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Do Teachers Really Leave for Higher Paying Jobs in Alternative Occupations?

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Abstract: In this paper we examine a very common perception which plays a central role in much current educational policy debate - that the large majority of teacher attrition is driven by the allure of higher paying jobs in alternative occupations. Using unique data from the state of Georgia that are created by merging administrative data from the educational system with wage records from the Unemployment Insurance system, we find very strong evidence that this common perception is not correct.

"The real school staffing problem is teacher retention. Our inability to support high quality teaching in many of our schools is driven not by too few teachers entering the profession, but by too many leaving it for other jobs."

The National Commission on Teaching and America's Future: No Dream Denied

"I have proposed a 10 percent pay raise for our teachers...How can we expect to keep our teachers in the classroom when the private sector can give them a higher salary?"

Linda Shrenko, Georgia State School Superintendent (elected) and candidate in 2002 Georgia Governor's race

"New college graduates as well as seasoned teachers are being lured to other professions with handsome salary offers while the teaching profession often isn't even in the horse race. (July 5, 2000)"

Sandra Feldman, President American Federation of Teachers (AFT)[1]

I. Introduction

In this paper we examine a very common perception which plays a central role in much current educational policy debate - that the large majority of teacher attrition is driven by the allure of higher paying jobs in alternative occupations. The reality is that little is known about what teachers do when they leave teaching. This reality is due primarily to a lack of data suitable for studying this issue; while much previous research has studied the retention decisions of teachers, virtually all previous research on exits from teaching has utilized "teacher-specific" data that were constructed from the administrative records of a particular state or school district, and, as a result, contained no information about the labor force status of individuals after they left teaching.

An exception is Stinebrickner (2002) who uses data from the National Longitudinal Study of the High School Class of 1972 (NLS-72) to provide some of the only evidence that the common perception above may not be particularly accurate. Among general longitudinal data sources, the NLS-72 was a logical choice because the survey design involved oversampling teachers. However, even with oversampling, the number of teachers in the NLS72 is very small relative to the number of teachers in teacher-specific data used by other

[1]The first quote can be found at www.nctaf.org/article/index.php?g=0&c=4&sc=16&ssc=&a=8&navs=. The second quote can be found at www.doe.k12.ga.us/communications/releases/00/103000.html. The third quote can be found in an AFT press release available at www.aft.org/press/2000/070500.html.

researchers. Perhaps more importantly from the standpoint of current policy debates, the majority of teachers in his sample graduated from college in 1976.

Our interest in this issue along with our fortunate access to previously unavailable teacher identifiers motivated the construction of a unique data set for the state of Georgia. The key feature of these data is that educational records related to schools and teachers are merged with wage records from the unemployment insurance system.[2] Using these data we find very strong evidence that new teachers are not leaving the teaching profession for higher paying jobs in alternative occupations. For example, among our findings, only 3.8 percent of new female elementary teachers and 5.4 percent of new female high school teachers who left full-time teaching during our sample period took a non-education sector job in Georgia that paid more than the state minimum teaching salary in Georgia. This finding is consistent with the reality that teaching is a very family friendly occupation. Teachers' decisions about whether to leave the workforce for family reasons take into account generous leave policies (including the fact that teachers often return to the same position on the rigid salary grid that they held when they left), and individuals who are interested in leaving the workforce to spend time with their families may be more likely to select into teaching.

The goal of our paper - to provide accurate information about what teachers do when they leave teaching - is very straightforward. In Section II, we discuss why this information is likely to be useful to policymakers and researchers. Section III describes the data and section IV analyzes the transitions made by full-time teachers. Section V discusses policy implications and provides concluding remarks.

II. Why does it matter to policymakers what teachers do after leaving teaching?

As the quotes at the top of the paper suggest, a variety of groups that advocate for teachers, teacher unions, and politicians routinely suggest that attrition out of the teaching force is a large problem and that the main cause of this attrition is that teachers leave for higher paying alternative occupations. These suggestions

[2] A similar data approach involving the use of Unemployment Insurance records is taken in the contemporary work of Podgursky, et al. (2004). While the emphasis of their paper is different than that of this paper, in Section V we discuss their specific findings that are complementary to this work.

are often used to justify policies of across the board pay increases for teachers, pay increases for teachers with many years of experience, and pay increases for teachers with post-baccalaureate degrees.[3]

This raises a couple of important issues. First, while the belief that attrition is too high is prominent in academic research and current education policy discussions, determining whether this is the case is very difficult. For example, on one hand, Rivkin et al. (2005) find that teachers gain valuable experience in their first two years of teaching. However, at the same time, there is nothing inherently bad about attrition and Stinebrickner (2002) finds evidence that attrition from teaching is actually lower than attrition from other occupations. Second, even if, as is very often the case, policymakers decide that reducing attrition is an appropriate objective, it is very difficult to determine whether pay raises represent the most cost effective way to achieve this objective.

In this paper we do not take a stand on whether current attrition rates are too high. Instead, in this section we discuss the second issue. Specifically, we describe why uncertainty about optimal policy may both lead to a situation in which beliefs about what teachers do when they leave teaching play an important role in policy decisions and provide certain groups with an incentive to promote the belief that teachers often leave for higher paying jobs. It is worth stressing that, from a theoretical standpoint, information about what teachers do when they leave teaching does not ease the difficulty of determining optimal policy for reducing teacher attrition (although in some cases such information does suggest new policies that should be considered). Thus, the goal of this section is not to describe how the new information in this paper should influence policy. Rather, the assumed goal is simply to outline why, under the current environment, beliefs about what teachers do when they leave teaching may play an important role in policy decisions, in which case providing correct information about these beliefs is potentially very valuable. The end of this section suggests why this research will be beneficial to other researchers who analyze the decisions of teachers using data in which one cannot observe what teachers do when they leave teaching.

[3]Of course, there may be other justifications for across the board pay increases, such as recruiting better teachers. Our analysis has very little to say about the recruitment issue.

Simple Theoretical Model

Suppose that a teacher who leaves teaching could either take a job in an alternative occupation or could leave the labor force. Under the simplifying assumption that individuals make decisions myopically, a person with full information about all factors that influence utility will choose to leave teaching if either the utility from an alternative occupation (denoted A) or the utility from being out of the workforce (denoted H) in some year is greater than the utility from teaching (denoted T) in that year. Assume for simplicity that the utility in each alternative is an additively separable function of the consumption purchased by her earnings (W) and non-pecuniary utility (NP) and that earnings are zero if the teacher leaves the workforce. It follows that the condition for leaving teaching can be written

(1) $W^T+NP^T<W^A+NP^A$ or $W^T+NP^T<NP^H$

Raising W^T or spending money to increase NP^T (e.g., by improving student discipline and/or reducing class sizes) represent the options available to influence the decisions of departing teachers.

Policymakers must choose way(s) to best reduce attrition

Assuming that reducing teacher attrition is the objective, a policymaker must choose among a variety of possible policies to raise W^T or increase NP^T, subject to some budget constraint. Ideally, for each teacher, the policymaker would know how much each possible policy would influence W^T+NP^T and how far each departing teacher is below the margin of indifference between being in and out of teaching. With this ideal information in hand, the policymaker could decide what policy lever(s) would most cost effectively accomplish the goal of reducing attrition.

Unfortunately, obtaining such information is a difficult and costly task, and, as a result, the information that the policymaker has at his disposal is far less than the ideal described above. For example, one reasonable approach for attempting to provide such information involves examining whether attrition rates vary across schools which have different salary scales or differ in observable ways that are related to working conditions. Unfortunately, while this approach establishes a useful descriptive relationship between observable characteristics and teacher attrition, its ability to provide evidence about the causal relationship

is much less certain because teacher pay and other observable school characteristics will, to some extent, be correlated with potentially important unobserved characteristics of both teachers and schools.[4] A second, very direct approach for attempting to obtain such information involves asking departing teachers to list or rank the things that made them dissatisfied with teaching. Unfortunately, the relative importance of factors such as "poor salary," "lack of student motivation," "inadequate administrative support," or "student discipline problems" does not provide quantitative information about the effect that raising teacher pay or spending money to improve working conditions would have on teacher retention.

It is in this environment of uncertainty about the effectiveness of the possible policy levers that information about what teachers do when they leave teaching can influence policy decisions. It is important to note that, from a theoretical standpoint, knowing what a teacher does when he/she leaves teaching is not informative about the relative cost effectiveness of raising teacher wages or improving working conditions.[5] Nonetheless, it seems quite likely that, in practice, policymakers use this information to infer something about the relative effectiveness of possible policies and whether attempting to address attrition is worthwhile at all.

To illustrate this basic point, consider a policymaker who is considering an across the board wage increase for all teachers. There are several reasons why the policymaker might be more inclined to deem this policy worth pursuing if she believes that departing teachers are moving to higher paying jobs in alternative occupations than if she believes that departing teachers are leaving the workforce altogether, say to care for

[4]The endogeneity problem arises, in part, because the initial school where a teacher works is determined by a complicated hiring and matching process (involving both schools and teachers) that likely takes into account unobserved characteristics of both schools and teachers. However, even if teachers were assigned randomly across all schools, one would worry that schools with high wages or other "good" observed characteristics may have better or worse unobserved characteristics than other schools. Boyd et al. (2005c) describes the endogeneity problems presented by this complicated hiring and matching process.

[5] Whether a departing teacher has chosen to leave the labor market (H) or work in an alternative occupation (A) can be informative about what the teacher may have learned or what may have changed since the person began teaching in order to push the person across the margin of indifference and out of teaching. But, this is not sufficient to understand the relative effectiveness of different policies. For example, even in the case where all teachers leave for H so that (under the assumption that teachers know the rigid teaching pay structure) the decision has not been influenced by learning about the financial aspects of the decision, teaching decisions may still be sensitive to W^T. This is the case because W^T influences how far the person is from the margin of indifference at the time of entrance and, therefore, how much other factors in equation (1) can change before the teacher will leave teaching.

young children. First, in practice a policymaker may be more likely to conclude that teachers are sensitive to wage changes if she believes that they are actually moving to positions in which they receive more money, although this conclusion does not follow from simple theory alone. Second, a wage increase that is motivated by the necessity or "fairness" of paying teachers what they could earn elsewhere might receive more support among government officials and the general public than a wage increase which is motivated by a desire to keep teachers from leaving the workforce altogether to care for young children, for example. Third, a policymaker who believes that departing teachers are leaving for family reasons may be more likely to conclude that many teachers will eventually return to teaching even without any type of policy intervention.[6] Finally, a policymaker who believes that teachers are leaving for family reasons may begin to explore alternative policies such as on-site day-care for teachers which, unlike the uniform wage increase, have the virtue of being able to more directly target teachers who are at the greatest risk of leaving. This discussion of how beliefs could potentially influence policy in practice is generally consistent with what is seen in many labor markets where employers frequently attempt to meet the financial aspects of outside job offers, but where it is probably much less common to raise a worker's salary in response to an intention to leave the workforce to care for children.

Of course, it is not possible to know exactly how perceptions about what teachers do when they leave teaching influence policy decisions in practice, and this is not the goal of this paper. What is important for the motivation of this paper is that the discussion above suggests plausible reasons that perceptions can play an important role in decisions. Further, the effort that teacher unions and other teacher advocacy groups expend to depict the view that teachers often leave for higher paying jobs in alternative occupations suggests that these groups also believe that the perception influences policy decisions. The incentive that a union may have to suggest that teachers tend to leave for other occupations stems from the fact that its objective function is potentially quite different than that of the school system. In particular, a union may desire to increase rents

[6] If the teacher's departure was generated entirely by a change in NP^H that accompanied the birth of a new child, one might expect that the teacher will find it optimal to return to teaching, when, for example the child enters school.

to groups of teachers who are unlikely to leave teaching under current compensation packages. Given the reality that wage increases in public schools are virtually always of the across-the-board variety, this increase in rents may be more likely to happen if policymakers focus on wage related causes of attrition rather than other causes of attrition (such as changes in family situations) that may be affecting specific types of teachers. The likelihood that perceptions matter, along with the reality that the common claim that teachers often leave for higher paying jobs in alternative occupations has remained largely unexamined to this point, motivates our goal of providing policymakers with the correct information about what teachers do when they leave teaching.[7]

An additional benefit of this work is that the results in this paper are directly useful for other researchers who, in the interest of expanding knowledge about both the role that teachers play in the education system and the manner in which teachers make a variety of decisions, have increasingly turned to unique data sources which contain rich information about teachers and the schools in which they teach. Unfortunately, the reality that these new data sources typically do not include information about what teachers do when they leave teaching can potentially be an important limitation given the fundamental role of teacher attrition in virtually all analyses of teacher issues. In some cases, this limitation implies that a researcher will not be able to estimate the model specification that would be deemed most desirable given a particular question of interest. As one example, in many (behavioral and non-behavioral) competing risks models of teacher occupational decisions, it is desirable to specify the set of risks to include various teaching opportunities, the option of leaving the workforce altogether, and the option of accepting a job in an alternative occupation. However, when teachers' post-teaching activity statuses are not observed, it becomes necessary to combine the latter two options (leaving the workforce altogether and accepting a job in an alternative occupation) into a single category. In general, because these two options are very different in nature, having knowledge about the relative frequency of exits to each of the two of options can greatly facilitate an appropriate interpretation of results. More specifically, the findings of this paper have substantial

[7] Of course, it is not possible to know whether incorrect claims are intentionally incorrect.

value for researchers interested in models of this type by providing evidence that the limitation of not observing the exit reason tends to be minor.[8, 9]

III. Data

To analyze the transitions of teachers, we merged three sources of data on all public schools teachers and all public schools in Georgia. Data on the characteristics of individual teachers from the 1991-92 school year to the 2000-01 school year were obtained from the administrative records kept by the Georgia Professional Standards Commission (GAPSC). Characteristics of individual schools from 1994-95 to 1990-2000, including the percentage of students eligible for free or reduced lunch, which is used in this paper, were provided by the Georgia Department of Education (GADOE). What makes the assembled database most unique comes from the third source of data. Actual quarterly wages paid to the teachers *and former teachers* comes from administrative payroll records from the state unemployment insurance (UI) system maintained by the Georgia Department of Labor (GADOL). These data, referred to as ES202 data, are described in detail by White, et al. (1990). All employers covered in the unemployment insurance system report each employee's wages to the GADOL on a quarterly basis. The ES202 data identify the industry (4-digit SIC code), but not the occupation of each individual.

Using ES202, the actual wages paid to teachers and former teachers were matched with the teacher records in the GAPSC files by social security number. For individuals listed in the GAPSC files as teachers

[8] That is, combining two options is not constraining if one of options is largely irrelevant.

[9] As a concrete example of the usefulness of the results in this paper for understanding the findings of other researchers, consider the recent work of Hanushek et al. (2005) who use unique data from the state of Texas to show that teachers who leave the profession are of similar quality (or perhaps of even lower quality) as those who remain. This is an important result because it is inconsistent with much previous discussion of the likely costs of teacher attrition which has been based largely on the current belief that many teachers are exiting for more lucrative occupations (which presumably are interested in hiring the best and brightest teachers). Our result that alternative occupations play little role in teaching exits sheds important light on the underlying reason for the empirical findings of Hanushek et al. (2005).

for a given year, the match of wages to teachers was almost perfect.[10] Wages paid to former teachers are also observed in the ES202 data *if they are employed in Georgia*. When an individual teacher disappeared from the GAPSC data after teaching the previous year, we searched the ES202 data to see if the individual earned wages in another occupation in that and subsequent years.

Virtually all employees are subject to the UI tax, and thus virtually all wages in non-teaching occupations are observed.[11] As a result, if a former teacher does not have a wage in the ES202 file then she is either living in Georgia but not working, living in another state and not working, living in another state and working as a teacher, or living in another state and working in a non-teaching occupation. The data do not allow us to differentiate between these possibilities so we group them together in a "leaving the Georgia workforce" category. In subsequent sections we pay careful attention to the implications of this classification. Appendix A discusses how we determine if someone is a teacher, determine if a teacher has left teaching, construct teaching wages, and define new teachers.

While use of national data would be preferred, the necessary national data are not currently available. However, reliance on state specific data has become quite common given the availability of administrative data in states such as Texas, North Carolina, and New York. There are a couple of reasons that Georgia is a good state on which to base this analysis. First, Georgia is a large state and an "average" state in many ways - including teacher salaries. Second, as discussed more in Section IV, Georgia had a very healthy economy during the 1990s which suggests that Georgia would be a good state to examine if one hoped to find evidence that teachers leave teaching for higher paying jobs in alternative occupations.

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[10] As evidence of the quality of the ES202 data, we found that of the roughly 820,000 teacher records over the 10-year period, only 7 records could not be matched to wage information in the ES202 data files.

[11] The list of excluded employment is quite small. The three main categories perhaps most likely to apply to former teachers are the self-employed, elected officials, and occupations where the individual is paid solely by commission (However, many salespeople are paid a small wage along with any commission earnings.) Thus, individuals who were working solely in an excluded occupation would be mislabeled as not working in Georgia. Also, we would understate wages for individuals with more than one job during the year, where at least one job was not covered by UI. Other occupations not covered by UI include caddies, some maids, and newspaper carriers (Section 108.02(15) of the UI Handbook for Employers). Of course, ES202 will miss wages paid in the underground economy.

IV. Results: Transitions out of full-time teaching

IV.A. A description of the primary sample and exit rates

For the primary analyses in this paper, we examine exits out of full-time public school teaching for the 10,145 new female elementary teachers and the 4,750 new female high school teachers who began their teaching careers between the academic years 1994-95 and 1999-00 and were twenty-six years of age or younger at the time that their teaching careers began. We concentrate on women to focus the discussion. Women account for approximately 83% of the Georgia teaching force, and this percentage remained remarkably stable over the 1990's. Given the possibility of differences by sex, we examine the results for men in Appendix C and summarize these results at the end of this section. Although our UI wage records begin with the 1991-1992 school year, there are two reasons to concentrate the primary analyses on teachers who began teaching at or after the 1994-1995 school year. First, as discussed earlier, our school characteristic information is not available before 1994-1995. Among other uses, this information allows us to distinguish between elementary teachers and high school teachers. Second, as described in more detail in Appendix A, having extra years before the start of our sample period allows us to create a sample of *new* teachers. Nonetheless, despite these advantages, for some of our analyses we find it useful to take advantage of the entire period that wage data are available, starting with the 1991-1992 school year.

We classify an individual as a full-time teacher if she receives at least the state minimum pay in any of the quarters during the teaching year.[12] The primary rationale for this definition, which is discussed fully in Appendix A, is that it allows us to avoid classifying very short spells out of the workforce as exits. Note that the use of quarterly wage data from the unemployment insurance system is beneficial in this regard because it allows us to differentiate between a full-time teacher who may have taken a short break from the

[12] Mandated by state law and updated annually, Georgia public schools systems face minimum salary schedules for all teachers they employ. Local school districts may pay teachers a supplement to the salary schedule and a large majority do so. Local supplements to the salary schedule vary widely.

labor force (perhaps, for example, for health or maternity reasons) and a teacher who is part-time for the entire year.

Figures 1a and 1b show Kaplan-Meier survivor functions associated with the first teaching spell of female elementary and high school teachers respectively. The Kaplan-Meier Survivor function takes into account that the first teaching spells are censored for 6,498 elementary teachers and 2,870 high school teachers. That is, these teachers remain in full-time teaching continuously through the last school year of the sample period, 2000-2001. A given survivor function evaluated at time t shows the probability that a teacher in our sample will teach t or more years before leaving full-time teaching. Thus, only approximately half of all elementary and high school teachers have first teaching spells that last more than five years. This is consistent with the findings of previous studies of teacher attrition.

IV.B Employment status in the year after exit

The rate at which teachers leave teaching, as shown in Figure 1a and Figure 1b, is well-known. What is not well-known is what teachers do after leaving teaching. For each of the 3,647 elementary and 1,880 high school teachers who exited teaching during the sample period we begin by examining the activity state in the first year that she is not a full-time teacher. Let T-1 be the last year of full-time teaching for individuals who exit the teaching force. Denoting the exit year as T, we determine whether each exiting teacher continued to work for the Georgia public educational system in some position other than as a full-time teacher in year T (e.g., as an administrator, counselor, part-time teacher, or substitute teacher) and whether the person held a job outside the public educational system in Georgia in year T.[13] We call the former the "education sector." We inflate all earnings to 2001 dollars (using the CPI-U) and discretize the earnings in each of the two "sectors" (education and non-education) into the following earnings categories: \$0, (\$0, \$10,000), [\$10,000, Minwage(T)), and [Minwage(T), ∞), where Minwage(T) is the mandated minimum teaching wage in Georgia in year T for a new teacher with no post-bachelor education.

[13] Clearly the exit year, T, varies by person. We suppress person specific notation on this variable.

Table 1 shows bivariate sample probabilities at time T for the elementary teachers who exited during the sample period. A particular element in the table shows the proportion of these teachers who, in their first year out of full-time teaching, had a particular combination of earnings in the education and non-education sectors in Georgia. For example, the number 0.0359 indicates that, in the year following their exit from teaching, about 3.6 percent of all exiting teachers earned a wage between ($0, $10,000] in both the education and the non-education sector. The bivariate sample probabilities for high school teachers are shown in Table 2.

The marginal sample probabilities for earnings in the Georgia education sector are shown in the last columns of Table 1 and Table 2. The last column of Table 1 indicates that many elementary teachers who leave full-time teaching remain in the public education sector in some capacity.[14] Six percent of exiting elementary teachers have earnings in the public education sector that are greater than the minimum teaching salary in the state. A total of twenty-three percent of exiting elementary teachers have earnings in the public education sector that are greater than $10,000. The last column of Table 2 shows similar results for high schools teachers.

The marginal sample probabilities for earnings in the non-education sector are shown in the last row of each of the two tables. The marginal probabilities provide strong evidence that the primary reason for teaching exits is not the attractiveness of non-teaching jobs. Only 3.8 percent of all exiting elementary teachers accept a non-education sector job in Georgia that pays more than the minimum teaching wage in the state. Note that, in an effort to be extremely cautious, we characterize a non-education salary as "high" if it is above the minimum teaching salary received in Georgia by a new teacher with no post-bachelor education. However, virtually all Georgia teachers are paid more than the minimum because local school districts supplement the state salary and because accrued training and experience lead to higher earnings as mandated by Georgia's statewide teacher salary schedule. Thus, as discussed in more detail in Section IV.C., the

[14] The jobs below the minimum are a combination of part-time teaching jobs and part-time administration jobs. The findings here are consistent with Brewer (1997) who reports that it is very common for administrators in New York State to be former teachers.

percentage of teachers in our sample who earned more in a non-education position than they did as a teacher is lower than 3.8 percent. Further, Podgursky and Tongrut (2005) suggest another reason that our interpretation is cautious. They find that teachers' pay, when considered on a weekly or hourly basis, compares very favorably and is even higher than weekly and hourly pay for many other occupations that require a college degree and that teachers' benefits tend to be relatively generous compared to alternative occupations. Thus, a former teacher observed to have non-education sector earnings greater than the minimum teaching wage may be actually earning a lower level of total compensation per hour relative to teaching.

Table 1 also reveals that only 9.9 percent of exiting elementary teachers work in a non-education job in Georgia that pays more than $10,000 in 2001 dollars. As shown in Table 2, the numbers for high school teachers are only slightly higher than those for elementary teachers; only 5.4 percent of high school teachers work in a non-education job in Georgia that pays more than the minimum teaching salary and only 12.5 percent of high school teachers work in a non-education job in Georgia that pays more than $10,000.[15]

Recall that our data contain information regarding only individuals who are working in Georgia. Thus, we do not observe the number of exiting teachers who work in a non-education job in another state, and, as a result, we cannot calculate the total percentage of exiting teachers who work in a non-education job. Nonetheless, based on both supply and demand considerations, it seems natural to think that observing a non-trivial number of individuals leaving teaching for non-education jobs in Georgia would be a necessary condition for believing that many individuals are leaving teaching to work in non-education jobs outside of Georgia. From a supply perspective, it would seem that if teachers have a strong desire to work in non-education jobs, many would find searching for such jobs in Georgia to be desirable. In general, finding potential job matches and participating in the relevant interviewing/hiring process is likely to be more costly

[15] One reason that a former teacher may have left the Georgia workforce is to pursue additional education. However, Stinebrickner (2002) finds that "The data indicate that returning to school full-time is not a common occurrence for teachers; only 8 of the 172 female teachers who are observed exiting the work force enter school full-time." Further, his data suggest that former female teachers are far less likely to go back to school than females who exit other occupations. Specifically, in his data, 66 out of 239 (28 percent) of females who left other occupations went back to school.

outside of one's current geographic location. In addition, all else equal, it seems likely that the individuals in our sample (who have already revealed a preference for living in Georgia) would tend to value jobs close to their current locations to minimize or avoid incurring costs of moving. This effect may be particularly strong for teachers; Boyd et al (2005b) find that 85% of teachers in New York State began their teaching careers within forty miles of their hometowns.

From a demand perspective, the economy in Georgia was very strong in absolute and relative terms during the time period covered by our data. According to the Census Bureau, the population of Georgia increased from about 6.5 million residents in 1990 to 8.2 million in 2000, the 4th largest increase in total population among states. Throughout the 1990s the unemployment rate in Georgia was below, and typically well below, the national unemployment rate. Further, the possibility that former teachers are of lower average ability than other college graduates could create lower demand for former teachers. For example, Corcoran et al. (2002) point out that the likelihood that a student has a teacher of high aptitude has declined substantially over the past several decades, and Hoxby and Leigh (2004) suggest that high aptitude individuals are pushed away from the teaching profession by pay compression.

Combining these supply and demand considerations, it seems highly unlikely that so few teachers would be observed in non-education jobs in Georgia if it is true that both a large number of teachers would like to leave teaching for non-education jobs and employers of high-paying jobs have a high demand for former teachers.[16]

While we believe that this intuitive argument implies with near certainty that the total number of teachers who leave teaching for high paying non-education jobs is very small, it is worth exploring whether informative upper bounds can be established on the total proportion of exiting teachers that could be working in high paying jobs in the non-education sector (inside and outside of Georgia). These upper bounds are

[16] Explanations for a low demand for former teachers include teachers having lower average ability or that in order to become a teacher, one must invest in human capital that does not have a high market value in non-teaching occupations. Although this paper does not address this issue, if the latter were true, then this required investment in teaching-specific human capital could substantially hamper the recruiting of teachers.

generated by making the very strong assumption that *all former Georgia teachers who leave the state are employed in a non-education sector occupation that exceeds Georgia's minimum teaching wage*. In reality, many teachers who leave Georgia are likely to remain in teaching or other education jobs or leave the full-time workforce altogether.

For our calculations, we require an estimate of the proportion of former female teachers who leave Georgia. We use two strategies. The first strategy assumes that all of the teachers who leave our teaching sample and never work in Georgia again during our sample period are individuals who left the state. This is likely to be an extremely conservative assumption given that Stinebrickner (2002) finds that women who leave teaching (often to care for young children) frequently remain out of the workforce entirely for a large number of years. The second strategy uses information on male teachers who leave teaching and do not return to work in Georgia before the end of the sample period to construct an estimate of the proportion of former female teachers who leave the state. The appeal of this approach is that male teachers who leave teaching and do not return to the workforce in Georgia within several years have almost certainly left the state.

These two strategies, which are described in detail in Appendix B, yield upper bound estimates of .355 and .266, respectively, for the proportion of exiting elementary school teachers who could be working in a non-education job and earning more than the minimum teaching wage. These two strategies yield upper bounds of 0.358 and 0.272, respectively, for high school teachers. We stress again that these upper bounds are almost certainly much too high both because our bounds almost certainly overstate the proportion of teachers who leave Georgia (this is especially true for our first bounding strategy) and because it is unlikely that a high percentage of teachers who leave Georgia work in high paying non-education jobs given that virtually no exiting teachers enter high paying non-education jobs in Georgia. [17] Nonetheless, the bounds

[17]With respect to the latter, our findings within Georgia suggest that even assuming that 50 percent of all exiting teachers who leave Georgia do so to work in a non-education job that pays more than the minimum teaching wage would be very cautious. In this case the upper bounds for elementary teachers become 0.196 and 0.152 and the bounds for high school teachers become 0.206 and 0.163.

are of interest because, despite being extreme, they still do not indicate the type of important role for high paying non-education jobs that is often portrayed in public discussion.

IV.C. Additional Results for teachers who exited

Earlier we discussed the possible incentives that unions may have to promote the belief that teachers often leave for higher paying jobs. In this section, we examine alternative explanations for why, despite our findings to this point, this belief is so common. First, we examine the possibility that, even if teachers do not receive substantial non-education earnings immediately after exit, they may eventually receive such earnings. Second, we examine the possibility that, even if young teachers do not frequently leave teaching for higher paying non-education jobs, teachers at other stages of their careers may frequently do so. Finally, we examine the possibility that, even if the group of teachers as a whole do not frequently leave teaching for higher paying non-education jobs, teachers at particular types of schools may frequently do so.

Do former teachers eventually receive higher non-teaching earnings?

Our methodology of examining earnings in the first year after an exit from teaching will tend to understate the importance of high-paying alternatives if some teachers leave for occupations that initially pay below current teaching salaries but have higher future wage growth.[18] Table 3 and Table 4 examine this possibility for elementary and high school teachers respectively. Specifically, continuing to use T as the first year after teaching exit, row j in each table shows sample probabilities associated with the maximum yearly non-education earnings observed over the years [T, T+1,..., T+j-1] for all female teachers who are observed at least j years after their exit from teaching. Thus, for example, the first row of Table 3 corresponds to the

[18] In their analysis of the earning losses of displaced private sector workers, Jacobson et al. (1993) find that it can be important to consider earnings several years after a job separation. Thus, it may be important to look at multiple years of post-exit earnings of former teachers here. Jacobsen et al. also find that wages of private sector workers typically fall in the time periods leading up to a displacement. That is unlikely to be the case with teachers as most job separations of teachers are voluntary and the rigid salary schedules that are present in public education prevent wage declines. As discussed in Appendix A, we use a teacher's highest quarterly earnings to avoid the issue of teachers leaving in the middle of an academic year providing a misleading measure of teaching earnings.

non-education earnings of elementary teachers in time T, and, as a result, contains the marginal probabilities from the last row of Table 1. Similarly, the third row of Table 3 shows the highest yearly non-education sector earnings observed over the three year period following the teaching exit for the 1838 elementary teachers who are observed at least three years after leaving teaching. The last row of Table 3 shows the highest yearly non-education earnings in the five year period following the teaching exit for the 628 elementary teachers who are observed at least five years after leaving teaching.

The results in Table 3 and Table 4 indicate that, while as expected the proportion of teachers who earn more than the minimum teaching salary in at least one post-teaching year increases with the length of the exit period, at no point does this proportion become particularly substantial. For example, the last row of Table 3 shows that only 9.9 percent (12.9 percent) of the elementary (high school) teachers who are observed five years after an exit from teaching earn more in a non-education job than the minimum teaching wage in Georgia in at least one of these five years.

In Section IV.B. we described why a comparison of non-education earnings in the first year after teaching exit to the minimum teaching salary will represent a cautious view of the importance of high paying non-education jobs. It is worth noting that the that the maximum non-education earnings numbers in Tables 3 and 4 tend to become even more cautious as the length of the post-teaching period increases. One reason for this is that the numbers in Tables 3 and 4 do not explicitly recognize that non-education earnings may sometimes jump to a level that is higher than teaching earnings for transitory rather than permanent reasons. Even with a non-education sector earnings process in which mean non-education sector earnings are below teaching earnings in all years, the probability of observing at least one year in which non-education sector earnings are greater than teaching earnings can be quite substantial if the transitory portion of the wage process is important, and this probability will be increasing in the length of the post-teaching period. While we do not examine the importance of this issue directly here, past research which has found that the transitory component of the earnings process is non-trivial (Haider, 2001) suggests that this reason is likely to be very relevant.

A second reason that the numbers in Tables 3 and 4 will tend to become even more cautious as the length of the post-teaching period increases relates to our use of the minimum teaching salary as the threshold for "high" non-education sector earnings. Even most first year teachers earn more than Georgia's minimum state teaching salary. Further, as a teacher moves further away from the time of her teaching exit, the minimum teaching salary we use becomes a substantially worse predictor of the teaching earnings that the teacher would have received if she had remained in teaching. This is the case because the teacher would have accrued experience and possibly training and would have moved up the salary schedule. As such, one might expect that a non-trivial number of the former teachers who earned more than the minimum teaching salary in at least one post-teaching year did not earn more than their counterfactual teaching salary in at least one post-teaching year. To examine this issue, we recomputed the numbers in Tables 3 and 4 after substituting a predicted measure of what each teacher's earnings would have been if she had remained in teaching in place of the minimum teaching salary in that year. We found that the numbers in the second to last column of Tables 3 and 4 decreased by about twenty-five percent. For example, the sample probability that an elementary teacher receives non-education sector earnings greater than her predicted teaching earnings in at least one of the five years after her exit from teaching was found to be 7.5 percent, compared to 9.9 percent in the last row of Table 3 when the minimum teaching salary was used. The sample probability that a high school teacher receives non-education sector earnings greater than her predicted teaching earnings in at least one of the five years after her exit from teaching was found to be 10.0 percent, compared to 12.9 percent in the last row of Table 4 when the minimum teaching salary was used.

Thus, Tables 3 and 4 contain little evidence that teachers are leaving teaching for non-education sector jobs with lower starting salaries but higher wage growth. It is at least possible that this type of higher wage growth would take more than five post-teaching years to reveal itself. While, for reasons discussed at the beginning of Section IV.A., we are not able to examine more than five years of post-exit earnings using our sample of new teachers, by changing our sample slightly to include all young teachers (rather than all new teachers) and by combining elementary and high school teachers we are able to increase the length of

the post-exit period that we can examine. Specifically, our data contain 948 elementary and high school teachers who were 26 years of age or younger in the 1991-1992 school year (the first year of our wage data) and exited teaching after either the 1991-1992 school year or after the 1992-1993 school year. For these teachers we observe either eight or nine years of post-teaching earnings. Table 5 shows that only 13.6 percent of these teachers are observed with non-education sector earnings that are higher than the minimum teaching salary in at least one of the observed post-teaching years. The fact that this number is not high, combined with the fact that the reasons described in the previous two paragraphs become even more relevant as the length of the post-teaching period increases, strongly suggests that teaching exits are not being driven by non-education sector jobs that eventually pay more than teaching wages.

Do older teachers leave for higher paying non-teaching jobs?

While our earlier results examine the decisions of young teachers, there are reasons to believe that patterns involving somewhat older teachers, who are much less likely to be leaving to start families, could be different. In Table 6, we combine elementary and high school teachers and recompute the results in Table 1 using the 11,760 female teachers who left teaching at any time during our data period and were between 35 and 45 years of age at the time of exit. We find results that are very similar to the results for younger teachers in Table 1 and Table 2–only 3.5 percent of former older teachers have non-education sector earnings higher than the minimum teaching wage. Thus, we find no evidence of differences in behavior between young and older teachers that could explain the disconnect between our earlier findings and the common perception that teachers often leave for higher paying non-teaching jobs.

Do teachers in certain types of schools leave for higher paying non-teaching jobs?

In a situation where the overall prevalence of exits to high paying non-teaching jobs is low, one might expect that these types of exits would receive more attention if they tend to be concentrated in a relatively small number of schools since a given principal or superintendent may highlight the issue if it is prevalent

in his/her particular school or district. As a result, it seems worthwhile to examine exits in a subset of schools where one might expect teacher decisions to be different or in a subset of schools where one might expect parents, principals, and superintendents to be particularly willing and/or able to publicize their concerns about issues that may be detrimental to their schools.

With respect to schools where teacher decisions may be substantially different, we first examine teachers who exit their teaching jobs in urban schools since working conditions may be different in these schools and teachers in these schools may have to either commute further distances to schools (Boyd et al., 2005a) or choose to live in areas that they might not find appealing. In Table 7 we combine elementary and high school teachers and recompute the results in Table 1 using all female teachers who left teaching during our data period, were less than 45 years of age at the time of exit, and were teaching in one of five urban school districts at the time of exit–these five districts include the five largest cities in Georgia: Atlanta, Augusta, Columbus, Macon, and Savannah. We find no evidence that exits to non-education jobs are particularly important for this subsample–only 3.4 percent of former urban teachers have non-education sector earnings higher than the minimum teaching wage.

We next examine teachers who exit their teaching jobs in Metropolitan Statistical Areas (MSAs), since these teachers living in more densely populated areas may have more non-education sector job opportunities. While, the subsample of teachers considered here includes the teachers discussed in the previous paragraph, teachers in suburban schools make up the majority of teachers in the MSA subsample. In Table 8 we combine elementary and high school teachers and recompute the results in Table 1 using all female teachers who left teaching during our data period, were less than 45 years of age at the time of exit, and were teaching in an MSA at the time of exit. We also find no evidence that exits to non-education jobs are particularly important for this subsample–only 3.3 percent of former older teachers have non-education sector earnings higher than the minimum teaching wage

With respect to schools where concerns about detrimental issues might be particularly likely to be heard, we examine schools with wealthy families. Specifically, in Table 8 we combine elementary and high

school teachers and recompute the results in Table 1 using all female teachers who left teaching during our data period, were less than 45 years of age at the time of exit, and were teaching in a school in which less than 5.0 percent of students qualify for free or reduced price lunch. As seen in Table 8, we also find no evidence that exits to non-education jobs are particularly important for this subsample–only 4.4 percent of former older teachers have non-education sector earnings higher than the minimum teaching wage.

IV.D. Proportions taking into account all teachers who start teaching

The previous sections consider the proportion of *exiting* teachers who take high paying alternative jobs. For policy purposes, it seems equally important to compute the proportion of *all* new teachers who leave teaching for high paying jobs in the non-education sector. Table 10 and Table 11 examine the activity status of each of the 10,145 elementary and 4,750 high school teachers (our primary sample described in Section IV.A.) in each year after the start of teaching and before the end of the sample period, with the proportions in the tables taking into account both possible returns to teaching after the exit year and the activity status of individuals who remain out of teaching after the exit year. For example, the third row of Table 10 shows that 8,455 individuals were observed for three years after the beginning of their teaching spell. Of these individuals, .803 were still in full-time teaching in the third year and .009 had non-education earnings of more than the Georgia minimum teaching salary in the third year.

The second rows of Table 10 and Table 11 indicate that less than one percent of teachers leave teaching for a high paying non-education job in Georgia after the first year of teaching,.003 for elementary teachers (Table 10) and .006 for high school teachers (Table 11). Further, using the most extreme estimate of the proportion of exiting teachers who accept high paying non-education sector jobs from above, only about five percent of new teachers exit to a high paying non-education jobs (inside or outside of Georgia) after the first year of teaching.[19] It is worth stressing again that this number is computed under the extremely

[19] These calculations are (0.136*0.355=0.048) for female elementary teachers and (0.153*0.358=0.055) for female high school teachers. The first number in each parentheses is the probability of leaving after the first year of teaching. The second number in each parentheses is the most conservative estimate of the total proportion

conservative assumption that all former teachers who are not observed earning wages in Georgia after exit are living in another state, working in a non-education sector job, and earning more than the Georgia state minimum teaching wage. The remaining rows in Table 10 and Table 11 indicate that at no point before the end of the sample period does a substantial proportion of the sample appear in non-education jobs that pay a substantial amount of money. The highest proportion of all new elementary teachers observed to earn more than the minimum teaching wage in the non-education sector in Georgia is 1.9 percent, and the corresponding figure is 3.4 percent for former high school teachers. The decrease in the proportion teaching that takes place over time–from 86.4 percent after the first year of teaching to 56.1 percent after six years of teaching–corresponds primarily to an increase in the proportion of females that are out of the Georgia workforce. Thus, these results further emphasize the earlier conclusion that exits to high paying non-education occupations do not represent an important phenomena for female teachers.

IV.E. Results for males

In Appendix C we present analogous results for men. We do find some differences between male and female teachers. For example, men, who are presumably less likely to leave the workforce for family reasons, are less likely to disappear from our data entirely after leaving teaching, and males who leave teaching are roughly twice as likely as females who leave teaching to appear in non-education jobs that pay more than the Georgia minimum teaching wage. Nonetheless, the general spirit of the results for males is very similar to that for females. Specifically, many males who leave full-time teaching remain in the education sector in some capacity, and extremely conservative estimates indicate that, at most, one in twenty male teachers leave teaching after the first year for a non-education job that pays more than the minimum Georgia teaching wage.

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of exiting teachers who earn more than the minwage in a non-education sector job.

These proportions decline with tenure because the hazard rate out of teaching declines with tenure.

V. Conclusions and policy implications

This paper shows that even under extremely conservative assumptions, it is not correct to say that new teachers typically, or even often, leave teaching for higher paying jobs in alternative occupations. This is also true for a variety of subgroups of teachers. Although this issue is not the main focus of their paper, the last column of Table 6 in Podgursky et al. (2005) reports results for Missouri teachers that strongly suggest that the findings in this paper are not specific to Georgia.

Given that our results are in contrast to much current public discussion on the issue, we also consulted the *1994-1995 Teacher Followup Survey (TFS; NCES, 1997)* in an effort to provide an independent validation of our conclusions. We find that our results are very consistent with the circumstantial evidence in that survey in the form of teachers' motives for leaving teaching and teachers' anticipated post-teaching activities. For example, only 12.1 percent of exiting teachers in the TFS reported that the "main reason for leaving the teaching profession" was to pursue another career and only 6.5 percent reported that they left teaching for better salary or benefits (NCES, 1997). When asked about their expected main activity for the following year, 9.4 percent of exiting teachers responded that it was "working outside the field of education" (NCES, 1997). Among all current teachers, only 0.6 percent reported that they expected to be "working outside the field of education" in the following year. Finally, 22.2 percent of exiting teachers reported that they expected to be "working in a non-teaching occupation in education" in the year after leaving teaching (NCES, 1997).

It is worth noting that, while little evidence exists on what teachers do when they leave teaching, the results in this paper also have a loose connection to the results in Lankford et al. (2002), Hanushek *et al.* (2004), Boyd et al. (2005a), and Scafidi et al. (2006) in the sense that both that work and this work suggests that many decisions that teachers make are not driven by the attractiveness of higher paying jobs in alternative occupations.[20] Finally, the results in this paper can be viewed as providing different but perhaps

[20] Of course, the primary focus of that work and this work is much different. The primary goal of that earlier work is to document how many and what types of teachers change schools and how these changes are related to characteristics of schools. The goal of this work is to provide information to the types of policymakers who are

complementary information to research such as Ingersoll (1997) who primarily uses a question from the 1994-1995 Teacher Follow-up Survey which asked former teachers to select from among twelve reasons that may have caused them to leave the teaching profession.

While public dialogue is often based on the assumption that teacher attrition rates are unacceptably high (see, e.g., the first quote at the beginning of this paper), it is not the goal of this paper to take a stand on this issue. Regardless, it seems important from a policy standpoint that our understanding of how potential policies affect teacher attrition is far from complete. Given the focus that is paid to increases in teacher salary as a potential policy lever, research which could provide credible evidence about the causal relationship between teacher pay and teacher retention would be very valuable.

However, less standard policy approaches may also be promising. The results in this paper about what teachers do when they leave teaching are very consistent with the findings of Stinebrickner (2002) who studied teachers from a previous generation. If, as in Stinebrickner (2001a, 2001b, 2002), exits out of the workforce are strongly related to family changes such as the birth of new children, it seems very possible that schools, which already have the infrastructure in place to take care of young children, might find it cost-effective to provide inexpensive on-site child-care.[21] In effect, this would give teachers with young children the new, potentially appealing option of being able to both work and be close to their young children. Other non-wage initiatives such as job-sharing may also be promising. From the standpoint of being cost-effective, these policies have the obvious advantage (over, for example, across the board pay increases) of specifically targeting individuals who are more likely to leave. The advantage of targeted programs also suggests that, if wage increases are determined by a policymaker to be a desirable policy instrument, it may be worthwhile

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likely to know roughly how long teachers remain in teaching (and are, therefore, not currently making the mistake of assuming that mobility between schools is actually attrition out of teaching), but have not been provided with evidence about what teachers are doing when they leave teaching altogether. That is, unlike that work, the goal of this work is to provide information about what teachers do when they leave teaching altogether.

[21] Using NLS72, Stinebrickner (2001a, 2001b, 2002) finds a very strong relationship between the birth of children and teacher attrition. The fact that the types of exits in our data are very similar to those in the NLS72 data suggests that family reasons are likely to still be important determinants of teacher exits. However, we cannot examine this directly because our administrative data do not contain family information.

to explore wage related policies that attempt to direct compensation specifically to teachers who are most likely to leave. One possibility would be to introduce a day care subsidy for women with young children.[22]

[22]However, simulations in Stinebrickner (2001b) suggest that the birth of new children leads to a very large increase in the non-pecuniary benefit of being out of the workforce and that large wage increases would be required to induce exiting teachers to return to teaching soon after the birth of children.

References

Boyd, D., H. Lankford, S. Loeb, and J. Wyckoff "Explaining the Short Careers of High Achieving Teachers with Low Performing Students," AEA Proceedings, (2005a), 95(2), 166-171.

Boyd, D., H. Lankford, S. Loeb, and J. Wyckoff "The Draw of Home: How Teachers' Preferences for Proximity Disadvantage Urban Schools," *Journal of Policy Analysis and Management* (2005b) 24(1) p. 113-132.

Boyd, D., H. Lankford, S. Loeb, and J. Wyckoff "Analyzing the Determinants of the Matching of Public School Teachers to Jobs: Estimating Compensating Differentials in Imperfect Labor Markets" (2005c), unpublished mauscript, University at Albany, SUNY.

Brewer, D., "Career Paths and Quit Decisions: Evidence from Teaching," *Journal of Labor Economics* 14 (1996), 313-339.

Clotfelter, C.T., H.F. Ladd, and J.L. Vigdor, "Who Teaches Whom? Race and the Distribution of Novice Teachers," Duke University working paper (2002).

Corcoran, S. P., W.N. Evans, and R.M. Schwab "Changing Labor Market Opportunities for Women and the Quality of Teachers, 1957-2000. *American Economic Review*, 2004, 94(2) 230-236.

Corcoran, S. P., W.N. Evans, and R.M. Schwab "Women, the Labor Market, and the Declining Relative Quality of Teachers," *Journal of Policy Analysis and Management* 23(3), 2004, p. 449-470.

Dolton, P. and W. van der Klaauw, "The Turnover of Teachers: A Competing Risks Explanation," *Review of Economics and Statistics* 81(3): 543-552, (1999).

Georgia Department of Education Report Cards, available at: http://accountability.doe.k12.ga.us/report01/

Gritz, M.R., and N.D. Theobald, "The Effects of School District Spending Priorities on Length of Stay in Teaching," *Journal of Human Resources*, 31, (summer 1996), 477-512.

Haider, S. "Earnings Instability and Earnings Inequality of Males in the United States: 1967-1991," *Journal of Labor Economics* 19(4), 2001. P. 799-836.

Hanushek, E.A, J.F. Kain, and S.G. Rivkin, "Why Public Schools Lose Teachers," *Journal of Human Resources* (2004), 39(2) 326-354.

Hanushek, Eric A., John F. Kain, Daniel M. O'Brien and Steven G. Rivkin "The Market for Teacher Quality," NBER Working Paper 11154 (2005).

Hoxby, C.M. and A. Leigh "Pulled Away or Pushed Out? Explaining the Decline of Teacher Aptitude in the United States," *American Economic Review* 94(2), p. 236-

Ingersoll, Richard, "Teacher turnover and teacher quality: The recurring myth of teacher shortages." Teachers College Record, Fall97, Vol. 99 Issue 1, p41, 4p

Jacobson, L.S., R.J. LaLonde, and D.G. Sullivan "Earnings Losses of Displaced Workers" *American Economic Review* (1993) 83(4) 685-709.

Lankford, H., S. Loeb, and J. Wyckoff, "Teacher Sorting and the Plight of Urban Schools: A Descriptive Analysis," *Education Evaluation and Policy Analysis* (2002), 24(1) 37-62.

Loeb, S. and M. Page, "Examining the Link Between Teacher Wages and and Student Outcomes: The Importance of Alternative Labor Market Opportunities and Non-Pecuniary Variation," *Review of Economics and Statistics*, 82(3), 2000, 393-408.

National Center for Education Statistics, U.S. Department of Education, *Digest of Education Statistics*, (2001).

National Center for Education Statistics, U.S. Department of Education, "Characteristics of Stayers, Movers, and Leavers: Results from the Teacher Followup Survey: 1994-95" (1997).

Podgursky, M. and R. Tongrut "Are Public School Teachers 'Underpaid?'" unpublished manuscript, University of Missouri - Columbia (2005).

Podgursky, M., R. Monroe, and D. Watson "The Academic Quality of Public School Teachers: An Analysis of Entry and Exit Behavior," *Economics of Education Review* 2004 23, p. 507-518.

Rivkin, S., E. Hanushek, and J. Kain, "Teachers, Schools and Academic Achievement," *Econometrica* (2005) 73(2) p.417-458.

Salzer, J. "State Teachers Top Wage Scale: Georgia Salaries 1st in Southeast, 17th Nationwide" *Atlanta Journal-Constitution* (May 17, 2001)

Scafidi B, D. Sjoquist, and T. Stinebrickner "Race, Poverty, and Teacher Mobility," *Economics of Education Review*, in press (2006).

Stinebrickner, Todd R. "A Dynamic Model of Teacher Labor Supply." *Journal of Labor Economics*, (2001a).

Stinebrickner, Todd R. "Compensation Policies and Teacher Decisions." *International Economic Review*, 42 (3): 751-789 (2001b).

Stinebrickner, Todd R. "An Analysis of Occupational Change and Departures from the Labor Force; Evidence of the Reasons that Teacher Quit." *Journal of Human Resources* 37 (1): 192-216 (2002).

UI Handbook for Employers, available at http://www.dwd.state.wi.us/UI201/t2201.htm#exclude

U.S. Bureau of the Census, www.census.gov

White, S., et al., "ES202: The Database for Local Employment Analysis," *Economic Development Quarterly*, 4, (August 1990), 240-53.

Appendix A

In this data appendix we discuss three issues particular to our database that had to be addressed in order to conduct the analysis of teacher attrition: who is a teacher, how should teaching wages be constructed, and how should "new teachers" be defined.

Who Is a Teacher?

Each record in the GAPSC data contains a job code, which is used to determine which individuals are teaching. Nevertheless, a large number of these teachers have low actual wages as reported by ES202. Perhaps these teachers were working for only part of the academic year. Since we do not know why these individuals are not earning a full-time annual teaching wage, we did not want to characterize their wage necessarily as their observed annual wage (see discussion about wages below).

In addition, some individuals who were a teacher in a given year and not listed in the GAPSC teacher files in a later year have a wage from the school district reported in ES202. The employer numbers in ES202 correspond to school districts, not individual schools. Therefore, we cannot identify which individual school or whether the district office employs these individuals. Furthermore, what they do for the school district is not observed. Although the work performed (teaching or non-teaching) by these individuals is unobserved, many of them have low annual wages relative to the minimum teaching wages mandated by Georgia's statewide salary schedule.[23]

Regarding the work performed by these individuals, who are not reported to be teachers but have reported wages from a school district, there are several possibilities. Some could be administrators in the district's central office. Others may be temporary, substitute, or part-time teachers or teachers who left teaching for part of the academic year. It is possible that some teachers were not reported to the state–either through a reporting error by the district or because these individuals were not teaching at the times teacher data are sent to the state. Districts are mandated to send information on all employed teachers to the state twice per academic year. Districts typically have a three week window in which to report teacher information. The first time window begins in mid-October and the second begins in mid-March. Perhaps some teachers who were employed only before, only after, or only in-between these windows are not reported to the state. Districts may report information on teachers outside this time window, but they are not required and have no incentive to do so.

To analyze teacher transitions, we had to classify these individuals (who are paid by the district, but are not recorded as teachers in the GAPSC teacher files) in some manner. Given the method of data reporting and typical low wages paid to these individuals, we deemed the most appropriate classification as "part-time

[23] Mandated by state law and updated annually, Georgia public schools systems face minimum salary schedules for all teachers they employ. Local school districts may pay teachers a local supplement to the salary schedule and many do so. The salary schedule lists the minimum teacher salary that must be paid based on teacher certification status, experience, and education.

teachers/administrators." That is, these individuals may typically be former full-time teachers who have transitioned into part-time teaching, teaching only part of an academic year, or administration. In the empirical work discussed below, whether we include these individuals in this manner or treat them as full-time teachers does not impact the results.

Constructing Teaching Wages

Teaching wages are observed quarterly in the ES202 data: January-March, April-June, July-September, and October-December. Georgia teachers are paid on 12-month contracts.[24] Since the quarterly data do not match the school year, care had to be taken in constructing annual teaching wages. In the 3rd quarter of the calendar year, the ES202 data will contain wages for teachers from two different academic years. To avoid this issue and the issue of teachers leaving in the middle of an academic year, we took the highest quarterly teaching wage and annualized that figure. Teachers making decisions on whether to leave the profession surely consider the wage they would be paid for the entire academic year as the wage offered in teaching.

Who is a New Teacher?

The time period that covers the sample of new teachers is the 1994-95 academic year through the 2000-2001 academic year, giving us six years of data. In this paper, we focus on new teachers who were under the age of 27 when they began their teaching career. Georgia does not collect consistent information on teacher experience. Therefore, teachers are defined as "new teachers" if they had not been a teacher in Georgia since the 1991-92 academic year, the first year of our teacher files. Thus, teachers deemed new in 1994-95 will have not taught in a Georgia public school in any of the previous three years. This method of defining new teachers would include teachers who are new to Georgia, but have taught previously in another state.

Appendix B

In this appendix, we describe the methods used to construct an upper bound of the total number of former teachers who earn a wage in a non-teaching occupation that exceeds the minimum Georgia teacher salary (Minwage).

For sake of argument, consider the set of elementary teachers in year T-1 who exit teaching and live either inside or outside of Georgia in year T. The proportion of this group working in year T in non-education jobs that pay more than the Georgia minimum teaching wage is

(B1) PR(exiting teacher work in non-education sector, earnings>Minwage(T)) =

[24] In the early 1990s, some school districts gave teachers the option to be paid over 10 months. For districts this was difficult because money from the state earmarked for teacher salaries was paid in 12-month installments. Although ended in the mid 1990s, the 10-month option was grandfathered in some districts. Thus, it is possible that some veteran teachers are paid over ten months. However, the GAPSC has assured us that "99 percent" of teachers are paid on a 12-month calendar, and have been during our sample period. Since we are considering only new teachers in this paper, this issue is not a concern.

PR(exiting teacher remains GA in T ∩ work in non-education, earnings>Minwage(T))

+PR(exiting teacher leaves GA in T ∩ work in non-education, earnings>Minwage(T))

= .038 + PR(exiting teacher leaves GA in T)

* PR(work in non-education, earnings>Minwage(T)| leave GA in T),

where PR represents probability.[25] We have no information about the term on the last line of equation (B1). Therefore, set this number to unity and compute an upper bound for equation (B1) as

(B2) .038 + PR(exiting teacher leaves GA in T).

This implies that our bound assumes that **all** individuals who leave the state work in a high-paying non-education job in year T. This is not realistic since many of the teachers who leave the state will remain in teaching and many are likely not to work. Thus, we stress that the bound in (B2) is undoubtedly extremely conservative.

We use two approaches for obtaining the necessary information about PR(exiting teacher leaves GA in T). The first stems from the likelihood that virtually all teachers who leave the workforce at time T will eventually return to work at some point in some manner in the future.[26] This implies that

(B3) PR(exiting teacher leaves GA at T)

≈PR(exiting teacher doesn't work in GA at T or after)

= PR(exiting teacher doesn't work in GA in T)

*PR(exiting teacher doesn't work in GA after T|exiting teacher doesn't work in GA at T)

=.458*PR(exiting teacher doesn't work in GA after T|exiting teacher doesn't work in GA at T)

where the .458 is the upper left entry in Table 1. If we had many years of UI records after T we could compute the probability term on the last line of equation (B3). Unfortunately, this is not the case. Instead, we compute the approximation of (B3) given by

(B4) 0.458*PR(exiting teacher doesn't work in GA after T **and before** 2001/2002|exiting teacher doesn't work in GA at T).

This will be a conservative approximation of 0.458* PR(exiting teacher leaves GA at T), if, as reported by Stinebrickner (2002), some women remain out of the workforce entirely for a non-trivial number of years before returning. Thus, using the approximation in equation (B4) to when computing equation (C2) will serve to make our upper bound even more conservative.

In an effort to tighten the bound as much as possible we estimate the probability in equation (B4) using only the exit years T=1993,1994,1995, 1996, 1997. Note that here we use several years that are earlier than our standard sample period in an effort to obtain a reasonable number of exits where we observe a minimum of four

[25] Recall that Minwage(T) equals the minimum teaching wage in Georgia at time T.

[26] Here we ignore the possibility that people leave Georgia and return at a future time.

years after T.[27] We observe a total of 970 exits during this time for which the exiting teacher received no earnings at time T.[28] Of these 970, 673 (69.4%) do not return to teaching after time T and before 2002. Thus, our estimate of equation (B4) is 0.458*0.694 = 0.317, and thus our upper bound in equation (B2) of the proportion of exiting teachers who could be working in a non-education job earning more than the minimum teaching wage is 0.038 + 0.317 = 0.355.

Our second approach is similar in spirit to the first but attempts to obtain information about departures from Georgia using information about male teachers. This approach is justified under an assumption that the proportion of young female teachers who leave Georgia is similar to the proportion of young male teachers who leave Georgia. The benefit of examining men is that we can potentially form a more accurate approximation of the proportion of exiting teachers who leave Georgia because few men are expected to leave the workforce for extended periods of time. This implies that if a young male does not have an income in Georgia for several years it is almost certainly the case that the person has left the state while, as discussed earlier, this may be less true for young females. We return to using teachers from our original sample period because observing a large number of years after T does not seem as important as it was for the females. Males spend a total of 5,450 person years in their first teaching spells between 1995 and 1999.[29] Of these person years, 160 (2.93%) are followed by an exit from teaching in which no earnings are observed in the exit year or any year after. Thus, this 2.93% is our upper bound estimate of the percentage of total teachers that leave the state in a particular year. This state exit rate estimate combined with information about the number of women who are teaching in each of the sample years and how many exiting teachers have zero earnings in time T yields an estimate that 49.9% of all the exiting female teachers who have no earnings in year T leave the state.[30] Thus, our estimate of equation (B4) is 0.458*0.499 = 0.228 and our upper bound in equation (B2) of the proportion of exiting teachers who could be working in a non-education job and earning more than the minimum teaching wage is 0.038 + 0.228= 0.266.

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[27] Our data contain information for the years 1991-92 to 2000-01. In other parts of the paper we have concentrated on new teachers who began teaching in 1994-95 or after. One reason for this is that information on school characteristics that will be used in subsequent analysis is only available during this period.

[28] For this exercise we have pooled all elementary, middle school, and high school teachers. This is necessitated by fact that we do not observe what type of school a teacher works in before 1995.

[29] Given the relatively small number of male teachers, for this exercise we pool all elementary, middle school, and high school male teachers in our data. We make 1999 the last year to ensure that each individual will have at least two years before the end of the sample period after his last year of full-time teaching.

[30] Assuming male and female former teachers have the same rate of interstate moves, the approximate proportion of female teachers who leave the state in year T after teaching in in T-1 is 0.029. The proportion of exiting females with zero earnings in year T who leave the state is found by dividing the total number of women who leave the state by the total number of exiting teachers with zero earnings in their exit year. We also computed numbers that took into account that the proportion of people who exit the state may vary with how many years a person has spent in teaching. This approach led to results very similar to the ones obtained by pooling all years.

Similar calculations for high school teachers lead to upper bounds of 0.358 and 0.272 respectively under the two strategies.[31]

Appendix C

In this appendix we replicate the analyses for new male teachers. Given the small number of new teachers who are male (and the small proportion of males in the Georgia teaching force as a whole), we treat them as one group in this analysis. Thus, in all analyses that follow, male elementary and male high school teachers are analyzed together.

Attrition of Male Teachers

Figure C.1 shows the Kaplan-Meier survivor function associated with the first teaching spell of all male teachers in the sample. Although males exhibit similar exit rates as females in the first couple of years, they are slightly more likely to teach more than five years. This is consistent with the findings of previous studies of teacher attrition.

Where Do Male Teachers Go?

Table C.1 shows bivariate sample probabilities for male teachers in year T, where a particular element in the table shows the proportion of exiting teachers in the sample who, in their first year out of full-time teaching, have a particular combination of earnings in the education and non-education sectors in Georgia. Relative to females, higher proportions of exiting males have non-education sector wages in the year after leaving the Georgia teaching force. However, the proportions remain low: 9.5 percent of exiting male teachers accept a non-education sector job that pays more than the minimum teaching wage and 21.5 percent earn more than $10,000 in the non-education sector.[32] As expected given likely differences in the way that males and females respond to family changes such as the birth of children, exiting males teachers are less likely to be observed without wages in Georgia after leaving teaching. Therefore, even though males are more likely to accept higher paying non-education sector jobs within Georgia, the extremely conservative upper bound estimates of the total proportion of exiting male teachers who earn more than the minimum Georgia teaching wage are only 0.315 and 0.264. These numbers represent extremely conservative upper bounds of the proportions *exiting* teachers who take high paying alternative jobs. For policy purposes, it seems equally important to compute the proportion of *all* new teachers who leave teaching for high paying jobs in the non-education sector. Using the most conservative estimates of the proportion of exiting teachers who accept high

[31] These numbers are calculated as 0.054+0.438*0.694 and 0.054+0.438*0.499 respectively.

[32] Only 17.7 of males have non-education sector earnings greater than the Minwage in any year after leaving teaching.

paying non-education sector jobs from above, about 4.5 percent of new teachers will exit to a high paying alternative job after the first year of teaching.[33]

As was the case for females, a non-trivial proportion of male teachers have earnings in the public education sector in the year after exiting teaching. However, males are much more likely to receive relatively high earnings in the public education sector. Exiting male teachers are more than twice as likely as exiting female teachers to accept non-teaching jobs in the education sector that pay more than the teaching minimum wage (marginal probability for exiting males equals 0.136).

[33] This calculation is (0.143*0.315=0.045) for all male teachers. The first number is the probability of leaving after the first year of teaching as displayed in Figure C.1. The second number is the most conservative estimate of the total proportion of exiting male teachers who earn more than the Minwage in a non-education sector job.

Figure 1a. Kaplan-Meier Survivor Functions for Elementary Teachers

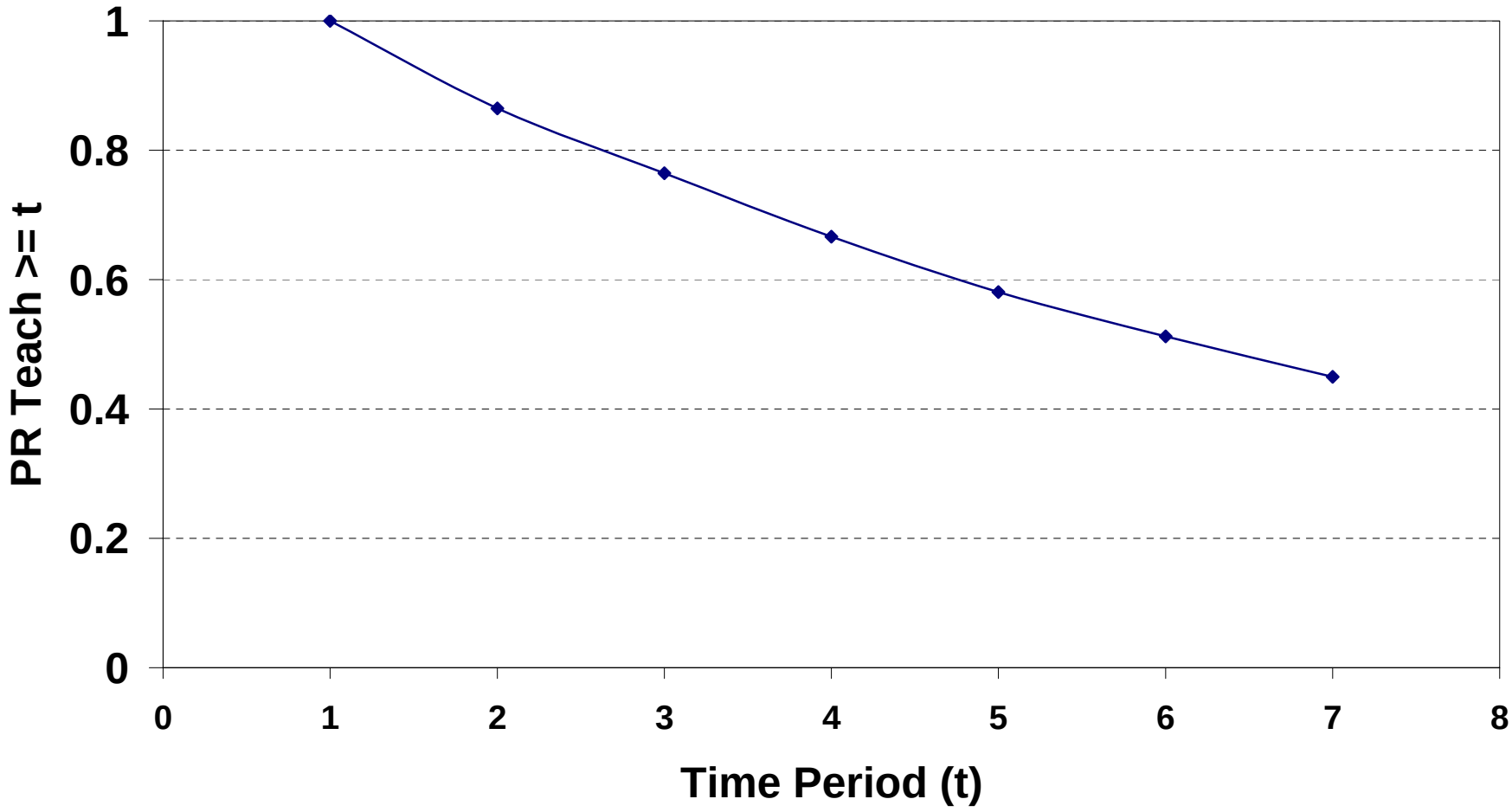

Figure 1b. Kaplan-Meier Survivor Function for High School Teachers

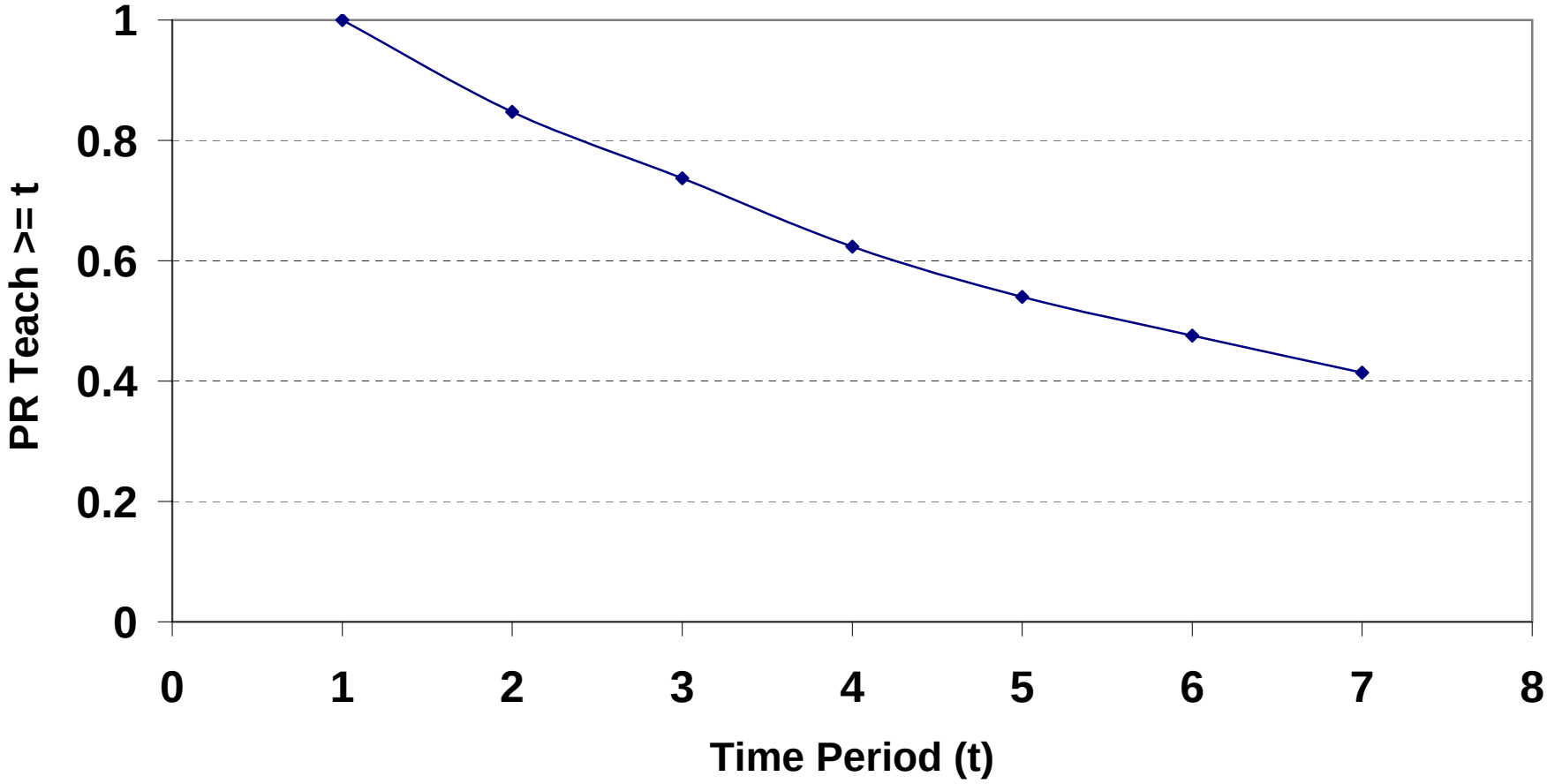

Table 1

Education Sector Earnings and Non-Education Sector Earnings
New Elementary School Teachers in 1st Year After Exit

		Non-Education Sector Earnings				
		0	(0-10,000]	(10,000-Minwage(T))	[Minwage(T), infinity)	Marginal Probability
Education Sector Earnings	0	0.4579	0.0751	0.0455	0.0302	0.6087
	(0-10,000]	0.1012	0.0359	0.0148	0.0071	0.1590
	(10,000-Minwage(T))	0.1382	0.0332	0.0008	0.0003	0.1725
	[Minwage(T), infinity)	0.0458	0.0137	0.0003	0.0000	0.0598
	Marginal Probability	0.7431	0.1579	0.0614	0.0376	1.0000

n=3647, primary sample of new female elementary teachers under age 27.

Table 2

Education Sector Earnings and Non-Education Sector Earnings
New High School Teachers in 1st Year After Exit

		Non-Education Sector Earnings				
		0	(0-10,000]	(10,000-Minwage(T))	[Minwage(T), infinity)	Marginal Probability
Education Sector Earnings	0	0.4378	0.1011	0.0559	0.0447	0.6394
	(0-10,000]	0.0883	0.0356	0.0133	0.0096	0.1468
	(10,000-Minwage(T))	0.1165	0.0314	0.0016	0.0000	0.1495
	[Minwage(T), infinity)	0.0489	0.0154	0.0000	0.0000	0.0644
	Marginal Probability	0.6915	0.1835	0.0707	0.0543	1.0000

n=1880, primary sample of new female high school teachers under age 27.

Table 3

Maximum Non-Education Sector Earnings of Former Elementary Teachers* in Multiple Years After Exit

	Maximum Yearly Earnings				
	0	(0-10,000]	(10,000,Minwage)	[Minwage,infinity)	Sample Size
maximum in 1st year after exit	0.7431	0.1579	0.0614	0.0376	3647
maximum over 2 years after exit	0.7066	0.1702	0.0697	0.0535	2655
maximum over 3 years after exit	0.6752	0.1904	0.0729	0.0615	1838
maximum over 4 years after exit	0.6442	0.2072	0.0673	0.0813	1144
maximum over 5 years after exit	0.6178	0.2245	0.0589	0.0987	628

*primary sample of new female elementary teachers under age 27. The .0535 in the second column indicates that 5.35% of all teachers who were observed at least three years after exit had non-education earnings that were greater than the minimum teaching salary in at least one of the these three years.

Table 4

Maximum Non-Education Sector Earnings of Former High School Teachers* in Multiple Years After Exit

	Maximum Yearly Earnings				
	0	(0-10,000]	(10,000,Minwage)	[Minwage, infinity)	Sample Size
maximum in 1st year after exit	0.6913	0.1836	0.0708	0.0543	1878
maximum over 2 years after exit	0.6595	0.1895	0.0677	0.0833	1404
maximum over 3 years after exit	0.6220	0.2091	0.0742	0.0947	971
maximum over 4 years after exit	0.5910	0.2286	0.0737	0.1068	665
maximum over 5 years after exit	0.5441	0.2676	0.0588	0.1294	340

*primary sample of new female high school teachers. For interpretation, see the note in Table 3.

Table 5

Maximum Non-Education Sector Earnings of Former, Young Elementary and High School Teachers* Over 8-9 Year Post-Teaching Period

	Maximum Yearly Earnings				
	0	(0-10,000]	(10,000,Minwage)	[Minwage,infinity)	Sample Size
maximum over 8-9 year period after exit	0.5696	0.2141	0.0802	0.1361	948

*Female elementary and high school teachers under age 27 and teaching in 1991-1992 academic year. The .1361 indicates that 13.61% of these teachers who left teaching after the 1991-1992 academic year or after the 1992-1993 academic year had non-education earnings that were greater than the minimum teaching salary in at least one of the 8-9 years that they were observed before end of sample period.

Table 6

Education Sector Earnings and Non-Education Sector Earnings of Former, Older Teachers in 1st Year After Exit

		Non-Education Sector Earnings					
		0	(0-10,000]	(10,000-Minwage(T))		[Minwage(T), infinity)	Marginal Probability
Education Sector Earnings	0	0.3140	0.0378	0.0189		0.0305	0.4012
	(0-10,000]	0.0880	0.0226	0.0057	#	0.0036	0.1199
	(10,000-Minwage(T))	0.1017	0.0136	0.0011		0.0005	0.1169
	[Minwage(T), infinity)	0.3223	0.0361	0.0030		0.0007	0.3620
	Marginal Probability	0.8260	0.1101	0.0287		0.0353	1.0000

n=11760 female teachers between the ages of 35 and 45 at the time of exit.

Table 7

Education Sector Earnings and Non-Education Sector Earnings of Former Teachers in Urban Schools in 1st Year After Exit

		Non-Education Sector Wages				
		No Wages 0	Less than 10,000 (0-10,000]	> than 10,000, but < state minimum (10,000-Minwage(T))	> state miminum [Minwage(T), infinity)	Marginal Marginal Probability
	0	0.4049	0.0667	0.0369	0.0287	0.5372
Education	(0-10,000]	0.0887	0.0341	0.0091	0.0054	0.1372
Sector Wages	(10,000-Minwage(T))	0.0642	0.0173	0.0005	0.0000	0.0819
	[Minwage(T), infinity)	0.2028	0.0383	0.0023	0.0002	0.2436
	Marginal Probability	0.7606	0.1564	0.0488	0.0343	1.0000

n=4285 teachers in the school districts that contain the five largest cities in Georgia.

Table 8

Education Sector Earnings and Non-Education Sector Earnings of Former Teachers in Metropolitan Schools in 1st Year After Exit

		Non-Education Sector Earnings				
		0	(0-10,000]	(10,000-Minwage(T))	[Minwage(T), infinity)	Marginal Probability
	0	0.4030	0.0571	0.0317	0.0273	0.5192
Education	(0-10,000]	0.0948	0.0255	0.0088	0.0049	0.1340
Sector Earnings	(10,000-Minwage(T))	0.0891	0.0172	0.0009	0.0002	0.1074
	[Minwage(T), infinity)	0.2075	0.0301	0.0015	0.0004	0.2394
	Marginal Probability	0.7944	0.1299	0.0429	0.0328	1.0000

n=16492 teachers in schools located with Metropolitan Statistical Areas (MSAs).

Table 9

Education Sector Earnings and Non-Education Sector Earnings of Former Teachers in Wealthy Schools in 1st Year After Exit

		Non-Education Sector Earnings				
		0	(0-10,000]	(10,000-Minwage(T))	[Minwage(T), infinity)	Marginal Probability
	0	0.4176	0.0528	0.0223	0.0416	0.5342
Education	(0-10,000]	0.0969	0.0198	0.0076	0.0020	0.1263
Sector Earnings	(10,000-Minwage(T))	0.0822	0.0122	0.0030	0.0005	0.0979
	[Minwage(T), infinity)	0.2182	0.0228	0.0005	0.0000	0.2415
	Marginal Probability	0.8148	0.1076	0.0335	0.0441	1.0000

n=1970 teachers in schools with less than 5 percent of the students eligible for free or reduced price lunch.

Table 10
Proportion of All New Elementary Teachers in Each Activity
in the First Seven Years After Starting Their Teaching Career

		Activity Status by Year After Start of Teaching - Elementary					
Year t		Teaching	Non-FT Teaching Education Sector Earnings (0,Infinity)	Non-Education Earnings (0-10,000]	Non-Education Earnings (10,000, Minwage)	Non-Education Earnings [Minwage, Infinity)	Out of Georgia Workforce Earnings 0
1	n=10,145	1.0	0.000	0.000	0.000	0.000	0.000
2	n=10,145	.864	0.056	0.013	0.010	0.003	0.051
3	n=8,455	.803	0.050	0.010	0.012	0.009	0.105
4	n=6,672	.730	0.056	0.023	0.013	0.014	0.161
5	n=4,593	0.667	0.056	0.022	0.015	0.018	0.219
6	n=3,335	0.619	0.065	0.022	0.014	0.019	0.258
7	n=1,656	0.561	0.083	0.027	0.012	0.019	0.295

Note: The numbers in a row show information related to the primary activity status of all elementary sample members who are observed in t years after the start of the time they began full-time teaching. For example, row 3 shows that 8,455 individuals were observed for three years after the beginning of their first full-time teaching spell. Of these individuals, .803 were in full-time teaching in the third year and .009 had non-education earnings that were greater than the minimum teaching wage (Minwage) in Georgia.

Table 11
Proportion of All New High School Teachers in Each Activity in the First Seven Years After Starting Their Teaching Career

Activity Status by Year After Start of Teaching - High School

Year		Teaching	Non-FT Teaching Education Sector Earnings (0,Infinity)	Non-Education Earnings (0-10,000]	Non-Education Earnings (10,000, Minwage)	Non-Education Earnings [Minwage, Infinity)	Out of Georgia Workforce Earnings 0
1	n=4,750	1.0	0.000	0.000	0.000	0.000	0.000
2	n=4,750	.847	0.058	0.018	0.018	0.006	0.057
3	n=4,000	.778	0.051	0.024	0.014	0.016	0.114
4	n=3,189	.688	0.058	0.031	0.019	0.027	0.174
5	n=2,383	0.626	0.060	0.026	0.021	0.028	0.236
6	n=1,599	0.582	0.066	0.026	0.016	0.034	0.273
7	n=778	0.534	0.065	0.039	0.016	0.029	0.313

Note: See note in Table 10.

Figure C.1 Kaplan-Meier Survivor Function for Male Teachers (Elementary and High School)

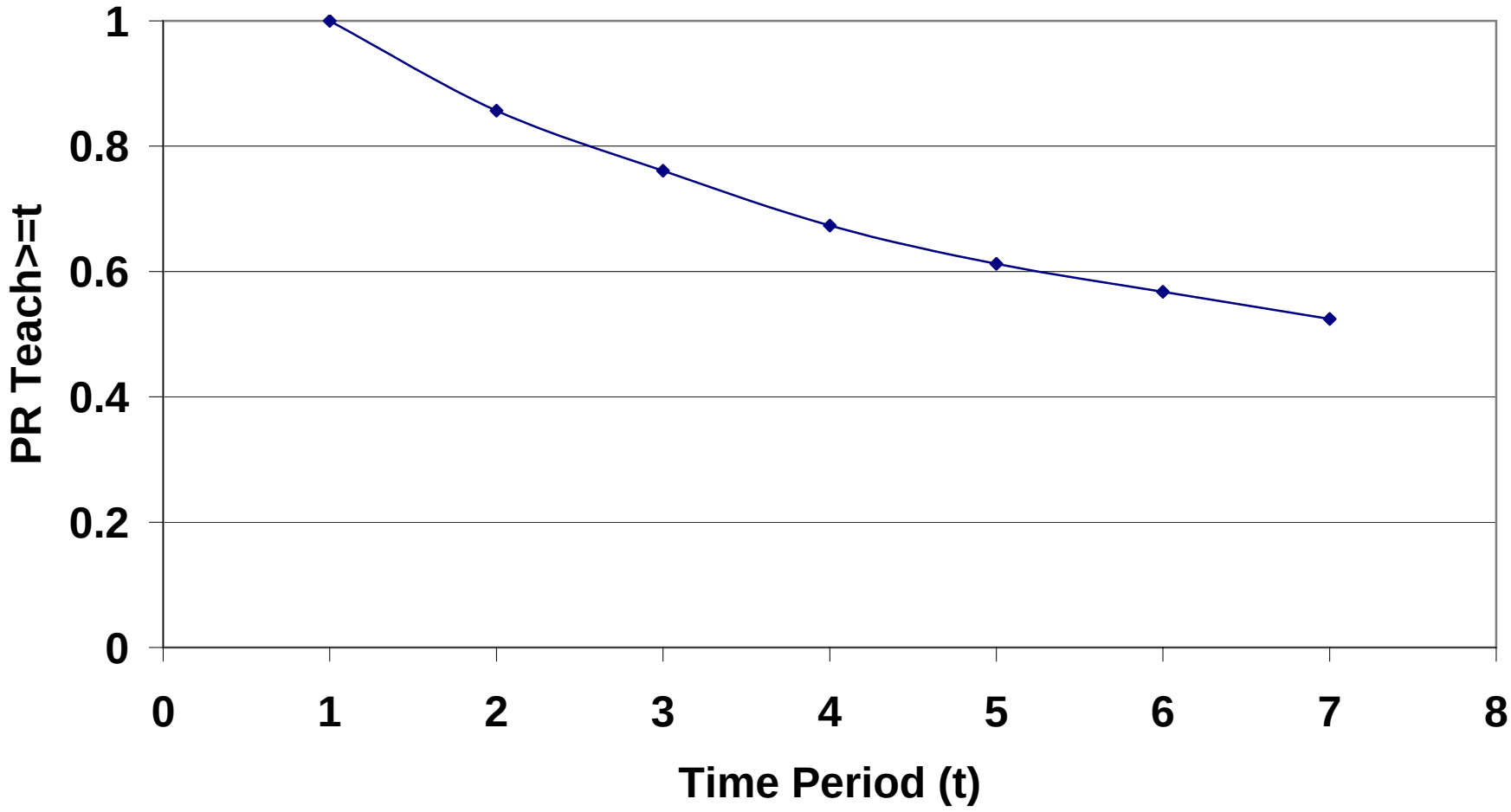

Table C.1

Education Sector Wages and Non-Teaching Wages of Male Former Full-Time Teachers (Elementary and High School)

		Non-Education Sector Wages				
		0	(0-10,000]	(10,000-Minwage(T))	[Minwage(T), infinity)	Marginal Probability
Education Sector Wages	0	0.3387	0.0995	0.0961	0.0824	0.6167
	(0-10,000]	0.0435	0.0412	0.0183	0.0114	0.1144
	(10,000-Minwage(T))	0.0881	0.0389	0.0057	0.0000	0.1327
	[Minwage(T), infinity)	0.1178	0.0172	0.0000	0.0011	0.1361
	Marginal Probability	0.5881	0.1968	0.1201	0.0950	1.0000

n=2652