TEACHER MOBILITY IN TENNESSEE

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Mobility of teachers into and out of education and across school districts has very important implications for Tennessee's ability to offer high quality education throughout the state. This report uses detailed data from the 2001-2002 through 2006-2007 school years to examine the propensity of teachers to transition from their existing positions. In total we find that between 83.0 percent and 86.1 percent of teachers stay in the same school from one year to the next. Those teachers that move can be categorized into four possible transitions: (1) movement to another school within their current district, (2) movement to another district, (3) movement by a classroom teacher to a non-classroom capacity, and (4) movement outside the Tennessee education labor force. We find that only about one percent of classroom teachers move to non-classroom responsibilities, so this transition is not considered further. Between 4.8 percent and 7.7 percent of teachers move to a different school within the same district each year and just under two percent move to a different district. Between 6.2 and 6.9 percent exit the Tennessee education labor force each year for reasons including (but not limited to) finding a job outside education or retiring.

This report investigates the underlying causes of these teacher transitions using simple statistics that compare the characteristics of the positions before and after the transition and using multivariate analysis that examines the probability that teachers will transition. We find that teachers enjoy greater per student expenditures at their new district than their old district but spending in their old district does not appear to be a consistently important factor in their decision to move. Teachers generally do not appear to move to schools in better areas or to schools with particular student characteristics. One exception is that teachers tend have a higher probability of moving to another school within the district or leaving the education workforce if their current school has more non-white students. Teachers are also less likely to leave education or move to another district when the unemployment rate in their current county is high. This may be a reflection of fewer job opportunities.

More characteristics of the teachers affect the probability of moving. Specifically, more experienced teachers and teachers in larger school systems are less likely to move to another district and male teachers are more likely to move to another district. Teachers with more than a master's degree and those teaching at the high school level are more likely to leave education and those teaching at the elementary level are less likely to move out of education. Teachers with greater experience are less likely to make any type of transition, except that those with more than 16 years of experience have higher probabilities of exiting the education labor force. Teacher salaries matter because the probability of exiting education diminishes by 11 to 18 percent for each $1000 of additional basic salary. Higher supplementary salaries also reduce the probability of exiting education. That said, salaries do not appear to have a consistent effect in causing teachers to transition across districts.

1. INTRODUCTION

Ongoing changes in population aging and growth, educational attainment, employment patterns, and geographic migration all present challenges to the market for teachers in Tennessee. In order to prepare for the effects of these changes, it is important to understand the underlying forces behind teacher mobility. In this report, we make use of detailed teacher data from the 2001-2002 through 2006-2007 school years to document teacher mobility patterns and their determinants in Tennessee. A key concern is the extent to which observed salary differentials across the state contribute to teacher mobility within Tennessee, either within a particular school district or across districts.

While no prior study of teacher mobility has focused specifically on Tennessee, findings from the prior literature are informative and motivate our empirical work. A few selected studies are listed in Table 1 below. All but one (Rickman and Parker (1990)) have focused on one particular state or metropolitan area. Several have focused specifically on new teachers. Fortunately, the two most recent studies have focused on two of Tennessee's neighboring states: North Carolina and Georgia. In this report, we consider all public school teachers at all levels in Tennessee.

Analysis of teacher mobility typically involves estimation of some form of transition model. The most basic of these are linear probability models or discrete choice models such as probits or logits, where the outcome of interest is a binary indicator of whether or not a teacher leaves her current position. The alternative outcome in many cases is extremely general, encompassing any transition out of the current position (e.g., changing schools within a district, changing districts within a state, leaving the state school data entirely, and perhaps even leaving the work force entirely). Most of the recent studies include at least one of these binary outcome models as a preliminary look at the data before moving on to more sophisticated methods such as duration models and multinomial logits.

Duration models are used to examine the effects of various factors on the probability that a spell of time spent in some activity will come to an end. In this literature, spells are typically defined as teaching spells within a particular school, with the end of the duration coming either from any type of transition out or, as with the simpler models described above, a specific type (or combined group of types) of transition out. Good examples in the recent literature can be found in studies by Clotfelter, Glennie, Ladd, and Vigdor (2008) and Imazeki (2005). While duration models are superior in their ability to consider the timing of mobility, their major shortcoming is that only one definition of "exit" can be considered in any particular model.

Multinomial logits are not able to account very well for timing issues, but they are perhaps the best tool available for estimating the effects of various factors on a variety of transition types simultaneously. In their most common application, multinomial logits are used to explore the effects of a set of control variables on transitions out of a baseline position into a set of possible outcomes. Studies by Scafidi, Sjoquist, and Stinebrickner (2007), Falch and Strom (2005), Hanushek, Kain, and Rivkin (2004), and Theobald and Gritz (1996) have made interesting use of multinomial logit analysis to explore the factors affecting teacher mobility decisions. We follow these four studies most closely by estimating multinomial logits of teacher

transitions (1) into other schools in other districts, (2) into other schools within the same district, or (3) out of the Tennessee teacher data entirely, with the baseline outcome defined as remaining at the same school. We provide more detail on our estimation strategy below.

Table 1: Selected Prior Studies of Teacher Mobility

Study	Data
Clotfelter, Glennie, Ladd, and Vigdor (2008)	North Carolina public middle and high school teachers, 1999-2004
Scafidi, Sjoquist, and Stinebrickner (2007)	Georgia public elementary school teachers, 1994-2001 (focus on young, new teachers)
Falch and Strom (2005)	Norway public school teachers in grades 1-10, 1992-2000
Imazeki (2005)	Wisconsin public school teachers, 1992-1998 (focus on new teachers)
Hanushek, Kain, and Rivkin (2004)	Texas public elementary school teachers, 1993-1996
Theobald and Gritz (1996)	Washington public school teachers, 1981-1992 (focus on new white teachers)
Bempah, Kaylen, Osburn, and Birkenholz (1994)	Missouri public school teachers, 1988-1990 (focus on new teachers)
Rickman and Parker (1990)	Current Population Survey, 1984-1985
Murnane (1981)	Midcity, 1965-1974
Greenberg and McCall (1974)	San Diego, 1970-1972

The findings from the previous literature are perhaps as diverse as the studies themselves, but a few interesting themes have emerged. First, salary levels and differentials appear to matter for most forms of teacher mobility (Clotfelter, Glennie, Ladd, and Vigdor (2008), Scafidi, Sjoquist, and Stinebrickner (2007), Imazeki (2005), Hanushek, Kain, and Rivkin (2004), and Theobald and Gritz (1996)). That said, most of these studies have found that the salary effects are often smaller than those of other factors such as student characteristics. This might be a result of a relatively low degree of salary variation within many of the data sets used in prior empirical studies.

One of the most prominent factors in teacher mobility from the earlier literature is the racial profile of the students in the teacher's school. Specifically, Scafidi, Sjoquist, and Stinebrickner (2007), Imazeki (2005), Hanushek, Kain, and Rivkin (2004), and Falch and Strom (2005) all find that teachers are more likely to leave schools with higher percentages of minority students. It is possible that omitted factors such as family income levels, crime rates, preferences for quality education, and the like are responsible for some of this effect, but studies that have controlled for some of these things often continue to find a strong effect of student race on teacher mobility patterns.

Another possible story that has not yet been explored is that schools with higher percentages of minority students might have more openings for new teachers in any given year. Clotfelter, Glennie, Ladd, and Vigdor (2008) and Hanushek, Kain, and Rivkin (2004) conclude that newer, less-experienced teachers are more mobile than more experienced teachers. All of this suggests a degree of caution in interpreting the theme from prior research that teachers tend to leave schools with more minorities. We will return to this issue in our analysis below.

Among the other factors that have been found to affect teacher mobility are the teacher's age and education and measures of student characteristics such as test scores and socioeconomic status. For age, Imazeki (2005) and Falch and Strom (2005) find that younger teachers are more likely to exit their current position or to leave the education sector entirely, even when controlling for years of experience. Imazeki (2005) and Clotfelter, Glennie, Ladd, and Vigdor (2008) find that teachers with advanced graduate degrees are more likely to leave their current teaching positions for non-teaching positions. Finally, Clotfelter, Glennie, Ladd, and Vigdor (2008) and Hanushek, Kain, and Rivkin (2004) both find that teacher mobility rises as student test scores fall and as the percentage of students receiving free or reduced lunches rises. We control for these and other factors in our empirical work below.

2. TEACHER MOBILITY IN THE TENNESSEE DATA

To examine teacher mobility in Tennessee, we make use of administrative records for all public school teachers for school years 2001-2002 through 2006-2007. Table 2 below shows raw transition probabilities for those who enter each two-year period as classroom teachers. Of the 55,862 classroom teachers in Tennessee public schools in the 2001-2002 school year, 46,361 (or 83 percent) were still classroom teachers in the same school in the 2002-2003 school year. Another 4,289 (7.7 percent) moved to another school within the same district and 1,013 (1.8 percent) moved to another school in a different district. A small number—about one percent—moved into a non-classroom job either in the same or a different district. These transitions are omitted from the remaining analysis in our report.

Looking across the columns of Table 2 reveals that a steadily increasing percentage of Tennessee's classroom teachers choose to remain in their current school over time. This percentage rises from 83 percent between the 2001-2002 and 2002-2003 school years to 86.1 percent between the 2005-2006 and 2006-2007 school years. Conversely, a steadily smaller percentage chooses to move within their current districts. This percentage falls from about 7.7 percent to 4.8 percent during our window of analysis. Interestingly, the percentage of classroom teachers who move to different districts remains fairly constant over time, generally between 1.6 and 1.9 percent (or about 1,000 teachers) in each two-year period.

The fourth and final transition of interest for our study involves exits from the Tennessee education data. Between 6.2 and 6.9 percent exit the Tennessee education labor force each year. There were 3,638 classroom teachers in Tennessee in 2001-2002 who left the data as of the 2002-2003 school year. These individuals either left the labor force entirely, switched to a non-education job in Tennessee, or moved to another state (either in education or otherwise). We are

able to match the teacher data to Unemployment Insurance records for those with UI-covered jobs in Tennessee, but we are not able to match to UI data from other states. Consequently, we follow several prior studies by combining all teachers who leave the Tennessee education data into a single category for the purposes of our remaining analysis. Nonetheless, we are able to exploit the data to examine behavior of those that exit the education labor force and remain in Tennessee. We find that about 70 percent of those exiting education are not in the Tennessee labor force (as measured by the UI data) in the year after they are in full time teachers, though some could re-enter at a later time. About one-sixth of those who exit the Tennessee education workforce re-enter the education work force at some subsequent time period, even if not after one year. Re-entering teachers are then potentially in subsequent transition analyses undertaken here.

Table 2: Tennessee Teacher Transitions

	'01-'02 to '02-'03		'02-'03 to '03-'04		'03-'04 to '04-'05		'04-'05 to '05-'06		'05-'06 to '06-'07	
Classroom teachers in initial year	55,862		56,260		57,284		58,266		59,073	
No change	46,361	83.0%	48,091	85.5%	49,078	85.7%	50,075	85.9%	50,858	86.1%
New school, same district	4,289	7.7%	3,189	5.7%	2,764	4.8%	2,917	5.0%	2,812	4.8%
New district	1,013	1.8%	942	1.7%	963	1.7%	942	1.6%	1,100	1.9%
Non-classroom job in same district	506	0.9%	531	0.9%	510	0.9%	567	1.0%	540	0.9%
Non-classroom job in new district	55	0.1%	42	0.1%	40	0.1%	38	0.1%	45	0.1%
Left TN education workforce	3,638	6.5%	3,465	6.2%	3,929	6.9%	3,727	6.4%	3,718	6.3%
Remain in TN workforce			1,036	1.8%	1,240	2.2%	1,105	1.9%	1,052	1.8%
Return to TN education workforce	639	1.1%	608	1.1%	619	1.1%	333	0.6%		

3. FACTORS RELATED TO TEACHER MOBILITY IN TENNESSEE

Our focus is on transitions among Tennessee's public classroom teachers into four primary outcomes on a year-by-year basis. Those outcomes include (1) the baseline or reference category of remaining a classroom teacher in the same school, (2) moving into a classroom teaching position in another school within the same district, (3) moving into a classroom teaching position in another district, and (4) moving out of the Tennessee education data. While our key focus is on the effects of teacher salaries on mobility patterns, we must control for other possible determinants of mobility in our multivariate analysis. Table 3 below lists the factors at the teacher, school, and district levels that are included in our work. This list is motivated by the findings from the prior literature as described above.

Table 3 lists three types of variables, teacher specific characteristics, school building specific characteristics and district level characteristics. Several points should be observed about these data. First, the school and district variables refer to the place where the teacher is employed during the year prior to transition. Second, three salaries are used in the analysis: the teacher's basic earnings from the Local Education Agency's salary schedule (Base Salary), salary supplements which may include payments for such tasks as coaching or other extra-curricular activities (Supplementary Salary), and earnings that the teacher receives from any sources outside the Local Education Agency that are covered by Unemployment Insurance (External Salary). The first two are based on rates of pay and may not represent the actual amounts received by a teacher for a variety of reasons, such as cases in which a teacher did not finish the school year. The external salary is based on actual earnings reported through the Tennessee Unemployment Insurance system. Third, some district characteristics are based on the political jurisdiction in which the district is located. Specifically, the unemployment rate and crime rate are for the county where the district is located.

Table 3: Control Variables Included in Multivariate Models

Teacher Characteristics	Description
Base Salary	Total State Salary Before Supplements
Supplementary Salary	Total Supplements to Teacher's State Salary
External Salary	Total Non-Education Pay from UI Data
Grade Level	Indicators for Teacher's Classroom Level (Elementary, Middle, High)
Education Level	Indicators for Teacher's Education (Bachelor's, Master's, More than Master's)
Experience	Teacher's Experience in Years
Gender	Indicator for Male
Race	Indicators for Teacher's Race (White, Black, Other)
School Characteristics	**Description**
Percent Non-White	Percent of Students in the School who are Non-White
Free/Reduced Lunch	Percent of Students in the School who Receive Free or Reduced Lunches
Test Score*	Composite Gateway Test Score
District Characteristics	**Description**
Teacher Count	Number of Teachers at the Teacher's Grade Level in the District
Instructional Spending	Per-Pupil (Average Daily Membership) Instructional Spending in the District
Unemployment Rate	Unemployment Rate in the District
Crime Rate	Violent Crimes per 1,000 Residents in the District
Suspension Rate	Percent of Students (ADM) in the District who had been Suspended
Expulsion Rate	Percent of Students (ADM) in the District who had been Expelled
Retention Rate	Percent of Students (ADM) in the District who were Retained in the Same Grade
Special Education Pct.	Percent of Students (ADM) in the District who Received Special Education
Federal Spending Share	Federal Funding Received as a Share of Total District Education Spending

*Note: Test scores used in our analysis are actual Gateway achievement scores for the 2004-2005 school year and beyond and the sum of proficiency percentages in algebra I, geometry and biology I for earlier years.

Table 4 lists average values for all public school teachers and not just teachers making a transition. The data show, for example, that the average teacher has about 14.5 years of experience across the study period. The average teacher earns less than $1000 working outside the school system, and other calculations not shown here reveal that the median value of external earnings is zero. As of the end of our data period, about 43 percent of teachers have a bachelor's degree as their highest level of education, nearly 39 percent have a master's degree and about 18 percent have education beyond a master's degree. Fifty-six percent of teachers are at the elementary level, 19 percent at the middle school level, and 26 percent at the high school level.

Table 4: Average Characteristics for All Teacher Data

Variable	'01-'02 to'02-'03	'02-'03 to'03-'04	'03-'04 to'04-'05	'04-'05 to'05-'06	'05-'06 to'06-'07
Base Salary	29509	29460	29963	36578	37245
Supplementary Salary	10773	11558	12247	7463	7258
External Salary	647	898	803	861	635
Percent Non-white*	27.55	28.19	30.66	31.33	31.98
Free/reduced lunch*	18.56	17.68	17.24	18.06	15.50
Test Score	171.5	171.6	170.6	1036.2	1054.0
Teacher Count	699	743	811	814	806
Instructional Spending	3514.8	3583.7	3824.6	4057.3	4091.5
Unemployment rate*	4.8	5.4	5.8	5.5	5.6
Crime Rate*	55.23	55.60	56.41	58.37	59.30
Suspension Rate*	8.44	8.51	9.09	8.57	8.63
Expulsion Rate*	0.25	0.23	0.23	0.20	0.30
Retention Rate*	3.81	4.14	3.96	3.49	3.53
Special Education Pct.*	2.05	2.54	2.49	1.52	1.37
Federal Spending Share*	10.52	11.13	11.77	12.57	12.30
Experience	14.67	14.73	14.67	14.60	14.48
Elementary Level*	52.97	54.11	55.87	55.54	55.51
Middle School Level*	19.98	19.55	18.91	19.17	18.97
High School Level*	27.04	26.34	25.23	25.30	25.52
Bachelor's Degree*	45.48	44.86	44.16	43.71	42.87
Master's Degree*	36.88	37.35	37.83	38.07	38.65
More than Master's*	17.64	17.79	18.01	18.21	18.49
Female*	78.28	78.29	78.53	78.54	78.63
Black*	10.27	10.78	10.76	10.63	10.32
Other Race*	24.28	20.09	20.33	21.18	22.38
White*	65.45	69.14	68.91	68.20	67.30

*Percent

Before turning to our multivariate econometric analysis, we present some comparisons of these factors before and after transitions for those teachers who change jobs (either within their district or across districts) between two school years. Table 5 below presents average values for most of the above characteristics before and after transitions occur. Statistics for those moving between two different districts are shown in the top panel and statistics for those moving within a district are shown in the bottom panel.

Table 5: Summary Statistics for Teachers Moving Between or Within Districts

BETWEEN DISTRICTS	'01-'02 to '02-'03		'02-'03 to '03-'04		'03-'04 to '04-'05		'04-'05 to '05-'06		'05-'06 to '06-'07	
Variable	**Before**	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**
Base Salary	26.90	27.23	26.97	27.85	27.49	32.84	31.96	33.34	32.56	33.90
Supplementary Salary	5.90	7.45	6.90	8.28	8.09	5.17	4.89	5.11	4.84	5.59
External Salary	N/A	N/A	1.23	2.64	1.27	2.82	1.20	1.85	1.03	2.19
Percent Non-White	20.53	21.21	23.22	23.73	27.12	27.57	25.88	26.86	29.34	28.62
Free/Reduced Lunch	19.22	18.39	18.24	17.71	17.59	18.19	18.14	15.50	15.43	14.54
Test Score	176.38	176.04	176.15	173.99	172.81	1049.15	1049.26	1058.67	1056.85	1054.72
Teacher Count	334.97	346.69	400.48	437.05	536.71	540.48	512.84	516.11	594.87	547.42
Instructional Spending	3339.20	3435.79	3442.67	3643.16	3707.40	3943.27	3912.50	3966.11	4068.75	4144.64
Unemployment Rate	4.94	5.50	5.66	6.11	5.89	5.62	5.56	5.63	5.58	5.21
Crime Rate	42.74	42.15	46.52	46.12	46.63	48.08	47.89	49.12	51.37	N/A
Suspension Rate	6.60	6.81	6.83	7.20	7.76	7.53	7.34	7.51	7.93	6.56
Expulsion Rate	0.29	0.16	0.17	0.18	0.19	0.16	0.18	0.23	0.24	0.23
Retention Rate	3.57	3.66	3.60	3.38	3.45	3.16	3.19	3.17	3.30	2.80
Special Education Pct.	1.60	1.95	1.95	1.89	2.32	1.35	1.36	1.19	1.20	1.26
Federal Spending Share	10.94	11.70	11.75	12.02	11.74	12.48	12.46	12.32	12.36	11.88

WITHIN DISTRICTS	'01-'02 to '02-'03		'02-'03 to '03-'04		'03-'04 to '04-'05		'04-'05 to '05-'06		'05-'06 to '06-'07	
Variable	**Before**	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**
Base Salary	28.48	28.75	28.34	29.19	28.72	35.04	34.26	35.56	34.94	36.36
Supplementary Salary	9.92	11.25	10.78	11.84	11.15	7.39	7.70	7.74	7.10	7.93
External Salary	N/A	N/A	1.01	0.73	0.16	0.02	1.02	0.72	0.74	0.56
Percent Non-White	37.68	41.62	41.88	44.91	43.63	45.55	48.38	48.35	51.66	49.36
Free/Reduced Lunch	18.14	17.12	17.18	16.75	16.74	17.95	17.34	15.24	15.38	14.78
Test Score	167.57	168.13	166.25	165.09	167.77	1036.95	1032.43	1041.21	1035.45	1033.93
Teacher Count	930.15	976.35	1027.14	1117.57	1088.43	1098.46	1279.49	1271.92	1282.10	1155.74
Instructional Spending	3664.45	3682.66	3672.04	3952.95	3829.32	4045.86	4157.81	4177.00	4195.42	4362.35
Unemployment Rate	4.51	5.13	5.12	5.46	5.75	5.50	5.19	5.28	5.33	5.04
Crime Rate	55.91	55.96	64.34	65.97	65.61	67.71	77.83	80.19	84.49	N/A
Suspension Rate	10.33	10.39	10.44	11.20	11.18	10.22	11.02	11.06	11.66	10.57
Expulsion Rate	0.27	0.26	0.26	0.24	0.27	0.23	0.23	0.43	0.43	0.56
Retention Rate	4.56	4.54	4.62	4.58	4.64	4.08	4.16	4.38	4.50	3.98
Special Education Pct.	2.77	4.29	4.00	3.81	2.44	1.56	1.78	1.62	1.65	1.16
Federal Spending Share	10.16	10.49	10.99	12.03	11.96	12.96	12.81	12.45	12.88	12.58

Beginning with the between-district movers, we first note that base salaries tend to rise for teachers who move either between or within districts. Teachers moving across districts consistently generally earn lower base and supplementary salaries than the state averages reported in Table 4. This suggests that most moves involve salary improvements rather than reductions, and implies that most moves are voluntary rather than reassignments of low-performing teachers. Of course, the salary changes are smaller for those who move within a district for obvious reasons. Similarly, for every two-year transition except 2003-2004 to 2004-2005, teachers who move enjoy larger average salary supplements in their destination districts. The difference here can be substantial—approaching $1,500 in the earlier years of our data. These data suggest that variation in salaries across the state might be contributing to teacher mobility, both for the base state salaries as well as supplementary pay.

We find a very interesting pattern involving external (non-education) pay as identified by the UI data. Specifically, those who move between districts have more external pay on average after their move than before. This suggests the possibility that the ability to earn income outside the school system could be important in teacher mobility, though the amounts earned are generally small. Movers earn much more external income than the average teacher, reinforcing the potential for external pay to be a factor. Conversely, those who move within a district not only have lower external pay before moving (as compared to the pre-move external pay of between-district movers), their external pay also falls on average after their moves. However, it is important to recall that those who leave the Tennessee teacher data entirely, but might be working in another state or in a Tennessee job that is not covered by the UI system, are not included in these comparisons.

Turning to non-salary factors, the Tennessee data do not suggest that mobile teachers are moving to avoid some of the perceived issues suggested by prior studies. For example, those moving between districts move into districts with higher percentages of non-white students than in their original districts and generally come from districts with lower-than-average shares of non-white students. The final two-year transition is the only exception to this general finding. That said, the percentage of students who receive free or reduced lunches is lower in the destination district than in the origin district in all but one of the two-year transition periods. These general patterns are also observed for the within-district movers. Student test scores do not appear to vary systematically across origin and destination districts for both groups of movers, suggesting that teachers are not necessarily moving in order to benefit from higher-quality student groups.

Until the final two-year transition within our data, teachers are generally moving into larger school systems as measured by the number of teachers in their grade areas and start from districts that are well under the state average. A comparison of these numbers with corresponding entries for within-district moves shows, unsurprisingly, that those changing schools within the same district tend to start and end up in larger systems. This is only natural, as those in larger school districts are more likely to be able to move within their district than those in smaller districts.

It is interesting to note that teachers who change schools, regardless of whether the move is between districts or within a district, typically enjoy higher levels of per-student instructional

spending in the destination school or district than in their origin district. Movers also tend to come from districts that spend less than the state average. The spending data are at the district level, so the higher amounts for within-district movers represent the year-to-year spending increase for districts where moves occur. It is interesting that between-district movers leave districts with lower spending than the within-district movers. Funding and salary issues aside, it is not clear that teachers are moving into better areas on average, as the changes in local unemployment and crime rates are sometimes positive and sometimes negative in our data. The same could generally be said about the overall characteristics of the student population as measured by suspensions, expulsions, retention, and special education percentages. The data do not suggest that teachers are moving into either more or less challenging school systems on average.

4. MULTIVARIATE ANALYSIS

In order to assess the independent influence of each of these characteristics on teacher mobility patterns, we now turn to a series of multivariate models. Specifically, we estimate separate multinomial logit models for each two-year transition period, where classroom teachers in one school year can either stay in their same school (the baseline reference outcome), move to a different school in a different district, move to a different school within their same district, or leave the Tennessee education data entirely. This statistical approach allows us to assess the impact of each individual factor on the various transition probabilities simultaneously while holding all of the other factors constant. Independent variables are based on the initial year in each two-year transition period, thereby giving us a "push" model of mobility. In this framework, we are analyzing the extent to which characteristics of a teacher's job in one school year influence his or her mobility decisions between that year and the following year. It would not be tractable to estimate a "pull" model of mobility, because such an approach would require us to control for the characteristics of all possible destinations simultaneously.

Results from the multinomial logits are shown in Table 6 below, where entries are expressed as odds ratios. To interpret, if the odds ratio is greater than one, then a one-unit change in that factor (or a change from zero to one for indicator variables) is associated with an increase in that particular transition probability relative to the probability of staying in the same school. Odds ratios that are less than one correspondingly indicate that increases in that factor reduce the transition probabilities relative to staying in the same school. Bold entries are statistically different from one at the five percent level. We focus our discussion on variables that are found to have consistently positive or negative effects on mobility of one form or another throughout the analysis period.

Perhaps the most interesting result among the findings in Table 6 is that education salaries, both in terms of base salaries and supplements, do not appear to influence decisions to move within or between districts. The exception is that supplementary salaries are related to moves within districts in the last two transition periods, but with opposite effects. This is not out of line with the prior literature on teacher mobility. However, those two salary measures have important effects on the odds of leaving the teacher data entirely. Specifically, those earning higher base salaries or more supplements are statistically less likely to leave the education data.

The odds ratios are in the range of 0.8244 to 0.8935, suggesting that an additional $1,000 of base salary reduces the probability of leaving the data by about 11 to 18 percent (1 minus the odds ratio) depending on the year. An additional $1,000 of salary supplements reduces the probability of leaving the data by about four to six percent, again depending on the year.

Results in Table 6 also reveal significant differences in transition probabilities for teachers at different levels. Specifically, elementary school teachers are less likely than high school teachers (the reference category) to leave the Tennessee education data than to stay in their current school, as judged by the odds ratios that are significantly below one for all four two-year transition periods in our data. The odds ratio of 0.8218 for the 2002-2003 to 2003-2004 transition period indicates that being an elementary school teacher makes one 17.82 percent (1 – 0.8218) less likely to leave the education data relative to staying in one's current school. On a similar but interestingly different note, middle school teachers are more likely than high school teachers to move within a district in all four transition periods (odds ratios are all above one).

A teacher's own education level has little effect on mobility, with the lone exception being that those with more than a masters degree are more likely to transition out of the education data, presumably because higher-educated teachers have a wider set of employment opportunities outside the state school system (in private elementary or secondary schools, public or private higher education institutions, or even non-education jobs). A smaller number of options outside of education may be an explanation for why elementary teachers are less likely to leave education. In a similar vein, the probability of exiting education or moving between districts falls as the unemployment rate rises, again potentially reflecting fewer opportunities.

A teacher's experience level is found to have important effects on the various transition probabilities. Those with more experience are generally less likely to move away from their current schools in any direction. That said, we find that experience has a non-linear effect on the odds of leaving the education data, with the negative base effect being partially offset by a positive quadratic effect at higher experience levels. This might only be evidence that those with the most experience are most likely to retire out of the education data entirely, particularly since the squared education term is generally statistically significant only for transitions out of the data. The results for the 2006-2007 transition indicate that teachers are increasingly more probable to stay in education with each additional year of experience until their eighth year, at which point more experience begins to lessen the probability of staying. For example, teachers with eight years of experience are 18.6 percent less likely to leave education and those with 12 years of experience are 14.4 percent more likely to stay in education. Experience after 16 years actually makes teachers less likely to stay in education.

Teacher race is not a strong determinant of mobility, except for the finding that non-black and non-white teachers (those with "other" race) are less likely to move out of the education data. As in much of the prior literature, we find that the race of the student population is more important, with teachers who face higher percentages of non-white students being slightly more likely to leave their current school for any of the three other transition outcomes. Teacher mobility does not appear to be strongly or systematically related to most of the other characteristics in our models, including the percentage of students receiving free or reduced lunches, student test scores, and, perhaps most interestingly, per-student instructional spending.

Surprisingly, there is some evidence that teachers in districts with higher test scores have a higher probability of leaving education though this is difficult to interpret since the test scores are for the district and not the specific building where the teacher is employed.

5. CONCLUSION

We investigate the propensity for teachers to transition between schools within a district, between districts, and outside of education using simple statistics to compare the average characteristics of the teachers, students, and areas both before and after the transitions. We also employ multivariate analysis to identify factors that influence the probability that teachers transition in one of the above ways. We find limited evidence that student characteristics matter. Teachers in districts with more non-white students are more probable to make any of the transitions and teachers are interestingly more likely to leave education if they are in districts with high test scores.

More teacher- and job-specific characteristics influence the probability of a transition. For example, teachers with more than a master's degree and those teaching at the high school level are more likely to move out of education and those teaching at the elementary level are less likely to move out of education. Teachers become generally less likely to move as their experience level rises, until they have more than 16 years of service when they become more likely to move out of education. The latter likely evidences the effects of retirement.

We find little evidence that teachers move to another district to take advantage of higher salaries. The important effect of salaries is to reduce the probability that teachers leave education. We also find some evidence that teachers with greater external earnings are less likely to move out of education. Teachers tend to move to districts that have higher per-student expenditures, but no consistent effect is found in the multivariate analysis.

Table 5: Multinomial Logit Results

Variable	Transition	'02-'03 to '03-'04	'03-'04 to '04-'05	'04-'05 to '05-'06	'05-'06 to '06-'07
Base Salary	Between	0.9463	0.9456	1.0663	0.9719
	Within	1.0015	0.9765	1.0362	1.0491
	Out	**0.8244**	**0.8475**	**0.8694**	**0.8935**
Supplementary Salary	Between	**0.9585**	0.9817	0.9899	0.9757
	Within	1.0151	1.0145	**1.0231**	**0.9512**
	Out	**0.9394**	**0.9595**	**0.9399**	**0.9451**
External Salary	Between	0.9990	0.9995	0.9996	**1.0255**
	Within	1.0080	**0.9454**	1.0034	1.0005
	Out	**1.0157**	0.9978	1.0003	**1.0201**
Elementary Level	Between	0.9519	0.9161	0.8799	0.9171
	Within	**0.8592**	1.0114	**1.1394**	1.1174
	Out	**0.8218**	**0.8167**	**0.7456**	**0.8636**
Middle School Level	Between	0.8875	0.8567	0.9421	0.9141
	Within	**1.3555**	**1.4965**	**1.3595**	**1.1480**
	Out	0.9692	1.0040	**1.1957**	0.9800
Masters Only	Between	0.9251	1.0352	1.0549	0.9776
	Within	1.0050	0.9652	1.0013	0.9269
	Out	0.9711	1.0194	1.0009	0.9989
More than Masters	Between	1.2724	1.0436	0.7269	1.2390
	Within	1.0822	1.1579	0.9939	1.0546
	Out	**1.3388**	**1.2412**	**1.4222**	**1.3508**
Experience	Between	0.9389	**0.9212**	**0.8404**	**0.8917**
	Within	**0.9525**	**0.9595**	**0.9058**	**0.9073**
	Out	**0.9489**	**0.9303**	0.9755	**0.9544**
Experience Squared	Between	0.9994	1.0003	1.0014	1.0010
	Within	1.0003	1.0002	**1.0014**	1.0011
	Out	**1.0032**	**1.0035**	**1.0026**	**1.0028**
Male	Between	**1.2366**	1.1112	**1.1400**	**1.3032**
	Within	1.0414	1.0481	0.9992	**1.1339**
	Out	1.0404	**0.8959**	1.0428	1.0011
Black	Between	0.9290	**1.3477**	0.8948	0.8675
	Within	0.8759	**1.1802**	1.0794	0.8031
	Out	1.0578	0.9952	0.9587	0.8299
Other Race	Between	0.9373	**0.7743**	0.9786	1.0520
	Within	1.0478	0.9181	0.9635	1.0724
	Out	**0.8678**	**0.7557**	**0.8211**	**0.8128**
Percent Non-White	Between	**1.0117**	**1.0066**	1.0032	1.0048
	Within	**1.0163**	**1.0089**	**1.0105**	**1.0062**
	Out	**1.0070**	**1.0085**	**1.0072**	**1.0063**

Table 5: Multinomial Logit Results (continued)					
Variable	**Transition**	**'02-'03 to '03-'04**	**'03-'04 to '04-'05**	**'04-'05 to '05-'06**	**'05-'06 to '06-'07**
Free/Reduced Lunch	Between	1.0149	1.0093	1.0069	1.0200
	Within	**1.0293**	1.0085	**1.0370**	1.0349
	Out	**0.9681**	**0.9480**	0.9987	1.0160
Test Score	Between	1.0042	0.9963	1.0024	**1.0076**
	Within	**1.0321**	1.0062	0.9970	**0.9947**
	Out	0.9992	**1.0114**	**1.0051**	**1.0117**
Teacher Count	Between	**0.9991**	**0.9992**	**0.9995**	**0.9994**
	Within	1.0000	**1.0005**	**1.0004**	1.0001
	Out	**1.0003**	1.0002	**1.0006**	1.0000
Instructional Spending	Between	**0.9996**	0.9997	0.9998	0.9999
	Within	1.0001	1.0001	**0.9998**	0.9999
	Out	**1.0005**	**1.0006**	0.9999	**0.9997**
Unemployment Rate	Between	0.9699	0.9662	0.9705	0.9242
	Within	**0.7923**	**1.0629**	**0.8661**	**0.8784**
	Out	**0.9173**	**0.9312**	1.0183	**0.9427**
Crime Rate	Between	1.0015	**0.9894**	0.9987	0.9936
	Within	1.0024	**0.9936**	1.0003	1.0063
	Out	**0.9888**	**0.9800**	**0.9910**	0.9969
Suspension Rate	Between	1.0072	1.0351	1.0102	1.0213
	Within	**0.9539**	**1.0328**	**0.9700**	1.0211
	Out	**0.9539**	0.9988	**1.0233**	1.0007
Expulsion Rate	Between	0.8228	0.9192	0.7531	**0.5780**
	Within	0.9153	**0.6748**	0.8909	0.9550
	Out	1.1336	**0.7160**	0.7799	**0.6688**
Retention Rate	Between	0.9453	**0.9124**	**1.0920**	1.0313
	Within	1.0423	0.9499	0.9759	0.9818
	Out	1.0060	0.9989	1.0519	1.0106
Special Education Pct.	Between	0.9681	1.0531	0.9801	0.9585
	Within	**1.1109**	0.9364	1.0459	0.9802
	Out	1.0182	**1.0898**	**0.8681**	**1.1437**
Federal Spending Share	Between	0.9901	0.9974	1.0026	1.0183
	Within	**1.0642**	0.9944	0.9916	1.0233
	Out	0.9928	1.0002	**0.9587**	1.0030
Intercept	Between	0.7963	2.4955	0.0017	**0.0001**
	Within	**0.0001**	**0.0209**	1.5614	5.5500
	Out	**18.8667**	0.6878	0.0729	**0.0000**

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