Retention of New Teachers in California

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Foreword

Numerous studies have been commissioned, and even more recommendations have been offered, on ways to improve America's K–12 system of education. Improved curricula, reduced class size, better teacher quality, better facilities, and just plain more money are a few of the ideas that have been offered over recent years as ways to enhance education outcomes for students. Education leaders and researchers are searching intently for that special combination of resources and talent that can give some assurance—though certainly not a guarantee—that taxpayers' dollars will be efficiently and effectively used to produce well-educated, well-trained youth ready to compete successfully in the ever more demanding U.S. labor market. In the latter half of the 20th century, that quality assurance goal became difficult to achieve. In the 21st century, major segments of our society face a lifetime of low-wage jobs unless we can reestablish public education as a passport to an improved lifestyle.

In the present study the authors shed some light on the importance of teacher retention for the provision of quality education in California. The authors recognize the importance of experienced teachers—experienced teachers are more effective at raising student test scores, on average, than teachers in their first year or two of teaching. And, in California, experienced teachers are more likely to be fully credentialed. So, retaining teachers not only increases the chances of improving student test scores and school quality in general, but retention also helps to address the current shortfall of fully credentialed teachers in California's schools.

In *Retention of New Teachers in California,* the authors find that 13 percent of new teachers leave public schools by the end of their second year, and 22 percent leave by the end of their fourth year. As a result, a quarter of new hires every year simply replace departing new teachers, and this turnover will be more challenging in the future as more experienced teachers reach retirement age. What can be done to stem the tide of teachers departing after such a short period on the job? The authors

conclude that professional development programs are a successful, cost-effective way to increase teacher retention. During the 1990s, the period studied in this report, the Beginning Teacher Support and Assessment (BTSA) program improved elementary school teacher retention by 26 percent and cost about $3,370 per participant. This approach to improved teacher retention is better and more cost effective than raising teacher salaries. In the same period, a salary increase of $4,400 reduced the probability that a new elementary school teacher would leave public school employment by 17 percent. Compensation clearly is an important factor in teacher retention, but the lower cost of teacher development programs is an important consideration for budget-strapped California.

Why are teacher development programs so important? Quite simply because the challenges facing a new teacher are formidable. Carrying a full class load, creating lesson plans, managing the classroom, handling tough-to-teach students, breaking up fights, and somehow communicating with parents, principals, and colleagues are all good reasons for a new teacher to need some help. It is one thing to face these challenges in theory as one signs on for a lifetime of teaching. It is quite another to deal with them the first year on the job and feel that support for one's efforts is limited. A teacher development program can address all of these issues and more and get right to the heart of the challenges new teachers face.

In sum, the authors conclude that certain policies improve teacher retention. BTSA, in particular, has enjoyed substantial, positive results. Since teachers without full credentials are not eligible for BTSA, the authors suggest that policymakers consider implementing a development program targeted at this population of teachers. And, to increase the number of credentialed teachers in high-poverty districts, the authors recommend expanding university credentialing programs in a targeted fashion, focusing on those that serve high-poverty districts. This report is a highly timely and useful contribution to the public debate over improving the efficiency and effectiveness of our public school system.

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President and CEO
Public Policy Institute of California

Summary

In the continuing effort to raise the academic performance of public schools, improving teacher retention could be an important strategy for California. Keeping new teachers in the classroom could improve academic performance, because experienced teachers are, on average, more effective at raising student test scores. Better retention of teachers could also ease the shortage of fully credentialed teachers in California public schools, because experienced teachers are more likely than new teachers to have full credentials. Thus, retaining teachers could make it less difficult for California to meet the teacher qualification requirements of the federal No Child Left Behind (NCLB) Act.

The purpose of this study is to increase understanding of teacher retention in California and of the public policies that could improve it. To that end, the report

- examines patterns of new teacher retention in public schools, from both the statewide and district perspectives;
- examines the effects of two policies to improve retention, as well as the consequences of class size reduction; and
- explores the relationship between teacher retention and the shortage of fully credentialed teachers, especially in high-poverty districts, where that shortage is most severe.

The study relies on New Teacher Administrative Records (NTAR), a database created for this study by linking credentialing information from the California Commission on Teacher Credentialing with employment information from the California Employment Development Department.

The NTAR is a rich source of information on teacher employment and the best source for statewide longitudinal employment information, but it has several limitations that affect our analysis. Notably, the NTAR sample contains information only from 1990 through 2000. Our study

covers teachers who received their first California teaching certification in 1990 or later and started teaching in California between 1991–92 and 1998–99. Another limitation is that the data report the district of employment but not the school, the grade level, or whether the employee was teaching or doing other work such as program administration.

We focus our analysis on retention of teachers with multiple-subject certifications (typically for kindergarten through sixth grade) and teachers with single-subject certifications (typically for grades seven through twelve). We should note that our estimates for California show lower turnover than estimates for the nation and other states, most likely because we consider only substantial leaves—two consecutive years without any public school employment in California.

How Severe Is the Teacher Retention Problem?

During the 1990s, 13 percent of new teachers left California public school employment in their first or second year of teaching; 22 percent left by the end of their fourth year. The problem was more severe for teachers with single-subject certifications, 27 percent of whom left by their fourth year. Among teachers starting with multiple-subject certifications, 20 percent left by the end of the fourth year. If new teacher retention patterns from the 1990s still hold, then about one-fourth of the roughly 20,000 new public school teachers hired in California every year are replacing recently hired teachers who have left public school employment.

What Can Be Done to Improve Teacher Retention?

We studied two policies aimed at retaining teachers: teacher compensation and teacher development. Of the two, teacher development appears to be more cost-effective. During the early 1990s, districts that adopted Beginning Teacher Support and Assessment (BTSA) programs improved retention by 26 percent for teachers with multiple-subject certifications and by 16 percent for teachers with single-subject certifications at a cost to the state of about $3,370 per participant. During the same period, a $4,400 increase in starting teacher salary reduced the probability that a new teacher would leave

public school teaching in the first two years by 17 percent for teachers with multiple-subject certifications and by 9 percent for teachers with single-subject certifications.

Although the BTSA program remains funded today, state funding for several other teacher development programs, such as Peer Assistance and Review, has been dramatically reduced. Our findings suggest that these programs should be reconsidered and evaluated for their effectiveness in improving teacher retention, teacher quality, and student academic performance. In addition, because starting teachers without full credentials are not eligible for BTSA, the state should consider implementing a development and assessment induction program for these teachers.

Possible Effects of NCLB on Teacher Retention and Quality

The federal NCLB Act makes teacher credentialing particularly critical. It requires that all teachers in core academic subjects be "highly qualified" by the end of 2005–06. In California, highly qualified teachers are defined as those who are fully credentialed or in an internship program during their first three years of teaching.

Defining intern teachers who are working toward a full credential as highly qualified is a practical solution for California where the share of starting teachers without a full credential increased substantially following the adoption of class size reduction programs in 1996. Although that share has dropped considerably in the last five years, it remained as high as 25 percent in 2004–05. We find that California's experience with teaching internships during the 1990s was promising: 85 percent of university interns and 70 percent of district interns were still teaching and fully credentialed by the beginning of their fourth year. Those who started as interns were just as likely, and in some cases more likely, than teachers who started with full credentials to remain teaching in public schools.

If California were to require a full credential for teachers to be considered highly qualified, schools would be at risk of losing federal funding. High-poverty schools would be most at risk for two reasons:

First, they tend to have a larger share of teachers without full credentials. Second, under federal Title I, the largest share of federal funding dollars goes to high-poverty schools.

One concern with the inclusion of interns in the definition of highly qualified is that this definition may contribute to the continued prevalence of underprepared teachers in public schools, particularly high-poverty schools. Including interns may reduce the pressure on policymakers to fund teacher preparation programs and to improve the share of fully credentialed teachers in high-poverty schools. Intern preparation and quality require further study. Research has found mixed evidence as to whether fully credentialed teachers are actually better teachers than those without full credentials.

Another concern with California's current policy on highly qualified teachers is that the three-year limit for interns may lead to higher teacher turnover. Under NCLB requirements, districts would have incentives to replace interns who had not become fully credentialed within three years with new, inexperienced interns. During the 1990s, a small but consequential share of teachers who started as interns were still teaching but not fully credentialed in their fourth year: 4 percent for university interns and 19 percent for district interns. If it induces teacher turnover, the policy would be expected to lower teacher quality, as research finds fairly consistent evidence that teachers with a few years of experience are better teachers than those who are just starting.

The relationship between teacher turnover and the three-year limitation for interns should be monitored, as incentives for entering and completing intern programs have changed under NCLB and the share of interns who achieve a full credential within three years may increase or decline. Indeed, the three-year limit should induce interns to keep up with requirements and internship programs to provide additional support for meeting requirements within three years. Alternatively, because the policy creates incentives for people who might have started on an emergency permit in past years to start in an internship program, the internship programs will need to expand and may be faced with teachers less qualified or less inclined to become fully credentialed. With further monitoring, the effect of the three-year limit on teacher turnover can be measured and, if needed, the policy could be adjusted.

Implications for High-Poverty Districts

The shortage of fully credentialed teachers is particularly acute in high-poverty districts, but teacher turnover is not the explanation. In fact, during the 1990s, new teachers in high-poverty districts were less likely than new teachers in low-poverty districts to leave teaching or transfer to other districts. Although this may seem surprising, district size and growth are related to lower turnover and help explain the better retention rates in high-poverty districts. The greater number of openings in these districts may have offered opportunities for new teachers to find positions that they preferred.

Rather, recruitment was the primary reason for lower shares of fully credentialed teachers in high-poverty districts. High-poverty districts have needed more starting teachers because of enrollment growth, and high-poverty districts have been less likely than other districts to recruit new teachers with full credentials. Our analysis suggests that a targeted expansion of university credentialing programs that serve high-poverty districts would likely be more effective than a general expansion because teacher labor markets tend to be local in nature: Over 70 percent of university-trained teachers started teaching in the same region where they attended university.

High Stakes for California

Education policy in California faces serious challenges in the coming years. Academic performance continues to be lower in California than nationally. Low performance continues to be acute in high-poverty districts and those with a large share of students of color. Federal standards require "highly qualified" teachers, yet California continues to have a high share of starting teachers without full credentials. Our results suggest that improving teacher retention may be one strategy for addressing these challenges. As new policies are implemented, ongoing examinations with the NTAR data should prove valuable in evaluating their consequences.

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1. Introduction

Improving the quality of public education has been a focus of California policy over the last decade, resulting in new programs such as class size reduction and academic performance standards. Retaining experienced teachers is another potential strategy for improving school quality and student performance because, on average, experienced teachers are more effective than teachers in their first year or two of teaching.[1] Improving teacher retention could also save the state money by reducing the need to train new teachers in public university credentialing programs.[2] In addition, better retention of teachers would ease the shortage of fully credentialed teachers in California public schools and would reduce the need to rely on new teachers without full credentials.[3] In 2004–05, 7 percent of all teachers, but 25 percent of newly hired teachers, lacked a full credential. In high-poverty districts, 9 percent of all teachers and about 28 percent of newly hired teachers did not have a full credential.[4]

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[1]Jepsen and Rivkin (2002, 2004) find that student performance declined in California with the influx of inexperienced teachers following class size reduction in 1996. Hanushek et al. (2005) show that teachers with more than one year of experience are more effective at raising student test scores in Texas (see also Kain and Singleton, 1996; and Rivkin, Hanushek, and Kain, 2005).

[2]The size of public university teacher credentialing programs is a matter of state policy and in recent years the California State University programs have expanded substantially. See Benner (2000) for estimates of the cost of teacher turnover in Texas.

[3]Ingersoll (2002) argues that improving retention would solve the national teacher shortage problem because a higher level of retention of current teachers would reduce the need to recruit new teachers.

[4]Statistics in this introduction are for school year 2004–05 from the California Basic Education Data System (CBEDS). Following California Department of Education practice, we include "preliminary" and "clear" credentials as "full" credentials. We define a district as "high-poverty" if the share of students enrolled in the free or reduced-price meals program is in the highest quartile (student-weighted). In 2004–05, high-poverty districts were those with at least 70 percent of students enrolled in that program.

Although research has not consistently found a relationship between full credentials and student academic performance, the shortage of fully credentialed teachers has been a focus of California policy since the late 1990s when class size reduction legislation dramatically increased the demand for new teachers and reliance on teachers without full credentials. The policy focus became more intense with the passage of the federal No Child Left Behind (NCLB) Act in 2001, which required that all teachers in core academic subjects be "highly qualified" by the end of 2005–06.[5] Failure to comply puts districts at risk of losing federal funding. In California, only teachers with a full credential and those in an internship program during their first three years of teaching meet NCLB requirements.

The purpose of this study is to understand teacher retention patterns in California and inform policies intended to improve retention. To this end, we examine a range of issues. We explore patterns in teacher retention for new teachers—those in their first seven years of teaching. In addition to measuring the probability that teachers leave public school district employment, we also consider interdistrict transfers because teachers who transfer may contribute to reliance on inexperienced new hires without full credentials in the origin districts. Districts also must spend time and resources to replace teachers who transfer and to train replacement hires. We examine the effects of teacher induction programs and teacher compensation as well as the unintended effects of class size reduction on teacher retention.[6] We also explore the relationship between teacher retention and the shortage of fully credentialed teachers, with a particular focus on high-poverty districts.

In this study, we do not measure the relationship between teacher retention and teacher quality. Although teacher retention is generally viewed as positive, one concern is that policies to reduce teacher turnover may encourage low-quality teachers to remain in teaching.

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[5]This description of NCLB teacher qualifications was taken from the California Department of Education website in November 2005.

[6]Our focus is on new teacher retention. We do not address impending teacher retirements or the broader policy approaches to improving the supply of high-quality teachers. See Esch et al. (2004) for a review of these issues in California. See Hanushek and Rivkin (2004) for a national study of teacher supply policy.

Unfortunately, although teacher quality is clearly an important consideration in teacher retention, our data do not include information on quality. Indeed, we cannot distinguish between teachers who left voluntarily and those who were fired. Some studies have found that more academically skilled teachers leave teaching sooner than do other teachers (Murnane and Olsen, 1990; and Hencke et al., 2000). In a study of urban schools in Texas, Hanushek et al. (2005) found that teachers who left teaching or transferred were no better (and sometimes worse) than teachers who stayed.[7] The Texas findings suggest that some teacher turnover can actually improve school quality when ill-suited teachers leave. To avoid encouraging retention of teachers with low performance, policies that promote teacher retention should go hand-in-hand with policies that evaluate teachers and encourage leaving for those not suited to teach. Alternatively, Hanushek and Rivkin (2004) suggest that retention incentives be targeted at high-performing teachers through performance-based pay.

The data for this project were developed in collaboration with the Labor Market Information Division of the California Employment Development Department (EDD) and the California Commission on Teacher Credentialing (CTC). By linking EDD data on employment with CTC data on teacher certifications and credentials, we have information on the credential status, employment, and earnings of teachers over time. For convenience, we refer to this dataset as the New Teacher Administrative Records (NTAR). One important goal of this project was development of the NTAR dataset for further study of teacher labor markets in California.[8]

The NTAR data provide a rich and powerful source of information on teachers in California. However, several limitations of the data affect our analysis. First, the data cover only teachers receiving or renewing teaching certification in California since 1990 (including any pre-1990

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[7]See also Pigge and Marso (1996).

[8]The NTAR data are confidential. Before making the data available to us, the EDD removed all individual identifiers such as social security numbers and names. Researchers using the data must have a confidentiality agreement with the CTC and EDD. Reed and Barbour (2006) describe construction of the NTAR data.

certifications for these teachers).[9] Therefore, we limit our analysis to "new teachers"—those who received their first California teaching certifications in 1990 or later. Teachers who were certified in other states before 1990 but were first certified in California after 1990 are included in the sample of new teachers. Our analysis begins with the 1991–92 school year. Second, the NTAR sample used in this report extends only through school year 1999–00. Therefore, we are unable to examine many new policies adopted since the late 1990s. Third, we observe the school district of employment but not the actual school or grade level. In a district with relatively high retention rates, there may still be schools with serious retention problems, even schools losing teachers to other schools in the same district. Further, although we use the term "new teachers," the data actually refer to public school district employees who hold a new teaching certification, regardless of whether they are in teaching or in other positions such as administration. In addition, the NTAR covers only California teaching certifications and employment. Therefore, we measure leaving public school employment in California but not whether teachers continued teaching in other states.

We limit our analysis to teaching certifications for two classroom types. Multiple-subject certifications authorize teaching in a "self-contained" classroom—a classroom in which multiple subjects are taught, typically used for kindergarten through sixth grade. Single-subject certifications authorize teaching in a specific subject in departmentalized classes such as those in most middle and high schools, typically grades seven through twelve.[10] We do not study other types of certifications, such as "specialist" credentials for special education or reading, adult or vocational education credentials, or credentials for teaching English learners. Teacher qualifications are described more fully in Chapter 4. Our analysis is based on the highest qualifications attained, although a teacher with a full credential may also hold a waiver

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[9]The data do not cover substitute and service credentials (i.e., for school counselors) before 1990. We limit our analysis to teachers with regular teaching certifications.

[10]In 1997–98, 89 percent of teachers in elementary schools had multiple-subject certifications and 72 percent of teachers in high schools had single-subject certifications. In middle schools, 39 percent of teachers had multiple-subject certifications, 51 percent had single-subject certifications, and 10 percent had both.

or emergency permit (for example, to teach an additional subject area). Full credentials include both preliminary and clear credentials.

Many new public school teachers leave teaching for substantial periods of time and later return to public schools: This makes the issue of retention complex to study. When we estimate teacher turnover, we recognize that some teachers who "leave" will return in future years. To reduce this measurement problem and consider only leaves of a substantial length, we define a "leave" to be two consecutive years out of teaching.

To estimate the effect of policies and district characteristics on teacher retention, we use a modeling framework to account simultaneously for multiple factors. The models, known as hazard models, use data from the entire period and adjust for differences in retention by duration of employment in teaching and by calendar year. Class size reduction (CSR) led to a substantial increase in teacher demand, and the models reflect this by providing separate estimates for the pre- and post-CSR periods.[11] For teachers who started in the period following CSR in 1996, NTAR has only two years of information on teacher turnover. Thus, changes that occurred with CSR may reflect temporary conditions driven by the tremendous increase in teacher demand rather than long-term changes in teacher retention patterns.

Chapter 2 describes patterns of new teacher retention during the 1990s. Chapter 3 describes the policies and other factors that affect new teacher retention. Chapter 4 explores the relationship between teacher retention and the shortage of fully credentialed teachers in public schools. Chapter 5 concludes with policy implications of the findings. Readers are referred to the appendixes for further details on the NTAR data created for this project and the basic statistical methods.

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[11] Likelihood-ratio tests of the model support the hypothesis that the entire set of model coefficients should be interacted with indicators for the period post-1996 and for teachers hired after 1996. For a description of the model and full model results, see Appendixes A and B.

2. Patterns in New Teacher Retention During the 1990s

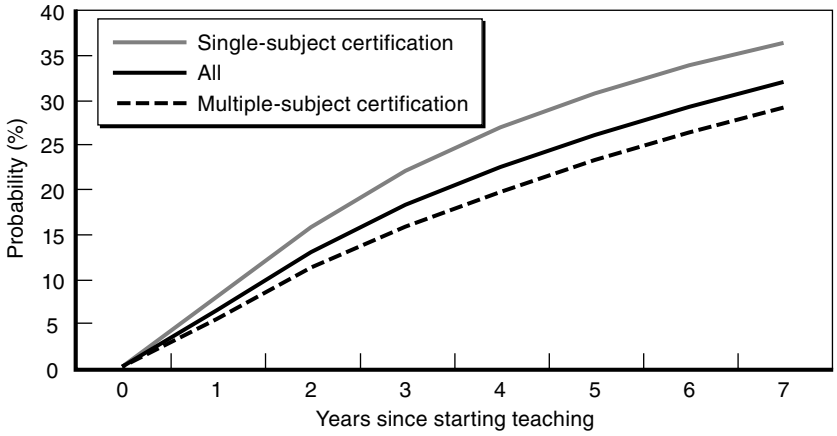
This chapter provides estimates of the probability that new teachers in California left public school employment during their first seven years of teaching and discusses the potential for improving teacher retention to reduce reliance on newly hired teachers. We also consider retention at the district level with estimates of the probability that a new teacher transferred to another district. This chapter describes the average retention over the 1990s and the pattern of annual fluctuations.

New Teachers Leaving Public Schools

During the 1990s, a substantial share of new teachers left public school employment within the first few years after starting teaching. By the end of their second year, 13 percent of new teachers were no longer working for public schools in the state (Figure 2.1).[1] By the end of the fourth year, 22 percent of new teachers had left public school districts. However, departures differed with the type of certification. Among new teachers with multiple-subject certifications, typically required for elementary school classrooms, 20 percent left by the fourth year. Among new teachers with single-subject certifications, typically required for secondary school classrooms, 27 percent left by the fourth year. The rate of leaving declines as teacher experience rises. Overall, we find that 32 percent of teachers left in the first seven years of teaching (the maximum number of years covered in our analysis).

To put teacher exits in perspective, consider that California hired about 20,000 new public school teachers in 2004–05. At 20,000 hired

[1]Teachers who started in 1997–98 are part of the analysis for Figure 2.1 only through the second year of teaching, whereas teachers who started in 1991–92 are part of the analysis for every year through the eighth year. See Appendix A for a description of hazard rate methods.



SOURCES: NTAR (1991–92 through 1999–00).
NOTE: The figure shows the percentage of teachers who left public school employment for at least two consecutive years.

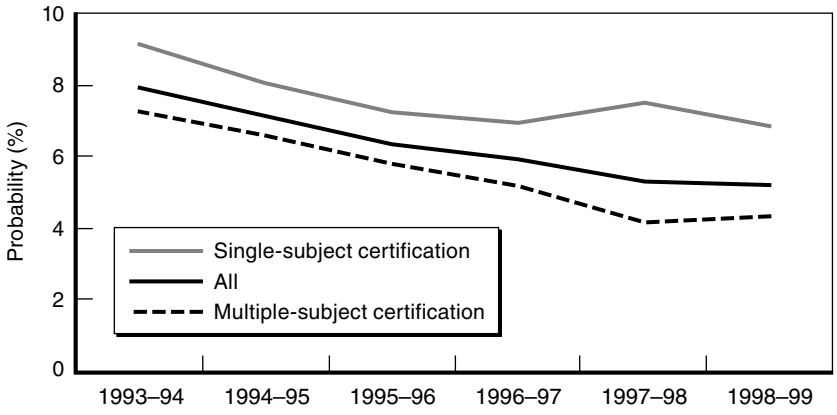
Figure 2.1—Percentage of Teachers Leaving, by Years of Teaching

per year, we would expect about 5,000 teachers to leave during their first seven years in teaching.[2] In other words, roughly one in four teachers hired would be replacing a new teacher who left within the first seven years. If the rate of leaving in the first seven years could be cut in half, for example, it would reduce the number of starting teachers needed per year from about 20,000 to about 17,500.

Over the 1990s, the probability that a new teacher would leave public school employment fell from about 8 percent in 1993–94 to just over 5 percent in 1998–99 (Figure 2.2). The decline in the probability of leaving can be seen for teachers with multiple-subject certifications and for those with single-subject certifications.

The teacher turnover rates for California as measured by the NTAR should not be compared to measures for the nation or other states. One important difference between this study and most other studies is that we consider only leaves of a substantial length—two consecutive academic

[2]There were 20,680 first-year teachers in the 2004–05 CBEDS. If 32 percent leave by the end of year 7 (Figure 2.1) and 21 percent return (of those gone at least two years; see Appendix A), then there are about 5,000 net leavers ($20{,}000 \times (0.32) \times (1 - 0.21) = 5{,}000$).



SOURCES: NTAR (1991–92 through 1999–00).
NOTE: The figure shows estimates based on hazard models that control for years of teaching.

Figure 2.2—Percentage of Teachers Leaving, by Year, 1993–1998

years with no earnings from any public school district. Even if we were to adjust our measure to consider leaves of one academic year, the NTAR would still underestimate leaves relative to survey data. Using the adjusted measure, a "leave" in the NTAR would occur when a teacher had no earnings from any public school district for an entire academic year. For example, a teacher who left public school employment in October 1993 and returned in April 1995 would have had public school earnings in 1993–94 and in 1994–95 and would not be a "leaver." Most studies are based on teacher surveys where teachers identify "left teaching" even for a partial year.[3]

The National Center for Education Statistics (NCES) reported that the share of recently hired teachers who left public schools was 7.8 percent in 1994–95 and 8.5 percent in 2000–01 (Lueckens, Lyter, and Fox, 2004). Replicating their analysis as well as possible with the NTAR data, we find that 8.6 percent of California teachers left in 1994–95 and

[3]Research for other states finds higher turnover than we find using the NTAR, probably because of the more substantial length of leaves as measured in the NTAR. See Brewer (1996) for New York, Texas Education Agency (1995) for Texas, Gritz and Theobald (1996) for Washington, and Murnane (1987) for Michigan.

6.7 percent left in 1999–00. Although we would expect the national estimate to be higher than the California estimate because of the more substantial length of the leaves measured by the NTAR, for the early 1990s the national estimate was lower, perhaps because the NCES result was based on all teachers with one to three years of *full-time* experience whereas our analysis is based on teachers with three years of experience or less (including part-time experience).[4] Furthermore, teachers who move to teach in other states are considered leavers in our study but are not leavers in the national study.[5]

The NCES study finds that, nationally, teacher turnover was higher in 2000–01 than in the early 1990s. For California, we find that turnover improved during the 1990s (Figure 2.2). During the 1990s, California experienced substantial enrollment growth, class size reduction, and the introduction of teacher induction programs. As we will discuss in the next chapter, these conditions led to improved retention rates in California during this period.

New Teachers Transferring Between Districts

From a district perspective, teachers who transfer to other districts also contribute to the retention problem because transfers can create the

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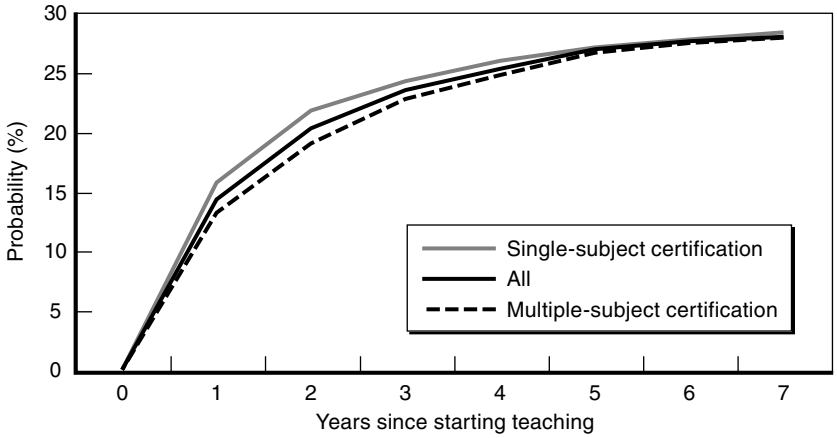
[4]The NTAR does not distinguish part-time from full-time. Our NTAR analysis is based on teachers with multiple- and single-subject certifications, whereas the NCES study includes all teachers. Teachers who move to administrative positions such as school principal are considered still employed in the NTAR but would be leavers in some national studies. Adjustments for leavers moving into administrative positions have very little effect on our retention results, suggesting that such movement in the first eight years of teaching is relatively uncommon (see Appendix A). Ingersoll (2002) uses NCES data from the late 1980s and early 1990s and reports that, nationally, 29 percent of teachers left teaching by the end of the third year. Replicating his method using the NTAR for 1993–94, we find that 24 percent of California teachers left teaching by the end of the third year. The California estimate is lower at least in part because of the more substantial length of leaves measured in the NTAR compared to the NCES survey. In addition, Ingersoll includes private school teachers who have higher rates of turnover than do public school teachers (Lueckens, Lyter, and Fox, 2004).

[5]Henke et al. (2000) and Henke and Zahn (2001) find that, nationally, among recent college graduates who were teaching in April 1994, about 20 percent had left teaching by April 1997. Although the methods are different, the results are similar to our results for California (22 percent of teachers left by the end of the fourth year). Henke and Zahn (2001) also conclude that attrition was similar between teachers and workers in other white-collar, professional occupations.

need for the origin district to rely on new, inexperienced teachers, many of whom do not have a full credential. Teacher turnover also creates challenges for districts as time and other resources are used to replace teachers who leave and to train their replacements.[6] In the 1990s, district transfers were particularly common in the first few years of teaching. During their first and second years of teaching, 20 percent of teachers transferred from their starting district (Figure 2.3). By the end of the fourth year, 25 percent of teachers had transferred. District transfers were not substantially different for teachers with multiple-subject and single-subject certifications.

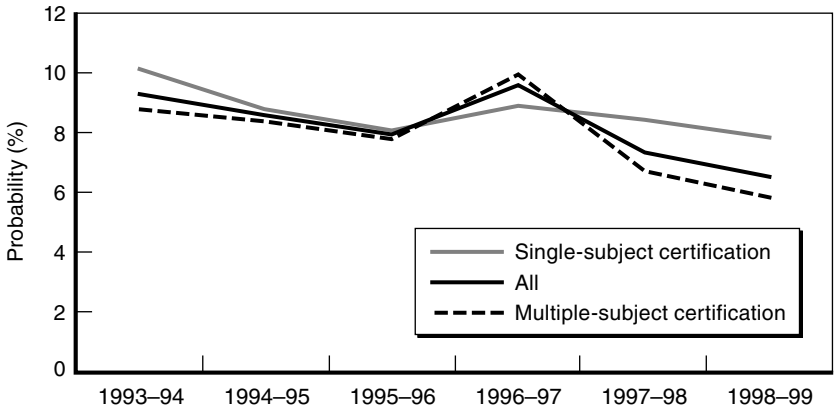
District transfers were somewhat lower in the late 1990s than in the early 1990s, but the striking feature of the pattern over the decade is the peak in transfers in 1996, especially among teachers with multiple-subject certifications (Figure 2.4). This peak in transfers coincided with the 1996 class size reduction legislation for kindergarten through third



SOURCES: NTAR (1991–92 through 1999–00).
NOTE: The figure shows the percentage of teachers who transferred from their first district to another district for at least two consecutive years.

Figure 2.3—Percentage of Teachers Transferring from Their Starting District, by Years of Teaching

[6]See Guin (2005) for a discussion of the challenges facing schools with high teacher turnover.



SOURCES: NTAR (1991–92 through 1999–00).
NOTE: The figure shows estimates based on hazard models that control for years of teaching.

Figure 2.4—Percentage of Teachers Transferring from Their Starting District, by Year, 1993–1998

grade, a development that we explore more fully in the next chapter where we take up the issue of which public policies and other factors influence new teacher retention and transfers.

3. What Affects New Teacher Retention?

The previous chapter demonstrated that many new teachers left California public schools, even during their first few years of teaching. In this chapter, we consider the degree to which public policies and other factors influenced new teacher retention. We study the effects of a teacher induction program that was designed specifically to improve new teacher retention. We also examine the importance of teacher compensation. We show that a third policy, class size reduction, although not explicitly intended to affect teacher retention, actually increased interdistrict transfers. We also consider two other factors that might be expected to influence teacher retention—student poverty in the district and employment opportunities outside teaching. A recent survey of California teachers suggests further policy approaches, particularly improving teaching conditions through improved school leadership, greater preparation time, and better resources (Harris, 2004; and Loeb, Darling-Hammond, and Luczak, 2005).[1] We do not consider these factors because the NTAR provides district-level information whereas these policies operate at the school level. In addition, there are no comprehensive data on these characteristics for the 1990s.

Teacher Induction Programs

Beginning Teacher Support and Assessment (BTSA) programs are two-year induction programs designed to provide new teachers with support such as counseling, assessment, and in-class assistance from veteran teachers. BTSA programs are primarily for teachers in their first

[1]National studies also find that teaching conditions are important for teacher retention. See Friedman (1991), Weiss (1999), and Luekens, Lyter, and Fox (2004).

or second year of teaching who have a full credential.[2] BTSA began as a pilot in 1992–93 with 15 local programs (collaborations of districts, county offices of education, and universities), supporting 1,100 first- and second-year teachers at a cost of about $5 million.[3] BTSA was expanded in 1997 and in 1998 California enacted legislation requiring an induction program for all beginning teachers. As of 2004–05, 148 BTSA programs were in place, serving 96 percent of all school districts. State funding for 2005–06 is estimated at $3,675 per teacher for first-year teachers and $3,357 per teacher for second-year teachers, with districts providing an additional $2,000 per teacher in "in-kind" resources (e.g., support from experienced teachers).

To estimate the effect of BTSA programs on teacher retention, we examine the early adopters—those districts with state BTSA grants before 1996.[4] Before the initiation of BTSA programs, teachers in the early-adopter districts were slightly more likely than teachers in other districts to leave teaching and to transfer from their district (Figure 3.1).[5] That is, districts that initiated BTSA programs before 1996 appeared to

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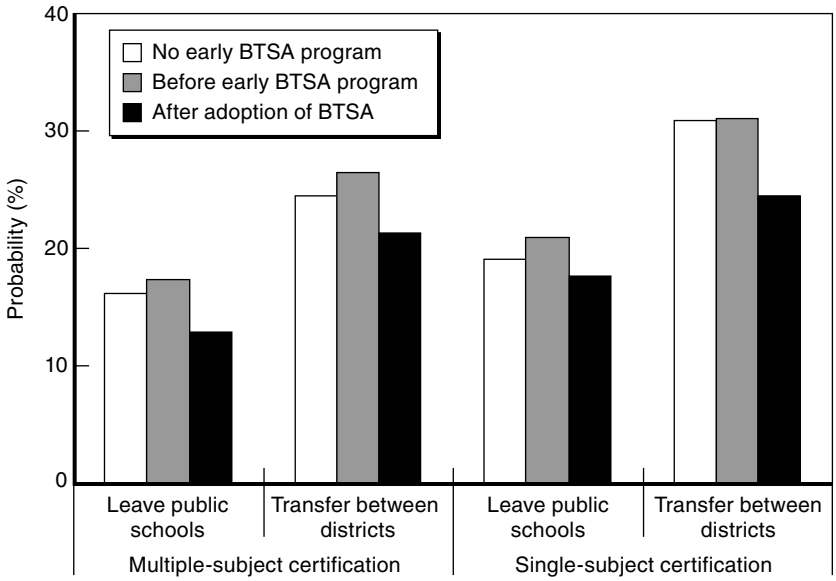
[2]In recent years, BTSA programs have provided required training for teachers with a preliminary credential working toward a clear credential. Both preliminary and clear credentials are considered full credentials. See Chapter 4 for a discussion of certification types. See Olebe (2001) for a description of the BTSA program during the 1990s.

[3]Cost in nominal dollars (not inflation-adjusted). BTSA developed from an earlier pilot program, the California New Teacher Project, begun in 1988, which showed promising results in the performance, retention, and satisfaction of beginning teachers.

[4]We chose the early period because we do not have complete information on when each district implemented a BTSA program in the later period. For the early BTSA programs, we had information on local BTSA partnerships. We contacted current administrators to determine which districts were involved in the early period. We identified 70 districts with early BTSA programs and 888 districts with no early BTSA programs. We dropped from the analysis teachers who started in the 133 districts where we did not have information on whether the district implemented an early BTSA program.

[5]As was shown in Figure 2.1, the probability of leaving teaching differs by year since starting teaching. For simplicity of exposition, we report our model results in terms of the probability of leaving by the end of the second year. Although magnitudes would differ if reported for a different duration of teaching, the reported patterns would be the same. We chose the end of the second year to include analysis specific to the period after class size reduction in 1996, for which we only have a few years of data. See Appendix A for a discussion of the model.



SOURCES: NTAR (1991–92 through 1995–96).
NOTE: Results are based on hazard models (see Appendix A).

Figure 3.1—Percentage of Teachers Leaving or Transferring by Their Second Year, by Presence of a BTSA Program

have more teacher retention problems than other districts had. However, on initiation of BTSA programs, the probability of leaving teaching or moving from the districts with BTSA declined substantially. For example, for teachers with multiple-subject certifications, the probability of leaving public school employment in the first two years fell from 17 percent to 13 percent when BTSA was adopted—a decline of 26 percent. For teachers with single-subject certifications, the probability of leaving fell from 21 percent to 18 percent—a decline of 16 percent. The probability of transferring between districts also fell substantially. The positive effect of BTSA on teacher retention is consistent with the findings of national studies on the importance of supportive conditions during the first year of teaching (Alliance for Excellent Education, 2004; Weiss, 1999).[6]

[6]See also Gold (1996) for a review of the research on beginning teacher support.

Estimates based on the early adopters of BTSA may not reflect the experience of later adopters. For example, the early adopters might also have been inclined to adopt other policies that, along with BTSA, improved teacher satisfaction and retention. In addition, the early adopters may have attracted particularly dedicated teachers because of BTSA and other programs. Furthermore, the early adopters of BTSA experienced declines in transfers, perhaps because teachers were attracted to the BTSA program, in which case the decline would not be as large for districts that adopted BTSA in later years when nearly every district had a BTSA program. Nevertheless, the magnitude of BTSA's effect on leaving public school employment was very impressive for the early adopters. For teachers with multiple-subject certifications, the probability of leaving in a single year fell by 2.4 percent when BTSA was implemented—a substantial amount when compared to the 2.9 percent overall decline in the probability of leaving over the period 1993–94 and 1998–99 (Figure 2.2).[7] For teachers with single-subject certifications, the probability of leaving declined 2.4 percent over the same period and the estimated effect of BTSA was a 1.8 percent decline. Thus, the implementation of BTSA likely explains a substantial share of the decline in the probability of leaving teaching over the 1990s.

Teacher Compensation

Teacher salary schedules are set by school districts through the collective bargaining process with teachers' unions.[8] Salary schedules have graduated steps based on educational credits and length of service in the district. Therefore, district salaries depend on the education and experience of teachers working in the district. Although salaries are set at the district level, since 1983 the state has had an incentive program to raise starting teacher salaries above a minimum level. Districts receive reimbursement based on the number of teachers who qualified and the

[7]For comparison with Figure 2.2, we use the probability of leaving in a single year, which is roughly half of the probability of leaving by the end of the second year (shown in Figure 3.1).

[8]This description of teacher compensation is based on information from the Ed-Data website at www.ed-data.k12.ca.us.

minimum salary paid by the district before implementation of the program.[9]

Employee benefits are a major component of teacher compensation. Benefits include health and life insurance, retirement plans, and professional development. The state requires district contributions to the State Teachers Retirement System (STRS), workers' compensation, state disability insurance, and unemployment insurance. Employee compensation, mostly teacher compensation, typically accounts for over 80 percent of school district budgets.

In our analysis, our teacher compensation measures include salary and benefits. We compare district salary schedules based on the starting compensation for a fully credentialed teacher (a teacher with a bachelor's degree plus 30 units) and the average annual compensation adjustment.[10]

As might be expected, teachers in districts with higher starting salaries and greater scheduled growth in salaries were less likely to leave public school teaching and less likely to transfer between districts (Figure 3.2). For example, among teachers with multiple-subject certifications, the probability of leaving teaching in a district with a low starting salary and low salary growth was 18 percent.[11] For a similar district with a

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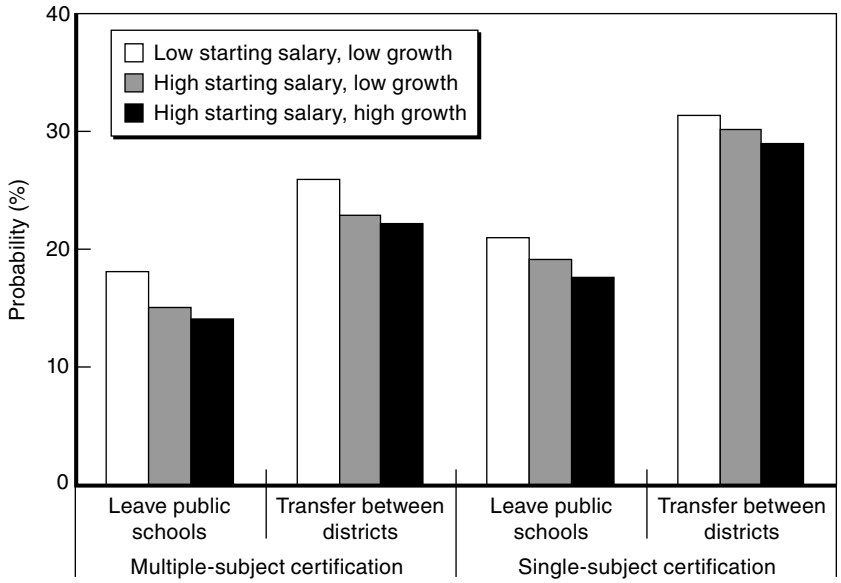
[9]In 1999–00, Governor Davis budgeted $50 million for the Minimum Teacher Salary Program, which raised starting teacher salaries to $34,000. The old minimum salary had been $32,500. The Legislative Analyst's Office (LAO) estimated that in 2002–03, 856 districts participated in the program and district revenues increased by an average of $34 per student.

[10]The annual adjustment is computed as the typical compensation for a teacher with 20 years of experience minus the starting compensation, divided by 20. We have data for 1990–91, 1994–95, and 1999–00. For each academic year, we use compensation data from the closest year for which we have data (see Reed and Barbour, 2006). See Rose et al. (2003) for a description of the compensation data and their construction.

[11]Low district starting salary is defined as the 25th percentile of district starting salaries (student-weighted) which was $34,909 over the 1990s. High district starting salary is defined as the 75th percentile which was $39,329. "Low growth," the 25th percentile of the average annual scheduled salary increase, was $1,092, and high growth, the 75th percentile, was $1,328. These salary statistics are reported in inflation-adjusted 1999 dollars. Salary measures include nonsalary compensation but do not adjust for cost of living differences between regions. Some cost of living differences will be picked up in the model by controls for urban, suburban, and rural districts.



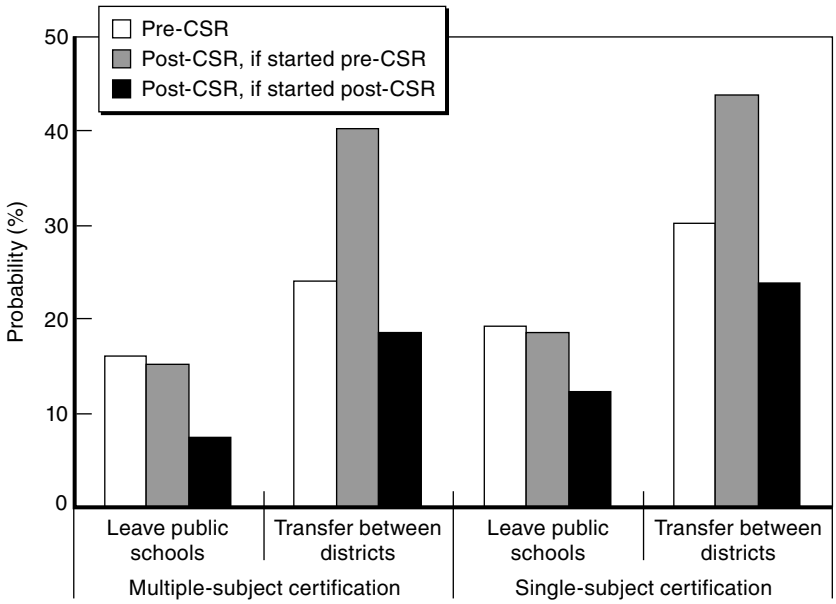
SOURCES: NTAR (1991–92 through 1995–96).
NOTES: Results are for the period before CSR (pre-1996). Salary measures include nonsalary compensation. Results are based on hazard models (see Appendix A).

Figure 3.2—Percentage of Teachers Leaving or Transferring by Their Second Year, by District Salary Level

high starting salary ($4,400 higher) but low salary growth, the probability of leaving was 15 percent—a decline of 17 percent compared to the low salary district. For a high starting salary district that also had high growth, the probability of leaving was 14 percent—a decline of 22 percent relative to a low starting salary, low growth district.

The results in Figure 3.3 are based on the years before CSR. (The effect of CSR on teacher retention is explored in the next section.) We note here that following CSR, district salary schedules were generally not associated with teacher retention.[12] This may be because districts with

[12]For teachers who started before CSR, transfers were actually more common after CSR among those from high salary districts (see Appendix B for model results). Apparently, following CSR, teachers transferred from relatively high salary districts to even higher salary districts. Among transferring teachers, the average difference in starting salary between the destination and origin districts was about $200. See Chapter 4 for an analysis of transfers by poverty level of the origin and destination districts.



SOURCES: NTAR (1991–92 through 1999–00).
NOTE: Results are based on hazard models (see Appendix A).

Figure 3.3—Percentage of Teachers Leaving or Transferring by Their Second Year, Before and After Class Size Reduction

retention problems tried to improve recruitment and retention by raising salaries. We believe that these results reflect a post-CSR adjustment period (we measure only two years of turnover for teachers starting after CSR), rather than that higher salaries no longer reduced turnover. Several studies have shown that salary is an important factor for teacher retention.[13]

Class Size Reduction

In July 1996, California enacted class size reduction legislation for kindergarten through third grade. CSR offered $650 per student to

[13]See Stinebrickner (1998, 2001) and Loeb, Darling-Hammond, and Luczak (2005). Using a national survey of teachers, Luekens, Lyter, and Fox (2004) report that 35 percent of new teachers who left public schools indicated that "better salary and benefits" affected their decision to leave teaching.

school districts that reduced class sizes to 20 or fewer students.[14] At that time, average class sizes in the lower grades were just below 30 students per teacher. Although the program was not mandatory, CSR was adopted relatively quickly with virtually all first and second grade classrooms meeting requirements by the second year and third grade and kindergarten classrooms meeting requirements by the fourth year. Adoption rates were somewhat uneven, with high-poverty districts implementing more slowly.

CSR created an additional demand for more than 25,000 teachers statewide and cost the state approximately $1 billion the first year and about $1.6 billion annually thereafter. CSR brought about a large increase in the demand for teachers as well as increased availability of positions in desirable districts.

For new teachers who started teaching before the passage of CSR, there was very little change in their probability of continuing teaching in public schools but a substantial increase in district transfers (Figure 3.3).[15] CSR not only increased transfers for teachers with multiple-subject certifications, typically required for teaching in an elementary school classroom, it also increased district transfers for teachers who held single-subject certifications at the time they started teaching. Some in this latter group attained new multiple-subject certifications. Others likely took positions vacated by former single-subject-certification

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[14]To receive CSR funding, smaller class sizes needed to be adopted first for all first grade classes, then second grade classrooms, then kindergarten and third grade. That is, if any first grade class had more than 20 students, the school would not receive CSR funding for the other grades. Districts could receive a smaller sum of money for reducing student-teacher ratios to 20-to-1 for half the day and for teaching math and English. Participating schools and districts were also eligible for additional funds for new facilities to house additional classes. For additional information on CSR in California, see Bohrnstedt and Stecher (2002) and Jepsen and Rivkin (2002).

[15]The results in Figure 3.3 do not imply that over 40 percent of all new teachers hired before 1996 transferred between districts after CSR. Indeed, only about 5,000 new teachers transferred in 1996–97 and fewer transferred in the following years. The middle bars of Figure 3.3 show model-based simulations of the probability that a "typical" new teacher would transfer by the end of his or her second year of employment, if faced with post-CSR conditions (e.g., increased demand for teachers) in each of the first two years of teaching. In reality, only teachers hired after CSR faced post-CSR conditions for the first two years of teaching. Model simulations use mean characteristics of teachers and median characteristics of districts (enrollment-weighted) to define a "typical" teacher.

teachers who earned multiple-subject certifications. Furthermore, there may have been adjustments through middle schools, if teachers with multiple-subject certifications moved to elementary schools and were replaced by teachers with single-subject certifications.

The post-CSR increase in transfers for teachers hired before CSR explains the peak in district transfers in 1996–97 (as shown in Figure 2.4). For teachers with single-subject certifications, transfers remained relatively high through 1998–99. This may reflect the much smaller program to encourage reduced class sizes in high schools. Starting in 1989, the state provided funds to a limited number of high schools to implement smaller class sizes. In 1998, the program was expanded to all high schools for ninth grade—providing $135 per student to high schools that offered one or two high school subjects in classes with an average of 20 students per teacher and a maximum of 22 per participating class.[16] The program cost a little less than $300 million in 1999–00.

Among teachers who began teaching after July 1996, the probability of leaving public school teaching or transferring between districts was substantially lower. Perhaps because of the increased demand for teachers and the greater availability of teaching positions, a higher share of new teachers may have been able to find starting positions that suited their tastes in terms of the grade level, school, and district. Thus, we expect that some of the measured improvement in retention in the late 1990s (as shown in Figure 2.2) likely reflects short-term adjustments to increased teacher demand rather than improved long-term retention.[17]

More generally, we find that the results of the teacher retention models change substantially after CSR. In effect, there are three models: one for the period before CSR, one for the period after CSR for teachers who started before CSR, and one for teachers who started after CSR. In

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[16]The reduced-size courses must meet graduation requirements and must include English and may include mathematics, social studies, or science.

[17]Mont and Rees (1996) find that smaller class sizes improve retention. Stinebrickner (1998) concludes that teacher wages are more important than are student-teacher ratios for retention. Further analysis of the NTAR for the period after 1998–99 would indicate whether teacher retention was improved after the initial implementation period for CSR.

what follows, we provide estimates for all three models. Because the NTAR covers only a few years following CSR, we interpret post-CSR results as short-term adjustments to the increase in teacher demand.

Student Poverty

Several studies for other states have found that teacher retention is a greater problem in schools with large shares of low-income students.[18] Surprisingly, we find that in California during the 1990s, teacher retention in high-poverty districts was actually better than in low-poverty districts (Figure 3.4). The probability of having left public school employment by the end of the second year was 8 percent for teachers starting in high-poverty districts and 16 percent for teachers starting in low-poverty districts.[19] If we also include district transfers, the probability of leaving the first district of employment by the end of the second year was 24 percent in high-poverty districts and 39 percent in low-poverty districts. It is important to note that this result is for district-level analysis and may not be true at the school level. That is, high-poverty schools may have had a retention problem—even an acute one—at the same time that high-poverty districts had better retention than low-poverty districts.[20]

Teacher retention was better in high-poverty districts in California in part because student poverty is confounded with other district characteristics not because student poverty per se causes teachers to stay

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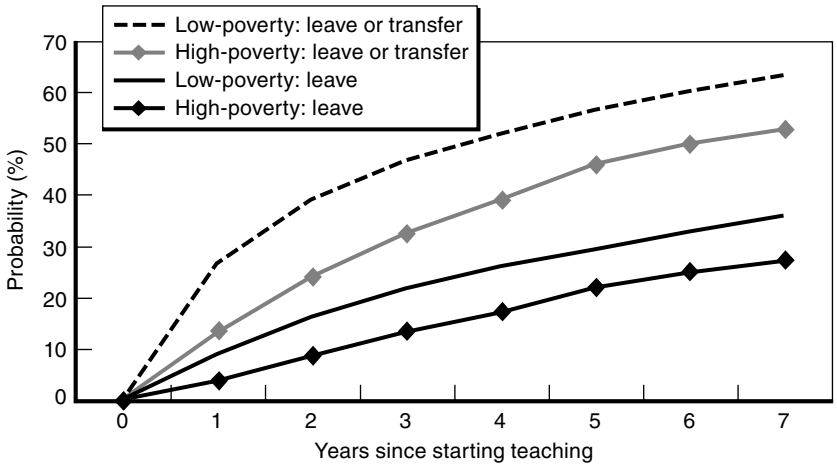
[18]See Hanushek, Kain, and Rivkin (2004a, 2004b) for Texas; Scafidi, Sjoquist, and Stinebrickner (2005) for Georgia; and Plecki et al. (2005) for Washington. We focus on student poverty as an indicator of student characteristics in districts. There is substantial correlation between high student poverty, low academic performance, low parental education, and a high share of Latino and African American students. We do not attempt to isolate independent effects of these factors.

[19]"High-poverty" districts are those in the highest quartile of percentage of students enrolled in the free or reduced-price meals program, whereas "low-poverty" districts are in the lowest quartile (enrollment-weighted). The quartile cutoffs used for unified districts during the 1990s were 69 percent and 30 percent. Quartiles were computed separately for elementary school districts and for high school districts.

[20]The NTAR data do not identify teacher employment at the school level. See Offenberg, Xu, and Chester (2001) for within-district analysis of school transfers for Philadelphia.



SOURCES: NTAR (1991–92 through 1999–00).

Figure 3.4—Percentage of Teachers Leaving or Transferring, by District Poverty

in districts. In particular, high-poverty districts were large and growing during the 1990s. In our statistical models, we find that districts with high and growing enrollments tend to have higher teacher retention (see also Ingersoll, 2001). One explanation for the relationship at the district level is that in large and growing districts, teachers have substantial within-district mobility, moving to new positions and different schools, whereas within small or shrinking districts, it is more difficult to transfer within the district.[21] In addition, high-poverty districts offered higher starting salaries—another factor that encourages retention.[22]

Nevertheless, even in the statistical models that control for district and teacher characteristics including enrollment and salary, we find that

[21]Another possible explanation is that districts with large enrollments also cover large geographic areas, so that a district transfer out of a large district might be more likely to require a long commute or change of residence than would a district transfer out of a small district.

[22]In 1999, the median starting salary for a fully credentialed teacher was just under $36,200. In the highest-poverty districts, the median was just over $36,900, and in the lowest-poverty districts, it was just under $36,200. Districts with student poverty in the second-lowest quartile had the lowest salaries, with a median of $35,800. (District salary statistics in this footnote are not enrollment-weighted.)

before class size reduction, teachers in high-poverty districts were less likely to leave teaching and less likely to transfer (Table 3.1).[23] For teachers who started after CSR, we see a similar pattern of better retention in high-poverty districts. However, for teachers with single-subject certifications, district transfers out of high-poverty districts were slightly more common than transfers out of low-poverty districts.

The substantial exception is the period immediately following CSR for teachers who began teaching before CSR. As shown in Figure 3.3, district transfers increased substantially following CSR. Table 3.1 shows that transfers increased more in high-poverty districts, resulting in markedly greater transfers out of high-poverty districts than out of low-poverty districts. The probability of leaving public school teaching from a high-poverty district was also slightly elevated following CSR for teachers who began teaching before CSR.

Table 3.1

Percentage of Teachers Leaving or Transferring by Their Second Year, by District Poverty

	Leave Public Schools		Transfer Between Districts	
	Low-Poverty	High-Poverty	Low-Poverty	High-Poverty
Multiple-subject				
Pre-CSR	18	14	25	23
Post-CSR, if started pre-CSR	14	16	36	46
Post-CSR, if started post-CSR	9	6	19	18
Single-subject				
Pre-CSR	21	17	31	29
Post-CSR, if started pre-CSR	17	20	39	50
Post-CSR, if started post-CSR	14	11	23	25

SOURCES: NTAR (1991–92 through 1999–00).

NOTE: Results are based on hazard models (see Appendix A).

[23]The finding that retention is better in districts with higher poverty is robust to a variety of specifications relating to district enrollment and enrollment growth as well as to excluding very small and very large districts from the estimation. The results are also robust to dropping teachers who worked in public schools before earning their first regular teaching certification (see Appendix A).

Business Cycles

Strong labor market conditions might be expected to reduce teacher retention by attracting teachers into other employment. However, during the early 1990s before CSR, teachers in regions with low unemployment rates were not substantially more likely than teachers in high unemployment regions to leave public school employment (Table 3.2).[24] Similarly, teachers in regions with employment growth were not more likely to leave teaching than were teachers in regions with employment declines. During the economic growth of the late 1990s following CSR, teachers were more likely to leave public school teaching if they worked in a region with a low unemployment rate and a growing economy. The overall effect of economic conditions was fairly small with one exception: New teachers who started in the early 1990s

Table 3.2

Percentage of Teachers Leaving by Their Second Year, by Business Cycle Conditions

	Unemployment Rate		Employment Change	
	High	Low	Decline	Growth
Multiple-subject				
Pre-CSR	16	16	16	16
Post-CSR, if started pre-CSR	14	17	15	15
Post-CSR, if started post-CSR	7	8	7	8
Single-subject				
Pre-CSR	19	19	19	19
Post-CSR, if started pre-CSR	17	21	19	19
Post-CSR, if started post-CSR	12	13	12	13

SOURCES: NTAR (1991–92 through 1999–00).

NOTE: Results are based on hazard models (see Appendix A).

[24]For the simulation, we use 6 percent for the low unemployment rate and 7.9 percent for the high unemployment rate. For employment change (i.e., the change in the number employed), we use a decline of 2.5 percent and growth of 3.3 percent. These represent the extremes of the statewide numbers over the period 1991–99. Table 3.2 describes the magnitude effects. For statistical significance, see Appendix Tables B.2 through B.7.

were about three percentage points more likely to leave public school employment in the late 1990s if they worked in a region with a low unemployment rate.[25]

The relatively small effect of business cycle conditions is perhaps surprising in light of research that suggests the importance of outside employment opportunities in explaining teacher turnover (Murnane, 1987; Murnane and Olsen, 1990; Theobald and Gritz, 1996; Gritz and Theobald, 1996). However, we find that about 60 percent of new teachers who left public school district employment during the 1990s did not work for a California employer in the following year.[26] Some of these teachers left the state (perhaps to teach in another state) and others may have become homemakers. (See Appendix C for further analysis of postteaching employment.)

In the next chapter, we examine the relationship between teacher certifications and teacher retention, exploring whether improvements in teacher retention would increase the share of fully credentialed teachers in public schools.

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[25]Table 3.2 also shows the lower probability of leaving among teachers who started after CSR, as shown in Figure 3.3.

[26]Similarly, Stinebrickner (2001) finds that, nationally, a large proportion of teachers who left were not working. Using a national survey, Luekens, Lyter, and Fox (2004) report that only 34 percent of new teachers who left public schools indicated that pursuing another career was important in their decision to leave the teaching profession. About 19 percent of new teachers indicated that pregnancy and childrearing were important to their decision.

4. Teacher Retention and the Shortage of Fully Credentialed Teachers

The federal No Child Left Behind Act of 2001 required that by the end of 2005–06, all teachers in core academic subjects be "highly qualified."[1] Currently, California defines highly qualified teachers as those with a full credential or participating in an internship program during their first three years of teaching. High-poverty districts face the greatest pressure under NCLB because they tend to have a greater share of teachers without full credentials and because they face losing funding from Title I—Improving the Academic Achievement of the Disadvantaged—which is targeted at schools serving students living in poverty. California's revenues under the Title I program were about $3 billion in 2003.[2]

In this chapter, we examine the relationship between teacher retention and the shortage of fully credentialed teachers in public schools, with particular attention to high-poverty schools. We show that better teacher retention would improve the share of fully credentialed teachers by reducing reliance on newly hired teachers who are the least likely to have full credentials. We focus on teacher credentials because of the intense policy focus on this topic. However, we note that existing research does not find consistent evidence that teachers with full credentials are better teachers than those without. In California, fully

[1]This description of NCLB teacher qualifications was taken from the California Department of Education website in November 2005.

[2]For NCLB, high-poverty schools are those with more than 50 percent of students participating in the free or reduced-price meals program. Under NCLB, the Title I program provides fairly flexible support through waivers for high-poverty schools to operate schoolwide programs. For more information on NCLB in California, see http://www.cde.ca.gov/pr/nclb/.

credentialed teachers are more likely to teach in districts with high academic performance, but it is not clear from this relationship whether credentialed teachers create the higher performance or whether they simply are more likely to be offered positions in districts where other student and district characteristics lead to strong performance.[3] In our view, some of the best evidence on this issue comes from Texas, where researchers have examined teachers' abilities to raise student test scores over the course of the academic year. Hanushek et al. (2005) found that teacher quality matters for academic performance but it is unrelated to receiving a passing score on the teacher certification exam or to achieving a master's degree.[4] In contrast, Darling-Hammond et al. (2005) examine data from Houston and conclude that certified teachers consistently produce stronger student achievement gains than do uncertified teachers.

Clearly, the results for Texas may not apply to teachers with a California credential. Unfortunately, research on this issue in California suffers from the inability to track a student's progress and identify characteristics of the student's teachers. However, research on recent reforms in San Diego does track students and teachers. Betts, Zau, and Rice (2003) found mixed evidence but in most cases found that student test score gains were not substantially different for teachers with or without full credentials. In analysis of California's class size reduction in 1996, Jepsen and Rivkin (2002, 2004) find declines in student achievement associated with the influx of inexperienced teachers and, to a lesser degree and less consistently, of teachers who did not have full credentials.

For readers not familiar with teacher certifications, we begin with an overview of teacher credentials and certifications in California. We then turn to estimates of retention by certification type and of conversions from emergency permits and internships to full credentials. We also

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[3]For a discussion of these relationships at the school level in California, see Betts, Rueben, and Danenberg (2000). For analysis of student and school data for the Central Valley, see Danenberg, Jepsen, and Cerdán (2002).

[4]For related research, see Kain and Singleton (1996), and Rivkin, Hanushek, and Kain (2005).

investigate the importance of district transfers in explaining the shortage of fully credentialed teachers in high-poverty districts.

Teacher Certifications

California teacher certifications can be divided into five types to designate the level of qualifications.[5] With the exception of teachers with a credential waiver, all teachers must hold certification with specific minimum requirements: possession of a bachelor's degree, verification of basic skills by passing the California Basic Educational Skills Test (CBEST), and college coursework in the subject assigned or evidence of subject matter mastery through passing California's subject matter exam.[6] A teacher may have more than one type of certification. In our analysis, we categorize teachers by the highest qualifications achieved.[7] The following list describes the five types of teacher certifications, ordered from the highest level of qualifications to the lowest.

Full Credential

A full credential is issued following successful completion of a teacher preparation program. Teacher preparation involves coursework at the master's degree level. Full credentials include "professional clear" credentials as well as "preliminary" credentials, which have a few remaining requirements such as the completion of a teacher induction program (e.g., BTSA).[8]

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[5]For a review of research on alternative teacher preparation programs, see Darling-Hammond and Sykes (2003). Teacher certifications and credentials may change. Readers interested in current policy should refer to the CTC website at www.ctc.ca.gov. Our descriptions of credentialing qualifications were taken from this website in 2005 and from EdSource (2002).

[6]Teacher certifications also require clearance through the U.S. Department of Justice or the Federal Bureau of Investigation.

[7]For example, a waiver may be issued to a fully credentialed teacher with a single-subject certification to authorize teaching classes beyond the authorized subject. A teacher with a full multiple-subject credential may hold an emergency credential to teach in a single-subject classroom and vice versa. Teachers who hold both multiple-subject and single-subject certifications at the same level of qualifications are coded as multiple-subject in our analysis.

[8]It is common practice for the CTC and the California Department of Education to include preliminary credentials in the count of full credentials. Preliminary credentials

Teachers who are credentialed in another state may be eligible for a full teaching credential through reciprocal agreements and by passing the CBEST test. We use the term *"out-of-state" credential* for teachers whose credential preparation occurred outside California.[9] We make this distinction because teacher retention patterns differ for these teachers. However, to teach in California, these teachers must also receive a California teaching certification from the CTC. The vast majority (over 95%) of the teachers for whom the CTC records "out-of-state" preparation as the basis of their California certification have a full credential in California (either preliminary or clear).

Internship Credential

Internship programs allow teachers to assume a paid teaching position while completing a teacher preparation program. A *university internship credential* (also known as an "Institute of Higher Education" or IHE intern credential) is issued to individuals who are enrolled in an accredited one- or two-year internship program administered by a university (or college) in partnership with local school districts.

A *district internship credential* is issued for up to two years to individuals who are enrolled in an authorized, district-administered internship program. During the internship, the individual is required to complete requirements as specified in a professional development plan. At the end of two years, the district's governing board can recommend to the CTC that the district intern be granted a full credential.

In 2003, the CTC introduced the *"individualized internship certificate"* (IIC) for individuals who met subject matter competency to be compliant with "highly qualified" teacher requirements of federal NCLB legislation. IIC interns were required to be enrolled in a university with an approved teacher preparation program and to develop

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often require the passing of safety courses or computer courses plus other professional development criteria before attainment of a clear credential.

[9]Throughout the 1990s, a substantial share of new teachers in California had credential training from other states. From 1992–93 to 1995–96, teachers with out-of-state credentials made up 12 percent of new California teachers. Following CSR, the share increased to 14 percent in 1996–97 and remained at 15 percent or higher through 1999–00.

a plan, in cooperation with that university, to achieve a full credential. In November 2005, a court ruled that the CTC does not have the authority to issue IICs without first promulgating regulations. Existing IICs have been converted to nonrenewable Special Temporary Certificates (STCs). Former IIC holders are no longer considered to be in an approved intern program and thus do not meet California's definition of "highly qualified." The commission will be seeking to have regulations for the IIC approved.[10]

Pre-Intern Certificate

The pre-intern programs were begun in 1998–99 to give additional training to teachers with emergency permits, through intensive preparation in classroom management and instruction methods with the frequent support of an experienced educator. Pre-intern certificates were issued to participants in an authorized program administered by a school district, county office of education, or consortium. Pre-intern certificates were valid for one year and could be renewed for one year. Beginning in July 2005, the CTC no longer issues pre-intern certificates.

Emergency Permit

These are requested by a district on behalf of an individual when the district is unable to locate enough fully credentialed teachers to meet its needs. Requirements for subject matter competency are lower for emergency credentials than for internships. In the 1990s, permits were issued for one year and could be renewed for a maximum of five years. Effective June 30, 2006, the CTC will no longer issue or renew multiple-subject, single-subject, or education specialist emergency permits and all such permits will expire on that date.

With the phasing out of emergency permits, the CTC introduced the *"provisional internship permit,"* effective July 2005, for individuals who have not met subject matter competence for an internship program. Similar to an emergency permit, this permit is requested by a district that is unable to locate enough fully credentialed teachers. A *"short term staff*

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[10]This description of the IIC was taken from the CTC website in November 2005. For the current status of IIC and other credentials, readers are referred to www.ctc.ca.gov.

permit" may be requested by a district to immediately fill an unforeseen vacancy. These new permits may be issued for a total of three years combined.

Credential Waiver

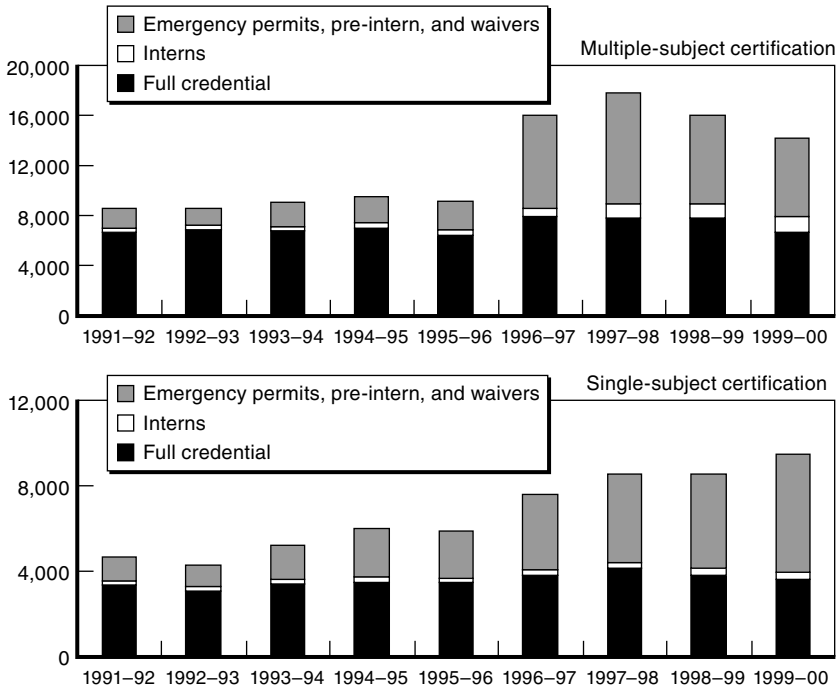
Waivers are requested by a district when the district is unable to locate enough credentialed teachers or candidates who qualify for an internship or provisional internship permit. Waivers are generally given for one year and candidates are required to demonstrate progress toward a credential by completing an examination or coursework before the employer can request a subsequent waiver.

Recent Trends in Teacher Certifications

In the early 1990s, there were roughly 9,000 starting teachers per year with multiple-subject certifications and about 80 percent of these starting teachers were fully credentialed (Figure 4.1).[11] With the increase in teacher demand that accompanied CSR, the number of starting teachers with multiple-subject certifications increased dramatically to about 16,000. The increase was mainly accomplished through hiring starting teachers without full credentials. The share of starting teachers with multiple-subject certifications who held full credentials fell from 71 percent in 1995–96 to only 49 percent in 1996–97 and the share remained low through 1999–00.

In the early 1990s, the number of starting teachers per year with single-subject certifications was under 5,000 and about 70 percent were fully credentialed. By 1995–96, the number of starters increased to 6,000 and the share fully credentialed was just below 60 percent. Although CSR did not directly increase the demand for teachers with single-subject certifications (who mainly teach in middle and high

[11] We categorize starting teachers by the highest level of certification they have attained in the year they start teaching.



SOURCES: NTAR (1991–92 through 1999–00).
NOTES: Pre-internships began in 1998–99. Waivers are tracked in the NTAR starting in 1994–95.

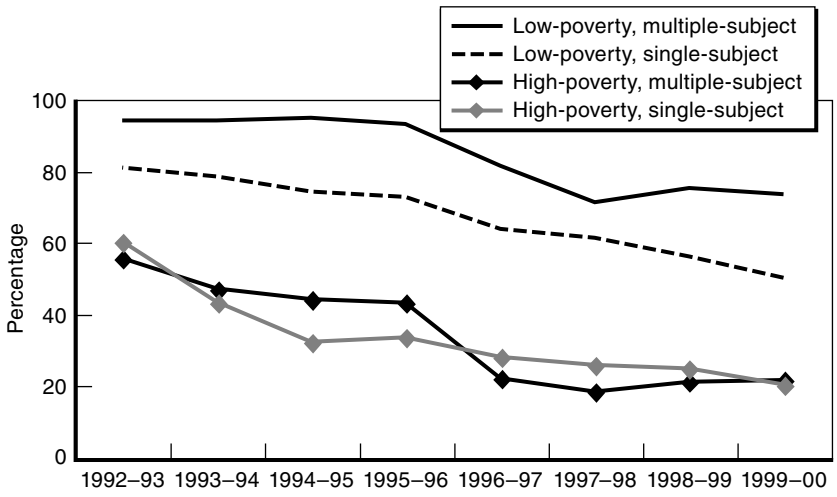
Figure 4.1—Starting Teachers in Their First Year, by Certification

schools), the number of starting teachers with single-subject certifications increased to about 8,000 after CSR, most likely because starting teachers were replacing experienced teachers who transferred to elementary schools. As with multiple-subject certifications, the share of starting teachers with single-subject certifications who held full credentials also fell, from 58 percent to 50 percent in the first year after CSR and then further, to less than 40 percent in 1999–00.

Among teachers starting without a full credential during the 1990s, emergency permits made up about 80 percent. In 1999–00, the share of emergency permits among teachers starting without a full credential fell to 72 percent, with the pre-internship program growing to 12 percent and university internships to 8 percent.

Since the early 1990s, high-poverty districts have had a lower share of teachers with full credentials among starting teachers (Figure 4.2). After CSR, the share of teachers with full credentials fell more dramatically for high-poverty districts (not shown), mainly because of the sheer number of starting teachers they hired—there simply were not enough fully credentialed teachers to fill the newly created positions. In the late 1990s, high-poverty districts hired about one-third of all starting teachers with multiple-subject certifications but only 13 percent of those with full credentials.[12]

One possible explanation for the low share of starting teachers with full credentials is that high-poverty and other districts intentionally hired teachers without full credentials to reduce costs. During the early 1990s, districts often paid thousands of dollars more for starting teachers with full credentials than for other starting teachers. The median salary



SOURCES: NTAR (1991–92 through 1999–00).

Figure 4.2—Percentage of Starting Teachers with Full Credentials in Their First Year, by District Poverty

[12]In the early 1990s, high-poverty districts hired about one-fourth of all starting teachers with multiple-subject certifications but only 16 percent of those with full credentials.

difference between a starting fully credentialed teacher and one receiving the lowest teacher salary was just over $6,100 in 1991–92.[13] The median salary differential fell to just under $4,000 by 1995–96. However, after CSR when the use of teachers without full credentials became more common, the median differential was only about $1,000. With median starting salaries for fully credentialed teachers around $33,000 in 1999–00, this differential amounted to savings of only 3 percent. Thus, there was some salary-savings incentive to hire teachers without full credentials, but it was relatively small.[14]

Since 1999, the share of starting teachers with full credentials has increased dramatically, from less than half in 1999–00 to 75 percent in 2004–05.[15] For those starting in high-poverty districts, the share increased from 28 percent to 72 percent over the five-year period. The improvement was likely due to the increasing size of university teacher preparation programs. The number of full credentials attained through university programs increased from less than 18,000 in 1999–00 to over 27,000 in 2003–04—mainly through increases in California State University and private university programs (California Commission on Teacher Credentialing, 2005). The growth in teacher credentialing demonstrates the importance of teacher-related policy since 1999 and highlights the value of further explorations with more recent NTAR data. However, the credentialing patterns alone do not imply that teacher retention has changed substantially since the 1990s. In fact, our

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[13]Figures in this paragraph are based on comparisons of teacher salaries without benefits, measured across districts (not enrollment-weighted). Salary figures are inflation-adjusted to 1999 dollars.

[14]Districts with large salary differentials were only slightly more likely than other districts to hire teachers on emergency permits. The correlation between the salary differential and the share of starting teachers on emergency permit (or waiver or pre-internship) was 7 percent or less in each year from 1996–97 through 1999–00.

[15]Statistics for recent years are from CBEDS. CBEDS and NTAR measurements differ for a number of reasons including that CBEDS information on starting teachers is based on a survey done during one month of the year. NTAR data include teachers working at any period during the entire year. Our NTAR analysis is limited to teachers with multiple- or single-subject certifications. In addition, the CBEDS data collection has changed over the years, but the total effect of those changes on the measurement of full credentials among starting teachers was probably quite small.

analysis of data from the early 1990s covers a period when full credential levels for new teachers were fairly similar to recent levels.[16]

This description of credentialing trends is based on the highest level of qualifications attained for each teacher. This tends to underestimate the degree to which teachers lack full credentials for the class they are teaching. For example, a teacher with a full credential for teaching science may teach math with a waiver. We cannot address this issue because the NTAR data do not identify teacher course assignments.

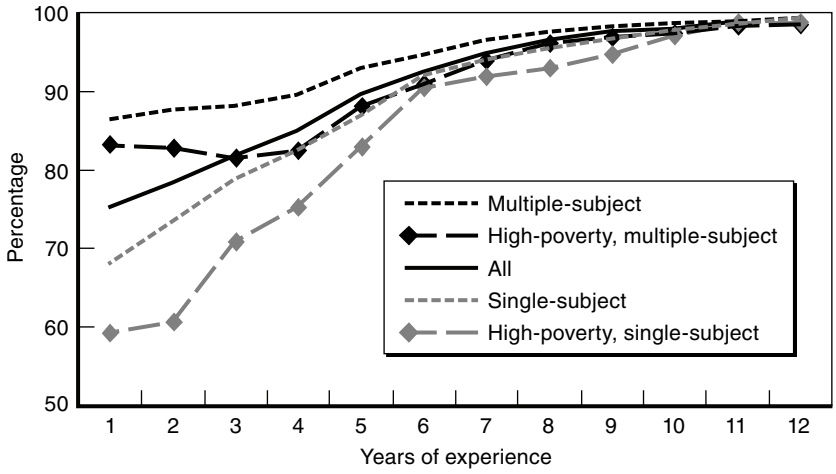
Retention by Starting Certification

Because many teachers start without full credentials, a critical question is whether they continue in teaching and, if so, whether they become fully credentialed. In this section, we show that teachers starting without full credentials were not substantially more likely than starting teachers with full credentials to leave public school teaching. In the next section, we show that of those who remain in teaching, a large share become fully credentialed in the first few years.

Despite the fact that the share of starting teachers with full credentials has been improving, recently hired teachers are the least likely to have full credentials. In 2004–05, among starting teachers, 75 percent were fully credentialed (Figure 4.3). Among those with five years of experience, 89 percent were fully credentialed; and among those with ten years of experience, 98 percent were fully credentialed. Starting teachers with single-subject certifications were even less likely to be fully credentialed; but among those with ten years of experience, nearly all were fully credentialed. Even in high-poverty districts, where a larger share of teachers started without full credentials, those with ten years of experience were nearly all fully credentialed.

What is not shown in Figure 4.3 is the steep decline in the number of teachers as experience increases. In 2004–05, there were almost 20,700 teachers in their first year and only just over 11,000 in their tenth year. Thus, there are two possible reasons to explain why the share

[16]Esch et al. (2004) suggest that full credential levels may fall in the coming decade because of the projected increase in demand for new teachers brought about by an increase in the number of retiring teachers.



SOURCE: CBEDS (2004–05).

Figure 4.3—Percentage of Public School Teachers with Full Credentials, by Years of Experience

fully credentialed grows with experience. First, teachers who started without full credentials may have left public schools. Second, teachers who started without full credentials may have become fully credentialed.[17]

Our analysis of data from the 1990s suggests the latter explanation. Indeed, we find that teachers with multiple-subject certifications who started without full credentials were less likely to leave than those who started with full credentials. For example, in the early 1990s, the probability that a teacher starting with a multiple-subject emergency permit left public employment in the first two years of teaching was 12 percent, whereas for a teacher starting with a full credential from a California program, the probability was 16 percent (Table 4.1). Teachers starting as interns were also less likely than fully credentialed teachers to leave public schools. Teachers with out-of-state credential preparation (the vast majority of whom had full California credentials) were the most likely to leave teaching—37 percent.

[17]A third possible explanation, that among teachers hired five to ten years ago a large share started with full credentials, was ruled out by the patterns in Figure 4.2.

Table 4.1

Percentage of Teachers Leaving by Their Second Year, by Starting Certification

	Waiver	Emergency	District Intern	University Intern	Full	Out-of-State
Multiple-subject						
Pre-CSR		12	15	8	16	37
Post-CSR, if started pre-CSR	5	14	20	6	13	37
Post-CSR, if started post-CSR	13	6	5	4	7	16
Single-subject						
Pre-CSR		19	17	17	16	34
Post-CSR, if started pre-CSR	22	21	27	16	14	31
Post-CSR, if started post-CSR	13	13	8	11	11	18

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Results are based on hazard models (see Appendix A). Because waivers were not identified in NTAR before 1994–95, we do not have enough data to identify pre-CSR conditions.

The same overall pattern holds for teachers with multiple-subject certifications who began teaching after CSR. The pattern is somewhat different after CSR for teachers who were already teaching before the legislation. We believe that this difference reflects a short-term adjustment to CSR rather than a major change in retention patterns.

For teachers with single-subject certifications, those who began with a full California-earned credential were somewhat less likely to leave teaching than were those who began with emergency permits or in an internship (with the exception of district internships after CSR). However, the differences in the probability of leaving are not enough to explain the steep improvement in the share with a full credential among teachers with more experience (Figure 4.3). For example, if teachers with single-subject certifications without full credentials left at a rate of 19 percent every two years and those with full credentials left at a rate of 16 percent (rates from Table 4.1), the share with full credentials would improve only from 68 percent to 72 percent by ten years of experience. We find improvement to 98 percent by ten years of experience (Figure 4.3). In addition, we find that some teachers starting with full

credentials—those with out-of-state credential preparation—had the highest propensity to leave public school teaching. One possible explanation for this is that teachers with out-of-state credentials were more likely to leave California.

For teachers with either multiple- or single-subject certifications, those who began teaching with a full credential from an in-state program were more likely than any other group (except university interns) to transfer out of their starting district—perhaps because fully credentialed teachers are more attractive to recruiting districts (Table 4.2). Thus, taking transfers into account, for a district concerned with retention, the results for the 1990s run counter to the possible expectation that fully credentialed starting teachers are more likely to be retained.

These results for teachers with multiple-subject certifications seem to contradict other studies that show that teachers who do not go through traditional credentialing routes tend to have high rates of turnover (Fowler, 2002; Raymond, Fletcher, and Luque, 2001). However, an important factor in teacher retention is prior teaching experience such as student teaching (Henke et al., 2000; National Commission on Teaching and America's Future, 2003). Interestingly, in California,

Table 4.2

Percentage of Teachers Transferring by Their Second Year, by Starting Certification

	Waiver	Emergency	District Intern	University Intern	Full	Out-of-State
Multiple-subject						
Pre-CSR	20	21	13	29	29	17
Post-CSR, if started pre-CSR	37	37	44	49	42	35
Post-CSR, if started post-CSR	20	18	7	23	20	14
Single-subject						
Pre-CSR	23	28	7	47	34	23
Post-CSR, if started pre-CSR	39	45	56	50	46	33
Post-CSR, if started post-CSR	21	23	12	36	26	18

SOURCES: NTAR (1991–92 through 1999–00).

NOTE: See the notes to Table 4.1.

teachers with emergency permits were more likely to have had public school district experience before starting teaching. Almost 40 percent of teachers starting with a multiple-subject emergency permit had a prior substitute teaching credential. In comparison, about 31 percent of teachers who started with a full multiple-subject credential had a prior substitute credential.[18] Furthermore, 54 percent of emergency permit teachers had some public school district employment before the emergency permit, whereas about 39 percent of the fully credentialed starters had such prior employment.

However, we note that former public school district employment does not explain all of the higher retention rates of teachers with multiple-subject emergency permits. When we estimate the retention model excluding all teachers with prior public school district work experience, we still find higher retention of these teachers than of those who started with full credentials.

Did Internships and Emergency Permits Lead to Full Credentials?

Because teachers who start without full credentials were not substantially more likely to leave teaching than those with full credentials, the explanation for improvement in the share fully credentialed as teacher experience increases is that teachers who start without full credentials attain them. In this section, we explore retention and conversions to full credentials by starting certification for teachers who start without a full credential. We focus on attainment of full credentials by the beginning of the fourth year because this is the time frame within which teachers must convert from internship certificates to full credentials to remain "highly qualified" under the No Child Left Behind legislation in California.

Over the 1990s, among teachers who started with an emergency permit, most (88%) were still teaching at the start of their fourth year and almost half (47%) were still teaching and fully credentialed (Table 4.3). These numbers imply that only 12 percent left teaching and that

[18]Statistics in this paragraph exclude out-of-state credential holders. The NTAR does not include substitute credentials granted before 1993.

Table 4.3

Percentage of Teachers Still Teaching and Holding a Full Credential Among Teachers Starting Without a Full Credential, by Year Since Starting Teaching

	University Intern	District Intern	Emergency	Waiver
Still teaching				
By second year	95	97	96	94
By third year	92	93	91	89
By fourth year	89	89	88	87
By fifth year	83	77	79	77
Still teaching with full credential				
By second year	42	0	17	6
By third year	81	2	34	16
By fourth year	85	70	47	25
By fifth year	80	72	54	32
Full credential rate				
By second year	44	0	18	6
By third year	88	2	38	18
By fourth year	96	78	54	29
By fifth year	96	93	68	42

SOURCES: NTAR (1991–92 to 1999–00).

NOTES: "Still teaching with full credential by second year" means that the full credential was received by the beginning of the second year and the teacher was still working for a public school district in the second year. The "full-credential rate" is the share of teachers with a full credential among those still teaching. Year-to-year changes may reflect teachers leaving teaching or their progress to full credential but they may also reflect differences between cohorts of new teachers. For example, we have information on the fifth year only for teachers who started in 1995–96 or earlier.

another 41 percent were still teaching without full credentials (although they may have moved from emergency permits to internships).[19] University interns, who began teaching while in a university-based intern program, were much more likely to become fully credentialed and often

[19]For retention, Table 4.3 presents a descriptive average for teachers starting in the 1990s, not adjusting for differences related to CSR, district salary, or other factors. Table 4.1 presents a model-based probability of leaving for a "typical" teacher, adjusting for teacher and district characteristics and year (see Appendix A).

did so by the beginning of the third year. District interns, who began teaching in a district-based intern program, were also substantially more likely than those starting with emergency permits to become fully credentialed and generally did so by the beginning of the fourth year. Indeed, teachers are allowed to teach with intern credentials for a total of only three years. Teachers who started on intern credentials and were still teaching but not fully credentialed in the fourth year may have received an emergency permit (or waiver) or may have taken a leave during the first three years. Not surprisingly, teachers who began on waivers, who have the lowest level of qualifications, were the least likely to become fully credentialed.

In high-poverty districts, retention was higher than overall retention for each certification type (comparing Tables 4.3 and 4.4). Compared to other university interns, those starting in high-poverty districts had similar rates of full credential attainment. Because of greater retention, by the fourth year a higher share of university interns who started in high-poverty districts were still teaching and fully credentialed: 91 percent compared to 85 percent in all districts.

For teachers starting with emergency permits and waivers and still teaching in the fourth year, those in high-poverty districts were less likely to have attained a full credential. For example, 51 percent of teachers starting with an emergency permit were still teaching but not fully credentialed at the beginning of the fourth year (91% minus 40% in Table 4.4). Thus, high-poverty districts had a lower rate of full credential attainment among those still teaching.

One partial explanation for lower full credential attainment among teachers with emergency permits in high-poverty districts is that districts with a large number of teachers starting without full credentials tended to have slower rates of full credentialing, perhaps because programs for credentialing were oversubscribed.[20] In addition, districts with a high

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[20]In a statistical model of conversion to full credential, the district's share of starting teachers without a full credential was associated with a lower probability of becoming fully credentialed (results available from the authors).

Table 4.4

Percentage of Teachers Still Teaching and Holding a Full Credential Among Teachers Starting Without a Full Credential in a High-Poverty District, by Year Since Starting Teaching

	University Intern	District Intern	Emergency	Waiver
Still teaching				
By second year	98	98	97	97
By third year	95	94	93	92
By fourth year	94	90	91	91
By fifth year	89	79	83	84
Still teaching with full credential				
By second year	42	0	10	5
By third year	85	1	25	13
By fourth year	91	73	40	20
By fifth year	87	74	53	31
Full credential rate				
By second year	43	0	10	5
By third year	89	1	27	14
By fourth year	97	81	44	22
By fifth year	97	93	63	37

SOURCES: NTAR (1991–92 to 1999–00).

NOTES: "Still teaching" includes those who transferred to districts that were not high-poverty. See the notes to Table 4.3.

share of starting teachers without full credentials were likely districts with staffing difficulties. They may have needed to hire emergency permit teachers with even fewer qualifications (e.g., less subject matter competence, fewer advanced degrees) than a typical teacher with an emergency permit. Indeed, Darling-Hammond (2003) finds that the qualifications of California teachers on emergency permits tend to be lower for those teaching in schools serving high proportions of minority and low-income students. In other work (Reed and Rueben, 2006), we find that rates of conversion to full credential fell in the mid-1990s, especially for high-poverty districts. The change appears to be associated with the influx of starting teachers without full credentials following CSR and may have been related to oversubscribed programs as well as to

the quality of teachers hired with emergency permits to meet the high demand after CSR.

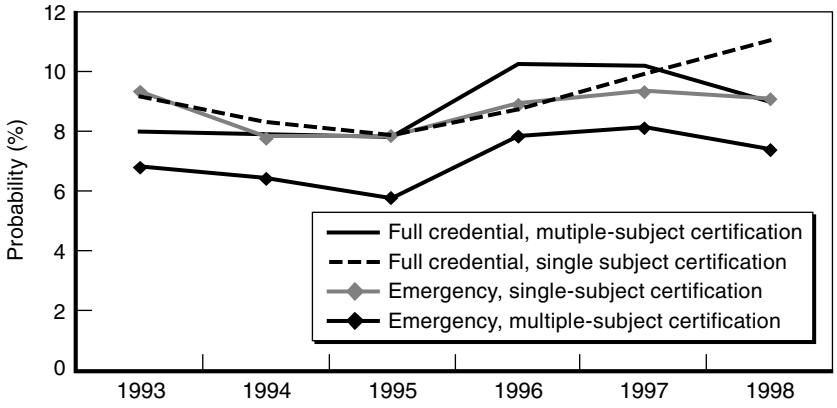
District Transfers and the Shortage of Fully Credentialed Teachers

District transfers contribute to the shortage of fully credentialed teachers in the districts of origin if teachers who transfer are fully credentialed and the origin district is not able to replace them with fully credentialed teachers. In addition, because teacher experience is an important element of teacher quality, transfers would be expected to reduce teacher quality in the origin district unless that district can hire district transfers from other districts. In this section, we investigate teacher transfers by certification status for origin and destination districts.[21]

As shown in the previous chapter, district transfers increased after CSR for teachers with multiple-subject or single-subject certifications. Before CSR, among teachers with multiple-subject certifications, those with emergency permits were less likely than those with full credentials to transfer, but the increase in transfers following CSR was similar for teachers with multiple-subject certifications who held emergency permits and those who held full credentials (Figure 4.4). Among teachers with single-subject certifications, the increase in transfers immediately after CSR (1996) was less pronounced than among teachers with multiple-subject certifications: Those with full credentials were most likely to transfer in 1998–99, which coincides with the implementation of class size reduction legislation for ninth grade.

We study the origin and destination districts by their poverty status. To illustrate any differences before and after CSR, we study the year

[21]In interpreting the results of this section, it is particularly important to keep in mind two limitations of the NTAR data. First, we are investigating interdistrict moves. If we measured teacher movements at the school level rather than at the district level, we would find substantially greater mobility, particularly within large districts. Second, the NTAR covers only teachers who began teaching after 1990. Thus, we do not observe the effect of CSR on the mobility of teachers with substantial years of experience.



SOURCES: NTAR (1992–93 through 1999–00).
NOTE: The figure is based on teachers starting before 1996–97 and shows estimates from a statistical model that adjusts for a teacher's years since starting teaching.

Figure 4.4—Percentage of Teachers Transferring Between Districts, by Certification and Year

before and the year after CSR.[22] In 1995–96, only 658 teachers transferred out of high-poverty districts whereas 526 teachers transferred into high-poverty districts (Table 4.5). Although teachers with full multiple-subject credentials made up the largest number of transfers, the net loss in teachers was fairly evenly distributed across those with full credentials and those without. In 1996–97, the number of transfers from high-poverty districts was substantially higher at 871 and the net loss of transfers increased to 212 from 132 in the previous year. The transfers and net losses were particularly concentrated among teachers with full multiple-subject credentials, but the total net loss of these teachers was only 87.

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[22]Because of the importance of CSR for district transfers and because CSR had a more direct effect on teachers with multiple-subject certifications, for teachers with both multiple- and single-subject certifications, we base this transfer analysis on the multiple-subject certification. We consider the certification a "full" credential if the teacher obtained a full credential by the year of the transfer. In the NTAR data from the early 1990s, we find that about 750 new teachers per year moved from single-subject certification to multiple-subject certification. After CSR, we find that about 1,000 new teachers per year made this transition.

Table 4.5

Percentage of Teachers Transferring Between Districts, by Certification and District Poverty

	All Teachers		Full Multiple-Subject		Full Single-Subject		Other Multiple-Subject		Other Single-Subject	
	Low-Poverty	High-Poverty	Low-Poverty	High-Poverty	Low-Poverty	High-Poverty	Low-Poverty	High-Poverty	Low-Poverty	High-Poverty
Before CSR, 1995–96										
Number transferred out (out-transfers)	989	658	617	328	310	133	16	120	46	77
Number transferred in (in-transfers)	1,123	526	655	288	376	102	32	83	60	53
Net transfers	134	–132	38	–40	66	–31	16	–37	14	–24
In-transfers as a share of transfers to all districts, %	31	15	32	14	37	10	13	34	24	21
After CSR, 1996–97										
Number transferred out (out-transfers)	1,165	871	733	423	352	149	21	187	59	112
Number transferred in (in-transfers)	1,510	659	954	336	394	119	67	135	95	69
Net transfers	345	–212	221	–87	42	–30	46	–52	36	–43
In-transfers as a share of transfers to all districts, %	33	15	36	13	35	10	17	34	26	19

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: The table includes only teachers who were hired before CSR (before 1996–97). The number transferring out of high-poverty districts includes those who transferred to other high-poverty districts. For "In-transfers as a share of transfers to all districts," the denominator is the sum of all transfers to all districts regardless of poverty level. The table does not include a few teachers who transferred from or to a district with missing information on poverty.

The number of transfers from low-poverty districts substantially exceeded the number from high-poverty districts in both years.[23] However, low-poverty districts were much more likely to hire district transfers so that, on net, these districts were not losing experienced new teachers.[24] Following CSR, low-poverty districts had a net gain of 221 teachers with full multiple-subject credentials.

In 1996–97, high-poverty districts hired only 14 percent of all fully credentialed, multiple-subject district transfers and only 10 percent of all fully credentialed, single-subject transfers. In that year, high-poverty districts hired 7,522 starting teachers (district transfers plus starting teachers); only 6 percent of them were fully credentialed district transfers. In comparison, low-poverty districts hired about 35 percent of all fully credentialed district transfers, representing 20 percent of all their hires in 1996–97 (they hired 6,525 teachers that year).

In sum, high-poverty districts were less likely than other districts to hire district transfers, particularly those with full credentials. Although this pattern occurred before CSR, the importance of the differential increased as the total numbers of district transfers grew after CSR. However, even after CSR, the importance of transfers in contributing to the shortage of fully credentialed teachers in high-poverty districts was fairly small (see also Gallagher, 2002).

Our analysis has touched on a number of unintended consequences of CSR: The number and share of starting teachers without full credentials increased substantially, the rate of attainment of full credentials for teachers starting without them declined, and net losses of

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[23]Note that, by construction, high-poverty and low-poverty districts have roughly the same number of students. High-poverty districts actually have more teachers in the NTAR because they had more teachers starting during the 1990s, primarily because of enrollment growth.

[24]The pattern of net losses for high-poverty districts and net gains for low-poverty districts can also be seen when we aggregate district transfers across the 1990s. After adjustment for enrollment and other district characteristics, transfer rates from high-poverty districts were somewhat lower than were transfers from low-poverty districts before CSR but the reverse was true following CSR (for teachers who started before 1996; see Table 3.1).

district transfers increased for high-poverty districts.[25] In Reed and Rueben (2006), we use the NTAR data to study the unintended consequences of CSR on the distribution of fully credentialed teachers across districts by poverty level. We find that differential hiring of starting teachers was the most important factor explaining why the share of fully credentialed teachers with multiple-subject certifications declined more in high-poverty districts than in low-poverty districts. High-poverty districts hired roughly 30 percent of all starting teachers with multiple-subject certifications in the late 1990s. If they had hired 30 percent of all starting teachers with *full* multiple-subject credentials (as opposed to only 13% of these teachers), the effect of CSR on teacher credential levels would have been much more similar in high-poverty and low-poverty districts.

The hiring differential has not been as stark in recent years but it still continues, resulting in lower shares of fully credentialed teachers among those starting in high-poverty districts in 2004–05. Additional analysis of the NTAR data suggests that targeted expansions of university credentialing programs that serve high-poverty districts likely would be more effective than a general expansion because teacher labor markets tend to be local in nature, with over 70 percent of university-trained teachers starting teaching in the same region where they attended university (see Appendix C).

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[25]These findings are consistent with other research on the effect of CSR (Jepsen and Rivkin, 2002; Bohrnstedt and Stecher, 2002).

5. Policy Implications

Improving teacher retention is one strategy for improving school quality and student performance by reducing reliance on newly hired, inexperienced teachers. If the teacher retention patterns from the 1990s still hold, then about one-fourth of the roughly 20,000 new public school teachers hired every year are replacing recently hired teachers who left public school employment. Put differently, reducing teacher turnover in the first seven years by half, for example, would cut the total number of new hires each year to about 17,500.

Raising teacher salaries appears to improve teacher retention. Teachers who started in districts with higher salaries (including benefits) were less likely to leave public school teaching altogether and were less likely to transfer from their district. Teachers in districts with greater scheduled annual raises were also less likely to leave or transfer. Controlling for other district factors, a $4,400 increase in starting teacher salary reduced the probability that a new teacher would leave public school teaching in the first two years by 17 percent for teachers with multiple-subject certifications and by 9 percent for teachers with single-subject certifications during the early 1990s. With over 300,000 public school teachers working in California, the cost of increasing all salaries by that increment would be over $1.3 billion.

Teacher induction and development programs may be a more cost-effective way to increase teacher retention. Implementation of the BTSA program in the early 1990s had a substantial, positive effect on teacher retention. Districts that adopted BTSA programs early improved retention by 26 percent for teachers with multiple-subject certifications and 16 percent for teachers with single-subject certifications. In those years, BTSA state funding averaged about $3,370 per participant with additional resources from districts, usually in-kind resources such as

employee time.[1] Thus, among new teachers, the BTSA program had a larger effect on retention but a smaller cost per participant than a $4,400 starting salary increase. These findings are consistent with national studies that suggest that improving teaching conditions is more effective for retaining teachers than improving teaching salary (Hanushek, Kain, and Rivkin, 2004a, 2004b).

Although the BTSA program has remained funded, state funding for several other teacher development programs has been dramatically reduced. Esch et al. (2004) show that state allocations declined from $222 million in 2000–01 to $63 million in 2004–05 for four other teacher development programs: Peer Assistance and Review, California Professional Development Institute, Mathematics and Reading Professional Development Program, and California Subject Matter Projects. Our findings for BTSA suggest that these programs should be reconsidered and evaluated for their effectiveness at improving teacher retention as well as teacher quality and academic performance.[2] In addition, starting teachers without full credentials are not eligible for BTSA. The state should consider implementing a development and assessment induction program for these teachers.

We find that improvements in teacher retention would help address the shortage of fully credentialed teachers. More experienced teachers are more likely to be fully credentialed—not because teachers who start with full credentials are more likely to remain in public school teaching, but because a substantial share of teachers who start without a full credential attain one. Thus, retaining experienced teachers reduces reliance on newly hired teachers who have the lowest rates of full credentials.

The federal NCLB Act requires that all teachers in core academic subjects be "highly qualified" by the end of 2005–06. In California, highly qualified teachers must be fully credentialed or in an internship program during their first three years of teaching. Including interns as

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[1]In nominal dollars, state funding for the early BTSA programs averaged $2,900 per participant. For comparison with the teacher salary figures, the cost was inflation-adjusted to 1999 dollars.

[2]Olsen and Anderson (2004) report that teachers in Los Angeles emphasized the importance of professional support throughout the career and not just during the induction period.

highly qualified is a practical solution for California because 25 percent of starting teachers lacked a full credential in 2004–05. Although the share fully credentialed has improved substantially in the last five years, we should not expect the share to reach 100 percent by the end of 2005–06. If California were to rate only fully credentialed teachers as highly qualified, schools would be at risk of losing federal funding. High-poverty schools would be most at risk because they tend to have a higher share of teachers without full credentials and because the largest share of federal funding dollars goes to high-poverty schools (under federal Title I).

On the other hand, advocates are concerned about the prevalence of underprepared teachers in public schools, particularly high-poverty schools. In 2005, these concerns prompted a lawsuit by Californians for Justice to stop the Commission on Teacher Credentialing from issuing the Individualized Internship Certification (IIC). The IIC was offered to teachers who met federal requirements for being highly qualified but were not enrolled in a university or district internship program. The court ruled that the commission does not have the authority to issue IICs without first promulgating regulations. At the time of this writing, the commission was seeking approval for the IIC regulations. One potential problem with defining IIC and other interns as highly qualified is that it may reduce the pressure on policymakers to fund teacher preparation programs and to improve the share of fully credentialed teachers in high-poverty schools. The importance of the concern with intern preparation and quality is something that requires further study. Research has found mixed evidence as to whether fully credentialed teachers are actually better teachers.

Another concern is that defining interns as highly qualified only for their first three years of teaching could increase teacher turnover if intern teachers who do not achieve full credentials are forced or encouraged to leave teaching at the end of the third year. If teacher turnover increases, the policy could reduce teacher quality as research finds fairly consistent evidence that teachers with a few years of experience are better teachers than starting teachers.

California's experience suggests that intern programs have been successful in terms of the retention and full credentialing of interns but

also that the three-year limitation could increase teacher turnover. During the 1990s, a substantial share of teachers who started in internship programs were fully credentialed and still teaching by the beginning of their fourth year: 85 percent of teachers who started in a university internship program and 70 percent of teachers who started in a district internship program. However, some teachers who started as interns remained in teaching in their fourth year but were not fully credentialed: 4 percent of university interns and 19 percent of district interns. Under new NCLB requirements, districts would have incentives to replace these experienced but not fully credentialed interns with inexperienced interns, potentially reducing teacher quality.

The relationship between the three-year limit for interns and teacher turnover is something that should be monitored. The share of interns receiving a full credential in three years may improve because interns will have strong incentives to become fully credentialed if they want to remain in teaching and programs will have strong incentives to provide support for finishing in three years. On the other hand, the share achieving a full credential may decline as NCLB requirements attract a broader range of new teachers into internships, some of whom may have less commitment to a full credential than interns did during the 1990s when emergency permits were available for teachers who were not committed to entering a credential program. Furthermore, if regulations for the IIC are approved, the share of these interns receiving a full credential by the third year may be lower than the share of interns in university and district intern programs, receiving a full credential.

The shortage of fully credentialed teachers is particularly acute in high-poverty districts. However, teacher turnover is not the explanation. During the 1990s, teachers in high-poverty districts were less likely than teachers in low-poverty districts to leave teaching or transfer to other districts. Teacher retention was better in high-poverty districts in California in part because student poverty is confounded with other district characteristics not because student poverty per se causes teachers to stay in districts. One explanation for the relationship at the district level is that high-poverty districts tend to be large and growing. In such districts, teachers may have substantial within-district mobility, moving to new positions and different schools, whereas in small or shrinking

districts, it is more difficult to transfer within the district. In addition, high-poverty districts offered higher starting salaries—another factor that encourages retention.

The primary reason for lower shares of fully credentialed teachers in high-poverty districts was recruitment differences. High-poverty districts have needed more starting teachers because of enrollment growth and high-poverty districts have been less likely than other districts to recruit starting teachers with full credentials. Our analysis suggests that a targeted expansion of university credentialing programs that serve high-poverty districts likely would be more effective than a general expansion because teacher labor markets tend to be local in nature, with over 70 percent of university-trained teachers starting teaching in the same region where they attended university. With the NTAR data, it would be possible to determine which specific universities tend to have placements in districts with acute shortages of fully credentialed teachers.

More generally, the shortage of fully credentialed teachers has been an area of active state policy in recent years, including new preparation standards, teacher tax credits, teacher housing allowances, and teaching fellowships to encourage teachers to work in disadvantaged schools. The NTAR dataset can play a key role in evaluating the effect of these policies on teacher retention, recruitment, and distribution. This study has laid the groundwork for further development of the NTAR using more recent waves of data to address these issues as well as new issues and policies yet to be identified.

Appendix A

Data and Methods

In this appendix, we briefly describe the dataset constructed for this project, the main methods used in our analysis, and directions for future research. A full description of the construction of the data is available in Reed and Barbour (2006).[1]

Administrative Data on Teachers

The NTAR was developed in collaboration with the Labor Market Information Division of the California EDD and the California CTC. The database is confidential. All individual identifiers were stripped from the records by the administrative agencies. Any reporting on the data must mask identification of individuals or employers, including specific school districts.

The CTC provided records on all teacher certifications from 1990 to 2000. For teachers receiving or renewing certifications after 1990, any records before 1990 were added to the data. In addition to the type of certification and the year received, the CTC data include information on education, credentialing institution, and age.

The EDD linked CTC data to a "base wage" file created from unemployment insurance records. The EDD data provide earnings information for public school district employees. For people with teaching certifications working outside public school districts, the EDD data provide industry of work and earnings.[2] The quarterly earnings data were aggregated into school years that run from July 1 to June 30. The employment data cover the period July 1991 to June 2000.

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[1]Reed and Barbour (2006) was written for researchers attempting to replicate our approach with the administrative records.

[2]Industry information comes from ES202 data. The employment data from EDD include all workers who are covered by unemployment insurance. A small share of workers in California are not covered (e.g., the self-employed, federal civilian and military employees, U.S. postal service workers, and railroad employees).

Therefore, this study covered school years 1991–92 through 1999–00. In the sample used for this study, individuals with teacher certification records were included only if they worked for a public school employer during this period.

We linked the EDD data to school district information from the California Department of Education. We have information on enrollment and student demographics from the CBEDS, the free or reduced-price meals program participation, and pay scales (from the Certificated Salary Report and Data or J-90). For convenience, we refer to district-level data from the Department of Education as CBEDS data, although some elements come from other datasets. For each district, we average CBEDS data from 1995, 1997, and 1999 to construct district measures that do not vary over time (with the exception of enrollment and salary).[3]

The resulting data provide a rich and powerful source of information on teachers in California. The data allow us to follow teachers over time with observations on their employment and earnings before entering teaching, after changing districts, and after exiting teaching for other employment in California.

The only other statewide longitudinal database of teachers in California is based on the CBEDS Professional Assignment Information Form (PAIF). The PAIF data are not ideal for longitudinal studies because the method of teacher identification is not consistent. For example, teachers are sometimes identified by name and sometimes by social security number. In the late 1990s, more than one-fourth of PAIF records could not be longitudinally matched (Gallagher, 2002).

Although the NTAR provides the best available longitudinal data on teachers, the data have notable limitations. Perhaps most important, we observe the school district of employment but not the actual school or grade level. Ideally, we would like to study recruitment and retention at the school level by grade of teaching. Instead, we study district-level patterns.

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[3]The response rate for the CBEDS is high, but, in any particular year, data are missing for several schools on a number of items. Therefore, changes across time have a high degree of measurement error and may not reflect true changes in district characteristics.

A second limitation is that the data cover only certifications received after 1990. Teachers who started before 1990 may not have had any certification activity during the 1990s. Furthermore, we cannot identify the year in which they started. Therefore, we limit our analysis to "new teachers"—those who started in 1991–92 and later. Another limitation of the data is the lack of information that previous research has shown to be important in determining teacher retention: marital status, parental status, gender, attitudes toward teaching, teacher quality, administrative support, and discipline problems.[4]

We focus our analysis on regular teachers in public school districts. We restrict our analysis to teachers in public school districts because we are interested in modeling the role of district-level characteristics on teacher retention. For public school teachers in other environments, we may not have district-level information or that information may be less relevant for teachers in certain settings (e.g., adult schools, juvenile detention centers, county offices of education).[5] Furthermore, several types of public teachers are not part of our analysis, including teachers in community colleges and public universities, charter schools, and public early childhood development. We do not include in our analysis teachers with only a substitute credential.

We define the first year of teaching as the first year of public school district employment following certification for teaching. Because the employment data are aggregated into full school years, there is some ambiguity about the actual start date. That is, we observe only that the person had school district earnings during a school year but not which month they started teaching. For a teacher who received a "first time" certification during calendar year 1993, the first year of teaching would be school year 1993–94, if he or she had public school district earnings during that year. Most teachers who entered public schools, over 96 percent, started teaching in the same year as they received their first certification for teaching. For those who did not start in the same

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[4]For studies of teacher retention, see Bobbitt, Whitener, and Lynch (1994); Whitener et al. (1997); Ingersoll (2001, 2002); Darling-Hammond and Sykes (2003); Hanushek, Kain, and Rivkin (2004a, 2004b); and Luekens, Lyter, and Fox (2004).

[5]For teachers moving into county offices of education, we consider the move a district transfer rather than as leaving public school teaching.

calendar year, we identify their starting certification as the highest certification received by the start year.[6] Many new teachers, 29 percent, had a substitute credential before their regular teaching certification. We do not include years spent in substitute teaching in our analysis.[7]

In sum, this study is based on the records for all public school district employees in California who were certified for teaching and began working in a public school district between July 1991 and June 2000. For simplicity, we refer to this group as "new" teachers. The data for the study include 168,732 new teachers. In comparison, the number of teachers in the CBEDS grew by 68,800 between 1990–91 and 1999–00.[8] The number of new teachers in NTAR is substantially higher because the NTAR includes replacement of teachers who leave public school teaching.

The size of the NTAR grows each year by the number of starting teachers and declines by the number who exit public school districts (see Table A.1). Even though the NTAR includes only teachers certified since 1991, the NTAR has over 145,000 teachers working in public school districts by 1999–00. In comparison, the total number of teachers in the CBEDS in that year was just over 292,000. Thus, the NTAR has almost half of all teachers and that share will increase with more recent waves of the NTAR. The match between CBEDS and the NTAR is not perfect. The NTAR includes some teachers who are working in school districts in nonteaching capacities and the CBEDS includes some teachers who are not in school districts (e.g., county offices of education). Table A.2 shows the number of starting teachers in the NTAR, by type of teacher certification.

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[6]For example, a person who receives an emergency permit in March 1993, a full credential in October 1994, and has his or her first school district earnings in 1994–95 would be coded as starting with a full credential in 1994–95.

[7]We use both "first time" and "new type" certification to identify new teaching certifications. "New type" certifications are treated as "first time" certifications if the individual has no prior teaching certifications in the CTC data. These teachers may have had substitute or service credentials that were not recorded. The NTAR does not include substitute credentials before 1993. Alternatively, this could represent a coding error in the "new type" variable.

[8]Because of nonresponse and other missing data, the count of teachers in the CBEDS is slightly too low.

Table A.1

NTAR Sample Size, by School Year

Year	Start Teaching	Cumulative Number	Number Still Teaching
1991–92	13,238	13,238	13,238
1992–93	12,846	26,084	24,978
1993–94	14,177	40,261	36,939
1994–95	15,456	55,717	49,463
1995–96	15,005	70,722	61,076
1996–97	23,551	94,273	80,870
1997–98	26,364	120,637	102,887
1998–99	24,456	145,093	121,955
1999–00	23,639	168,732	145,594

SOURCES: NTAR (1991–92 through 1999–00).

NOTE: In this table, "teaching" refers to public school employment.

Table A.2

NTAR Starting Teachers, by Certification Type and School Year

Year	Full Credential	University Intern	District Intern	Pre-Intern	Emergency Permit	Waiver	Total
1991–92	10,030	418	70	0	2,720	0	13,238
1992–93	9,942	357	129	0	2,418	0	12,846
1993–94	10,197	352	165	0	3,463	0	14,177
1994–95	10,438	389	291	0	3,830	508	15,456
1995–96	9,878	315	289	0	4,007	516	15,005
1996–97	11,702	585	339	0	9,436	1,489	23,551
1997–98	11,887	954	512	0	11,481	1,530	26,364
1998–99	11,567	947	547	150	10,658	587	24,456
1999–00	10,262	1,065	450	1,646	9,680	536	23,639

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Waivers were not tracked by CTC before 1994–95. Pre-internship programs started in 1998–99.

The Revolving Nature of Public School Employment

Many new public school teachers leave teaching for substantial periods of time and later return to public schools.[9] Across the 1990s, of

[9]See Beaudin (1993) for analysis of this issue for Michigan. Darling-Hammond and Sykes (2003) characterize the national research as showing that 20 to 30 percent of

those who left public school employment for an entire year, 13 percent returned in the second year after leaving and 6 percent returned in the third year (Table A.3).[10] By the eighth year, 31 percent had returned.

The revolving nature of teaching makes the issue of retention complex. When we estimate teacher turnover, some of the teachers who "leave" will return in future years. To reduce this measurement problem, we define a "leave" as two consecutive years out of teaching. Therefore, we are investigating leaves of a substantial length. Over 40 percent of those who will return by the eighth year will have already returned by the second year and will not be counted as leavers in our analysis. Nevertheless, about 21 percent of leavers by this definition will return by the eighth year and probably a few more will return thereafter. We do not attempt to fully model returns to teaching and subsequent exits

Table A.3

Share of Leavers Who Return (in percent)

	Share Returning	Cumulative Share Returned
Second year	13	13
Third year	6	19
Fourth year	4	24
Fifth year	3	27
Sixth year	2	29
Seventh year	2	30
Eighth year	1	31

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: The sample is limited to new teachers who "leave" public schools. A teacher who is considered a leaver has no public school district earnings for an entire academic year.

teachers eventually return to teaching in the same state. We find a slightly higher rate for California, which may be because California is a large state with more school district employment opportunities than smaller states.

[10]Rates in Table A.3 are calculated by year of leaving and then averaged across the 1990s. Differences by year of leaving are not substantial. However, the probability of return increased by about 2 or 3 percentage points in 1996–97 following the implementation of class size reduction.

because of the relatively short time period covered in our analysis of retention.[11]

Hazard Rate Models

Analysis of teacher retention is complicated for several reasons. First, teachers who start in later years are observed only for a few years before the sample ends in 1999–00, whereas teachers who start in 1991–92 are observed for up to nine years. Furthermore, in 1991–92, all teachers in the sample are in their first year of teaching, whereas in 1999–00 some teachers are in their first year, others are in their ninth year, and others are in between. The probability that a teacher chooses to continue teaching in 1997–98 is related to whether that is his or her first or seventh year. The probability that a teacher who starts teaching in 1993–94 is still teaching in 1997–98 is the cumulative probability of not exiting teaching in every intervening year. The appropriate statistical model in this case is known as a hazard rate model (also known as a survival model or life-table approach).[12]

The hazard rate model estimates the probability that a teacher exits in a specific year as a function of how long he or she has been teaching. The probability of remaining in teaching for a fourth year is one minus the cumulative probability of exiting in any of the three prior years.[13] We estimate a multinomial logit model that considers two forms of exit from a district: moving to a new school district and leaving public school employment.[14]

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[11]Using this two-year definition, we cannot investigate leaves in our most recent year of data, 1999–00, because we do not observe employment in the following year, 2000–01. If we were to define leaves based on three consecutive years out of teaching, we would consequently not be able to investigate leavers in 1998–99. See Beaudin (1993) for a study of teachers who return after leaving.

[12]See Cox (1972), Kalbefleisch and Prentice (1980), and Willett and Singer (1991) for descriptions of this statistical approach.

[13]Because we limit the analysis to new teachers in the 1990s, we observe the start year for the entire sample (i.e., no "left-side censoring").

[14]This type of hazard rate model is known as a "competing risks" model. We model only the first district move. In statistical terms, leaving the school district for two consecutive years is an "absorbing" state in our model. The observations in the model are teachers at each duration (i.e., year of teaching). We use up to four observations per

To assess the importance of a single factor, we report the simulated probabilities of leaving teaching and transferring between districts for a teacher with typical characteristics. For typical teacher characteristics, we use the mean value across teachers. For typical district characteristics, we use the median across districts (enrollment-weighted).

Robustness of Results

There are several potential problems with the NTAR data, which we considered when examining the robustness of our results. First, about 38 percent of new public school teachers had earnings from a California public school district before receiving a regular teaching certification. A large share, about 29 percent, of new teachers held a substitute credential before a regular certification. Others may have held a substitute or service credential that was not recorded (the first substitute credential in the NTAR is from 1993). Others may have worked as teacher aides or in a nonteaching capacity. However, it is possible that some held regular teaching certifications that were not properly identified in the NTAR. Therefore, to consider the effect of this possible data problem, we repeated our analysis dropping teachers who did not have a recorded substitute credential but had annual earnings of over $10,000 from public school districts before their first identified regular teaching certification. Teacher retention was not notably different in this smaller sample (Table A.4). Indeed, the model results from the smaller sample were within 2 percentage points of those for the full sample. That is, the conclusions of this report are robust to limiting the analysis to the smaller sample.

A second issue is that the NTAR identifies public school district employment but not the occupation or work assignment. Some teachers exit teaching for administrative positions in districts. When we include as leavers those teachers who have an active administrative credential, it reduces the retention rates in teaching only slightly (Table A.4). This suggests that either administrative moves are common only after the

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teacher in our main models. We relax the assumption that model error terms for the same teacher are independent across years by allowing for error "clustering" on the teacher identifier in STATA.

Table A.4

Share of New Teachers Remaining, Alternative Methods

	All New Teachers	Remove Those with Prior School District Employment	Remove Those Who Leave for Administration	New Teachers Earning at Least $10,000 in First Year	Include Single-Year Leavers
First year	94	93	94	97	93
Second year	87	87	87	92	85
Third year	82	82	82	87	80
Fourth year	78	77	77	83	75
Fifth year	74	74	73	79	71
Sixth year	71	71	70	76	68
Seventh year	68	68	66	74	65

SOURCES: NTAR (1991–92 through 1999–00).

NOTE: See the text for column descriptions.

eighth year of teaching or that administrative credentials are incomplete measures of who has left teaching for administrative positions. We base our analysis on "left public school employment" rather than on the administration-adjusted definition.

About 18 percent of new teachers have earnings of less than $10,000 in their first year of teaching. Some of these teachers may have been working part-time; others may have worked only part of the year. If we eliminate these low-earning starters from the analysis, we find higher rates of retention: 92 percent were still teaching in the third year and 79 percent were still teaching in the sixth year. Eliminating new teachers who earned less than $10,000 increases the share still working in their second year from 94 to 97 percent because a substantial share of those earning less than $10,000 in their first year did not teach at all in their second year. This suggests that an important reason for the low earnings in the first year is that teachers left partway through the year. Therefore, to not bias our results by dropping these leavers, in our analysis we investigate retention rates for all teachers regardless of earnings in the start year.

Because of the revolving nature of teaching employment, we chose to consider only leaves of a substantial length: two academic years with no earnings from any public school district. If we instead consider leaves of

one academic year, we find slightly lower retention (Table A.4, final column). Even this measure includes only leaves of a substantial length. For example, a teacher who leaves teaching in the fall and returns in 18 months will not have a full academic year without public school earnings. It would be possible to construct a NTAR dataset with quarterly records for more comparability with national studies that rely on survey data where teachers report a "leave" of any duration.

Extensions for Future Research

This study is the first major analysis of linked EDD and CTC administrative records on teachers.[15] Although this study has a broad scope, many issues are not addressed here that could be studied in future analysis with the NTAR data. The analysis presented in this study could be extended to focus on particular types of teachers (e.g., substitute teachers) or teachers in particular types of employment (e.g., county offices of education). Teacher shortages are often acute in certain fields such as special education, math, and science. The NTAR could be used to study teachers with those specific certifications. The NTAR could also be used to study specific districts or to evaluate districts' alternative preparation programs (e.g., district internships). The NTAR could also be used to evaluate universities in terms of the placement and retention of teachers from their programs.

The administrative records that form the NTAR are collected annually and thus the NTAR could be annually updated. With data from the last few years, it will be possible to evaluate several recent policies including new preparation standards, teacher tax credits, teacher housing allowances, and teaching fellowships and loan programs that tried to encourage teachers to work in low-performance schools. In the future, the NTAR can be used to evaluate the effects of No Child Left Behind on the teacher labor market.

Over time, the limitation that the NTAR includes only teachers attaining certifications after 1990 will become less serious as fewer teachers will have been certified before that time. However, the

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[15]The only prior studies with the NTAR are preliminary analyses of the data used in this study by PPIC, EDD, and CTC.

identification of district of employment as opposed to school or classroom assignment will remain a serious limitation for the study of teacher retention, teacher shortages, and the distribution of teachers. Studies of particular districts may be able to overcome this limitation, if districts provide information on classroom assignment by social security number or by a teacher identification number that can be linked to a social security number. In the future, it may be possible to overcome this limitation statewide if the California Department of Education begins collecting information by a teacher identification number that can be linked to the social security number and joins in the NTAR collaboration with EDD and CTC. To extend the research beyond teacher labor markets to fully evaluate teacher performance, the teacher data would also need to be linked to individual student data, especially academic performance indicators.

Appendix B

Data Means and Model Results

Table B.1

NTAR Sample Means, by Poverty Level

	All		High-Poverty		Low-Poverty	
Teacher characteristics						
Starting age	28	(8)	28	(8)	28	(8)
22 or younger (%)	4	(19)	5	(22)	3	(17)
23–34 (%)	67	(47)	68	(47)	66	(47)
35–44 (%)	19	(39)	17	(38)	21	(41)
45 and older (%)	10	(30)	10	(29)	10	(31)
45 and older (continuous)	4.1	(4)	4.4	(4)	3.8	(3)
Waiver (%)	3	(17)	5	(21)	2	(13)
Emergency permit (%)	34	(47)	54	(50)	18	(39)
District intern (%)	2	(13)	5	(23)	0	(4)
University intern (%)	3	(18)	2	(14)	3	(17)
Out-of-state credential (%)	15	(35)	9	(29)	19	(39)
Full credential (%)	43	(49)	22	(42)	58	(49)
District characteristics						
Enrollment < 30,000 (continuous)	12	(8)	11	(9)	11	(8)
Enrollment 30,000–39,999 (%)	4	(19)	5	(22)	3	(16)
Enrollment 40,000–59,999 (%)	4	(21)	7	(26)	3	(18)
Enrollment ≥ 60,000 (%)	18	(39)	49	(50)	0	(0)
Enrollment growth since 1991 (%)	5.2	(78)	3.7	(2)	3.4	(5)
Elementary school district (%)	21	(40)	22	(41)	23	(41)
High school district (%)	9	(28)	4	(20)	11	(31)
Unified district (%)	71	(45)	74	(44)	67	(47)
Students on meal program (%)	47	(23)	75	(7)	17	(9)
Elementary school students on meal program (%)	10	(23)	17	(33)	4	(8)
High school students on meal program (%)	2	(9)	3	(12)	1	(3)
Starting salary ($1,000s)	36.7	(3)	37.0	(2)	36.3	(3)
Annual salary increase ($1,000s)	1.2	(0)	1.3	(0)	1.2	(0)
Unemployment rate (%)	7	(3)	8	(4)	6	(2)
Change in unemployment (%)	2	(2)	1	(2)	2	(3)
Rural district (%)	16	(37)	15	(36)	13	(34)
Suburban district (%)	47	(50)	7	(25)	77	(42)
Urban district (%)	37	(48)	78	(41)	10	(30)

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Observations are included only if all teacher and district characteristics are observed. Standard deviations are in parentheses. Means and standard deviations for teacher characteristics are at the individual level (measured at the first year of teaching) and district variables are at the district level (enrollment-weighted, averaged over time within district, and then averaged over districts). Enrollment variables refer to enrollment in 1991 and growth (percentage). Pre-intern credentials are not included because the pre-intern program began in 1998–99.

Table B.2

Transfer Model Results, Pre-CSR Starters with Multiple-Subject Certifications

	Transfer			
	Pre-CSR		CSR Interactions	
Teacher characteristics				
Starting age				
22 or younger	0.33**	(0.06)	–0.15	(0.11)
23–34	Reference		Reference	
35–44	–0.14**	(0.03)	–0.17**	(0.06)
45 and older	–0.11	(0.07)	–0.17	(0.13)
45 and older (continuous)	0.02	(0.01)	–0.02	(0.03)
Waiver	–0.48	(0.30)	0.36	(0.36)
Emergency permit	–0.43**	(0.04)	0.24**	(0.07)
District intern	–1.00**	(0.19)	1.09**	(0.23)
University intern	–0.02	(0.08)	0.20	(0.14)
Out-of-state credential	–0.44**	(0.05)	0.37**	(0.09)
Full credential	Reference		Reference	
District characteristics				
Enrollment < 30,000	–0.01**	(0.00)	0.01*	(0.00)
Enrollment 30,000–39,999	–0.27**	(0.08)	–0.49**	(0.14)
Enrollment 40,000–59,999	–0.66**	(0.09)	–0.18	(0.14)
Enrollment ≥ 60,000	–0.85**	(0.07)	–0.51**	(0.13)
Enrollment growth since 1991	–0.25**	(0.01)	–0.28**	(0.02)
Elementary school district	0.20**	(0.07)	–0.49**	(0.13)
High school district	0.36*	(0.19)	0.59	(0.41)
Unified district	Reference		Reference	
Students on meal program (100)	–0.35**	(0.10)	1.36**	(0.18)
Students on meal program in elementary school district (100)	–0.09	(0.13)	–0.24	(0.24)
Students on meal program in high school district (100)	–0.36	(0.59)	0.71	(1.34)
Starting salary (1,000)	–0.04**	(0.00)	0.07**	(0.01)
Annual salary increase (1,000)	–0.18**	(0.07)	0.79**	(0.14)
Unemployment rate	2.18**	(0.46)	–5.14**	(0.89)
Change in unemployment	–0.02	(0.20)	1.36**	(0.40)
Rural district	–0.05	(0.06)	–0.88**	(0.11)
Suburban district	0.02	(0.04)	–0.14**	(0.07)
Urban district	Reference		Reference	
Duration 1	Reference		Reference	
Duration 2	–0.69**	(0.03)	0.01	(0.06)
Duration 3	–1.06**	(0.05)	0.12*	(0.07)
Constant	0.17	(0.19)	0.17	(0.19)

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Standard errors are in parentheses. Standard error calculations are robust to clustering at the teacher level. Estimates of the enrollment effect were multiplied by 1,000 to show significant digits. Models also control for school year (these results are not shown).

*Indicates significance at the .10 level.

**Indicates significance at the .05 level.

Table B.3

Retention Model Results, Pre-CSR Starters with Multiple-Subject Certifications

	Retention			
	Pre-CSR		CSR Interactions	
Teacher characteristics				
Starting age				
22 or younger	0.26**	(0.08)	0.40**	(0.13)
23–34	Reference		Reference	
35–44	–0.30**	(0.04)	–0.14*	(0.08)
45 and older	–0.35**	(0.09)	–0.03	(0.16)
45 and older (continuous)	0.04**	(0.02)	–0.03	(0.03)
Waiver	–0.88	(0.59)	0.53	(0.64)
Emergency permit	–0.39**	(0.05)	0.36**	(0.08)
District intern	–0.21	(0.16)	0.68**	(0.21)
University intern	–0.75**	(0.16)	–0.01	(0.29)
Out-of-state credential	1.00**	(0.04)	0.22**	(0.08)
Full credential	Reference		Reference	
District characteristics				
Enrollment < 30,000	–0.01**	(0.00)	0.01	(0.01)
Enrollment 30,000–39,999	–0.13	(0.10)	–0.37*	(0.19)
Enrollment 40,000–59,999	–0.60**	(0.10)	–0.03	(0.18)
Enrollment ≥ 60,000	–0.56**	(0.09)	–0.02	(0.16)
Enrollment growth since 1991	–0.26**	(0.01)	–0.28**	(0.02)
Elementary school district	–0.03	(0.09)	–0.23	(0.17)
High school district	0.12	(0.27)	1.01*	(0.53)
Unified district	Reference		Reference	
Students on meal program (100)	–0.96**	(0.12)	1.57**	(0.23)
Students on meal program in elementary school district (100)	0.27	(0.16)	–0.87**	(0.32)
Students on meal program in high school district (100)	–0.21	(0.93)	–0.17	(1.80)
Starting salary (1,000)	–0.05**	(0.01)	0.07**	(0.01)
Annual salary increase (1,000)	–0.32**	(0.08)	1.23**	(0.17)
Unemployment rate	–1.11*	(0.66)	–6.63**	(1.26)
Change in unemployment	0.37**	(0.14)	–0.05	(0.85)
Rural district	–0.44**	(0.07)	–0.36**	(0.15)
Suburban district	–0.21**	(0.05)	0.18**	(0.09)
Urban district	Reference		Reference	
Duration 1	Reference		Reference	
Duration 2	0.01	(0.04)	–0.02	(0.08)
Duration 3	–0.22**	(0.05)	0.18**	(0.09)
Constant	0.82**	(0.23)	0.82**	(0.23)

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Standard errors in parentheses. Standard error calculations are robust to clustering at the teacher level. Estimates of the enrollment effect were multiplied by 1,000 to show significant digits. Models also controlled for school year (these results are not shown).

*Indicates significance at the .10 level.

**Indicates significance at the .05 level.

Table B.4

Transfer Model Results, Pre-CSR Starters with Single-Subject Certifications

	Transfer			
	Pre-CSR		CSR Interactions	
Teacher characteristics				
Starting age				
22 or younger	0.06	(0.10)	0.10	(0.17)
23–34	Reference		Reference	
35–44	–0.03	(0.04)	–0.18**	(0.08)
45 and older	–0.11	(0.09)	–0.17	(0.15)
45 and older (continuous)	0.01	(0.02)	0.04	(0.02)
Waiver	–0.49**	(0.19)	0.30	(0.23)
Emergency permit	–0.21**	(0.04)	0.25**	(0.07)
District intern	–1.86**	(0.59)	1.82**	(0.67)
University intern	0.52**	(0.08)	–0.36**	(0.17)
Out-of-state credential	–0.36**	(0.05)	0.03	(0.10)
Full credential	Reference		Reference	
District characteristics				
Enrollment < 30,000	0.00	(0.00)	0.00	(0.01)
Enrollment 30,000–39,999	–0.06	(0.11)	–0.66**	(0.18)
Enrollment 40,000–59,999	–0.37**	(0.11)	–0.55**	(0.18)
Enrollment ≥ 60,000	–0.81**	(0.09)	–0.66**	(0.16)
Enrollment growth since 1991	–0.26**	(0.02)	–0.40**	(0.03)
Elementary school district	0.04	(0.13)	0.02	(0.26)
High school district	0.08	(0.09)	0.59**	(0.16)
Unified district	Reference		Reference	
Students on meal program (100)	–0.26**	(0.13)	1.49**	(0.23)
Students on meal program in elementary school district (100)	0.37	(0.24)	–1.26**	(0.48)
Students on meal program in high school district (100)	–0.61**	(0.25)	–0.50	(0.48)
Starting salary (1,000)	–0.02**	(0.01)	0.05**	(0.01)
Annual salary increase (1,000)	–0.27**	(0.09)	1.15**	(0.18)
Unemployment rate	2.47**	(0.60)	–3.48**	(1.18)
Change in unemployment	0.39**	(0.14)	–0.31	(0.80)
Rural district	0.10	(0.08)	–1.23**	(0.15)
Suburban district	0.07	(0.05)	–0.11	(0.09)
Urban district	Reference		Reference	
Duration 1	Reference		Reference	
Duration 2	–0.66**	(0.04)	0.04	(0.08)
Duration 3	–1.07**	(0.06)	0.12	(0.10)
Constant	–0.54**	(0.24)	–0.54**	(0.24)

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Standard errors are in parentheses. Standard error calculations are robust to clustering at the teacher level. Estimates of the enrollment effect were multiplied by 1,000 to show significant digits. Models also control for school year (these results are not shown).

**Indicates significance at the .05 level.

Table B.5

Retention Model Results, Pre-CSR Starters with Single-Subject Certifications

	Retention			
	Pre-CSR		CSR Interactions	
Teacher characteristics				
Starting age				
22 or less	0.46**	(0.10)	0.14	(0.16)
23–34	Reference		Reference	
35–44	–0.09*	(0.05)	–0.11	(0.09)
45 and older	–0.24**	(0.10)	–0.21	(0.17)
45 and older (continuous)	0.05**	(0.02)	0.02	(0.03)
Waiver	0.24	(0.21)	0.19	(0.24)
Emergency permit	0.11**	(0.05)	0.34**	(0.08)
District intern	–0.18	(0.34)	1.00**	(0.40)
University intern	0.16	(0.12)	0.01	(0.22)
Out-of-state credential	0.84**	(0.05)	0.02	(0.09)
Full credential	Reference		Reference	
District characteristics				
Enrollment < 30,000	–0.01**	(0.00)	0.00	(0.01)
Enrollment 30,000–39,999	–0.14	(0.13)	–0.30	(0.20)
Enrollment 40,000–59,999	–0.39**	(0.12)	–0.37*	(0.20)
Enrollment ≥ 60,000	–0.70**	(0.11)	0.02	(0.17)
Enrollment growth since 1991	–0.26**	(0.02)	–0.39**	(0.03)
Elementary school district	–0.21	(0.16)	–0.22	(0.30)
High school district	–0.01	(0.10)	0.75**	(0.18)
Unified district	Reference		Reference	
Students on meal program (100)	–0.79**	(0.14)	1.58**	(0.25)
Students on meal program in elementary school district (100)	0.50*	(0.30)	–0.61	(0.54)
Students on meal program in high school district (100)	–0.78**	(0.30)	–0.92	(0.57)
Starting salary (1,000)	–0.03**	(0.01)	0.04**	(0.01)
Annual salary increase (1,000)	–0.47**	(0.11)	1.43**	(0.20)
Unemployment rate	0.58	(0.77)	–7.14**	(1.53)
Change in unemployment	0.23	(0.19)	–0.09	(0.99)
Rural district	–0.19**	(0.09)	–0.64**	(0.17)
Suburban district	–0.16**	(0.06)	0.20**	(0.10)
Urban district	Reference		Reference	
Duration 1	Reference		Reference	
Duration 2	0.04	(0.05)	–0.01	(0.09)
Duration 3	–0.19**	(0.06)	0.21**	(0.11)
Constant	–0.11	(0.28)	–0.11	(0.28)

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Standard errors are in parentheses. Standard error calculations are robust to clustering at the teacher level. Estimates of the enrollment effect were multiplied by 1,000 to show significant digits. Models also controlled for school year (these results are not shown).

*Indicates significance at the .10 level.

**Indicates significance at the .05 level.

Table B.6

Transfer and Retention Model Results, Post-CSR Starters with Multiple-Subject Certifications

	Transfer		Retention	
Teacher characteristics				
Starting age				
22 or less	0.09	(0.09)	0.37**	(0.11)
23–34	Reference		Reference	
35–44	–0.10**	(0.05)	–0.09	(0.07)
45 and older	–0.19**	(0.09)	–0.23*	(0.12)
45 and older (continuous)	0.02	(0.02)	0.05**	(0.02)
Waiver	–0.01	(0.10)	0.64**	(0.13)
Emergency permit	–0.16**	(0.04)	–0.22**	(0.06)
District intern	–1.13**	(0.24)	–0.47**	(0.23)
University intern	0.11	(0.09)	–0.66**	(0.19)
Out-of-state credential	–0.35**	(0.06)	0.83**	(0.06)
Full credential	Reference		Reference	
District characteristics				
Enrollment < 30,000	–0.02**	(0.00)	0.00	(0.00)
Enrollment 30,000–39,999	–0.61**	(0.12)	0.08	(0.15)
Enrollment 40,000–59,999	–0.50**	(0.11)	–0.05	(0.15)
Enrollment ≥ 60,000	–1.17**	(0.10)	–0.14	(0.13)
Enrollment growth since 1991	–0.19**	(0.01)	–0.21**	(0.01)
Elementary school district	–0.32**	(0.10)	–0.53**	(0.14)
High school district	1.44**	(0.32)	1.55**	(0.43)
Unified district	Reference		Reference	
Students on meal program (100)	–0.07	(0.14)	–1.02**	(0.18)
Students on meal program in elementary school district (100)	0.50**	(0.18)	0.82**	(0.25)
Students on meal program in high school district (100)	–0.87	(1.03)	–1.72	(1.68)
Starting salary (10,000)	–0.03	(0.06)	0.11	(0.08)
Annual salary increase (1,000)	–0.14	(0.11)	0.27*	(0.15)
Unemployment rate	2.21**	(0.66)	–3.09**	(1.04)
Change in unemployment	1.89**	(0.26)	1.87**	(0.39)
Rural district	–0.67**	(0.09)	–0.77**	(0.13)
Suburban district	–0.21**	(0.05)	–0.22**	(0.07)
Urban district	Reference		Reference	
Duration 1	Reference		Reference	
Duration 2	–0.69**	(0.04)	–0.24**	(0.05)
Year 1997	Reference		Reference	
Year 1998	0.75**	(0.04)	1.04**	(0.05)
Constant	–1.48**	(0.27)	–3.29**	(0.36)

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Standard errors are in parentheses. Standard error calculations are robust to clustering at the teacher level. Estimates of the enrollment effect were multiplied by 1,000 to show significant digits.

*Indicates significance at the .10 level.

**Indicates significance at the .05 level.

Table B.7

Transfer and Retention Model Results, Post-CSR Starters with Single-Subject Certifications

	Transfer		Retention	
Teacher characteristics				
Starting age				
22 or younger	0.06	(0.13)	0.10	(0.15)
23–34	Reference		Reference	
35–44	0.14**	(0.06)	0.04	(0.07)
45 and older	0.08	(0.11)	–0.02	(0.12)
45 and older (continuous)	0.03*	(0.02)	0.05**	(0.02)
Waiver	–0.22**	(0.08)	0.22**	(0.10)
Emergency permit	–0.11**	(0.06)	0.18**	(0.07)
District intern	–0.94*	(0.52)	–0.41	(0.53)
University intern	0.46**	(0.12)	0.09	(0.19)
Out-of-state credential	–0.37**	(0.07)	0.55**	(0.08)
Full credential	Reference		Reference	
District characteristics				
Enrollment < 30,000	–0.01*	(0.00)	0.00	(0.01)
Enrollment 30,000–39,999	–0.39**	(0.14)	0.13	(0.17)
Enrollment 40,000–59,999	–0.25*	(0.13)	0.32**	(0.16)
Enrollment 60,000 and higher	–0.97**	(0.13)	0.01	(0.15)
Enrollment growth since 1991	–0.29**	(0.03)	–0.29**	(0.02)
Elementary school district	0.02	(0.19)	–0.04	(0.23)
High school district	0.46**	(0.12)	0.54**	(0.15)
Unified district	Reference		Reference	
Sudents on meal program (× 100)	0.24	(0.17)	–0.65**	(0.22)
Students on meal program in elementary school district (× 100)	0.04	(0.34)	0.13	(0.44)
Students on meal program in high school district (× 100)	–1.05**	(0.35)	–0.78*	(0.43)
Starting salary (× 1,000)	0.03	(0.07)	0.11	(0.09)
Annual salary increase (× 1,000)	0.02	(0.14)	–0.12	(0.17)
Unemployment rate	–0.30	(0.92)	–1.79	(1.25)
Change in employment	1.42**	(0.45)	1.93**	(0.52)
Rural district	–0.44**	(0.12)	–0.65**	(0.15)
Suburban district	0.18**	(0.07)	0.03	(0.08)
Urban district	Reference		Reference	
Duration 1	Reference		Reference	
Duration 2	–0.72**	(0.06)	–0.04	(0.06)
Year 1997	Reference		Reference	
Year 1998	0.72**	(0.06)	0.92**	(0.06)
Constant	–1.78**	(0.33)	–2.79**	(0.42)

SOURCES: NTAR (1991–92 through 1999–00).

NOTES: Standard errors are in parentheses. Standard error calculations are robust to clustering at the teacher level. Estimates of the enrollment effect were multiplied by 1,000 to show significant digits.

*Indicates significance at the .10 level.

**Indicates significance at the .05 level.

Appendix C

Teachers in the California Labor Market

Employment opportunities outside public school teaching likely affect teachers' decisions about starting a teaching career as well as leaving such a position.[1] The NTAR data are fairly unusual in that they cover any California employment before, during, and after teaching. In this appendix, we explore two issues related to the recruitment and retention of new teachers. We begin by examining the local nature of teacher recruitment. We then describe the industries where teachers work before and after public school teaching.

How Local Were Teacher Labor Markets?

One issue in the training and recruiting of teachers is whether teachers trained in one region of the state would be likely to take positions in other regions. For example, how important is it to take into account regional supply and demand when funding or expanding teacher training programs? Recent research on New York suggests that the teacher labor market is fairly localized, with a substantial share of teachers actually working in the same district in which they attended high school (Boyd et al., 2003). Although the NTAR does not have the same sort of information as the New York data, NTAR data do include information on the county of any employment before teaching and on the county of the teacher preparation program (i.e., the institute of higher education).

[1]Several studies argue that outside opportunities are important, including Murnane (1987), Murnane and Olsen (1990), Theobald and Gritz (1996), and Gritz and Theobald (1996). Stinebrickner (2001) suggests that family factors may be more important. Luekens, Lyter, and Fox (2004), using a national survey of teachers, find that among new teachers who left public schools, 34 percent indicated that pursuing another career was important in their decision to leave and about 19 percent indicated that pregnancy and childrearing were important.

Almost 60 percent of new teachers begin teaching in the same county where they held employment before teaching (Table C.1).[2] Over 75 percent begin teaching in the same region as prior employment. Of teachers who go through a university credentialing program, over half begin teaching in the same county as the program, and close to 70 percent begin teaching in the same region.[3] When we consider teachers who transfer out of their first district, 55 percent move to a new district in the same county, and 76 percent move to a new district in the same region.

Teacher labor markets appear to be "local" in the sense that there is a strong tendency for people to start teaching in the region where they had previous employment or schooling. However, this does not imply that the regional supply of teachers is unaffected by salary and other incentives in out-of-region districts.

Table C.1

Percentage of Teachers Teaching in Same Region as Previous Work, Education, and Teaching

	Percentage
Begin teaching in	
Same county as previous employment	58
Same region as previous employment	77
Same county as university	53
Same region as university	71
Transfer to district in the same county	55
Transfer to district in the same region	76

SOURCES: NTAR (1991–92 to 1999–00).

[2]For "previous employment," the sample is limited to those with previous employment in an identifiable county (county of employment is not identified for employers with multiple establishments). For "same as university" statistics, the sample is limited to those with an identifiable institute of higher education by the first year of teaching (42% of new teachers). "Regions" are constructed by combining counties following the Census Bureau's Consolidated Metropolitan Statistical Areas (CMSAs) where applicable, Metropolitan Statistical Areas (MSAs) for metropolitan counties not part of a CMSA, and individual counties for those counties not part of an MSA or CMSA.

[3]If we drop all teachers who enrolled in programs in Los Angeles County, the numbers in Table C.1 fall by two to five percentage points.

This analysis supports the approach of targeting university program expansions in regions with high vacancies and high use of emergency permits. The analysis also suggests another potential use of the NTAR data. Because university programs are identified in the credential records, it is possible to use these data to evaluate programs in terms of the share of program graduates who teach in public school districts, which school districts they go to, and even the retention rates for teachers from the program.

Which Industries Did Teachers Come From and Move To?

Understanding the mix of industries where teachers worked before teaching can be important for targeting recruitment activities, for anticipating the economic effect of major changes in teacher demand (such as class size reduction), and for considering the effect on the teacher labor market of shifts in other industries. Information on post-teaching employment is helpful in understanding why teachers leave public schools. For this analysis, an important limitation is that the NTAR includes employment only in California. For example, teachers working in other states after their California public school district employment cannot be distinguished from those who remained in California and were not employed.[4]

For analysis of pre-teaching employment, we consider new public school teachers age 30 and over to capture prior work activities that were not simply part-time jobs during college and teacher training. Before CSR, about 34 percent of new teachers over age 29 had no prior California employment recorded in the NTAR. For teachers starting after CSR, the share with no prior employment fell to 13 percent. Most of this difference is simply an artifact of the data: Employment information begins with 1991, so for teachers starting in 1991–92, there is no prior employment observed in the data. For teachers starting in the

[4]Johnson (2000) shows a high level of migration out of California during the 1990s. A small number of working Californians are not included in the EDD employment data because they are not covered by unemployment insurance (e.g., they are self-employed, federal civilian and military employees, U.S. postal service workers, and railroad employees).

late 1990s, the data include several prior years during which any California employment is observed. For a more comparable statistic, we compute that among teachers starting in 1995–96, 85 percent had prior employment since 1991. Among teachers starting in 1996–97, 83 percent had prior employment since 1992.

The most common employer before teaching was public school districts (Table C.2).[5] Almost 40 percent of these teachers had substitute credentials before starting regular teaching. Most had no

Table C.2

Industry Distribution Before and After Teaching (in percent)

	Before Teaching, Pre-CSR	Before Teaching, Post-CSR	After Teaching, Pre-CSR	After Teaching, Post-CSR	California Workforce, Females
Service sector					
Public school	28	23			
Private school	4	4	21	16	8
Child care	2	2	4	2	1
Higher education	4	4	9	11	6
Other social services	3	3	5	4	2
Health services	4	4	3	3	16
All other services	18	19	26	30	26
Retail trade	13	13	10	8	7
Manufacturing	7	6	6	6	8
Finance, insurance, real estate	5	7	5	5	9
Public administration	3	4	6	6	5
Transportation	3	4	2	3	8
Wholesale trade	3	3	3	3	2
Construction	2	2	1	1	1
Agriculture	1	1	1	1	0
Mining	0	0	0	0	0

SOURCES: NTAR (1998–99 through 1999–00) for teachers; Census 2000 for the California workforce.

NOTES: California workforce statistics are for workers ages 23–64 who have at least a bachelor's degree. For comparison to former teachers, workers in public schools are excluded (9% of working women).

[5]Most but not all teachers with prior employment had an identifiable industry of employment.

record of a prior teaching certification but may have held a substitute credential from years before 1993 or may have been working as teacher aides or in non-teaching positions.[6] A substantial number of new teachers came from teaching environments other than public schools, including private schools, child care, and colleges. Over 60 percent came from service industries.

We analyze employment for teachers leaving public schools using the first academic year with no public school earnings. About 60 percent of teachers who leave public schools had no California employment in the following year (regardless of whether they left before CSR). Of those with California employment, private schools are the most common industry of employment—hiring 21 percent of working prior public school teachers who left before 1996 and 16 percent of those who left in 1996 and later. The higher education industry was also fairly common; hiring about 10 percent of exiting teachers who worked in California. Compared to working college-educated women in California, prior teachers are much more likely to be in these two industries.[7]

The distribution of prior industries was not substantially different for those starting teaching before CSR relative to those starting after CSR. However, to understand the potential effect of CSR on an industry, we need to assess the number of new teachers from that industry relative to the number of workers in the industry. For example, 4 percent of new public school teachers worked in private schools before public schools. In 1995–96, there were about 38,000 full-time private school teachers and 11,000 part-time private school teachers (California Department of Education, 2004). The number that entered public schools after CSR, about 1,500, was roughly 3 percent of the number of private school teachers working in 1995–96. The full effect of CSR on teacher supply in the private school industry was slightly larger as fewer

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[6]Indeed, during the 1990s, there were programs to encourage teaching aides and other school paraprofessionals to become teachers. The NTAR data do not include substitute credentials received before 1993. See Appendix A for further discussion.

[7]For comparability with NTAR data, military personnel are excluded from the Census analysis. Census data are not entirely comparable because industry is self-reported by a worker whereas in the NTAR, the industry is reported by employers. Furthermore, the classifications in the two datasets are somewhat different.

teachers left public schools after CSR and, of those, the share going to private schools was lower (16% versus 21%; Table C.2).

The NTAR also includes information on earnings in public school districts and in other industries. However, the data are problematic in that they do not distinguish between full-time and part-time work. For example, about 30 percent of teachers who moved to other industries earned less than $10,000 in their first year after teaching. The high share of workers with very low earnings suggests a substantial degree of part-time work. Similarly, any change in earnings that occurred when a teacher entered public schools from another industry may also reflect movement between part-time and full-time work. An additional limitation of the NTAR data is the lack of information on non-earnings compensation such as vacation time, health insurance, and pension benefits. Finally, the NTAR, because it is based on new teachers, is able to compare earnings early in teaching to earnings early in another career, not reflecting the long-term earnings potential in either career track. Therefore, the NTAR should not be used to evaluate teacher compensation. For a study of teacher earnings in California, see Sonstelie, Brunner, and Ardon (2000, p. 109).

Purely for descriptive purposes, Table C.3 provides earnings comparisons between teaching and pre- or post-employment. When we compare earnings before public school teaching to earnings in the first year of teaching, 70 percent of new public school teachers earned less in their prior job and 22 percent earned substantially more in their prior job.[8] Among teachers who left public schools and worked in California, in their first year in the new industry, just over half earned substantially more than they had in their last year of teaching. However, more than one-third of teachers (36%) actually experienced a decline in earnings of at least 10 percent. The earnings patterns suggest that, for a substantial number of teachers, the move to other industries was not motivated by a desire for an immediate increase in earnings.

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[8]Earnings are measured as the sum of earnings from all employers from July through June (academic years). Earnings before teaching are the maximum annual earnings before teaching and are compared to earnings in the first year of teaching for teachers who began teaching at age 30 or older. Earnings after teaching are measured in the year following teaching and are compared to earnings in the final year of teaching.

Table C.3

Earnings Relative to Teaching Earnings (in percent)

	Before Teaching	After Teaching
Earned less than 90% of teaching earnings	70	36
Earned about the same as teaching	8	13
Earned more than 110% of teaching earnings	22	51

SOURCES: NTAR (1998–99 through 1999–00).

NOTE: Analysis for the table includes only those with pre- or post-teaching earnings.

In addition to working in other industries before and after public schools, many teachers work in other industries in the same years that they are teaching (e.g., summer employment in other industries). For example, in school year 1997–98, about 18 percent of new public school teachers worked in other industries as well as in public school districts. These teachers worked in roughly the same industries as teachers who worked before teaching, although they were more likely to work in retail trade or in the service sector outside teaching, health, and social services. Most of these teachers had relatively low earnings from other sources—89 percent had less than $10,000 from other sources. On average, about 15 percent of their annual earnings came from employers other than public schools.

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