 2020-21 school year was in line with pre-pandemic norms, there appears to be a relatively large increase in switchers entering the 2021-22 school year. Compared to the pre-pandemic average, the rate of switchers increased by 0.8 percentage points (a 38% relative increase) which corresponds to an additional 250 teachers exiting the classroom for a non-instructional role statewide during the 2021-22 school year.

Three years after the start of the pandemic, however, we observe increased turnover that matches the highest turnover pre-pandemic year observed in Arkansas. Entering the 2022-23 school year, approximately one-quarter of prior-year teachers were no longer teaching in the same

school. This increased turnover appears to be driven largely by increased exits from the Arkansas education workforce and increased switches to non-instructional roles. While before the pandemic 2.5% of Arkansas teachers exited the classroom for these non-instructional positions each year, 4.3% of Arkansas teachers made this switch entering the 2022-23 school year.

<< Figure 2 - Arkansas Teacher Turnover: Black Teachers >>

Given available research showing the benefits of a diverse teacher workforce (Dee, 2005; Gershenson et al., 2022), in figure 2, we similarly compare the turnover of teachers before and during the pandemic, this time with a focus on Black teachers. Here, we see that even before the pandemic the highest retention rate for Black teachers was comparable with the lowest retention for teachers overall. This result is in line with prior literature documenting the challenges of maintaining a diverse teaching workforce (Goldhaber & Mizrav, 2021). Overall, the turnover rate for Black teachers in the state averaged 27.4 percent pre-pandemic with a low of 24.9% in 2014-15 and a high of 29.2% in 2016-17. While there is more variability in terms of what drives this turnover, we see proportions of Exiters and Movers that are generally comparable with overall teacher turnover in the state. However, we see that a higher proportion of Black teachers transition to non-instructional roles than the general teacher population during this period.

During the pandemic school years, however, we see higher rates of turnover for Black teachers than in any pre-pandemic year. The retention rate in 2021-22 reaches a low of 67.1% which is nearly ten percentage points lower than the retention rate for teachers generally. The increase in turnover among Black teachers during the pandemic appears to be driven primarily by increased movements between schools and increased switches to non-instructional roles. The proportion of Black teachers exiting the profession was only about 1 percentage point higher during the pandemic years as compared to the pre-pandemic average. In contrast, the rate of Black teachers switching to non-instructional roles increased from 3.8 percent in the pre-pandemic period to 6.6 percent (a 73% relative increase) in the 2022-23 school year. Similarly, while the rate of moving between schools among Black teachers did not change much entering the first pandemic school year (2020-21), we see an increase in the proportion of Black teachers changing schools of

nearly 3 percentage points in the 2021-22 school year before returning to pre-pandemic levels entering the 2022-23 school year.

4.2 Factors associated with teacher turnover before and during the pandemic.

We next further study factors associated with teacher turnover, and how they might have changed during the pandemic, estimating discrete hazard models as described in (1). Results from our primary analysis are reported in tables 1a and 1b[17]. In table 1a, we focus on factors relating to teacher turnover before the pandemic while in table 1b we address how these factors have changed in the three school years since the pandemic started. Bolded estimates in table 1b represent statistically significant differences in the estimated coefficients as compared to pre-pandemic years.

Although our descriptive analysis documented differences in teacher retention rates for Black teachers pre-COVID, once we control for other factors in our discrete hazard models we find that these differences are not statistically significant at conventional confidence levels as shown in table 1a. However, pre-COVID we do see that Black teachers were 1.3 percentage point more likely to switch to non-instructional positions and 1.3 percentage points less likely to exit the public school workforce than white teachers, all else equal. These differences are significant at the 99.9% confidence level.

<< Table 1a – Factors Associated with Teachers' Labor Force Outcomes >>

Before the pandemic, we found that teachers aged 35-54 were between 3 and 4.5 percentage points more likely to be Stayers than teachers under the age of 35 and that teachers

[17] Unabridged results tables containing estimated average marginal effects for all variables described in (1) can be found in Appendix B: Unabridged Results Tables.

with more than 25 years of experience were 3 percentage points less likely to remain in the classroom and 3.8 percentage points more likely to exit the education workforce entirely. These findings are consistent with prior literature that found that teacher retention tends to be highest among mid-career educators and lowest for early and late-career teachers (Papay et al., 2017). Teachers serving as instructor of record for one or more STEM classes appear more mobile than non-STEM teachers. All else equal, STEM teachers were 2.2 percentage points less likely to remain teaching in the same school each year and 2.8 percentage points more likely to move to another school within the same district or to another district entirely. Interestingly, we see that STEM teachers were 1.2 percentage points less likely to switch to a non-instructional role as compared to non-STEM teachers. These estimates are significant at the 99.9% confidence level.

In line with the existing literature on teacher turnover (Goldhaber et al., 2023), we also document a negative relationship between the probability of a teacher being retained and the demographics of students at that school. All else equal, a 10 percentage point increase in the proportion of non-white students at a school was associated with a 0.7 percentage point decrease in the probability of a teacher being retained in the pre-pandemic years. This estimate is significant at the 99% confidence level.

Additionally, teachers appeared to respond to factors relating to working conditions as higher discipline rates were associated with decreased probabilities of retention and an increased likelihood of moving to another school or district or exiting the education sector workforce entirely. Lastly, we find different patterns of retention by urbanity in the pre-pandemic period. All else equal, teachers at urban schools were nearly 4 percentage points more likely to be retained and 2 percentage points less likely to move schools or exit the education sector workforce entirely as compared to teachers at rural schools. These estimates are significant at the 99% confidence level.

<< Table 1b – Changes in Factors Associated with Teachers' Labor Force Outcomes >>

Moving to changes in the relationship of these explanatory factors and teacher turnover during the pandemic years, in table 1b, we see that entering the 2020-21 school year the probability of Black teachers exiting the profession rose slightly but the difference from white teachers remained only marginally significant. Entering the 2021-22 school year, however, we see that Black teachers were 3.1 percentage points less likely to be retained and 1.9 percentage points more likely to exit the public school workforce than white teachers, all else equal. These estimates are significant at the 99% confidence level. In contrast, entering the 2022-23 school year, we see that the relationship between being Black and being a Stayer, Switcher, or Exiter has largely returned to pre-pandemic trends. Importantly, entering the 2022-23 school year Black teachers were 2.3 percentage points less likely to move between schools as compared to white teachers, all else equal. This estimate is significant at the 99.9% confidence level and statistically significantly different from the pre-pandemic estimate.

Entering the 2020-21 school year, when controlling for teacher experience we find that teachers aged 55 or older were 6.5 percentage points less likely to be Stayers than teachers under the age of 35. Interestingly, the likelihood of these teachers aged 55 or older remaining in the same school from one year to the next increased, relative to pre-pandemic trends, entering the 2021-22 and 2022-23 school year. Similarly, while before the pandemic teachers with more than 25 years of experience were approximately 4 percentage points more likely to exit the education sector workforce than mid-career teachers, controlling for teacher age, entering the first pandemic school year these teachers become 5.4 percentage points more likely to exit the education sector workforce as compared to mid-career teachers. This elevated probability of late-career teachers (i.e., are eligible for full or partial retirement) exiting the education sector workforce as compared to mid-career teachers has risen from 5.4 percentage points entering the 2020-21 school year to 7.2 percentage points entering the 2022-23 school year.

We also find evidence of decreased retention among early career teachers with fewer than 5 years of experience. All else equal, early career teachers were 2.8 percentage points less likely to be retained entering the 2020-21 school year and 2.5 percentage points less likely to be retained

entering the 2022-23 school year than mid-career teachers. This decrease in retention appears to be driven by an increased probability of early career teachers moving to another school and a slight increase in the likelihood of these teachers exiting the education sector entirely.

As described above, teacher attrition and retention in Arkansas public schools was also related to student demographics before the COVID-19 pandemic. During the COVID-19 pandemic, we see large changes in how school demographics relate to teacher turnover that differed by year. Entering the 2020-21 school year, we see that the relationship between the proportion of non-white students in a school and the likelihood of teachers being Stayers diminished in magnitude and was no longer significant at conventional confidence levels. However, this change appears to have been temporary as entering the 2021-22 and 2022-23 school years a 10 percentage point increase in the proportion of non-white students at a school was associated with a 1 percentage point decreased probability of being retained and an approximately 0.5 percentage point increased probability of moving to another school, all else equal. These estimates are significant at the 99% confidence level. Interestingly, the relationship between exiting the public school workforce and the proportion of non-white students was nearly one-third of the pre-pandemic level for the 2020-21 and 2021-22 school years, but this relationship returned to two-thirds of its pre-pandemic level entering the 2022-23 school year.

Teacher retention and student enrollment are strongly linked as a large decline in student enrollment requires fewer teachers to maintain staffing ratios. We see that, before the pandemic, a 10 percentage point decrease in a school's enrollment was associated with a 3.4 percentage point decrease in the probability of a teacher returning to that school in the following school year. Consistent with the idea that teachers who lose employment due to changes in enrollment may still be attached to the teaching profession, the same change in student enrollment pre-pandemic was associated with a 3.2 percentage point increased probability of moving to another school and continuing in a teaching role. These estimates are significant at the 99% confidence level. While this relationship was largely unchanged entering the 2020-21 school year, it was significantly attenuated entering the 2021-22 and 2022-23 school years. All else equal, the same 10 percentage

point decrease in student enrollment was associated with a 1.5 and 2.4 percentage point lower probability of being a Stayer in 2021-22 and 2022-23 (55% and 30% relative decreases), respectively, with corresponding changes in the probability of being a Mover. These estimates are significant at the 99% confidence level.

Entering the 2020-21 and 2021-22 school years, we observe a large and significant change in the relationship between discipline rate (e.g., number of discipline incidents reported per student) and retention. While turnover was already negatively associated with discipline rates before the pandemic, the size of this relationship was several times larger entering these two pandemic school years. All else equal, an increase of one more discipline incident per student was associated with a 2.6-3.6 decrease in the probability of a teacher returning to that school to teach a subsequent year and a 2.3 percentage point increase in the probability of moving to another school. These estimates are significant at the 99% confidence level. However, this change should be interpreted with caution as the total number of discipline referrals in Arkansas has fallen sharply during the pandemic (Anderson & McKenzie, 2022) which may indicate that this variable captures different types of discipline incidents before and after the start of the pandemic.

We also see significant variability in patterns of retention by urbanicity during the pandemic. Entering the first pandemic school year (2020-21), we see that teachers in city and town schools had a decreased probability of being retained as compared to before the pandemic. While before the pandemic teachers in urban schools were approximately 4 percentage points more likely to be Stayers than teachers in rural schools, all else equal, entering the 2020-21 school year we do not observe any statistically significant difference between urban and rural teachers at the 95% or greater confidence level. By the start of the second pandemic school year, these relationships appeared to rebound with teachers in city and town schools being 4 and 1.6 percentage points more likely to be retained than teachers in rural schools, respectively. These estimates are significant at the 95% or greater confidence level. Entering the 2022-23 school year, we see that, relative to teachers in rural schools, teachers in urban and suburban have an

increased retention rate of 3-6 percentage points. These estimates are significant at the 99% confidence level.

Lastly, the average marginal effects for year indicators in our model represent changes in turnover and retention holding the composition of the teacher workforce constant. These estimates closely match those reported in figure 1, however, they also highlight that the likelihood of teachers being "Stayers" has consistently fallen since the beginning of the pandemic. While the probability of teachers being "Mover" has been statistically significant since the beginning of the pandemic, it was not until the 2021-22 school year that the probability of a teacher being a "Switcher" became statistically significant and not until the 2022-23 school year until the probability of a teacher being an "Exiter" became statistically significant.

4.3 Changes in the quality of the teacher workforce.

In addition to examining how patterns of teacher turnover changed in terms of teacher and student demographics, we also examine how the quality of the teacher workforce (as measured by value-added teacher contributions to student test scores) has changed throughout the pandemic. Decreases in the quality of the teacher labor force could have important implications moving forward as schools try to accelerate student learning after the deceleration of student growth during the pandemic. Based upon changes in the composition of the teacher labor force during the Great Recession, some have hypothesized that high-value-add teachers may be better retained due to the economic conditions created by the pandemic (West et al., 2020). To estimate these relationships, we adapt the multinomial discrete-time hazard model specified in (1) to include both a variable indicating if a value-added score was available for each teacher and the interaction of having a value-added score (VAS) estimated with the subject-specific value add score for that teacher. We report the results of this alternative specification in table 2, below.

<< Table 2 – Changes in the Quality of the Arkansas Teacher Workforce >>

Overall, teachers in tested subjects are only slightly better retained than those in non-tested subjects and this relationship does not change significantly during the pandemic. However, among teachers in tested subjects, prior to the COVID-19 pandemic, higher value-added teachers were more likely to be retained. All else equal, a one-standard deviation increase in value-add for teachers in math and ELA was associated with a 21 and 17 percentage point increase in the probability of being a Stayer, respectively. These estimates are significant at the 99% confidence level and are matched by corresponding decreases in the probability of being a Mover or Exiter. However, entering the 2021-22 school year we see that the association between value-add and retention for math teachers diminished by 6.6 percentage points (31%) with a corresponding increase in the likelihood of exiting the education sector workforce. These differences are different from the pre-pandemic trends at the 95% confidence level.

Interestingly, the association between high value-add and retention for English teachers increased entering the 2021-22 school year, an increase that appears to be cause by a decreased likelihood of moving schools. While less precisely estimated, the point estimate for the negative association between ELA value-added and the likelihood of being a Mover approximately doubles in magnitude entering the 2021-22 school year as compared to the pre-pandemic period. However, and like our results for math value-add, we see suggestive evidence that higher value-add ELA teachers have become more likely to exit the education sector during the pandemic as compared to pre-pandemic trends. While prior to the pandemic, a one-standard deviation increase in ELA value-added was associated with a 7.4 percentage point decrease in the likelihood of being an Exiter this relationship is no longer statistically significant with a point estimate near zero entering the 2021-22 school year.

4.4 Potential Explanatory Factors

We next explore the relationship between potential explanations behind changes in teacher turnover using an augmented version of the multinomial logit discrete-time hazard model specified in (1). As described in the data section, we first explore pandemic specific factors that could have

a short lived effect on teacher turnover. Specifically, we use two explanatory variables to explore the relationship between teacher turnover and instructional mode during the 2020-21 school year. First, we use a measure of effective in-person learning (Kurmann & Lalé, 2021) which represents the exposure to in-person learning as the fraction of total school hours that students had access to in-person learning during the 2020-21 school year. Second, we use a variable indicating if the district changed instructional mode (e.g., temporarily switching to remote or hybrid learning) during the 2020-21 school year.

Given the increase we observed in transitions to non-instructional roles during the pandemic, we estimate the relationship between district's use of ESSER relief funds and teachers' labor transitions. The ways in which ESSER funds could have contributed to teacher switches to non-instructional roles has important implications for the stability of the teacher labor force moving forward as these funds must be obligated in budgets by September 2024. While an ideal variable for this analysis would be the proportion of funds allocated for stipends and salaries associated with new positions, these data are not currently available. Instead, we infer that any expenditures for new positions funded by ESSER would be classified as student support funds according to the category descriptions provided by the Arkansas Department of Education[18].

Importantly, as each of these potential explanatory factors could be correlated with other characteristics of schools and districts such as local political leanings (Grossmann et al., 2021), the demographic composition of students enrolled in the school (Camp & Zamarro, 2021), and district poverty (Gordon & Reber, 2021). We estimate the association between each potential explanatory factor and turnover for all years, including the pre-pandemic period. As it is impossible for shifts

[18] The alternative categories are either for directly investing in facilities and technology, implementing contract tracing and disinfection, or to be used to ensure food security for students.

to remote learning during the 2020-21 school year or emergency relief funds to have effects on pre-COVID turnover, estimates for the pre-pandemic period serve as a placebo test for these explanatory factors and provide us with information on the extent to which our estimates may reflect the influence of time-invariant endogeneity. To maximize sample size, we estimate this augmented version of (1) separately for each explanatory factor and report relevant average marginal effects in table 3, below[19].

<< Table 3 – Potential Explanatory Factors and Placebo Tests >>

In panel A of table 3, we present our results for the association between EIPL and teacher turnover. Interestingly, while we find no statistically significant association between effective in-person learning during the 2020-21 school year and turnover entering the 2021-22 school year, this factor is positively associated and statistically significant before the pandemic and entering the 2020-21 school year, indicating that schools with higher levels of in-person learning during the 2020-21 school year were those with higher levels of teacher retention pre-pandemic and entering the 2020-21 school year. In this respect, it is important to note that EIPL captures uptake of in-person learning options and not only districts' primary learning modality. Schools with lower pre-pandemic turnover and stronger relationship with families might be expected to more effectively communicate safety measures during the pandemic which could increase participation in in-person learning (Polikoff et al., 2022). The lack of statistical significance for the EIPL measure entering 2021-22 and 2022-23 school years could then be explained by either an increase in turnover among teachers who taught primarily in-person or an increase in retention among teachers who taught most through a hybrid or remote modality.

[19] Full results for each potential explanatory factor are available in Appendix B: Unabridged Results Tables.

In panel B of table 3, we examine the association between changing instructional modes and teacher turnover. As all districts in Arkansas were required to offer in-person learning from the beginning of the 2020-21 school year, any changes in instructional mode would be temporary pivots to remote or hybrid learning in response to issues such as staffing challenges or surges in COVID-19 cases. All else equal, teachers in districts that changed instructional mode at least once during the 2020-21 school year were 4.2 percentage points less likely to be Stayers, 3.1 percentage points more likely to be Movers, and 1 percentage point more likely to exit the education sector entirely entering the 2021-22 school year than teachers in districts which did not change instructional mode. These estimates are significant at the 95% confidence level or higher. We find no statistically significant association between changes in instructional mode during the 2020-21 school year and turnover pre-pandemic. We also observe that this association attenuates towards pre-pandemic levels for turnover entering the 2022-23 school year.

In panel C of table 3, we examine the correlation between the proportion of district funds potentially allocated towards stipends and salaries versus other uses and turnover. As with panel B, we find no association between use of ESSER funds during the pandemic and pre-pandemic turnover. Entering the first pandemic school year, we see that use of ESSER funds was associated with an increase in teacher retention entering the 2020-21 school year which is matched by corresponding decreases in the likelihood of moving between schools or districts. However, entering the 2021-22 school year we observe that the proportion of ESSER funds allocated towards student support as opposed to other categories has become negatively associated with teacher retention. All else equal, a 10 percentage point increase in the proportion of ESSER funds potentially allocated towards stipends, bonuses, and salaries is associated with a 0.9 percentage point decrease in the likelihood of being a Stayer, a 0.2 percentage point increased possibility of being a Switcher, and a 0.4 percentage point increase probability of exiting the education sector workforce. These estimates are significant at the 95% confidence level or higher.

4.5 Mid-Year Teacher Turnover

Much of the discussion of teacher turnover during the COVID-19 pandemic has focused on the additional stress and dissatisfaction that teachers have reported during these difficult times. As teachers are contractually committed to working for a full school year, abnormally high levels of mid-year turnover may be indicative of this increased stress manifesting into unplanned exits from the classroom. This appears to be the case in North Carolina where the rate of mid-year turnover increased substantially during the COVID-19 pandemic (Bastian & Fuller, 2023). We explore this phenomenon by comparing employment records from mid-October and mid-February of each year in our panel. Importantly, this differs from the North Carolina analysis of mid-year turnover which examined turnover between September and May of each school year. Additionally, the Arkansas context differs from other states because districts hiring teachers already under contract with another district for that school year face potentially large financial penalties[20]. In this way, the teacher labor market is less fluid within the academic year than in other states.

For this analysis, Exiters are those teachers who are assigned to a school in October of a given school year but no longer appear employed by any Arkansas public school in any role in February of that same school year. Similarly, Switchers are those who begin the school year as a teacher but, at some point before the February report, switch to a non-instructional role either at the same school or at a different school. As teaching assignments may routinely vary by semester, we only consider Movers who teach in a different district in the spring than they did in the fall. We show mid-year Exiters, Switchers, and Movers as a proportion of the total teacher workforce in figure 3.

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[20] Arkansas Code § 6-17-304 requires the hiring district to pay the district which holds a valid contract with the hired teacher an amount equal to the employee's salary at the non-hiring district excluding benefits.

Figure 3 - Mid-Year Teacher Turnover >>

Overall, we see no significant difference in mid-year turnover before and after the start of the COVID-19 pandemic. While there has been a slight increase in the proportion of teachers switching to non-instructional roles during the 2022-23 school year, this increase represents less than a quarter of one percent of teachers statewide.

5 Discussion and Conclusions

Since the beginning of the COVID-19 pandemic in March 2020, teachers have faced considerable challenges and frequent, abrupt, changes in working conditions. Early research documented high levels of teachers' stress and burnout and an increase in reported intentions to leave their positions (Zamarro et al., 2021). Some commentators raised concerns about a potential increase in teacher turnover and widespread teacher shortages while others stressed that even small increases in turnover could exacerbate existing, highly localized, teacher shortages (Goldhaber, 2021).

In this paper, we use administrative data from the state of Arkansas to document the impact of the COVID-19 pandemic on teachers' mobility and attrition before and three years after the start of the pandemic. Similar to analyses of turnover documented in Massachusetts, Washington State, and North Carolina (Bacher-Hicks et al., 2021; Bastian & Fuller, 2021; Goldhaber & Theobald, 2022b) we find relatively stable turnover rates entering the first pandemic school year (2020-21) followed by a moderate increase in turnover entering the second pandemic school year (2021-22). Additionally, and in line with research from North Carolina and Washington State (Bastian & Fuller, 2023; Goldhaber & Theobald, 2023), we find evidence of more dramatic increases in teacher turnover entering the 2022-23 school year. This increase in turnover occurred even as COVID-19 waned in terms of cases and fatalities and indicates that the effects of the pandemic on teacher labor markets may be felt for years to come.

Additionally, we provide initial evidence that teacher attrition during the pandemic may be driven, to some extent, by the use of ESSER funds. This finding is consistent with results from an IES survey conducted in January 2022 which found that 30% of school vacancies were newly created positions (Institute of Education Sciences, 2022). Given the unprecedented scale of these relief funds and how progressively they were allocated to high-poverty districts (Gordon & Reber, 2021), there will no doubt be questions in policy, advocacy, and research about the impact these funds had, or did not have, on student outcomes. Understanding how ESSER funds were spent by districts, such as by creating new positions, is an important context for these future debates. Our results from panel C of table 3 also indicate that there is a meaningful relationship between district's allocation of ESSER funds and teacher retention entering the 2020-21 school year. These results are congruent with an existing literature on the effects of retention bonus payments (e.g., Clotfelter et al., 2008). Future research may explore the effects that one-time bonuses (Aldeman & Silberstein, 2021) had on teacher retention and turnover.

Our results also indicate that schools may have become less responsive to changes in enrollment since the start of the COVID-19 pandemic. Given widespread decreases in public school enrollments (Dee, 2023), a lack of responsiveness to changes in enrollment may result in an overcommitment of funds once hold-harmless provisions for enrollment declines and ESSER funds run out, leading districts to face a "fiscal cliff," (Roza, 2021).

Finally, who is leaving the teaching profession is as important as how many are leaving. We find evidence suggesting that relative to pre-pandemic trends, higher value-added math teachers are more likely to exit the Arkansas education workforce than before the pandemic. We also find that teachers with 25 or more years of experience were nearly 2 percentage points more likely to leave the education sector workforce in the first two pandemic school years and nearly twice as likely to leave the education sector workforce entering the 2022-23 school years. Losing experienced teachers who otherwise would have remained in the classroom could harm students' academic progress for years to come. Additionally, we find that Black teachers have become more likely to move between schools, switch to non-instructional roles, and exit the education sector

workforce during the pandemic, although turnover for these teachers entering the 2022-23 school year is more in-line with pre-pandemic patterns than entering the 2020-21 or 2021-22 school years. Given the evidence supporting teacher race-matching effects (Gershenson et al., 2022), a loss of diversity in the teaching workforce is analogous to a loss in teacher quality. Efforts should be made to address concerns about teachers leaving the classroom and promote the diversity of new entrants to the teacher workforce.

While not rising to the level of the mass exodus of teachers that some warned about in popular media, the observed increase in teacher turnover entering the 2021-22 and 2022-23 school years raises concerns about potential instability in the Arkansas teacher labor force. Further increases in turnover could create significant issues, particularly for those districts already facing staffing challenges. Finding ways to facilitate a supportive work environment could help retain teachers during this pandemic. In this respect, Kraft et al., (2021) showed that schools with strong communication, targeted training, meaningful collaboration, fair expectations, and authentic recognition for their teachers were more successful at maintaining teachers' sense of success at the beginning of this pandemic.

Moving forward, it will be important to continue monitoring the effects of the pandemic on the Arkansas teacher labor force to help inform policymakers and stakeholders and find ways to better support teachers and schools in the state, especially in those areas most affected by teacher shortages.

References

Ai, C., & Norton, E. C. (2003). Interaction terms in logit and probit models. *Economics Letters, 80*(1), 123 129. https://doi.org/10.1016/S0165-1765(03)00032-6

Aldeman, C., & Silberstein, K. (2021). *How COVID-19 Usherd In A Wave of Promising Teacher Pay Reforms*. Edunomics Lab at Georgetown University. https://edunomicslab.org/2021/12/14/a-wave-of-promising-teacher-pay-reforms/

Anderson, K., & McKenzie, S. C. (2022). *Arkansas Student Discipline Report* (Arkansas Education Report). Office for Education Policy. https://oep.uark.edu/files/2022/09/19.6-2021-Arkansas-Student-Discipline-Report.pdf

Arel-Bundock, V. (2023). *marginaleffects: Predictions, comparisons, slopes, marginal means, and hypothesis tests* [Manual]. https://vincentarelbundock.github.io/marginaleffects/

Bacher-Hicks, A., Chi, O. L., & Orellana, A. (2023). Two Years Later: How COVID-19 Has Shaped the Teacher Workforce. *Educational Researcher*, 0013189X2311536. https://doi.org/10.3102/0013189X231153659

Bacher-Hicks, A., Chi, O., & Orellana, A. (2021). *COVID-19 and the Composition of the Massachusettes Teacher Workforce* (Wheelock Educational Policy Center) [Policy Brief]. Boston University. https://wheelockpolicycenter.org/wp-content/uploads/2021/10/TeacherWorkforce_PolicyBrief_Final.pdf

Bastian, K. C., & Fuller, S. (2023). *Educator Attrition and Hiring in North Carolina Public Schools During the COVID-19 Pandemic* (EPIC Insights). Education Policy Initiative at

Carolina. https://epic.unc.edu/wp-content/uploads/sites/1268/2023/02/Educator-Attrition-and-Hiring-in-NC.pdf

Bastian, K. C., & Fuller, S. C. (2021). *Teacher and Principal Attrition During the COVID-19 Pandemic in North Carolina* (Education Policy Initiative at Carolina) [Policy Brief]. The University of North Carolina at Chapel Hill. https://epic.unc.edu/wp-content/uploads/sites/1268/2021/09/Teacher-and-Principal-Attrition-During-the-COVID-19-Pandemic-in-North-Carolina-June-2021.pdf

Camp, A., & Zamarro, G. (2021). Determinants of Ethnic Differences in School Modality Choices During the COVID-19 Crisis. *Educational Researcher*, 0013189X2110575. https://doi.org/10.3102/0013189X211057562

Camp, A., Zamarro, G., & McGee, J. B. (2022). *Changes in Teachers' Mobility and Attrition in Arkansas During the First Two Years of the COVID-19 Pandemic.* https://doi.org/10.26300/KHRG-KF39

Carbonari, M. V., Davison, M., DeArmond, M., Dewey, D., Dizon-Ross, E., Goldhaber, D., Hashim, A. K., Kane, T. J., McEachin, A., Morton, E., Patterson, T., & Staiger, D. (2022). *The Challenges of Implementing Academic Interventions During COVID: Evidence from the Road to Recovery Project* (No. 275 1122). Center for Education Policy Research, Harvard University. https://cepr.harvard.edu/sites/hwpi.harvard.edu/files/cepr/files/the_challenges_of_implementing_academic_covid_recovery.pdf?m=1677190353

CERRA. (2022). *South Carolina Annual Educator Supply & Demand Data Tables, 2022-23.* Winthrop University. https://www.cerra.org/uploads/1/7/6/8/17684955/supply____demand_data_tables_2022-23.pdf

Clotfelter, C., Glennie, E., Ladd, H., & Vigdor, J. (2008). Would higher salaries keep teachers in high-poverty schools? Evidence from a policy intervention in North Carolina. *Journal of Public Economics*, *92*(5 6), 1352 1370. https://doi.org/10.1016/j.jpubeco.2007.07.003

Dee, T. S. (2005). A Teacher Like Me: Does Race, Ethnicity, or Gender Matter? *American Economic Review*, *95*(2), 158–165. https://doi.org/10.1257/000282805774670446

Dee, T. S. (2023). *Where the Kids Went: Nonpublic Schooling and Demographic Change during the Pandemic Exodus from Public Schools.* The Urban Institute. https://www.urban.org/research/publication/where-kids-went-nonpublic-schooling-and-demographic-change-during-pandemic

Diliberti, M. K., & Schwartz, H. L. (2023). *Educator Turnover Has Markedly Increased, but Districts Have Taken Actions to Boost Teacher Ranks: Selected Findings from the Sixth American School District Panel Survey.* RAND Corporation. https://doi.org/10.7249/RRA956-14

Diliberti, M. K., Schwartz, H. L., & Grant, D. (2021). *Stress Topped the Reasons Why Public School Teachers Quit, Even Before COVID-19.* RAND Corporation. https://doi.org/10.7249/RRA1121-2

Donohue, K., Papay, J. R., Schwartz, N., & O'Brien, B. (2022). *Sustaining the Teacher Workforce: Teacher Retention in Providence* (No. 3; Teacher Workforce Series). Annenberg Institute at Brown University. https://www.annenberginstitute.org/sites/default/files/AIB%20-%20%20Sustaining%20Teacher%20Workforce%20-%20April%202022.pdf

Gershenson, S. (2021). *Identifying and Producing Effective Teachers.* https://doi.org/10.26300/RZSY-7158

Gershenson, S., Hart, C. M. D., Hyman, J., Lindsay, C. A., & Papageorge, N. W. (2022). The Long-Run Impacts of Same-Race Teachers. *American Economic Journal: Economic Policy, 14*(4), 300–342. https://doi.org/10.1257/pol.20190573

Goldberg, E. (2021, April 7). As Pandemic Upends Teaching, Fewer Students Want to Pursue It. *The New York Times.* https://www.nytimes.com/2021/03/27/us/covid-school-teaching.html

Goldhaber, D. (2021, May 18). Analysis: COVID-19 Raised Fears of Teacher Shortages. But the Situation Varies from State to State, School to School & Subject to Subject. *The 74 Million.* https://www.the74million.org/article/analysis-covid-19-raised-fears-of-teacher-shortages-but-the-situation-varies-from-state-to-state-school-to-school-subject-to-subject/

Goldhaber, D., Kane, T., McEachin, A., Morton, E., Patterson, T., & Staiger, D. (2022). *The Consequences of Remote and Hybrid Instruction During the Pandemic* (No. 30010). National Bureau of Economic Research. https://doi.org/10.3386/w30010

Goldhaber, D., Kasman, M., Quince, V., Theobald, R., & Wolff, M. (2023). *How Did It Get This Way? Disentangling the Sources of Teacher QUality Gaps through Agent-Based Modeling* (Working Paper No. 259 0223). National Center for Analysis of Longitudinal Data in Education Research. https://caldercenter.org/sites/default/files/CALDER%20WP%20259-0223 0.pdf

Goldhaber, D., & Mizrav, E. (2021). *The prospective teacher pipeline: Simulation evidence on levers to influence teahcer diversity* (Research Brief No. 28-1121). National Center for Analysis of Longitudinal Data in Education Research. https://caldercenter.org/sites/default/files/CALDER%20Policy%20Brief%2028-1121.pdf

Goldhaber, D., & Theobald, R. (2022a). Teacher Attrition and Mobility Over Time. *Educational Researcher*, *51*(3), 235–237. https://doi.org/10.3102/0013189X211060840

Goldhaber, D., & Theobald, R. (2022b). Teacher Attrition and Mobility in the Pandemic. *Educational Evaluation and Policy Analysis*, 016237372211392. https://doi.org/10.3102/01623737221139285

Goldhaber, D., & Theobald, R. (2023). *Teacher Turnover Three Years Into The Pandemic Era: Evidence from Washington State* (No. 32 0223; CALDER Policy Brief). Center for Analysis of Longitudinal Data in Education Research. https://caldercenter.org/sites/default/files/CALDER%20Policy%20Brief%2032-0223.pdf

Gordon, N. E., & Reber, S. J. (2021). *Were Federal COVID Relief Funds for Schools Enough?* National Bureau of Economic Research.

Grossmann, M., Reckhow, S., Strunk, K. O., & Turner, M. (2021). All States Close but Red Districts Reopen: The Politics of In-Person Schooling During the COVID-19 Pandemic. *Educational Researcher, 50*(9), 637–648. https://doi.org/10.3102/0013189X211048840

Hanushek, E. A. (2023). *The Economic Cost of the Pandemic: State by State*. Hoover Institution. http://hanushek.stanford.edu/publications/economic-cost-pandemic-state-state

Hanushek, E. A., Rivkin, S. G., & Schiman, J. C. (2016). Dynamic effects of teacher turnover on the quality of instruction. *Economics of Education Review, 55*, 132–148. https://doi.org/10.1016/j.econedurev.2016.08.004

Ingersoll, R. M. (2001). Teacher Turnover and Teacher Shortages: An Organizational Analysis. *American Educational Research Journal, 38*(3), 499–534. https://doi.org/10.3102/00028312038003499

Institute of Education Sciences. (2022). *School Staffing Shortages: Results from the January School Pulse Panel* (School Pulse Panel). Institute of Education Sciences. https://ies.ed.gov/schoolsurvey/spp/2022_SPP_Staffing.pdf

Kraft, M. A., Simon, N. S., & Lyon, M. A. (2021). Sustaining a Sense of Success: The Protective Role of Teacher Working Conditions during the COVID-19 Pandemic. *Journal of Research on Educational Effectiveness, 14*(4), 727–769. https://doi.org/10.1080/19345747.2021.1938314

Kurmann, A., & Lalé, E. (2021). School Closures and Effective In-Person Learning during COVID-19: When, Where and for Whom. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3963981

Lavery, L. (2020, December 19). The pandemic is causing teachers to flee the profession. *Salon*. https://www.salon.com/2020/12/19/the-pandemic-is-causing-teachers-to-flee-the-profession/

Nguyen, T. D., Bettini, E., Redding, C., & Gilmour, A. F. (2022). *Comparing Turnover Intentions and Actual Turnover in the Public Sector Workforce: Evidence from Public School Teachers*. https://doi.org/10.26300/3AQ0-PV52

Nguyen, T. D., Pham, L. D., Crouch, M., & Springer, M. G. (2020). The correlates of teacher turnover: An updated and expanded Meta-analysis of the literature. *Educational Research Review, 31*, 100355. https://doi.org/10.1016/j.edurev.2020.100355

Papay, J. P., Bacher-Hicks, A., Page, L. C., & Marinell, W. H. (2017). The Challenge of Teacher Retention in Urban Schools: Evidence of Variation From a Cross-Site Analysis. *Educational Researcher, 46*(8), 434–448. https://doi.org/10.3102/0013189X17735812

Polikoff, M. S., Silver, D., Garland, M., Saavedra, A. R., Rapaport, A., & Fienberg, M. (2022). The Impact of a Messaging Intervention on Parents' School Hesitancy During COVID-19. *Educational Researcher, 51*(2), 156–159. https://doi.org/10.3102/0013189X211070813

Roza, M. (2021, December 1). 5 Mistakes to Avoid When Spending COVID-Relief Funds. *Education Week*. https://www.edweek.org/leadership/opinion-5-mistakes-to-avoid-when-spending-covid-relief-funds/2021/12

West, M. R., Nagler, M., & Piopiunik, M. (2020, Fall). How the Cornavirus Crisis May Improve Teacher Quality: Recession Hiring Boosts Tacher Quality and Student Learning. *Education Next, 20*(4), 56–62.

Zamarro, G., Camp, A., Fuchsman, D., & McGee, J. (2021). *Understanding how COVID-19 has Changed Teachers' Chances of Remaining in the Classroom* (EDRE Research Brief No. 2021 01). University of Arkansas. https://edre.uark.edu/ resources/pdf/teacher turnover covid.pdf

Figure 1 - Arkansas Teacher Turnover: All Teachers

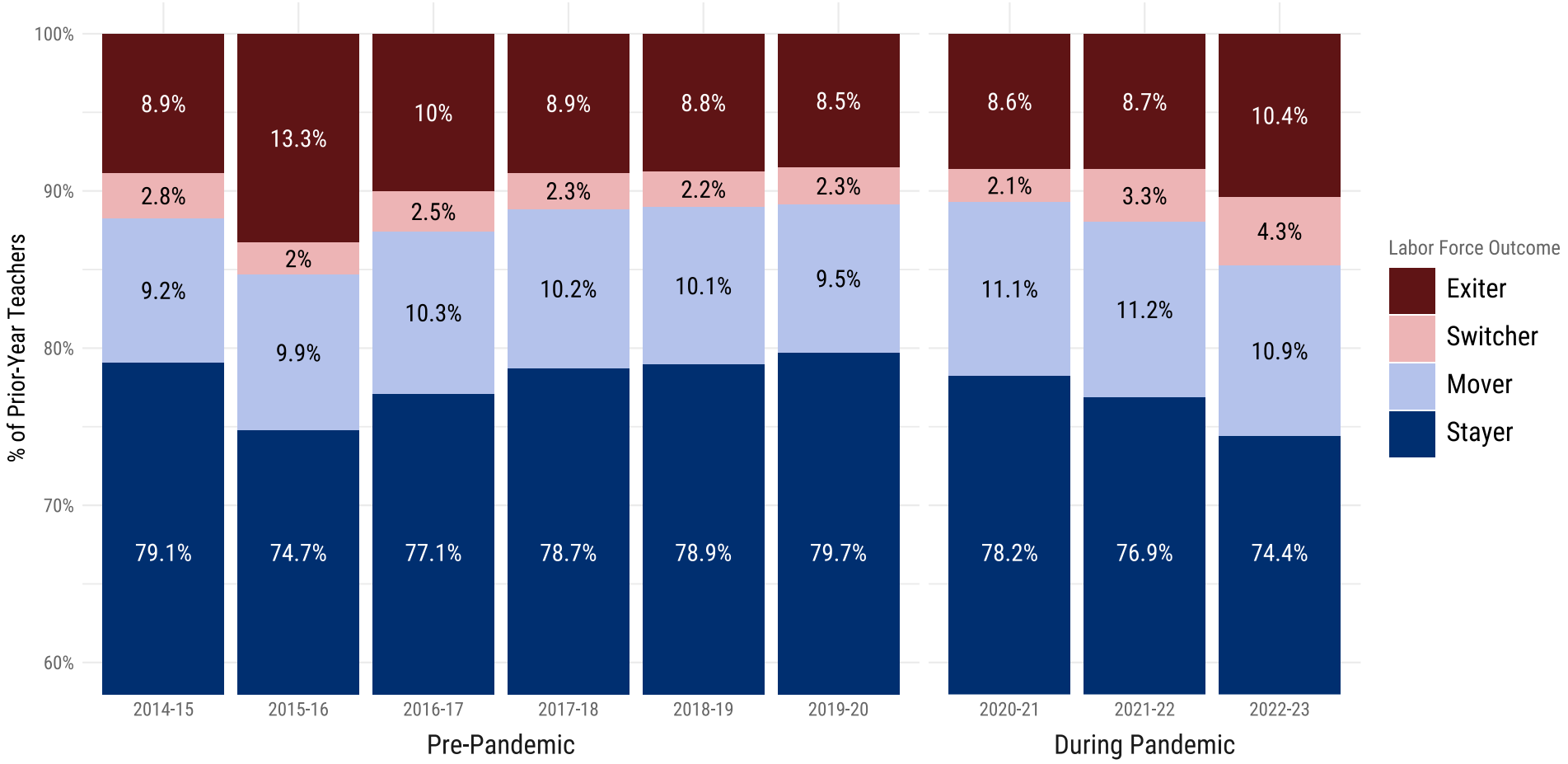

Figure 2 - Arkansas Teacher Turnover: Black Teachers

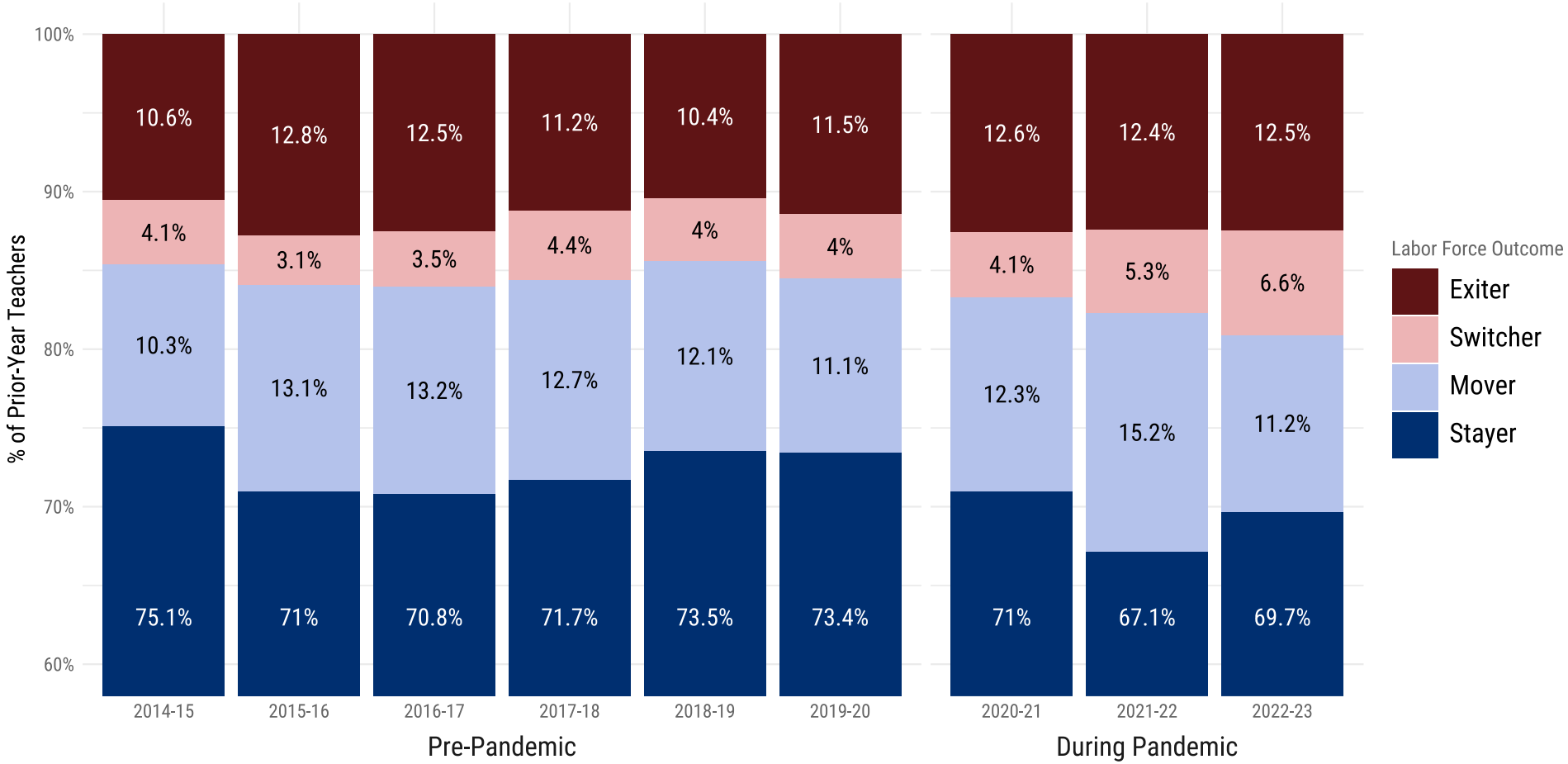

Figure 3 - Mid-Year Teacher Turnover

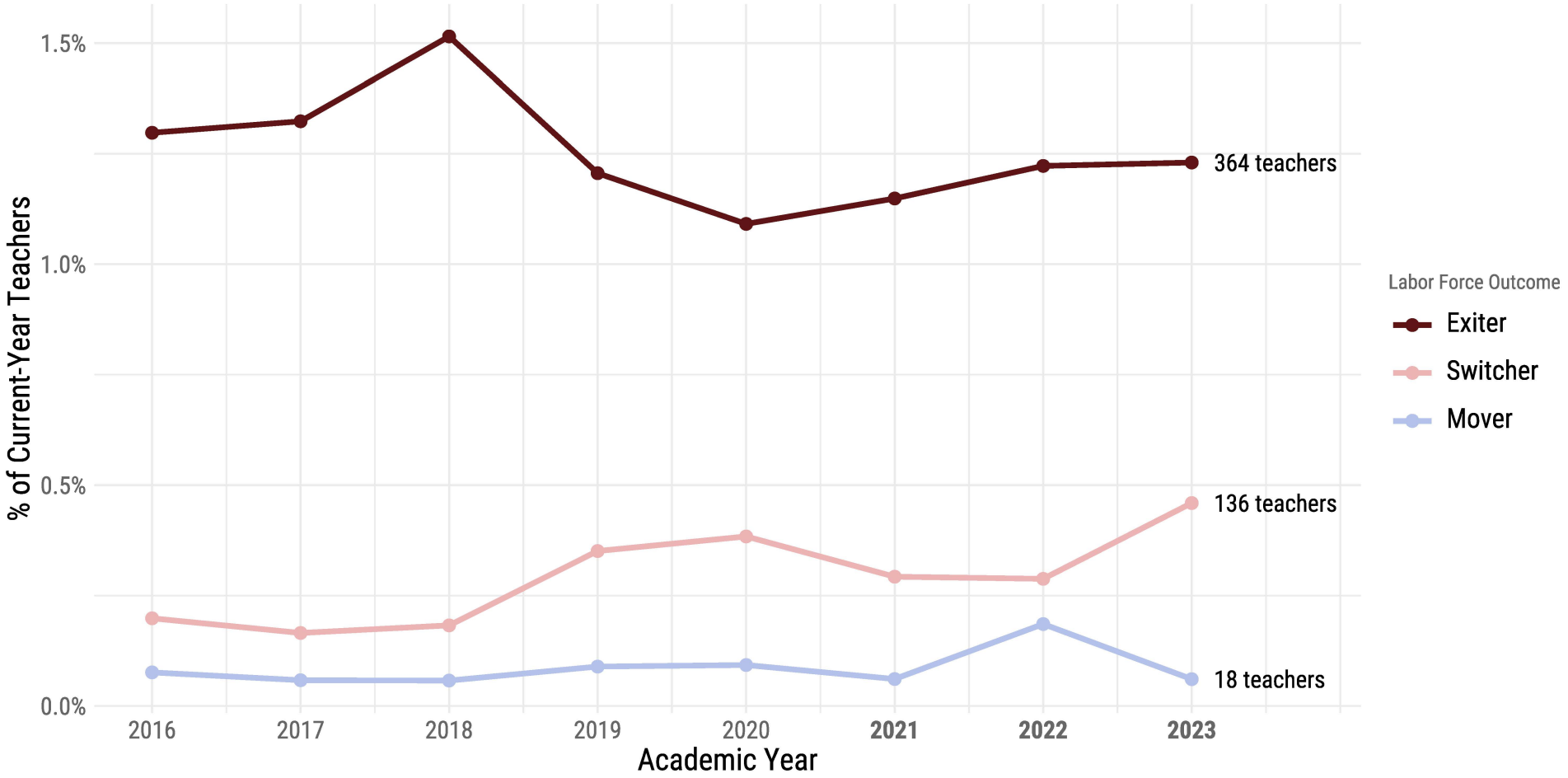

Table 1a – Factors Associated with Teachers' Labor Force Outcomes (Group Average Marginal Effects)

	Stayer	Mover	Switcher	Exiter
Teacher: Black	-0.002	0.003	0.013***	-0.013***
	(0.006)	(0.005)	(0.003)	(0.004)
Teacher: Age 35-44	0.028***	-0.013***	0.003+	-0.018***
	(0.004)	(0.003)	(0.002)	(0.003)
Teacher: Age 45-54	0.044***	-0.022***	-0.004*	-0.018***
	(0.005)	(0.003)	(0.002)	(0.003)
Teacher: Age 55+	-0.036***	-0.041***	-0.010***	0.087***
	(0.007)	(0.004)	(0.002)	(0.006)
Teacher: Early Career	-0.007	0.004	-0.006***	0.009**
	(0.005)	(0.003)	(0.002)	(0.003)
Teacher: Late Career	-0.030***	-0.007	-0.001	0.038***
	(0.006)	(0.005)	(0.002)	(0.004)
Teacher: STEM	-0.022***	0.028***	-0.012***	0.006
	(0.006)	(0.005)	(0.002)	(0.004)
School: % Non-white	-0.075***	0.007	-0.002	0.070***
	(0.010)	(0.007)	(0.004)	(0.007)
School: % FRL	-0.016	0.047***	0.006	-0.036***
	(0.013)	(0.010)	(0.005)	(0.009)
School: Enroll Increase	0.336***	-0.317***	0.002	-0.021
	(0.019)	(0.013)	(0.007)	(0.014)
School: Discipline Rate	-0.008***	0.006***	0.001	0.001
	(0.002)	(0.002)	(0.001)	(0.002)
Urbanicity: City	0.037***	-0.016***	0.002	-0.022***
	(0.005)	(0.004)	(0.002)	(0.004)
Urbanicity: Suburb	-0.032***	0.033***	0.002	-0.003
	(0.006)	(0.005)	(0.002)	(0.004)
Urbanicity: Town	0.012**	-0.007*	-0.004*	-0.001
	(0.005)	(0.003)	(0.002)	(0.003)
Pseudo R^2		0.117		
Observations		146,462		

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001;

Heteroskedastic robust standard errors reported.

Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.

Table 1b – Changes in Factors Associated with Teachers' Labor Force Outcomes (Group Average Marginal Effects)

	Stayer			Mover			Switcher			Exiter		
	2020-21	2021-22	2022-23	2020-21	2021-22	2022-23	2020-21	2021-22	2022-23	2020-21	2021-22	2022-23
Teacher: Black	-0.019*	**-0.031****	0.013	0.001	-0.004	**-0.023*****	0.011**	0.016**	0.010*	**0.007**	**0.019****	0.000
	(0.009)	**(0.010)**	(0.010)	(0.007)	(0.006)	**(0.006)**	(0.004)	(0.005)	(0.005)	**(0.006)**	**(0.006)**	(0.007)
Teacher: Age 35-44	0.019**	0.039***	**0.045*****	-0.008+	-0.017***	-0.004	0.002	0.000	0.003	-0.012**	-0.021***	**-0.044*****
	(0.007)	(0.006)	**(0.007)**	(0.005)	(0.005)	(0.005)	(0.002)	(0.003)	(0.003)	(0.005)	(0.004)	**(0.004)**
Teacher: Age 45-54	**0.017***	0.035***	**0.065*****	**-0.005**	-0.011*	-0.015**	-0.002	-0.008**	-0.007*	-0.011*	-0.016***	**-0.042*****
	(0.007)	(0.007)	**(0.007)**	**(0.005)**	(0.005)	(0.005)	(0.002)	(0.003)	(0.003)	(0.005)	(0.005)	**(0.005)**
Teacher: Age 55+	**-0.065*****	**-0.012**	**-0.001**	-0.034***	-0.044***	-0.040***	-0.006*	-0.017***	-0.009*	0.105***	0.074***	**0.050*****
	(0.010)	**(0.010)**	**(0.010)**	(0.006)	(0.006)	(0.006)	(0.003)	(0.003)	(0.004)	(0.009)	(0.008)	**(0.008)**
Teacher: Early Career	**-0.028*****	-0.001	**-0.025*****	**0.016****	0.009+	0.014**	-0.007***	**-0.018*****	-0.008**	0.020***	0.010*	0.019***
	(0.007)	(0.007)	**(0.007)**	**(0.005)**	(0.005)	(0.005)	(0.002)	**(0.003)**	(0.003)	(0.005)	(0.005)	(0.005)
Teacher: Late Career	-0.044***	-0.048***	-0.042***	-0.014*	-0.012+	-0.021**	0.004	0.002	-0.009*	**0.054*****	**0.059*****	**0.072*****
	(0.009)	(0.010)	(0.010)	(0.007)	(0.007)	(0.007)	(0.003)	(0.004)	(0.004)	**(0.007)**	**(0.007)**	**(0.008)**
Teacher: STEM	-0.010	**-0.001**	-0.030**	0.023***	0.013+	0.024***	-0.012***	-0.016***	-0.018***	-0.002	0.004	**0.024*****
	(0.009)	**(0.009)**	(0.009)	(0.007)	(0.007)	(0.007)	(0.002)	(0.003)	(0.003)	(0.006)	(0.006)	**(0.007)**
School: % Non-white	**-0.020**	-0.109***	-0.103***	-0.012	**0.066*****	**0.041*****	0.007	**0.014***	**0.022****	**0.025****	**0.030****	**0.040*****
	(0.014)	(0.014)	(0.016)	(0.011)	**(0.010)**	**(0.011)**	(0.005)	**(0.006)**	**(0.007)**	**(0.009)**	**(0.009)**	**(0.011)**
School: % FRL	-0.030+	-0.003	**0.035+**	0.028*	0.032**	0.027*	0.005	-0.004	**-0.028*****	**-0.003**	-0.024*	-0.034*
	(0.018)	(0.016)	**(0.018)**	(0.014)	(0.012)	(0.013)	(0.006)	(0.007)	**(0.008)**	**(0.012)**	(0.010)	(0.013)
School: Enroll Increase	0.309***	**0.154*****	**0.243*****	-0.296***	**-0.174*****	**-0.187*****	-0.010	0.013	-0.017	-0.003	0.007	-0.040+
	(0.029)	**(0.030)**	**(0.030)**	(0.024)	**(0.024)**	**(0.022)**	(0.011)	(0.012)	(0.014)	(0.018)	(0.019)	(0.021)
School: Discipline Rate	**-0.036*****	**-0.026****	-0.011*	**0.023*****	**0.023*****	0.008*	0.004**	0.003	0.001	**0.009****	0.000	0.002
	(0.005)	**(0.008)**	(0.005)	**(0.004)**	**(0.006)**	(0.003)	(0.002)	(0.004)	(0.002)	**(0.003)**	(0.006)	(0.004)
Urbanicity: City	**-0.014+**	0.037***	**0.060*****	**0.021****	**-0.033*****	-0.029***	-0.001	-0.002	**-0.018*****	**-0.006**	**-0.002**	-0.013*
	(0.008)	(0.007)	**(0.008)**	**(0.007)**	**(0.005)**	(0.006)	(0.003)	(0.003)	**(0.003)**	**(0.005)**	**(0.005)**	(0.006)
Urbanicity: Suburb	-0.014	**0.016+**	**0.033*****	0.020**	**-0.013***	**-0.029*****	**-0.007****	0.000	**-0.009***	0.001	-0.004	0.004
	(0.009)	**(0.008)**	**(0.009)**	(0.007)	**(0.006)**	**(0.006)**	**(0.003)**	(0.004)	**(0.004)**	(0.006)	(0.006)	(0.007)
Urbanicity: Town	**-0.020****	0.016*	**-0.012+**	**0.018*****	**-0.023*****	0.000	-0.002	0.001	**0.005**	0.003	0.007	0.007
	(0.007)	(0.007)	**(0.007)**	**(0.006)**	**(0.005)**	(0.005)	(0.002)	(0.003)	**(0.003)**	(0.004)	(0.005)	(0.005)
Year Indicators	-0.009**	-0.027***	-0.054***	0.010***	0.017***	0.015***	-0.001	0.010***	0.016***	0.001	0.000	0.022***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Pseudo R^2	0.117											
Observations	146,462											

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001;

Heteroskedastic robust standard errors reported.

Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.

Table 2 – Changes in the Quality of the Arkansas Teacher Workforce (Group Average Marginal Effects)

	Stayer		Mover		Switcher		Exiter	
	Pre	2021-22	Pre	2021-22	Pre	2021-22	Pre	2021-22
VAS: Math	0.213***	**0.147****	-0.085**	-0.117**	-0.008	0.011	-0.120***	**-0.041**
	(0.038)	**(0.048)**	(0.027)	(0.036)	(0.013)	(0.019)	(0.026)	**(0.032)**
VAS: ELA	0.167***	0.253***	-0.104***	-0.203***	0.011	-0.042	-0.074**	-0.008
	(0.040)	(0.065)	(0.029)	(0.048)	(0.014)	(0.026)	(0.028)	(0.045)
VAS: Science	0.098	0.151+	-0.014	-0.074	-0.016	0.025	-0.069	-0.102+
	(0.060)	(0.091)	(0.043)	(0.067)	(0.022)	(0.041)	(0.042)	(0.059)
Has VAS	0.009**	0.011*	0.004	-0.003	-0.001	-0.001	-0.012***	-0.007*
	(0.003)	(0.005)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)	(0.003)
Teacher: Black	0.000	-0.028**	0.002	-0.005	0.013***	0.016**	-0.014***	0.018**
	(0.006)	(0.009)	(0.005)	(0.006)	(0.003)	(0.005)	(0.004)	(0.006)
Teacher: Age 35-44	0.028***	0.040***	-0.013***	-0.018***	0.003+	0.000	-0.018***	**-0.022*****
	(0.004)	(0.006)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	**(0.004)**
Teacher: Age 45-54	0.045***	0.036***	-0.022***	-0.012*	-0.004*	-0.008**	-0.018***	**-0.017*****
	(0.005)	(0.007)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	**(0.005)**
Teacher: Age 55+	-0.035***	-0.011	-0.041***	-0.045***	-0.010***	-0.017***	0.086***	0.073***
	(0.007)	(0.010)	(0.004)	(0.006)	(0.002)	(0.003)	(0.006)	(0.008)
Teacher: Early Career	-0.007	**0.000**	0.003	**0.009+**	-0.006***	-0.018***	0.009**	0.009+
	(0.005)	**(0.007)**	(0.003)	**(0.005)**	(0.002)	(0.003)	(0.003)	(0.005)
Teacher: Late Career	-0.030***	-0.048***	-0.007	**-0.012+**	-0.001	**0.002**	0.038***	**0.058*****
	(0.006)	(0.010)	(0.005)	**(0.007)**	(0.002)	**(0.004)**	(0.004)	**(0.007)**
Teacher: STEM	-0.019**	**0.002**	0.030***	**0.012+**	-0.012***	-0.016***	0.002	0.002
	(0.006)	**(0.009)**	(0.005)	**(0.007)**	(0.002)	(0.003)	(0.004)	(0.006)
School: % Non-white	-0.074***	-0.105***	0.007	0.063***	-0.002	**0.014***	0.069***	0.029**
	(0.010)	(0.014)	(0.007)	(0.010)	(0.004)	**(0.006)**	(0.007)	(0.009)
School: % FRL	-0.012	0.005	0.045***	**0.026***	0.006	-0.005	-0.039***	**-0.026***
	(0.013)	(0.016)	(0.010)	**(0.012)**	(0.005)	(0.007)	(0.009)	**(0.010)**
School: Enroll Increase	0.331***	**0.147*****	-0.315***	**-0.166*****	0.002	0.012	-0.018	0.007
	(0.019)	**(0.030)**	(0.013)	**(0.024)**	(0.007)	(0.012)	(0.014)	(0.019)
School: Discipline Rate	-0.007***	-0.026**	0.005***	**0.023*****	0.001	0.003	0.001	0.000
	(0.002)	(0.008)	(0.002)	**(0.006)**	(0.001)	(0.004)	(0.002)	(0.006)
Urbanicity: City	0.034***	**0.034*****	-0.015***	**-0.031*****	0.002	-0.002	-0.021***	-0.001
	(0.005)	**(0.008)**	(0.004)	**(0.005)**	(0.002)	(0.003)	(0.004)	(0.005)
Urbanicity: Suburb	-0.033***	0.016+	0.034***	-0.012*	0.002	0.000	-0.003	-0.004
	(0.006)	(0.008)	(0.005)	(0.006)	(0.002)	(0.004)	(0.004)	(0.006)
Urbanicity: Town	0.011*	0.015*	-0.007*	-0.023***	-0.004*	0.001	-0.001	0.007
	(0.005)	(0.007)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	(0.005)
Year Indicator		-0.027***		0.017***		0.010***		0.000
		(0.003)		(0.002)		(0.001)		(0.002)
Pseudo R^2				0.110				
Observations				89,298				

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001;
Heteroskedastic robust standard errors reported.
Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.

Table 3 – Potential Explanatory Factors and Placebo Tests (Group Average Marginal Effects)

Panel A: EIPL				Panel B: Ever Changed Modes				Panel C: ESSER Soft Costs			
Stayer				**Stayer**				**Stayer**			
Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23
0.057**	0.085*	**-0.018**	0.033	-0.004	**-0.012***	**-0.042*****	-0.003	-0.015	0.064**	**-0.085*****	-0.040+
(0.022)	(0.033)	**(0.033)**	(0.034)	(0.004)	**(0.006)**	**(0.006)**	(0.006)	(0.014)	(0.020)	**(0.019)**	(0.021)
Mover				**Mover**				**Mover**			
Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23
-0.044**	-0.066*	0.041+	**0.033**	0.004	0.017***	0.031***	**0.009***	0.003	-0.073***	0.026+	**0.007**
(0.016)	(0.026)	(0.025)	**(0.024)**	(0.003)	(0.005)	(0.005)	**(0.005)**	(0.011)	(0.016)	(0.015)	**(0.015)**
Switcher				**Switcher**				**Switcher**			
Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23
0.008	-0.016	0.012	-0.013	0.001	0.001	0.003	0.001	0.001	0.002	0.019*	0.004
(0.008)	(0.011)	(0.014)	(0.016)	(0.001)	(0.002)	(0.003)	(0.003)	(0.005)	(0.007)	(0.008)	(0.009)
Exiter				**Exiter**				**Exiter**			
Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23
-0.021	**-0.003**	**-0.035**	-0.053*	-0.001	**-0.006**	**0.009***	-0.007	0.012	**0.007**	**0.041*****	0.029*
(0.015)	**(0.021)**	**(0.022)**	(0.024)	(0.003)	**(0.004)**	**(0.004)**	(0.005)	(0.009)	**(0.013)**	**(0.012)**	(0.014)
Pseudo R^2	0.170			Pseudo R^2	0.274			Pseudo R^2	0.133		
Obs.	139,097			Obs.	122,004			Obs.	145,209		

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$;
Heteroskedastic robust standard errors reported.
Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.

Appendix A: Variable Construction

Teacher-Level Variables

Race & Gender

The state administrative data we use contain a teacher race/ethnicity variable with seven possible response options: Asian, Black/African American, Hispanic, Native American/Alaskan Native, Native Hawaiian/Pacific Islander, two or more races, or white. District personnel is responsible for selecting one option from this list for each teacher. The Arkansas teacher workforce is, on average, approximately 88% white, 9% Black, and 1% Hispanic with all other options for the race/ethnicity variable comprising less than 2% of the population. In our multinomial logistic analyses, we combine these other races into a single "Other Race" group due to sample size limitations. Similarly, the state data system allows district personnel to report teacher gender as either male or female. We code an indicator variable for observations listed as male.

Age & Experience

Our data contain each teacher's date of birth. We calculate the teacher's age as of October 1st of each academic year and subsequently categorize each teacher-year observation into one of four bins: under 35 years old, 35-44 years old, 45-54 years old, and aged over 55. Teachers over the age of 55 are more likely eligible for full or partially reduced retirement under Arkansas Teacher Retirement System eligibility guidelines.

We define two variables representing early career and late career status using a years of experience variable provided in the administrative data. Early career teachers are defined as those with fewer than 5 years of experience and thus are not vested in the state teacher retirement system. Late career teachers are those with more than 24 years of experience and, consequentially, are eligible for full or partial retirement under the state teacher retirement system.

Advanced Degree

We construct a dummy variable representing if a teacher has a master's degree or higher using information provided in the administrative data.

Spell Length

As is normal in discrete time hazard models, we include the natural log of spell length, or the length of time an individual has been a teacher at a given school, in our models. In our data, this is calculated from a date of hire variable provided in the administrative data.

School and District-Level Variables

For the following variables, we first attempt to match each school to records in the Arkansas Department of Education's Data Center[21]. If this variable is unavailable at the school level, we impute it at the district level. While imperfect, most of the missing values in our data come from smaller school districts where there is typically only one building per grade level and, so, characteristics of each building will not vary significantly from the entire school district.

Student Body Composition

We include two measures of student body composition in our models. We calculate both, the proportion of FRL students and proportion of non-white students, as the number of

[21] https://myschoolinfo.arkansas.gov/

students in each category (i.e., FRL or non-white) divided by the total enrollment for that school.

Enrollment Change

We calculate the enrollment change from year t to year $t+1$ as the change in 3rd quarter average daily membership (which is used by the State of Arkansas in funding formulas), divided by the 3rd quarter average daily membership from year t. For years in which the 3rd quarter average daily membership is not yet available, we use the enrollment averaged over the first and second quarters.

Discipline Rate

We use the discipline rate calculated as the number of recorded office/administrative referrals divided by building enrollment. These referrals are typically reserved for more serious discipline infractions and not routine detentions/teacher-created consequences.

Average Techer Experience

We calculate this variable for each teacher at the school level as the average number of years of experience for all teachers in a building except for that individual teacher (i.e., $(Exp_{SchoolTotal} - Exp_i)/(N_{teachers} - 1)$).

Urbanicity

We use the NCES's locale classifications to construct urbanity indicator variables for each school. Urban schools are defined as those located within both an urbanized area (e.g., a population greater than 50,000 people) and the principal city of a core-based statistical area (CBSA). Suburban schools are those located within an urbanized area, but outside of a CBSA principal city. Town schools are located inside an urban cluster (e.g., a population between 2,500 and 50,000 people). Rural schools are those schools located outside of urban clusters and urbanized areas.

Grade Levels Served

We match schools in our panel to data from the Common Core of Data (CCD) from the National Center for Education Statistics (NCES) using the Urban Institute's Education Data Portal API. We then construct indicator variables for each teacher-year observation based on the grade levels served. Teachers in schools offering pre-kindergarten through 4th grade are classified as teaching in an elementary school. Those in schools offering 5-8th grade are classified as teaching in a middle school. Those in schools offering 9-12th grade are classified as teaching in a high school. For teachers in the 18 schools in the state that offer multiple grade bands, we classify teachers based on the lowest grade level served. For example, a school serving kindergarten through 6th grade would be classified as an elementary school.

Effective In-Person Instruction (EIPL)

We use publicly available data provided by Kurmann and Lalé (2021)[22] which is a weekly measure of the proportion of students participating in in-person instruction at the district level. We construct a single year-long average (mean) to include in our models from these data, excluding the week of major U.S. holidays (i.e., Thanksgiving and Christmas).

Changes in Mode of Instruction

We use district-level longitudinal data from the American Enterprise Institute's Return 2 Learn Tracker to construct measures related to instructional mode during the 2020-21 academic year. These data contain weekly instructional status for 141 districts

[22] https://osf.io/cghs2/

representing 81.6% of statewide student enrollment from August 10th, 2020, through June 7th, 2021. Districts were classified as fully in-person if all grade levels were offered in-person learning five days per week and remote if all grades above first grade participated only in remote learning. Districts were classified as hybrid if all students in any grade above first grade were unable to attend school in-person five days per week. Districts that offered in-person learning only for particular student subgroups (e.g., students receiving special education services) were classified as fully remote. We then construct an indicator variable representing if a district changed its mode of instruction during the school year to capture disruptions and changes to normal working conditions that may impact teacher retention. As schools in Arkansas were required to offer five days of in-person learning starting in the fall of the 2020-2021 school year, these changes in modality would most often represent changes from in-person learning to hybrid or fully remote modalities due to increased COVID cases and related teacher shortages.

Appendix B: Unabridged Results Tables

Appendix B Table 1 – Changes in Factors Associated with Teachers' Labor Force Outcomes (Group Average Marginal Effects)

	Stayer				Mover				Switcher				Exiter			
	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23
Teacher: Black	-0.002	-0.019*	**-0.031****	0.013	0.003	0.001	-0.004	**-0.023*****	0.013***	0.011**	0.016**	0.010*	-0.013***	**0.007**	**0.019****	0.000
	(0.006)	(0.009)	**(0.010)**	(0.010)	(0.005)	(0.007)	(0.006)	**(0.006)**	(0.003)	(0.004)	(0.005)	(0.005)	(0.004)	**(0.006)**	**(0.006)**	(0.007)
Teacher: Hispanic	0.029*	0.025	-0.004	0.018	-0.018+	-0.029*	-0.006	-0.006	-0.004	0.011	0.013	-0.001	-0.007	-0.007	-0.003	-0.011
	(0.014)	(0.019)	(0.020)	(0.019)	(0.010)	(0.013)	(0.014)	(0.013)	(0.005)	(0.009)	(0.011)	(0.009)	(0.010)	(0.013)	(0.013)	(0.013)
Teacher: Other Race	0.012	0.005	-0.017	-0.030	-0.022*	-0.011	-0.001	-0.018	-0.006	0.000	-0.004	-0.008	0.016	0.006	0.023	0.056**
	(0.014)	(0.020)	(0.021)	(0.022)	(0.009)	(0.014)	(0.015)	(0.014)	(0.005)	(0.007)	(0.008)	(0.009)	(0.010)	(0.014)	(0.015)	(0.018)
Teacher: Male	-0.036***	-0.038***	-0.029***	-0.029***	0.033***	0.036***	0.030***	0.040***	0.002	-0.001	-0.003	0.001	0.001	0.003	0.002	**-0.012****
	(0.004)	(0.006)	(0.006)	(0.007)	(0.003)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	**(0.004)**
Teacher: Age 35-44	0.028***	0.019**	0.039***	**0.045*****	-0.013***	-0.008+	-0.017***	-0.004	0.003+	0.002	0.000	0.003	-0.018***	-0.012**	-0.021***	**-0.044*****
	(0.004)	(0.007)	(0.006)	**(0.007)**	(0.003)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)	**(0.004)**
Teacher: Age 45-54	0.044***	**0.017***	0.035***	**0.065*****	-0.022***	**-0.005**	-0.011*	-0.015**	-0.004*	-0.002	-0.008**	-0.007*	-0.018***	-0.011*	-0.016***	**-0.042*****
	(0.005)	**(0.007)**	(0.007)	**(0.007)**	(0.003)	**(0.005)**	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	**(0.005)**
Teacher: Age 55+	-0.036***	**-0.065*****	**-0.012**	**-0.001**	-0.041***	-0.034***	-0.044***	-0.040***	-0.010***	-0.006*	-0.017***	-0.009*	0.087***	0.105***	0.074***	**0.050*****
	(0.007)	**(0.010)**	**(0.010)**	**(0.010)**	(0.004)	(0.006)	(0.006)	(0.006)	(0.002)	(0.003)	(0.003)	(0.004)	(0.006)	(0.009)	(0.008)	**(0.008)**
Teacher: Early Career	-0.007	**-0.028*****	-0.001	**-0.025*****	0.004	**0.016****	0.009+	0.014**	-0.006***	-0.007***	**-0.018*****	-0.008**	0.009**	0.020***	0.010*	0.019***
	(0.005)	**(0.007)**	(0.007)	**(0.007)**	(0.003)	**(0.005)**	(0.005)	(0.005)	(0.002)	(0.002)	**(0.003)**	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
Teacher: Late Career	-0.030***	-0.044***	-0.048***	-0.042***	-0.007	-0.014*	-0.012+	-0.021**	-0.001	0.004	0.002	-0.009*	0.038***	**0.054*****	**0.059*****	**0.072*****
	(0.006)	(0.009)	(0.010)	(0.010)	(0.005)	(0.007)	(0.007)	(0.007)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	**(0.007)**	**(0.007)**	**(0.008)**
Teacher: Adv. Degree	-0.017***	-0.016***	-0.019***	-0.028***	0.001	0.000	0.009*	0.006+	0.015***	0.017***	0.017***	**0.025*****	0.001	-0.001	**-0.008***	-0.004
	(0.003)	(0.005)	(0.005)	(0.005)	(0.003)	(0.004)	(0.004)	(0.004)	(0.001)	(0.002)	(0.002)	**(0.002)**	(0.002)	(0.003)	**(0.003)**	(0.004)
Teacher: Spell Length	0.037***	0.032***	0.039***	0.040***	-0.021***	-0.020***	-0.024***	-0.022***	-0.001	-0.001	-0.001	0.002	-0.016***	-0.012***	-0.014***	-0.020***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Teacher: STEM	-0.022***	-0.010	**-0.001**	-0.030**	0.028***	0.023***	0.013+	0.024***	-0.012***	-0.012***	-0.016***	-0.018***	0.006	-0.002	0.004	**0.024*****
	(0.006)	(0.009)	**(0.009)**	(0.009)	(0.005)	(0.007)	(0.007)	(0.007)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.006)	(0.006)	**(0.007)**
School: % Non-white	-0.075***	**-0.020**	-0.109***	-0.103***	0.007	-0.012	**0.066*****	**0.041*****	-0.002	0.007	**0.014***	**0.022****	0.070***	**0.025****	**0.030****	**0.040*****
	(0.010)	**(0.014)**	(0.014)	(0.016)	(0.007)	(0.011)	**(0.010)**	**(0.011)**	(0.004)	(0.005)	**(0.006)**	**(0.007)**	(0.007)	**(0.009)**	**(0.009)**	**(0.011)**
School: % FRL	-0.016	-0.030+	-0.003	**0.035+**	0.047***	0.028*	0.032**	0.027*	0.006	0.005	-0.004	**-0.028*****	-0.036***	**-0.003**	-0.024*	-0.034*
	(0.013)	(0.018)	(0.016)	**(0.018)**	(0.010)	(0.014)	(0.012)	(0.013)	(0.005)	(0.006)	(0.007)	**(0.008)**	(0.009)	**(0.012)**	(0.010)	(0.013)
School: Enroll Increase	0.336***	0.309***	**0.154*****	**0.243*****	-0.317***	-0.296***	**-0.174*****	**-0.187*****	0.002	-0.010	0.013	-0.017	-0.021	-0.003	0.007	-0.040+
	(0.019)	(0.029)	**(0.030)**	**(0.030)**	(0.013)	(0.024)	**(0.024)**	**(0.022)**	(0.007)	(0.011)	(0.012)	(0.014)	(0.014)	(0.018)	(0.019)	(0.021)
School: Discipline Rate	-0.008***	**-0.036*****	**-0.026****	-0.011*	0.006***	**0.023*****	**0.023*****	0.008*	0.001	0.004**	0.003	0.001	0.001	**0.009****	0.000	0.002
	(0.002)	**(0.005)**	**(0.008)**	(0.005)	(0.002)	**(0.004)**	**(0.006)**	(0.003)	(0.001)	(0.002)	(0.004)	(0.002)	(0.002)	**(0.003)**	(0.006)	(0.004)
School: Avg. Exp.	0.003***	0.004***	0.004***	0.005***	-0.001**	-0.001	-0.002**	0.000	-0.001***	-0.001***	**-0.002*****	**-0.004*****	-0.001***	**-0.003*****	-0.001+	-0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	**(0.000)**	**(0.000)**	(0.000)	**(0.000)**	(0.000)	(0.001)
Urbanicity: City	0.037***	**-0.014+**	0.037***	**0.060*****	-0.016***	**0.021****	**-0.033*****	-0.029***	0.002	-0.001	-0.002	**-0.018*****	-0.022***	**-0.006**	**-0.002**	-0.013*
	(0.005)	**(0.008)**	(0.007)	**(0.008)**	(0.004)	**(0.007)**	**(0.005)**	(0.006)	(0.002)	(0.003)	(0.003)	**(0.003)**	(0.004)	**(0.005)**	**(0.005)**	(0.006)
Urbanicity: Suburb	-0.032***	-0.014	**0.016+**	**0.033*****	0.033***	0.020**	**-0.013***	**-0.029*****	0.002	**-0.007****	0.000	**-0.009***	-0.003	0.001	-0.004	0.004
	(0.006)	(0.009)	**(0.008)**	**(0.009)**	(0.005)	(0.007)	**(0.006)**	**(0.006)**	(0.002)	**(0.003)**	(0.004)	**(0.004)**	(0.004)	(0.006)	(0.006)	(0.007)
Urbanicity: Town	0.012**	**-0.020****	0.016*	**-0.012+**	-0.007*	**0.018*****	**-0.023*****	0.000	-0.004*	-0.002	0.001	**0.005**	-0.001	0.003	0.007	0.007
	(0.005)	**(0.007)**	(0.007)	**(0.007)**	(0.003)	**(0.006)**	**(0.005)**	(0.005)	(0.002)	(0.002)	(0.003)	**(0.003)**	(0.003)	(0.004)	(0.005)	(0.005)
Grade: District	-0.029***	**-0.061*****	-0.024**	-0.048***	0.016**	**0.051*****	0.012*	0.025***	0.006*	0.008*	-0.002	0.013**	0.007+	0.002	0.013*	0.010
	(0.006)	**(0.009)**	(0.008)	(0.009)	(0.005)	**(0.008)**	(0.006)	(0.007)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)
Grade: Middle	-0.018***	**0.004**	**-0.001**	**0.004**	0.022***	**0.001**	**0.005**	**0.004**	-0.002	-0.001	-0.004	**-0.011*****	-0.002	-0.003	0.000	0.004
	(0.005)	**(0.007)**	**(0.007)**	**(0.007)**	(0.004)	**(0.005)**	**(0.005)**	**(0.005)**	(0.002)	(0.002)	(0.003)	**(0.003)**	(0.003)	(0.004)	(0.004)	(0.005)
Grade: Secondary	-0.006	-0.018*	0.005	**0.014+**	0.011**	0.017**	0.001	**-0.011***	-0.003	-0.004	-0.008**	**-0.011*****	-0.002	0.005	0.002	0.009
	(0.005)	(0.008)	(0.007)	**(0.008)**	(0.004)	(0.006)	(0.006)	**(0.005)**	(0.002)	(0.002)	(0.003)	**(0.003)**	(0.003)	(0.005)	(0.005)	(0.006)
Year Indicators		-0.009**	-0.027***	-0.054***		0.010***	0.017***	0.015***		-0.001	0.010***	0.016***		0.001	0.000	0.022***
		(0.003)	(0.003)	(0.003)		(0.002)	(0.002)	(0.002)		(0.001)	(0.001)	(0.001)		(0.002)	(0.002)	(0.002)
Pseudo R^2	0.117															
Observations	139,097															

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001;
Heteroskedastic robust standard errors reported.
Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.

Appendix B Table 2 – Changes in the Quality of the Arkansas Teacher Workforce (Group Average Marginal Effects)

	Stayer		Mover		Switcher		Exiter	
	Pre	2021-22	Pre	2021-22	Pre	2021-22	Pre	2021-22
VAS: Math	0.213***	**0.147****	-0.085**	-0.117**	-0.008	0.011	-0.120***	**-0.041**
	(0.038)	**(0.048)**	(0.027)	(0.036)	(0.013)	(0.019)	(0.026)	**(0.032)**
VAS: ELA	0.167***	0.253***	-0.104***	-0.203***	0.011	-0.042	-0.074**	-0.008
	(0.040)	(0.065)	(0.029)	(0.048)	(0.014)	(0.026)	(0.028)	(0.045)
VAS: Science	0.098	0.151+	-0.014	-0.074	-0.016	0.025	-0.069	-0.102+
	(0.060)	(0.091)	(0.043)	(0.067)	(0.022)	(0.041)	(0.042)	(0.059)
Has VAS	0.009**	0.011*	0.004	-0.003	-0.001	-0.001	-0.012***	-0.007*
	(0.003)	(0.005)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)	(0.003)
Teacher: Black	0.000	-0.028**	0.002	-0.005	0.013***	0.016**	-0.014***	0.018**
	(0.006)	(0.009)	(0.005)	(0.006)	(0.003)	(0.005)	(0.004)	(0.006)
Teacher: Hispanic	0.027+	-0.005	-0.017+	-0.005	-0.004	0.013	-0.006	-0.003
	(0.014)	(0.020)	(0.010)	(0.014)	(0.005)	(0.011)	(0.010)	(0.013)
Teacher: Other Race	0.012	**-0.018**	-0.023*	-0.001	-0.006	**-0.004**	0.016	0.023
	(0.014)	**(0.021)**	(0.009)	(0.015)	(0.005)	**(0.008)**	(0.010)	(0.015)
Teacher: Male	-0.034***	-0.027***	0.033***	0.029***	0.002	**-0.003**	0.000	0.001
	(0.004)	(0.006)	(0.003)	(0.005)	(0.002)	**(0.003)**	(0.003)	(0.004)
Teacher: Age 35-44	0.028***	0.040***	-0.013***	-0.018***	0.003+	0.000	-0.018***	**-0.022*****
	(0.004)	(0.006)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	**(0.004)**
Teacher: Age 45-54	0.045***	0.036***	-0.022***	-0.012*	-0.004*	-0.008**	-0.018***	**-0.017*****
	(0.005)	(0.007)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	**(0.005)**
Teacher: Age 55+	-0.035***	-0.011	-0.041***	-0.045***	-0.010***	-0.017***	0.086***	0.073***
	(0.007)	(0.010)	(0.004)	(0.006)	(0.002)	(0.003)	(0.006)	(0.008)
Teacher: Early Career	-0.007	**0.000**	0.003	**0.009+**	-0.006***	-0.018***	0.009**	0.009+
	(0.005)	**(0.007)**	(0.003)	**(0.005)**	(0.002)	(0.003)	(0.003)	(0.005)
Teacher: Late Career	-0.030***	-0.048***	-0.007	**-0.012+**	-0.001	**0.002**	0.038***	**0.058*****
	(0.006)	(0.010)	(0.005)	**(0.007)**	(0.002)	**(0.004)**	(0.004)	**(0.007)**
Teacher: Adv. Degree	-0.018***	-0.019***	0.001	0.009*	0.015***	0.018***	0.002	-0.008*
	(0.003)	(0.005)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)	(0.003)
Teacher: Spell Length	0.037***	**0.039*****	-0.020***	**-0.023*****	-0.001	-0.001	-0.016***	-0.014***
	(0.002)	**(0.003)**	(0.002)	**(0.002)**	(0.001)	(0.001)	(0.001)	(0.002)
Teacher: STEM	-0.019**	**0.002**	0.030***	**0.012+**	-0.012***	-0.016***	0.002	0.002
	(0.006)	**(0.009)**	(0.005)	**(0.007)**	(0.002)	(0.003)	(0.004)	(0.006)
School: % Non-white	-0.074***	-0.105***	0.007	0.063***	-0.002	**0.014***	0.069***	0.029**
	(0.010)	(0.014)	(0.007)	(0.010)	(0.004)	**(0.006)**	(0.007)	(0.009)
School: % FRL	-0.012	0.005	0.045***	**0.026***	0.006	-0.005	-0.039***	**-0.026***
	(0.013)	(0.016)	(0.010)	**(0.012)**	(0.005)	(0.007)	(0.009)	**(0.010)**
School: Enroll Increase	0.331***	**0.147*****	-0.315***	**-0.166*****	0.002	0.012	-0.018	0.007
	(0.019)	**(0.030)**	(0.013)	**(0.024)**	(0.007)	(0.012)	(0.014)	(0.019)
School: Discipline Rate	-0.007***	-0.026**	0.005***	**0.023*****	0.001	0.003	0.001	0.000
	(0.002)	(0.008)	(0.002)	**(0.006)**	(0.001)	(0.004)	(0.002)	(0.006)
School: Avg. Exp	0.003***	0.004***	-0.001**	-0.002**	-0.001***	-0.002***	-0.001***	-0.001+
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Urbanicity: City	0.034***	**0.034*****	-0.015***	**-0.031*****	0.002	-0.002	-0.021***	-0.001
	(0.005)	**(0.008)**	(0.004)	**(0.005)**	(0.002)	(0.003)	(0.004)	(0.005)
Urbanicity: Suburb	-0.033***	0.016+	0.034***	-0.012*	0.002	0.000	-0.003	-0.004
	(0.006)	(0.008)	(0.005)	(0.006)	(0.002)	(0.004)	(0.004)	(0.006)
Urbanicity: Town	0.011*	0.015*	-0.007*	-0.023***	-0.004*	0.001	-0.001	0.007
	(0.005)	(0.007)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	(0.005)
Grade: District	-0.028***	-0.023**	0.015**	0.012+	0.006*	-0.002	0.006	0.013*
	(0.006)	(0.008)	(0.005)	(0.006)	(0.002)	(0.003)	(0.004)	(0.005)
Grade: Middle	-0.019***	-0.002	0.022***	0.006	-0.002	-0.004	-0.001	0.000
	(0.005)	(0.007)	(0.004)	(0.005)	(0.002)	(0.003)	(0.003)	(0.004)
Grade: Secondary	-0.005	0.008	0.011**	0.000	-0.003+	-0.009**	-0.003	0.001
	(0.005)	(0.007)	(0.004)	(0.006)	(0.002)	(0.003)	(0.003)	(0.005)
Year Indicator		-0.027***		0.017***		0.010***		0.000
		(0.003)		(0.002)		(0.001)		(0.002)
Pseudo R^2	0.110							
Observations	89,298							

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001;
Heteroskedastic robust standard errors reported.
Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.

Appendix B Table 3A – Changes in Factors Associated with Teachers' Labor Force Outcomes (Group Average Marginal Effects)

	Stayer				Mover				Switcher				Exiter			
	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23
EIPL	0.057**	0.085*	**-0.018**	0.033	-0.044**	-0.066*	0.041+	**0.033**	0.008	-0.016	0.012	-0.013	-0.021	**-0.003**	**-0.035**	-0.053*
	(0.022)	(0.033)	**(0.033)**	(0.034)	(0.016)	(0.026)	(0.025)	**(0.024)**	(0.008)	(0.011)	(0.014)	(0.016)	(0.015)	**(0.021)**	**(0.022)**	(0.024)
Teacher: Black	0.001	-0.020*	-0.032**	0.013	0.002	0.001	-0.001	-0.020**	0.011***	0.011**	0.018***	0.007	-0.015***	0.008	0.015*	0.000
	(0.006)	(0.010)	(0.010)	(0.010)	(0.005)	(0.007)	(0.007)	(0.006)	(0.003)	(0.004)	(0.005)	(0.005)	(0.004)	(0.006)	(0.007)	(0.007)
Teacher: Hispanic	0.029*	0.021	-0.007	0.017	-0.018+	-0.032*	-0.005	-0.004	-0.004	0.014	0.008	0.000	-0.007	-0.003	0.003	-0.013
	(0.014)	(0.020)	(0.021)	(0.019)	(0.010)	(0.013)	(0.014)	(0.013)	(0.005)	(0.010)	(0.010)	(0.010)	(0.010)	(0.014)	(0.014)	(0.013)
Teacher: Other Race	0.008	0.006	-0.025	-0.028	-0.023*	-0.007	0.000	-0.018	-0.004	0.000	-0.002	-0.007	0.019+	0.001	0.027+	**0.053****
	(0.014)	(0.021)	(0.022)	(0.023)	(0.009)	(0.015)	(0.016)	(0.015)	(0.005)	(0.007)	(0.009)	(0.009)	(0.011)	(0.014)	(0.016)	**(0.018)**
Teacher: Male	-0.035***	-0.038***	-0.030***	**-0.027*****	0.033***	0.036***	0.031***	0.041***	0.002	-0.002	-0.003	-0.001	0.001	0.003	0.003	**-0.014****
	(0.004)	(0.006)	(0.006)	**(0.007)**	(0.003)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	**(0.004)**
Teacher: Age 35-44	0.027***	**0.020****	0.040***	**0.046*****	-0.012***	**-0.007**	-0.017***	-0.005	0.002	0.001	0.001	0.003	-0.017***	-0.014**	-0.025***	**-0.043*****
	(0.005)	**(0.007)**	(0.007)	**(0.007)**	(0.003)	**(0.005)**	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)	**(0.005)**
Teacher: Age 45-54	0.044***	**0.018***	0.035***	**0.066*****	-0.022***	-0.005	-0.010+	-0.017**	-0.004*	-0.002	-0.007*	-0.007*	-0.017***	-0.011*	-0.017***	**-0.042*****
	(0.005)	**(0.008)**	(0.007)	**(0.007)**	(0.003)	(0.006)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	**(0.005)**
Teacher: Age 55+	-0.037***	**-0.065*****	-0.015	-0.003	-0.042***	**-0.034*****	-0.044***	-0.040***	-0.009***	-0.007*	**-0.014*****	-0.010*	0.088***	**0.105*****	0.073***	0.053***
	(0.007)	**(0.011)**	(0.010)	(0.010)	(0.004)	**(0.006)**	(0.006)	(0.006)	(0.002)	(0.003)	**(0.003)**	(0.004)	(0.006)	**(0.009)**	(0.008)	(0.008)
Teacher: Early Career	-0.005	-0.032***	0.002	-0.022**	0.003	0.018**	0.007	0.010*	-0.006***	-0.008***	-0.017***	-0.007*	0.009*	**0.022*****	**0.007**	**0.019*****
	(0.005)	(0.007)	(0.007)	(0.008)	(0.003)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	**(0.005)**	**(0.005)**	**(0.006)**
Teacher: Late Career	-0.026***	-0.043***	-0.042***	-0.038***	-0.007	-0.013+	-0.010	-0.022**	-0.002	0.004	0.000	**-0.008+**	0.035***	0.051***	**0.052*****	0.067***
	(0.006)	(0.009)	(0.010)	(0.010)	(0.005)	(0.007)	(0.008)	(0.007)	(0.002)	(0.003)	(0.004)	**(0.004)**	(0.004)	(0.007)	**(0.007)**	(0.008)
Teacher: Adv. Degree	-0.018***	-0.016**	-0.019***	-0.029***	0.002	0.000	0.009*	0.006	0.014***	0.017***	0.018***	0.026***	0.002	**-0.001**	-0.007*	-0.003
	(0.003)	(0.005)	(0.005)	(0.005)	(0.003)	(0.004)	(0.004)	(0.004)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	**(0.003)**	(0.003)	(0.004)
Teacher: Spell Length	0.036***	0.030***	0.039***	0.040***	-0.020***	-0.020***	-0.025***	-0.022***	-0.001	-0.001	-0.001	0.002	-0.015***	-0.010***	-0.013***	**-0.019*****
	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	**(0.002)**
Teacher: STEM	-0.021***	**-0.009**	**-0.002**	**-0.033*****	0.027***	0.024**	**0.015***	**0.025*****	-0.012***	-0.012***	-0.016***	-0.018***	0.006	**-0.003**	**0.003**	0.027***
	(0.006)	**(0.009)**	**(0.009)**	**(0.010)**	(0.005)	(0.007)	**(0.007)**	**(0.007)**	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	**(0.006)**	**(0.006)**	(0.007)
School: % Non-white	-0.060***	-0.005	-0.117***	**-0.103*****	0.001	-0.015	0.072***	**0.054*****	0.001	0.001	0.014*	**0.014+**	0.058***	0.020+	0.032**	0.036**
	(0.011)	(0.016)	(0.015)	**(0.017)**	(0.008)	(0.012)	(0.011)	**(0.012)**	(0.004)	(0.005)	(0.007)	**(0.007)**	(0.008)	(0.010)	(0.010)	(0.012)
School: % FRL	-0.037**	-0.037*	**-0.008**	**0.028**	0.057***	0.023	**0.031***	**0.021**	0.006	0.011	-0.002	-0.023**	-0.026**	0.004	**-0.020+**	-0.026+
	(0.014)	(0.019)	**(0.017)**	**(0.019)**	(0.010)	(0.014)	**(0.013)**	**(0.014)**	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)	(0.012)	**(0.011)**	(0.014)
School: Enroll Increase	0.360***	**0.333*****	0.163***	0.227***	-0.321***	**-0.306*****	-0.186***	-0.169***	-0.002	-0.009	0.009	-0.016	-0.037**	**-0.018**	0.014	-0.042+
	(0.020)	**(0.033)**	(0.031)	(0.031)	(0.013)	**(0.026)**	(0.024)	(0.023)	(0.008)	(0.012)	(0.012)	(0.014)	(0.014)	**(0.021)**	(0.019)	(0.022)
School: Discipline Rate	-0.010***	**-0.039*****	**-0.024****	**-0.010***	0.006***	0.024***	**0.017****	0.007+	0.002*	0.005**	**0.001**	**0.002**	0.003+	**0.010****	0.006	0.002
	(0.002)	**(0.005)**	**(0.008)**	**(0.005)**	(0.002)	(0.004)	**(0.006)**	(0.003)	(0.001)	(0.002)	**(0.004)**	**(0.002)**	(0.002)	**(0.003)**	(0.006)	(0.004)
School: Avg. Exp.	0.001**	**0.004*****	0.004***	**0.005*****	-0.001	**-0.001+**	**-0.003*****	**0.000**	0.000*	-0.001*	-0.001***	**-0.004*****	0.000	**-0.002*****	0.000	-0.001
	(0.001)	**(0.001)**	(0.001)	**(0.001)**	(0.000)	**(0.001)**	**(0.001)**	**(0.001)**	(0.000)	(0.000)	(0.000)	**(0.000)**	(0.000)	**(0.001)**	(0.001)	(0.001)
Urbanicity: City	0.040***	**-0.013**	**0.049*****	**0.066*****	-0.018***	**0.022****	**-0.035*****	**-0.033*****	0.000	**-0.001**	-0.003	**-0.017*****	-0.022***	-0.008	-0.011*	-0.016**
	(0.006)	**(0.009)**	**(0.008)**	**(0.008)**	(0.004)	**(0.007)**	**(0.006)**	**(0.006)**	(0.002)	**(0.003)**	(0.003)	**(0.004)**	(0.004)	(0.005)	(0.005)	(0.006)
Urbanicity: Suburb	-0.034***	**-0.005**	0.017*	**0.035*****	0.031***	**0.010**	**-0.015***	-0.030***	0.002	-0.007*	0.002	**-0.008***	0.000	0.002	-0.005	0.004
	(0.006)	**(0.009)**	(0.009)	**(0.009)**	(0.005)	**(0.007)**	**(0.006)**	(0.006)	(0.002)	(0.003)	(0.004)	**(0.004)**	(0.004)	(0.006)	(0.006)	(0.007)
Urbanicity: Town	0.012*	**-0.017***	0.021**	**-0.011**	-0.007*	**0.017****	-0.026***	-0.002	-0.004*	-0.002	0.001	0.005	-0.001	0.002	0.004	0.009
	(0.005)	**(0.007)**	(0.007)	**(0.007)**	(0.003)	**(0.006)**	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
Grade: District	-0.025***	**-0.057*****	-0.024**	**-0.048*****	0.014**	**0.048*****	**0.014***	**0.027*****	0.006*	0.009*	-0.002	**0.013****	0.005	0.000	0.012*	0.008
	(0.007)	**(0.010)**	(0.009)	**(0.009)**	(0.005)	**(0.008)**	**(0.007)**	**(0.007)**	(0.003)	(0.004)	(0.003)	**(0.004)**	(0.004)	(0.006)	(0.006)	(0.006)
Grade: Middle	-0.018***	0.007	-0.003	**0.002**	0.025***	-0.002	0.008	**0.006**	-0.002	-0.001	-0.003	**-0.012*****	-0.004	-0.004	-0.002	0.004
	(0.005)	(0.007)	(0.007)	**(0.007)**	(0.004)	(0.005)	(0.005)	**(0.005)**	(0.002)	(0.002)	(0.003)	**(0.003)**	(0.003)	(0.004)	(0.004)	(0.005)
Grade: Secondary	-0.007	-0.019*	0.005	0.012	0.012**	0.016**	0.001	-0.011*	-0.003+	-0.002	-0.007**	-0.011***	-0.002	0.005	0.002	0.010+
	(0.005)	(0.008)	(0.007)	(0.008)	(0.004)	(0.006)	(0.006)	(0.006)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)
Year Indicators		-0.012***	-0.032***	-0.058***		0.012***	0.019***	0.016***		-0.001	0.010***	0.017***		0.001	0.002	0.025***
		(0.003)	(0.003)	(0.003)		(0.002)	(0.002)	(0.002)		(0.001)	(0.001)	(0.001)		(0.002)	(0.002)	(0.002)
Pseudo R^2	0.170															
Observations	139,097															

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001;
Heteroskedastic robust standard errors reported.
Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.

Appendix B Table 3B – Changes in Factors Associated with Teachers' Labor Force Outcomes (Group Average Marginal Effects)

	Stayer				Mover				Switcher				Exiter			
	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23
Ever Changed Modes	-0.004	**-0.012***	**-0.042*****	-0.003	0.004	0.017***	0.031***	**0.009***	0.001	0.001	0.003	0.001	-0.001	**-0.006**	**0.009***	-0.007
	(0.004)	**(0.006)**	**(0.006)**	(0.006)	(0.003)	(0.005)	(0.005)	**(0.005)**	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)	**(0.004)**	**(0.004)**	(0.005)
Teacher: Black	-0.008	-0.035***	-0.038***	0.010	0.008	0.014+	-0.003	-0.018*	0.011***	0.011**	0.020***	0.008	-0.012**	0.010	0.021**	0.000
	(0.007)	(0.011)	(0.011)	(0.011)	(0.005)	(0.008)	(0.007)	(0.007)	(0.003)	(0.004)	(0.006)	(0.005)	(0.004)	(0.007)	(0.007)	(0.008)
Teacher: Hispanic	0.028+	0.029	-0.008	0.025	-0.014	-0.037**	-0.007	-0.008	-0.007	0.011	0.011	-0.002	-0.007	-0.003	0.003	-0.014
	(0.015)	(0.021)	(0.021)	(0.020)	(0.011)	(0.014)	(0.015)	(0.013)	(0.005)	(0.009)	(0.011)	(0.009)	(0.011)	(0.014)	(0.014)	(0.013)
Teacher: Other Race	0.007	0.009	-0.023	-0.027	-0.024*	-0.006	-0.006	-0.023	-0.003	-0.002	-0.001	-0.008	0.020+	-0.001	0.030+	**0.058****
	(0.014)	(0.021)	(0.022)	(0.023)	(0.010)	(0.016)	(0.016)	(0.014)	(0.005)	(0.007)	(0.009)	(0.009)	(0.011)	(0.014)	(0.016)	**(0.019)**
Teacher: Male	-0.033***	-0.039***	-0.031***	**-0.025*****	0.035***	0.038***	0.030***	0.040***	0.001	-0.002	-0.004	-0.002	-0.003	0.003	0.004	**-0.014****
	(0.005)	(0.007)	(0.007)	**(0.007)**	(0.004)	(0.006)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	**(0.005)**
Teacher: Age 35-44	0.027***	**0.021****	0.042***	**0.045*****	-0.010**	**-0.006**	-0.015**	-0.005	0.001	0.001	0.000	0.004	-0.018***	-0.016**	-0.027***	**-0.044*****
	(0.005)	**(0.007)**	(0.007)	**(0.007)**	(0.003)	**(0.006)**	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	**(0.005)**
Teacher: Age 45-54	0.043***	0.020*	0.037***	**0.068*****	-0.021***	-0.004	-0.009	-0.018**	-0.004*	-0.003	-0.008**	-0.007+	-0.018***	-0.013*	-0.019***	**-0.044*****
	(0.005)	(0.008)	(0.008)	**(0.008)**	(0.004)	(0.006)	(0.006)	(0.006)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	**(0.005)**
Teacher: Age 55+	-0.039***	**-0.063*****	-0.017	-0.001	-0.045***	-0.031***	-0.042***	-0.038***	-0.010***	-0.007**	**-0.013*****	-0.007	0.093***	0.101***	0.072***	0.046***
	(0.008)	**(0.011)**	(0.011)	(0.011)	(0.004)	(0.007)	(0.007)	(0.007)	(0.002)	(0.003)	**(0.004)**	(0.004)	(0.007)	(0.010)	(0.009)	(0.009)
Teacher: Early Career	-0.007	-0.026**	0.005	-0.024**	0.004	0.015*	0.007	**0.007**	-0.006***	-0.008***	-0.017***	-0.005	0.009*	0.019***	**0.005**	**0.021*****
	(0.005)	(0.008)	(0.008)	(0.008)	(0.004)	(0.006)	(0.006)	**(0.006)**	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.006)	**(0.005)**	**(0.006)**
Teacher: Late Career	-0.027***	-0.038***	-0.042***	-0.040***	-0.001	-0.012	**-0.006**	-0.022**	-0.003	0.004	0.000	**-0.010***	0.031***	0.046***	**0.048*****	0.072***
	(0.007)	(0.010)	(0.010)	(0.011)	(0.006)	(0.008)	**(0.008)**	(0.008)	(0.002)	(0.004)	(0.004)	**(0.004)**	(0.005)	(0.007)	**(0.007)**	(0.009)
Teacher: Adv. Degree	-0.018***	-0.017**	-0.022***	-0.026***	0.002	-0.001	0.014***	0.005	0.014***	0.017***	0.018***	0.027***	0.001	0.001	-0.010**	-0.006
	(0.004)	(0.005)	(0.005)	(0.006)	(0.003)	(0.004)	(0.004)	(0.004)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.004)	(0.003)	(0.004)
Teacher: Spell Length	0.034***	0.031***	**0.039*****	0.037***	-0.020***	-0.020***	-0.025***	-0.022***	-0.001	-0.002	-0.001	0.003+	-0.014***	-0.010***	-0.013***	**-0.017*****
	(0.002)	(0.003)	**(0.003)**	(0.004)	(0.002)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	**(0.002)**
Teacher: STEM	-0.022**	**-0.005**	0.002	-0.035***	0.032***	**0.019***	**0.015***	0.031***	-0.013***	-0.014***	-0.017***	**-0.020*****	0.003	**-0.001**	**0.000**	0.024**
	(0.007)	**(0.009)**	(0.009)	(0.010)	(0.005)	**(0.008)**	**(0.007)**	(0.008)	(0.002)	(0.002)	(0.003)	**(0.004)**	(0.004)	**(0.006)**	**(0.006)**	(0.008)
School: % Non-white	-0.073***	0.023	-0.105***	**-0.104*****	0.009	-0.051***	0.067***	0.017	-0.004	0.005	0.004	**0.043*****	0.067***	**0.023***	0.034**	0.044***
	(0.012)	(0.018)	(0.017)	**(0.019)**	(0.009)	(0.014)	(0.013)	(0.013)	(0.005)	(0.006)	(0.008)	**(0.008)**	(0.008)	**(0.012)**	(0.011)	(0.013)
School: % FRL	-0.014	-0.057**	**0.020**	**0.046***	0.047***	0.055**	**0.020**	**0.045****	0.007	0.004	0.000	-0.050***	-0.040***	-0.002	-0.040**	-0.041**
	(0.015)	(0.022)	**(0.019)**	**(0.022)**	(0.011)	(0.017)	**(0.014)**	**(0.016)**	(0.005)	(0.007)	(0.008)	(0.009)	(0.010)	(0.014)	(0.012)	(0.015)
School: Enroll Increase	0.376***	**0.332*****	0.138***	0.224***	-0.337***	**-0.300*****	-0.154***	-0.167***	-0.004	-0.007	0.007	-0.001	-0.036*	-0.025	0.010	-0.056*
	(0.021)	**(0.034)**	(0.033)	(0.033)	(0.013)	**(0.027)**	(0.026)	(0.024)	(0.008)	(0.012)	(0.013)	(0.015)	(0.015)	(0.022)	(0.021)	(0.023)
School: Discipline Rate	-0.011***	-0.038***	**-0.021***	**-0.007**	0.006***	0.023***	**0.018****	0.006+	0.001+	0.004*	**0.000**	**0.000**	0.004*	0.011**	0.003	0.001
	(0.002)	(0.005)	**(0.009)**	**(0.005)**	(0.002)	(0.004)	**(0.006)**	(0.004)	(0.001)	(0.002)	**(0.004)**	**(0.003)**	(0.002)	(0.003)	(0.006)	(0.004)
School: Avg. Exp.	0.002**	**0.003****	0.004***	0.006***	-0.001	**0.000**	**-0.003*****	0.001	0.000+	-0.001**	-0.001***	**-0.005*****	-0.001	**-0.002*****	**0.000**	-0.001*
	(0.001)	**(0.001)**	(0.001)	(0.001)	(0.000)	**(0.001)**	**(0.001)**	(0.001)	(0.000)	(0.000)	(0.000)	**(0.000)**	(0.000)	**(0.001)**	**(0.001)**	(0.001)
Urbanicity: City	0.047***	**-0.019+**	**0.064*****	**0.065*****	-0.025***	**0.024****	**-0.056*****	**-0.026*****	0.002	**-0.001**	0.001	**-0.030*****	-0.025***	-0.004	-0.009	-0.009
	(0.006)	**(0.010)**	**(0.009)**	**(0.010)**	(0.005)	**(0.008)**	**(0.006)**	**(0.007)**	(0.003)	**(0.003)**	(0.004)	**(0.004)**	(0.004)	(0.006)	(0.006)	(0.007)
Urbanicity: Suburb	-0.036***	**-0.006**	0.028**	**0.035*****	0.032***	**0.007**	**-0.031*****	-0.028***	0.004	-0.006*	0.004	-0.017***	0.000	0.005	-0.002	**0.010**
	(0.007)	**(0.010)**	(0.009)	**(0.010)**	(0.006)	**(0.008)**	**(0.006)**	(0.007)	(0.003)	(0.003)	(0.005)	(0.003)	(0.005)	(0.007)	(0.006)	**(0.008)**
Urbanicity: Town	0.016**	**-0.017***	0.032***	-0.013	-0.011**	**0.012+**	-0.042***	0.001	-0.002	-0.002	0.004	-0.003	-0.003	0.007	0.006	0.015*
	(0.005)	**(0.008)**	(0.008)	(0.008)	(0.004)	**(0.007)**	(0.005)	(0.006)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)	(0.005)	(0.005)	(0.006)
Grade: District	-0.024***	-0.070***	-0.015+	**-0.042*****	0.012*	**0.063*****	**0.005**	**0.027*****	0.005+	0.007+	-0.001	**0.008+**	0.008+	0.001	0.011+	0.007
	(0.007)	(0.010)	(0.009)	**(0.009)**	(0.005)	**(0.009)**	**(0.006)**	**(0.007)**	(0.003)	(0.003)	(0.003)	**(0.004)**	(0.005)	(0.006)	(0.006)	(0.007)
Grade: Middle	-0.017**	**-0.004**	**0.000**	**0.013+**	0.027***	0.010	**0.002**	**0.003**	-0.003+	-0.001	-0.001	**-0.012*****	-0.007*	-0.005	-0.002	-0.004
	(0.005)	**(0.008)**	**(0.008)**	**(0.008)**	(0.004)	(0.006)	**(0.006)**	**(0.006)**	(0.002)	(0.003)	(0.003)	**(0.003)**	(0.003)	(0.005)	(0.005)	(0.006)
Grade: Secondary	-0.003	-0.024**	0.015*	0.018*	0.008*	0.020**	-0.008	-0.016**	-0.003+	-0.002	-0.008**	-0.011**	-0.002	0.006	0.001	0.009
	(0.005)	(0.008)	(0.007)	(0.008)	(0.004)	(0.007)	(0.006)	(0.006)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)
Year Indicators		-0.013***	-0.032***	-0.055***		0.015***	0.020***	0.014***		-0.001	0.011***	0.018***		0.000	0.002	0.024***
		(0.003)	(0.003)	(0.003)		(0.002)	(0.002)	(0.002)		(0.001)	(0.001)	(0.001)		(0.002)	(0.002)	(0.002)
Pseudo R^2	0.274															
Observations	122,004															

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001;
Heteroskedastic robust standard errors reported.
Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.

Appendix B Table 3C – Changes in Factors Associated with Teachers' Labor Force Outcomes (Group Average Marginal Effects)

	Stayer				Mover				Switcher				Exiter			
	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23	Pre	2020-21	2021-22	2022-23
ESSER Soft Costs	-0.015	0.064**	**-0.085*** **	-0.040+	0.003	-0.073***	0.026+	**0.007**	0.001	0.002	0.019*	0.004	0.012	**0.007**	**0.041*** **	0.029*
	(0.014)	(0.020)	**(0.019)**	(0.021)	(0.011)	(0.016)	(0.015)	**(0.015)**	(0.005)	(0.007)	(0.008)	(0.009)	(0.009)	**(0.013)**	**(0.012)**	(0.014)
Teacher: Black	-0.001	-0.021*	-0.030**	0.013	0.004	0.002	-0.003	-0.023***	0.011***	0.012**	0.017***	0.010*	-0.014***	0.007	0.015*	0.000
	(0.006)	(0.009)	(0.010)	(0.010)	(0.005)	(0.007)	(0.007)	(0.006)	(0.003)	(0.004)	(0.005)	(0.005)	(0.004)	(0.006)	(0.006)	(0.007)
Teacher: Hispanic	0.027+	0.023	-0.008	0.017	-0.019+	-0.031*	-0.004	-0.006	-0.005	0.013	0.010	-0.001	-0.004	-0.005	0.001	-0.010
	(0.014)	(0.020)	(0.020)	(0.019)	(0.010)	(0.013)	(0.014)	(0.013)	(0.005)	(0.010)	(0.011)	(0.009)	(0.010)	(0.014)	(0.013)	(0.013)
Teacher: Other Race	0.009	0.004	-0.021	-0.029	-0.023*	-0.010	-0.001	-0.018	-0.005	0.002	-0.002	-0.008	0.018+	0.004	0.025	**0.055** **
	(0.014)	(0.020)	(0.022)	(0.022)	(0.009)	(0.014)	(0.016)	(0.014)	(0.005)	(0.008)	(0.009)	(0.009)	(0.010)	(0.014)	(0.015)	**(0.018)**
Teacher: Male	-0.036***	-0.039***	-0.029***	**-0.029*** **	0.033***	0.037***	0.030***	0.040***	0.002	-0.001	-0.003	0.001	0.001	0.003	0.003	**-0.012** **
	(0.004)	(0.006)	(0.006)	**(0.007)**	(0.003)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	**(0.004)**
Teacher: Age 35-44	0.028***	**0.019** **	0.040***	**0.045*** **	-0.012***	**-0.008**	-0.018***	-0.004	0.002	0.001	0.001	0.003	-0.017***	-0.013**	-0.023***	**-0.044*** **
	(0.004)	**(0.007)**	(0.007)	**(0.007)**	(0.003)	**(0.005)**	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)	**(0.004)**
Teacher: Age 45-54	0.043***	**0.018***	**0.035*** **	**0.065*** **	-0.021***	-0.005	-0.012*	-0.015**	-0.004*	-0.002	-0.007*	-0.007*	-0.018***	-0.011*	-0.016***	**-0.043*** **
	(0.005)	**(0.007)**	**(0.007)**	**(0.007)**	(0.003)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	**(0.005)**
Teacher: Age 55+	-0.037***	**-0.064*** **	-0.011	**-0.001**	-0.041***	**-0.033*** **	-0.045***	-0.040***	-0.010***	-0.006*	**-0.016*** **	-0.009*	0.088***	**0.103*** **	0.072***	0.050***
	(0.007)	**(0.010)**	(0.010)	**(0.010)**	(0.004)	**(0.006)**	(0.006)	(0.006)	(0.002)	(0.003)	**(0.003)**	(0.004)	(0.006)	**(0.009)**	(0.008)	(0.008)
Teacher: Early Career	-0.007	-0.031***	-0.001	-0.025***	0.004	0.017**	0.009+	0.014**	-0.006***	-0.008***	-0.017***	-0.008**	0.009**	**0.021*** **	**0.010***	**0.019*** **
	(0.005)	(0.007)	(0.007)	(0.007)	(0.003)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	**(0.005)**	**(0.005)**	**(0.005)**
Teacher: Late Career	-0.027***	-0.042***	-0.046***	-0.041***	-0.007	-0.013+	-0.011	-0.021**	-0.002	0.003	0.002	**-0.009***	0.036***	0.052***	**0.056*** **	0.071***
	(0.006)	(0.009)	(0.010)	(0.010)	(0.005)	(0.007)	(0.007)	(0.007)	(0.002)	(0.003)	(0.004)	**(0.004)**	(0.004)	(0.006)	**(0.007)**	(0.008)
Teacher: Adv. Degree	-0.018***	-0.016***	-0.019***	-0.028***	0.001	0.000	0.009*	0.006+	0.015***	0.017***	0.018***	0.025***	0.002	**0.000**	-0.008*	-0.004
	(0.003)	(0.005)	(0.005)	(0.005)	(0.003)	(0.004)	(0.004)	(0.004)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	**(0.003)**	(0.003)	(0.004)
Teacher: Spell Length	0.036***	0.031***	**0.038*** **	0.040***	-0.020***	-0.020***	-0.024***	-0.022***	-0.001	-0.001	-0.001	0.002	-0.015***	-0.010***	-0.013***	**-0.019*** **
	(0.002)	(0.003)	**(0.003)**	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	**(0.002)**
Teacher: STEM	-0.024***	**-0.010**	**-0.001**	**-0.030** **	0.028***	0.024***	**0.014***	**0.024*** **	-0.011***	-0.012***	-0.015***	**-0.018*** **	0.007+	**-0.002**	**0.002**	0.024***
	(0.006)	**(0.009)**	**(0.009)**	**(0.009)**	(0.005)	(0.007)	**(0.007)**	**(0.007)**	(0.002)	(0.002)	(0.003)	**(0.003)**	(0.004)	**(0.006)**	**(0.006)**	(0.007)
School: % Non-white	-0.064***	-0.016	-0.113***	**-0.104*** **	0.003	**-0.011**	0.065***	0.041***	-0.002	0.004	0.012+	**0.022** **	0.063***	0.023*	0.036***	0.041***
	(0.010)	(0.015)	(0.014)	**(0.016)**	(0.007)	**(0.011)**	(0.011)	(0.011)	(0.004)	(0.005)	(0.006)	**(0.007)**	(0.007)	(0.009)	(0.009)	(0.011)
School: % FRL	-0.038**	-0.031+	**-0.004**	**0.033+**	0.055***	0.019	**0.027***	**0.027*** **	0.008+	0.007	-0.002	-0.028***	-0.025**	0.004	**-0.021***	-0.032*
	(0.013)	(0.018)	**(0.016)**	**(0.019)**	(0.010)	(0.014)	**(0.012)**	**(0.013)**	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)	(0.012)	**(0.011)**	(0.013)
School: Enroll Increase	0.359***	**0.315*** **	**0.151*** **	0.245***	-0.320***	**-0.294*** **	**-0.176*** **	-0.187***	-0.001	-0.009	0.013	-0.017	-0.038**	**-0.012**	0.012	-0.040+
	(0.020)	**(0.032)**	**(0.030)**	(0.030)	(0.013)	**(0.025)**	**(0.024)**	(0.022)	(0.008)	(0.011)	(0.012)	(0.014)	(0.014)	**(0.020)**	(0.019)	(0.021)
School: Discipline Rate	-0.010***	**-0.036*** **	**-0.028*** **	**-0.011***	0.006***	0.022***	**0.020*** **	0.008*	0.002*	0.005**	**0.003**	**0.001**	0.003+	**0.010** **	0.004	0.002
	(0.002)	**(0.005)**	**(0.008)**	**(0.005)**	(0.002)	(0.004)	**(0.006)**	(0.003)	(0.001)	(0.002)	**(0.003)**	**(0.002)**	(0.002)	**(0.003)**	(0.005)	(0.004)
School: Avg. Exp.	0.001**	**0.004*** **	0.004***	**0.005*** **	-0.001	**-0.001***	**-0.003*** **	0.000	0.000*	-0.001*	-0.002***	**-0.004*** **	0.000	**-0.002*** **	**0.000**	-0.001
	(0.001)	**(0.001)**	(0.001)	**(0.001)**	(0.000)	**(0.001)**	**(0.001)**	(0.001)	(0.000)	(0.000)	(0.000)	**(0.000)**	(0.000)	**(0.001)**	**(0.001)**	(0.001)
Urbanicity: City	0.038***	**-0.017***	**0.043*** **	**0.062*** **	-0.016***	**0.027*** **	**-0.030*** **	**-0.029*** **	0.001	**-0.001**	-0.003	**-0.019*** **	-0.023***	-0.009+	-0.010*	-0.015*
	(0.005)	**(0.008)**	**(0.008)**	**(0.008)**	(0.004)	**(0.007)**	**(0.005)**	**(0.006)**	(0.002)	**(0.003)**	(0.003)	**(0.003)**	(0.004)	(0.005)	(0.005)	(0.006)
Urbanicity: Suburb	-0.038***	**-0.010**	0.013	**0.032*** **	0.035***	**0.015***	**-0.012***	-0.029***	0.003	-0.006*	0.002	**-0.008***	0.000	0.002	-0.002	0.005
	(0.006)	**(0.009)**	(0.008)	**(0.009)**	(0.005)	**(0.007)**	**(0.006)**	(0.006)	(0.002)	(0.003)	(0.004)	**(0.004)**	(0.004)	(0.006)	(0.006)	(0.007)
Urbanicity: Town	0.012**	**-0.019** **	0.017*	-0.012+	-0.006+	**0.019*** **	-0.022***	0.000	-0.004*	-0.003	**0.001**	0.005	-0.002	0.002	0.004	0.007
	(0.004)	**(0.007)**	(0.007)	(0.007)	(0.003)	**(0.006)**	(0.005)	(0.005)	(0.002)	(0.002)	**(0.003)**	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)
Grade: District	-0.028***	**-0.062*** **	**-0.022** **	**-0.049*** **	0.016**	**0.052*** **	**0.013***	**0.025*** **	0.006*	0.009**	-0.003	**0.013** **	0.006	0.001	0.013*	0.010
	(0.007)	**(0.009)**	**(0.008)**	**(0.009)**	(0.005)	**(0.008)**	**(0.006)**	**(0.007)**	(0.002)	(0.004)	(0.003)	**(0.004)**	(0.004)	(0.006)	(0.006)	(0.006)
Grade: Middle	-0.018***	0.005	-0.001	**0.004**	0.024***	0.000	0.006	**0.004**	-0.002	-0.001	-0.004	**-0.011*** **	-0.003	-0.004	-0.001	0.004
	(0.005)	(0.007)	(0.007)	**(0.007)**	(0.004)	(0.005)	(0.005)	**(0.005)**	(0.002)	(0.002)	(0.003)	**(0.003)**	(0.003)	(0.004)	(0.004)	(0.005)
Grade: Secondary	-0.007	-0.019*	0.004	0.014+	0.013**	0.017**	0.002	-0.011*	-0.003+	-0.003	-0.008**	-0.011***	-0.002	0.005	0.002	0.009+
	(0.005)	(0.008)	(0.007)	(0.008)	(0.004)	(0.006)	(0.006)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)
Year Indicators		-0.010***	-0.030***	-0.057***		0.011***	0.018***	0.016***		-0.001	0.011***	0.017***		0.001	0.001	0.024***
		(0.003)	(0.003)	(0.003)		(0.002)	(0.002)	(0.002)		(0.001)	(0.001)	(0.001)		(0.002)	(0.002)	(0.002)

Pseudo R^2	0.133
Observations	145,209

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001;
Heteroskedastic robust standard errors reported.
Bolded estimates are statistically significantly different from pre-COVID average marginal effects at the 95% or greater confidence level.