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State-Level High School Completion Rates: Concepts, Measures, and Trends[1]

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Abstract
Since the mid 1970s the national rate at which incoming 9th graders have completed high school has fallen slowly but steadily; this is also true in 41 states. In 2002, about three in every four students who might have completed high school actually did so; in some states this figure is substantially lower. In this paper I review state-level measures of high school completion rates and describe and validate a new measure that reports these rates for 1975 through 2002. Existing measures based on the Current Population Survey are conceptually imperfect and statistically unreliable. Measures based on Common Core Data (CCD) dropout information are unavailable for many states and have different conceptual weaknesses. Existing measures based on CCD enrollment and completion data are systematically biased by migration, changes in cohort size, and/or grade retention. The new CCD-based measure described here is considerably less biased, performs

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differently in empirical analyses, and gives a different picture of the dropout situation across states and over time.

Keywords: High school dropout; Measurement; Common Core of Data.

Each fall, and in every state, a new cohort of students enters high school for the first time. A few years later a portion of each cohort receives a high school diploma and the rest does not. At first glance, the task of quantifying the proportion of entering students in each state who go on to complete high school seems straightforward. Years of effort by academic and government researchers has proven otherwise.

There are at least three compelling reasons to develop, analyze, and disseminate state-level high school completion rates. The first is that high school completion is extremely important both socially and economically for students and for the states in which they reside. Consequently, it is inherently worth asking how successful students are in each state at reaching this critical educational milestone. Second, as part of the provisions of the 2002 No Child Left Behind legislation states must meet annual yearly progress (AYP) goals. For secondary education, states' definitions of AYP are mandated to include "graduation rates for public secondary school students (defined as the percentage of students who graduate from secondary school with a regular diploma in the standard number of years)" [Sec 1111(b)(2)(D)(i)].[2] Third, researchers who are interested in the impact of state education policy initiatives—such as the implementation of mandatory state high school exit examinations or changes in course requirements for high school graduation—need reliable and valid state-level high school completion rates in order to come to sound empirical conclusions.

In this paper I review and critique existing measures of state-level high school completion rates and describe a new measure that reports state-level high school completion rates for the graduating classes of 1975 through 2002. This new measure is more conceptually sound and less biased than existing measures, performs differently in empirical analyses, and yields a different picture of variability across states and over time in state-level high school completion rates. I conclude by using this new measure to demonstrate that high school completion rates have fallen modestly but steadily nationwide—and in 41 states—since the mid 1970s.

Conceptual and Technical Goals

My goal is to develop a state-level measure of the rate at which incoming 9th grade students complete public high school by obtaining a state-certified diploma; I do not count holders of General Educational Development (GED) certificates as high school completers. This conceptualization ignores high school dropout/completion that occurs before or long after the high school years and it also ignores private high school completers.[3] The state-level high school completion measure that I create is thus *not* a measure of the rate at which people earn any

[2] Unfortunately I am not able to compute the high school completion rate developed in this paper at the school or school district level.

[3] Below I discuss the implications of ignoring private high school completers.

secondary education credential; it is a measure of the rate at which people succeed in obtaining a public high school diploma.[4]

Following Hauser (1997), there are several desirable technical properties of any good measure of the rate of high school completion. Three are particularly relevant here. First, such measures should have face validity. For example, if every student in a particular incoming cohort in a particular state goes on to obtain a high school diploma then the high school completion rate for that cohort in that state should equal 100%. As I will demonstrate, widely-used and much-publicized measures of state-level high school completion rates fail to meet this basic standard. Second, such measures should "be consistent with a reasonable understanding of the process or processes that it purports to measure" and "should pertain to a well-defined population and set of events." For present purposes, a good measure of state-level high school completion rates should pertain to specific cohorts of incoming students (e.g., students who first entered the 9th grade in 1988) and should adequately account for such issues as migration, changes over time in the size of incoming cohorts, mortality, and grade retention. Finally, such measures should be statistically robust: Good measures of state-level public high school completion rates should be based on enough observations to allow statistically sound comparisons across states and across cohorts of the rate at which incoming students complete public high school.

Current Measures

Existing measures of annual state-level high school completion and dropout rates come from one of only two sources of data: the Current Population Survey (CPS) and the Common Core of Data (CCD).[5] The CPS is a monthly survey of more than 50,000 households, and is conducted by the Bureau of the Census for the Bureau of Labor Statistics. Households are selected in such a way that it is possible to make generalizations about the nation as a whole, and in recent years about individual states and other specific geographic areas. Individuals in the CPS are broadly representative of the civilian, non-institutionalized population of the United States. In addition to the basic demographic and labor force questions that are included in each monthly CPS survey, questions on selected topics are included in most months. Since 1968 the October CPS has obtained basic monthly data as well as information about school enrollment—including current enrollment status, public versus private school enrollment, grade attending if enrolled, most recent year of enrollment, enrollment status in the preceding October, grade of enrollment in the preceding October, and high school completion status. In recent years the October CPS has also ascertained whether high school completers earned diplomas or GED certificates.

The Common Core of Data, compiled by the National Center for Education Statistics (NCES), is the federal government's primary database on public elementary and secondary education. Each year the CCD survey collects information about all public elementary and secondary schools from local and state education agencies. One component of the CCD—the State Nonfiscal Survey—provides basic, annual information on public elementary and secondary school

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[4] The measure that I create is not a four-year high school completion rate measure. It is a measure of the rate at which incoming 9th grade public-school students complete public high school. This means that my measure does not squarely meet the AYP definition described above, which requires a measure of four year completion rates.

[5] State-level high school completion and dropout rates can also be computed from decennial census data—but only for every tenth year—and recently from the American Community Survey. I am referring to data that allow *annual* state-level estimates for several high school graduating classes.

students and staff for each state and the District of Columbia. CCD data from the State Nonfiscal Survey includes counts of the number of students enrolled in each grade in the fall of each academic year and the number of students who earned regular diplomas, who earned other diplomas, and who completed high school in some other manner in the spring of each academic year. Although the State Nonfiscal Survey has collected counts of public school dropouts since the 1991–1992 academic year, as described below many states have not provided this information or have provided it in a manner inconsistent with the standard CCD definition of dropout (U.S. Department of Education, 2000).

Measures Based On CPS Data

Estimates of high school completion and dropout have historically been based on CPS data. CPS-derived *event dropout rates* report the percentage of students in a given age range who leave school each year without first obtaining a diploma or GED. For example, 4.8% of 15 to 24 year olds who were enrolled in high school in October 1999 left school by October of 2000 without obtaining a diploma or GED. CPS-derived *status dropout rates* report the percentage of people within an age range—typically ages 16 to 24—who are not enrolled in school and who have not obtained a diploma or GED. In October 2000, about 10.9% of 16 to 24 year olds were not enrolled in school and did not have a diploma or GED (U.S. Department of Education, 2001a). Conversely, CPS-based *high school completion rates* reflect the percentage of 18- through 24-year-olds who have left high school and earned a high school diploma or the equivalent, including a GED (e.g., Federal Interagency Forum on Child and Family Statistics, 2005; U.S. Department of Education, 2001a). For example, as of October 2002 87% of 18- to 24-year-olds who had left school reported that they had earned a high school diploma or a GED.

For present purposes there are a number of conceptual and technical problems with CPS-derived measures of high school dropout and completion, particularly when computed at the state level. First and foremost, the sample sizes for some states are not large enough to produce reliable estimates of rates of high school completion or dropout (Kaufman, 2001; U.S. Department of Education, 2000). Even when data are aggregated across years—for example, in the Annie E. Casey Foundation's *Kids Count* (2004) measure—the standard errors of estimates for some states are frequently so large that it is difficult to make meaningful comparisons across states or over time. What is more, by aggregating across years the resulting measure no longer pertains to specific cohorts of incoming students; this is a serious problem for researchers interested in the effects of state education policy reforms that typically take effect for specific cohorts of students.

Second, until 1987 it was not possible to distinguish high school completers from GED recipients in the CPS; since 1988 October CPS respondents who recently completed high school have been asked whether they obtained a diploma or GED, but there are serious concerns about the quality of the resulting data (Chaplin, 2002; Kaufman, 2001). Third, as noted by Greene (2002), "[status] dropout statistics derived from the Current Population Survey are based on young people who live in an area but who may not have gone to high school in that area" (p. 7). To the extent that young people move from state to state after age 18, CPS-based state-level high school dropout rates—particularly status dropout rates based on 16 to 24 year olds—may be of questionable validity (see also U.S. Department of Education, 1992).[6] Fourth, some observers have expressed concern about coverage bias in the CPS, particularly for race/ethnic minorities. The CPS is representative of

[6] In computing its CPS-based status dropout measure, the Annie E. Casey foundation limits the CPS sample to 16 to 19 year olds, partially alleviating this problem.

the civilian, non-institutionalized population of the United States, and so young people who are incarcerated or in the military are not represented. To the extent that these populations differ from the rest of the population with respect to frequency and method of high school completion, there is the potential for bias in estimates. Finally, substantial changes over time in CPS questionnaire design, administration, and survey items have made year-to-year comparisons difficult (Hauser, 1997; Kaufman, 2001).

For these reasons, the state-level high school completion rate measure that I construct is based primarily on CCD data, not on CPS data. In the sections that follow I describe existing techniques for estimating state-level high school completion rates using CCD data. Each technique has serious conceptual shortcomings and is subject to random data errors, and below I demonstrate that each technique also yields systematically biased estimates. The CCD-based measure that I subsequently develop is still subject to random data errors, but overcomes major conceptual shortcomings and is thus much less systematically biased.

Measures Based on Common Core Data I: The NCES Completion Rate (NCES)

Since the early 1990s NCES has asked state education agencies to report the number of students who drop out in each year; state-level dropout rates have been part of the CCD beginning with the 1992–1993 data collection (U.S. Department of Education, 2002b) which asked about the 1991–1992 academic year. On October 1 of each year the NCES asks states to define as a dropout any student who (1) was enrolled at any point during the previous academic year, (2) was not enrolled at the beginning of the current academic year, and (3) has not graduated or completed an approved education program (e.g., obtained a GED). Students are not counted as dropouts if they died, if they are absent from school for reasons of health or temporary suspension, or if they transfer to another jurisdiction. NCES then computes annual event dropout rates by dividing the number of 9^{th} through 12^{th} grade dropouts by the total 9^{th} through 12^{th} grade enrollment as of October 1. Using these dropout data, NCES also reports a 4-year high school completion rate as:

$$\text{NCES} = \frac{\text{H.S. Completers}_{\text{Spring of Academic Year X}}}{\left(\begin{array}{c}\text{H.S. Completers}_{\text{Spring of Academic Year X}} + \\ \text{Dropouts from Gr 9}_{\text{Academic Year X-3}} + \text{Dropouts from Gr 10}_{\text{Academic Year X-2}} + \\ \text{Dropouts from Gr 11}_{\text{Academic Year X-1}} + \text{Dropouts from Gr 12}_{\text{Academic Year X}}\end{array}\right)}. \tag{1}$$

Under this formulation, high school completers include students who receive regular diplomas, students who receive alternative (non-standard) diplomas, and students who complete high school in some other manner. However, regular diploma recipients comprise almost 99% of all high school completers (U.S. Department of Education, 2002a). A conceptual problem with this measure stems from the fact that many students drop out of school in one academic year, only to re-enroll in subsequent years. It is possible, then, for some students to be counted as dropouts more than once in the denominator of Equation 1; it is also possible for students who are counted as dropouts in the denominator to also be counted as high school completers in the numerator.

Beyond these conceptual problems, NCES dropout and high school completion measures have serious practical limitations. First, event dropout rates are available beginning only with academic year 1991–1992 (U.S. Department of Education, 2002a), and so completion rates are available beginning only in 1995–1996, making analyses of historical trends difficult. Second, many states do not report these dropout rates, and others report them in a manner that does not correspond with the NCES dropout definition (U.S. Department of Education, 2002a). As a result, for academic year 1999–2000 dropout rates are available for only 36 states and the D.C. and high school completion rates are available for only 32 states (U.S. Department of Education, 2002b).[7]

Measures Based on Common Core Data II: Basic Completion Rates (BCR–9 and BCR–8)

As described above, CCD data include (1) counts of the number of public school students who are enrolled in each grade at the beginning of each academic year and (2) counts of the number of public school students who complete high school each spring. Using these two sets of figures, it is intuitively appealing to compute a Basic Completion Rate (BCR–9) by simply comparing the number of enrolled public school 9th graders in the fall of one academic year to the number of high school completers three academic years later, when that cohort of 9th graders should have obtained diplomas. If we do so, the Basic Completion Rate is:

$$\text{BCR} = \frac{\text{High School Completers}_{\text{Spring of Academic Year X}}}{9^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Academic Year X-3}}} \qquad (2)$$

Indeed Haney (2000; 2001) has used exactly such a measure in highly publicized and much-cited work on the impact of state high school exit examinations on rates of high school completion. The BCR is purportedly a measure of the overall high school completion rate, not a measure of the four-year high school completion rate. However, the BCR has at least four problems, each of which induces systematic bias in the measure.

The first problem with the BCR has to do with migration. Students who appear as 9th graders in a state in the fall of academic year X may move to another state before the spring of academic year X+3; they may be replaced by (a smaller or larger number of) students who are counted among the number of high school completers in the spring of academic year X+3 but who lived in another state in the fall of academic year X. A second problem with the BCR has to do with grade retention. If we are interested in the number of incoming 9th graders who go on to complete high school, then measures like the BCR are problematic to the extent that the denominator includes 9th graders who are enrolled in the 9th grade in more than one academic year; essentially, such measures count retained 9th graders in the denominator for more than one year but in the numerator a maximum of one time. As I demonstrate below in a series of simulations, each of these first two issues call into question the validity of the BCR as a measure of state high school completion rates. In recent work, Haney and colleagues (2004) have tried to overcome the grade retention problem by using the number of 8th graders enrolled in academic year X-4 as the denominator (which I will refer to as BCR–8). Since many fewer students are made to repeat 8th grade than are made to repeat 9th grade, this partially alleviates the grade retention bias; however, the longer time horizon exacerbates the migration bias. A third problem with the BCR has to do with mortality: Students who die before they complete high school are counted as dropouts. A fourth problem has to do with students who

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[7] These data problems are related to states' own widely disparate efforts to measure rates of high school completion and dropout. As noted recently by the National Governors Association in its *Compact on State High School Graduation Data* "the quality of state high school graduation and dropout data is such that most states cannot fully account for their students as they progress through high school. Until recently, many states had not collected both graduation and dropout data, and those that have collected these data have not generally obtained accurate information (National Governors Association 2005a)."

are in un-graded (frequently special education) programs and who might be counted as high school completers in the numerator but not as 9th graders in the denominator. Because less than 0.2% of young people die during the modal ages of high school enrollment (Arias, 2002) and because the percentage of students in un-graded programs in any given state is also usually very low—typically about 2% in 1986–1987 and about 1% in 1999–2000—I do not dwell on these issues in this paper.[8]

Measures Based on Common Core Data III: Averaged Freshman Graduation Rate (AFGR)

I am not the first to recognize the potential consequences of migration and grade retention for CCD-based state-level high school completion rates like the BCR. The National Center for Education Statistics recently endorsed the Averaged Freshman Graduation Rate (AFGR) "based on a technical review and analysis of a set of alternative estimates" (U.S. Department of Education, 2006, p. 1). The AFGR can be computed as

$$\text{AFGR} = \frac{\text{Regular High School Diploma Recipients}_{\text{Spring of Academic Year X}}}{\left(\text{"Smoothed" } 9^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Academic Year X-3}}\right)} \tag{3}$$

where

$$\text{"Smoothed" } 9^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Acad. Year X-3}} = \frac{\begin{pmatrix} 8^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Acad. Year X-4}} + \\ 9^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Acad. Year X-3}} + \\ 10^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Acad. Year X-2}} \end{pmatrix}}{3} \tag{4}$$

Note that the AFGR differs from the BCR measures by limiting the numerator to *regular* high school diplomas; other types of high school diplomas or completions are ignored. The averaging in the denominator is "intended to account for higher grade retentions in the ninth grade" (U.S. Department of Education, 2006, p. 1). As demonstrated in a series of simulations below, the AFGR does not, in fact, accomplish that goal. What is more, the AFGR does nothing to account for migration or other systematic biases that are common to CCD-based measures of states' high school completion rates.

Measures Based on Common Core Data IV: Adjusted Completion Rate (ACR I and ACR II)

Greene and Winters (2002; 2005) have constructed two distinct sets of state-level high school completion rates by dividing the number of regular diplomas—again, not the total number of diplomas—issued by public schools in each state by an estimate of the number students at risk of receiving those diplomas. Greene and Winters (2002) Adjusted Completion Rate (ACR I) is computed as

$$\text{ACR} = \frac{\text{Regular High School Diploma Recipients}_{\text{Spring of Academic Year X}}}{\left(\text{"Smoothed" } 9^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Academic Year X-3}}\right) \times \left(\text{Migration Adjustment}\right)} \tag{5}$$

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[8] It is worth noting, however, that the measure I develop does account for student mortality.

where

$$\text{"Smoothed" } 9^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Acad. Year X-3}} = \frac{\begin{pmatrix} 8^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Acad. Year X-4}} + \\ 9^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Acad. Year X-3}} + \\ 10^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Acad. Year X-2}} \end{pmatrix}}{3} \quad (6)$$

and

$$\text{Migration Adjustment} = 1 + \left(\frac{\left(\begin{matrix} \left(\text{Total } 9^{\text{th}} \text{ -} 12^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Academic Year X}} \right) - \\ \left(\text{Total } 9^{\text{th}} \text{ -} 12^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Academic Year X-3}} \right) \end{matrix} \right)}{\text{Total } 9^{\text{th}} \text{ -} 12^{\text{th}} \text{ Grade Enrollment}_{\text{Fall of Academic Year X-3}}} \right). \quad (7)$$

As with the AFGR, "smoothing" the 9th grade enrollments is designed to minimize the bias introduced by grade retention. The migration adjustment in the 2002 estimates (which I will refer to as ACR I) is designed to account for bias introduced by net migration between academic years X-3 and X. The authors revised their migration adjustment for the 2005 estimates (ACR II) such that

$$\text{Migration Adjustment} = 1 + \left(\frac{\left(\begin{matrix} \left(\text{Number of 17 Year Olds}_{\text{Summer of Academic Year X-1}} \right) - \\ \left(\text{Number of 14 Year Olds}_{\text{Summer of Academic Year X-4}} \right) \end{matrix} \right)}{\text{Number of 14 Year Olds}_{\text{Summer of Academic Year X-4}}} \right). \quad (8)$$

As I will show below in a series of simulations, these adjustments produce valid state-level completion rates only under very specific (and relatively unlikely) demographic circumstances. Although ACR I and ACR II are intended to adjust for the two major problems in completion rates like the BCR, as I show below the details of the ACR I actually produce *less* valid results than the BCR under most circumstances and the ACR II suffers from the same 9th-grade-retention-induced biases as the BCR and the ACR I.

What is more, because states differ among themselves and over time with respect to whether and how they differentiate between "regular diplomas," "other diplomas," and "other high school completers," the AFGR and ACR measures include a new form of potential bias by restricting the numerator to "regular diplomas." For example, in the CCD data the number of *regular diplomas* issued in New York fell by 7% from 165,379 in 1988 to 154,580 in 1989—apparently reflecting a dramatic one year change in the number of high school completers. However, the *total number of high school completers* in New York fell by only about 4% from 165,379 in 1988 to 157,678 in 1989—reflecting much less change. This is because the CCD data report that 3,098 "other diplomas" were issued in New York in 1989, while none were issued in 1988. It is clear that this is a change in classification, not a change in reality. In producing our own state-level completion rates we follow NCES and other researchers by combining these types of diplomas (and by continuing to exclude GED recipients from the category of high school completers).

Measures Based on Common Core Data V: Cumulative Promotion Index (CPI)

Swanson (2003) recently proposed an innovative method for calculating a state-level four-year high school completion rate which "approximates the probability that a student entering the 9th grade will complete high school on time with a regular diploma. It does this by representing high school graduation rate [*sic*] as a stepwise process composed of three grade-to-grade promotion transitions (9 to 10, 10 to 11, and 11to 12) in addition to the ultimate high school graduation event (grade 12 to diploma)" (p. 14). Specifically, the Cumulative Promotion Index is:

$$CPI = \left(\frac{\text{Diplomas}_{\text{Acad. Year X}}}{E^{\text{Grade 12}}_{\text{Acad. Year X}}} \right) \times \left(\frac{E^{\text{Grade 12}}_{\text{Acad. Year X+1}}}{E^{\text{Grade 11}}_{\text{Acad. Year X}}} \right) \times \left(\frac{E^{\text{Grade 11}}_{\text{Acad. Year X+1}}}{E^{\text{Grade 10}}_{\text{Acad. Year X}}} \right) \times \left(\frac{E^{\text{Grade 10}}_{\text{Acad. Year X+1}}}{E^{\text{Grade 19}}_{\text{Acad. Year X}}} \right) \quad (9)$$

where $E^{\text{Grade12}}_{\text{Acad. Year X}}$ equals the number of 12th graders enrolled in the fall of academic year X. The author notes that this approach "estimates the likelihood of a 9th grader from a particular district completing high school with a regular diploma in four years *given the conditions in that district during the [given] school year*" (p. 15; emphasis in original). Swanson (2003) argues that this measure has the virtues of being timely and reflective of current education system performance because it requires data from only two academic years. As I will demonstrate below, the CPI is systematically biased except when there is no net student migration between geographic units. What is more, the CPI shares with the AFGR and the ACR measures the technical weakness of including only regular diploma recipients in the numerator; in his defense, Swanson's (2003) includes only regular diploma recipients in his four-year high school completion rate because this is what is required under the AYP provisions of No Child Left Behind.

As described in more detail below, the measure that I introduce—the Estimated Completion Rate (ECR)—begins with the BCR and then introduces adjustments to the denominator to account for grade retention and migration. The ECR conceptually represents the ratio of the number of diplomas that are issued in a state in a particular year to the number of students at risk of obtaining those diplomas. As discussed below, the ECR is not completely unbiased, but the magnitude of the bias in the ECR is considerably smaller than the biases in the measures reviewed above. All CCD-based measures are subject to a certain amount of random error (resulting from reporting errors, for example), and all are subject to a common set of systematic error (as described below). However, the ECR overcomes the two most serious forms of systematic error in CCD-based measures by accounting for 9th grade retention and state-to-state migration in an empirically sound manner.

Evaluating Measures Based on Common Core Data

Table 1 presents a series of simulations of enrollment counts, high school completer counts, and high school completion rates in one geographic area over ten academic years. For demonstration purposes, *the first three simulations stipulate that every single student obtains a high school diploma*. By design, then, valid measures of *overall* high school completion rates should report a 100% completion rate for every academic year in these simulations; *four-year* completion rates (the CPI) may be less than 100% in the presence of grade retention (which would delay students' graduation). The first three simulations differ only with respect to assumptions about changes over time in the numbers of incoming 8th graders, net migration rates, and grade retention rates. Each of these three simulations begin with 1,000 students entering the 8th grade for the first time in the fall of the 1994–1995 academic year and follows that and subsequent cohorts of students over ten academic years under a variety of assumptions about cohort sizes, net migration, and grade retention.

Panel A of Table 1 simulates a situation in which the size of the incoming 8th grade cohort increases by 3% annually, from 1,000 in 1994–1995 to 1,030 in 1995–1996 and so forth; there is no net migration, no students are ever retained in grade, and all students obtain a high diploma. Given these parameters, *all* of the 1,000 students who enter 8th grade in the fall of 1994 progress to the 9th grade in the fall of 1995, to the 10th grade in the fall of 1996, to the 11th grade in the fall of 1997, and to the 12th grade in the fall of 1998, and all 1,000 receive diplomas in the spring of 1999. The incoming cohort of 8th graders in fall 1995 enjoys similar success, such that all 1,020 obtain regular diplomas in spring 2000. As reported at the bottom of the panel, each of the CCD-based completion rates correctly reports a 100% high school completion rate—except the ACR I. The ACR I equals 109% under these conditions. In general, if the annual change in the size of 8th grade cohorts equals X (e.g., 0.03 in Panel A), then the ACR I equals the true rate times $(1+X)^3$.

Panel B of Table 1 simulates a situation in which the net migration rate equals +2% at each grade level, such that the number of students in each grade and in each year grows by 2% during the course of the academic year because more students move into the geographic than leave it. Here there is no annual change in the size of incoming cohorts of 8th graders, no students are ever retained in grade, and no student drops out. Under this scenario, most of the CCD-based high school completion rates are biased. The BCR–8 yields a 110% completion rate, while the other measures each yield a 108% completion rate. In general, if the annual net migration rate is expressed as proportion Y, then the BCR–9, the AFGR, the ACR I, and the CPI yield completion rates that equal the true rate times $(1+Y)^4$. Note that if the net migration rate is negative then each of these measures will be downwardly biased. In the end only the ACR II and the ECR are not biased by net migration.

Panel C of Table 1 presents a simulation in which the percentage of 9th graders made to repeat the 9th grade begins at 5% in 1994–1995 and then rises by 3% each subsequent year. Here there is no annual change in the size of incoming cohorts of 8th graders, there is no net migration, and every student obtains a high school diploma. Although 1,000 students enter the 9th grade for the first time in each academic year, not all of them move on to the 10th grade in the succeeding academic year. Consequently, the observed number of 9th graders in each year is higher than the number of new, incoming 9th graders in that year. Except for the BCR–8 and the ECR, each of the CCD-based measures of *overall* high school completion rates described above is downwardly biased when any 9th graders are retained—even though *all* incoming 9th graders end up completing high school.[9] This is because the biased measures count retained students in their denominators twice (once in the year in which they first entered the 9th grade and once in the following year) but in their numerators only once. The fact that more students repeat 9th grade than any other high school grade—combined with recent claims that rates of 9th grade retention are increasing (Haney et al., 2004)—is troubling, since retention in the 9th grade has such deleterious consequences for the validity of all of these measures with the exception of the BCR–8 and the ECR.

[9] The CPI—again, a *four-year* measure of completion rates—is not biased in this way.

Table 1

High School Completion Rates Under Different Assumptions: A Simulation

A. *Cohort Sizes Increase by 3% Annually*

	1994-'95	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04
No. of New 8th Graders	1,000	1,020	1,040	1,061	1,082	1,104	1,126	1,149	1,172	1,195
Fall Enrollment, Grade 8	1,000	1,030	1,061	1,093	1,126	1,159	1,194	1,230	1,267	1,305
Fall Enrollment, Grade 9		1,000	1,030	1,061	1,093	1,126	1,159	1,194	1,230	1,267
Fall Enrollment, Grade 10			1,000	1,030	1,061	1,093	1,126	1,159	1,194	1,230
Fall Enrollment, Grade 11				1,000	1,030	1,061	1,093	1,126	1,159	1,194
Fall Enrollment, Grade 12					1,000	1,030	1,061	1,093	1,126	1,159
Number of High School Completers in Spring					1,000	1,030	1,061	1,093	1,126	1,159
BCR-9 (e.g., Haney 2000)					a	100%	100%	100%	100%	100%
BCR-8 (e.g., Haney et al. 2004)					a	100%	100%	100%	100%	100%
AFGR (National Center for Education Statistics 2005)					a	100%	100%	100%	100%	100%
ACR I (e.g., Greene and Winters 2002)					a	a	a	a	109%	109%
ACR II (e.g., Greene and Winters 2005)						100%	100%	100%	100%	100%
CPI (e.g., Swanson 2003)					a	100%	100%	100%	100%	a
ECR (Current Paper)					a	100%	100%	100%	100%	100%

B. *Net Migration Rate of +2% at Each Grade Level*

	1994-'95	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04
No. of New 8th Graders	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fall Enrollment, Grade 8	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fall Enrollment, Grade 9		1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020
Fall Enrollment, Grade 10			1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040
Fall Enrollment, Grade 11				1,061	1,061	1,061	1,061	1,061	1,061	1,061
Fall Enrollment, Grade 12					1,082	1,082	1,082	1,082	1,082	1,082
Number of High School Completers in Spring					1,104	1,104	1,104	1,104	1,104	1,104
BCR-9 (e.g., Haney 2000)					a	108%	108%	108%	108%	108%
BCR-8 (e.g., Haney et al. 2004)					a	110%	110%	110%	110%	110%
AFGR (National Center for Education Statistics 2005)					a	108%	108%	108%	108%	108%
ACR I (e.g., Greene and Winters 2002)					a	a	a	a	108%	108%
ACR II (e.g., Greene and Winters 2005)					a	100%	100%	100%	100%	100%
CPI (e.g., Swanson 2003)					a	108%	108%	108%	108%	a
ECR (Current Paper)					a	100%	100%	100%	100%	100%

a Completion rate cannot be computed for this academic year given the data in this table.

Table 1 (Continued)
High School Completion Rates Under Different Assumptions: A Simulation

C. 9th Grade Retention Begins at 5%, Rises 3% Annually

	1994-'95	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04
No. of New 8th Graders	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fall Enrollment, Grade 8	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fall Enrollment, Grade 9		1,000	1,052	1,056	1,058	1,060	1,061	1,063	1,065	1,067
Fall Enrollment, Grade 10			949	996	998	998	998	998	998	998
Fall Enrollment, Grade 11				949	996	998	998	998	998	998
Fall Enrollment, Grade 12					949	996	998	998	998	998
Number of High School Completers in Spring					949	996	998	998	998	998
BCR-9 (e.g., Haney 2000)					a	95%	95%	94%	94%	94%
BCR-8 (e.g., Haney et al. 2004)					a	100%	100%	100%	100%	100%
AFGR (National Center for Education Statistics 2005)					a	98%	98%	98%	98%	98%
ACR I (e.g., Greene and Winters 2002)					a	a	a	a	98%	98%
ACR II (e.g., Greene and Winters 2005)					a	98%	98%	98%	98%	98%
CPI (e.g., Swanson 2003)					a	94%	94%	94%	94%	a
ECR (Current Paper)					a	100%	100%	100%	100%	100%

D. 5% of 9th Graders Drop Out

	1994-'95	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04
No. of New 8th Graders	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fall Enrollment, Grade 8	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fall Enrollment, Grade 9		1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fall Enrollment, Grade 10			950	950	950	950	950	950	950	950
Fall Enrollment, Grade 11				950	950	950	950	950	950	950
Fall Enrollment, Grade 12					950	950	950	950	950	950
Number of High School Completers in Spring					950	950	950	950	950	950
BCR-9 (e.g., Haney 2000)					a	95%	95%	95%	95%	95%
BCR-8 (e.g., Haney et al. 2004)					a	95%	95%	95%	95%	95%
AFGR (National Center for Education Statistics 2005)					a	97%	97%	97%	97%	97%
ACR I (e.g., Greene and Winters 2002)					a	a	a	a	97%	97%
ACR II (e.g., Greene and Winters 2005)					a	97%	97%	97%	97%	97%
CPI (e.g., Swanson 2003)					a	95%	95%	95%	95%	95%
ECR (Current Paper)					a	95%	95%	95%	95%	95%

a Completion rate cannot be computed for this academic year given the data in this table.

Finally, Panel D of Table 1 simulates a situation in which 5% of 9th graders drop out of school during the academic year. Under this scenario, I have specified no change in the size of 8th grade cohorts, no net migration, and no grade retention. Thus, unbiased measure of high school completion rates should equal 95%. As shown in Table 1, all measures except the AFGR and the ACR II do equal 95%. The AFGR and the ACR II each equal 97% under these conditions.

The simulations in Table 1 make the point that CCD-based high school completion rates like those reviewed above—including newer and "improved" measures introduced by Greene and Winters (2005) and the U.S. Department of Education (2006)—are systematically biased. The ACR I is uniquely biased by changes in the size of incoming cohorts of 8th graders; the BCR–8, the BCR–9, the AFGR, the ACR I, and the CPI are systematically biased by migration; the BRC–9, the AFGR, the ACR I, the ACR II, and the CPI are systematically biased by 9th grade retention; and the AFGR, the ACR I, and the ACR II are systematically biased by 9th grade high school dropout. The direction and magnitude of these biases depend on the configuration of demographic and grade retention patterns in particular states in particular years. Beyond misrepresenting the *absolute* rates of states' high school completion, this means that these measures also misrepresent *differences across states* and *trends over time* in high school completion rates—unless net migration, the size of incoming cohorts of 8th graders, and rates of 9th grade retention remain stable over time and across states. What is more, as I will show below these alternate measures produce substantively different results in empirical analyses.

A New Method for Measuring States' High School Completion Rates

In this section I describe a new CCD-based measure of state-level high school completion rates—labeled the Estimated Completion Rates (ECR)—that I have computed for the graduating classes of 1975 through 2002. As shown in Table 1, this new measure produces estimates of the rate of public high school diploma acquisition that are not systematically biased by migration, grade retention, or changes over time in incoming cohort sizes. After describing the construction of this new measure I employ it for the purposes of comparing high school completion rates across states and over time.

The ECR conceptually represents the proportion of incoming public school 9th graders in a particular state and in a particular year who go on to obtain a high school diploma (and so it is an overall completion rate, not a four-year completion rate). The ECR is computed as

$$\text{ECR} = \frac{\text{High School Completers}_{\text{Spring of Academic Year X}}}{\text{Estimated \# of First Time } 9^{\text{th}} \text{ Graders}_{\text{Fall of Acad. Year X-3}} \times \text{Migration Adjustment}}. \quad (10)$$

For reasons described above, the numerator in Equation 10 is the total number of public high school completers (excluding GED recipients), regardless of whether completers earned regular diplomas, earned "other diplomas," or completed high school in some other way. Historically about 99% of completers have earned regular diplomas. The denominator begins with an estimate of the number of first-time 9th graders in each state and in each academic year and then adjusts those estimates to account for net migration (and, incidentally, mortality).

Estimating the Number of First-Time 9th Graders

Like Haney and colleagues (2004) I use the number of public school 8th graders in a state in the fall of one year as an estimate of the number of first-time public school 9th graders in that state in the fall of the following year. This estimation technique is fundamentally justified by the fact that 8th grade retention rates are generally extremely low—usually less than 2 or 3%—even in states with high retention rates in other grades. For example, for the 1998–1999 academic year the 8th grade retention rate in North Carolina was reported to be 2.4% while the 9th grade retention rate was reported to be 16.6% (North Carolina State Board of Education, 2004).

How accurate is this technique for estimating the number of first-time 9th graders? Table 2 makes use of published administrative data from Massachusetts, Texas, and North Carolina (Massachusetts Department of Education, 2005; North Carolina State Board of Education, 2004; Texas Education Agency, 2000). For various academic years each state has reported the statewide percentage of public-school 9th graders who were required to repeat the 9th grade; these figures appear in Column 3 of Table 2. This table has two purposes: First, to validate states' reported 9th grade retention rates and second, to validate the use of the number of 8th graders in one academic year as an estimate of the number of first-time 9th graders the following academic year.

Column 4 in Table 2 reports the total number of 9th graders in academic year X+1 that we might expect on the basis of the total numbers of 8th and 9th graders in academic year X and the percentage of 9th graders retained after academic year X. So, for example, in the fall of 1994 in Massachusetts there were 64,097 8th graders and 66,707 9th graders; 6.3% of those 9th graders were retained. We would expect, then, that the total number of 9th graders in the fall of 1995 in that state would equal the number of 8th graders in the fall of 1994 plus 6.3% of the number of 9th graders in the fall of 1994: So, 64,097 + (0.063)(66,707) = 68,300. It is then possible to compare that estimate to the observed total number of 9th graders in academic year X+1 (shown in column 5). Column 6 reports that the expected total number of 9th graders in academic year X+1 falls within 2 percentage points of the observed number in all three states and in each academic year for which requisite data are available—even before accounting for migration or mortality. This suggests that for these states in these years, the reported 9th grade retention rates are quite plausible.

Column 7 reports the estimated number of first-time 9th graders for these states in these selected years. These estimates are based on the number of 9th graders in the previous year, the number of 9th graders in the current year, and the 9th grade retention rate the previous year. So, for example, the estimated number of first-time 9th graders in Massachusetts in the fall of 1995 equals the total number of 9th graders in that state in that year (68,623) minus the product of the total number of 9th graders the previous academic year (66,707) times the percentage of 9th graders retained the previous year (6.3%): 68,623-(66,707 x 0.063) = 64,420. That is, using plausible data on the 9th grade retention rate in Massachusetts after the 1994–1995 academic year I estimate that there were 64,420 first-time 9th graders in Massachusetts in the fall of 1995. The ECR uses the number of 8th graders in academic year X as an estimate of the number of first-time 9th graders in academic year X+1. How good is this estimate? Column 8 in Table 2 demonstrates that the number of 8th graders in academic year X falls within 2.2 percentage points of the estimated number of first time 9th graders in each state and academic year considered.

Table 2

Using the Number of 8th Graders in Academic Year X as a Proxy for the Number of New 9th Graders in Academic Year X+1

State and Academic Year	(1) 8th Graders Observed in Acad. Year X	(2) 9th Graders Observed in Acad. Year X	(3) 9th Graders Retained after Acad. Year X	(4) **EXPECTED** Number of 9th Graders in Acad. Year X+1	(5) **OBSERVED** Number of 9th Graders in Acad. Year X+1	(6) % Difference between Column 5 and Column 4	(7) **ESTIMATED** Number of 1st Time 9th Graders in Acad. Year X+1	(8) % Difference between Column 1 and Column 7
Massachusetts								
1994-1995	64,097	66,707	6.3%	68,300	68,623	0.5%	64,420	-0.5%
1995-1996	65,724	68,623	6.3%	70,047	70,811	1.1%	66,488	-1.1%
1997-1998	69,388	72,256	6.8%	74,301	74,668	0.5%	69,755	-0.5%
1998-1999	72,101	74,668	7.1%	77,402	77,733	0.4%	72,432	-0.5%
1999-2000	72,545	77,733	8.1%	78,841	78,201	-0.8%	71,905	0.9%
2000-2001	74,527	78,201	8.4%	81,096	80,394	-0.9%	73,825	1.0%
Texas								
1994-1995	281,109	323,162	16.8%	335,400	335,819	0.1%	281,528	-0.1%
1995-1996	284,875	335,819	17.8%	344,651	343,867	-0.2%	284,091	0.3%
1996-1997	290,666	343,867	17.8%	351,874	347,951	-1.1%	286,743	1.4%
1997-1998	292,648	347,951	17.6%	353,887	350,743	-0.9%	289,504	1.1%
North Carolina								
1998-1999	95,522	108,749	16.6%	113,574	111,493	-1.8%	93,441	2.2%
1999-2000	96,542	111,493	16.1%	114,492	112,416	-1.8%	94,466	2.2%
2000-2001	99,295	112,416	14.6%	115,708	114,236	-1.3%	97,823	1.5%
2001-2002	102,126	114,236	14.7%	118,919	117,724	-1.0%	100,931	1.2%

Note: Data for columns 1, 2, and 5 were derived from CCD data. Data for column 3 were derived from the Texas Education Agency (2000), the Massachusetts Department of Education (2005), and the North Carolina State Board of Education (2005).

Although the number of 8th graders in one academic year appears to be a pretty good estimate of the number of new 9th graders the following academic year, there are four potential sources of error inherent in this estimation procedure. The first is random error: random data collection/recording errors are inherent in large administrative data sets, and the CCD is no exception. The second source of error is more systematic and has to do with migration: The number of 8th graders in a state in academic year X is only equal to the number of first-time 9th graders in academic year X+1 if no 8th graders die and if net migration of 8th graders equals zero. As described below, however, the migration adjustment in the ECR accounts for inter-state migration (and mortality) between grades 8 and 9. The third potential source of error introduced by this technique for estimating the number of first-time 9th graders has to do with 8th grade retention. Although 8th grade retention rates are low it is nonetheless true that 8th grade retention downwardly biases the ECR; this is also true of the BCR–8. However, unlike the other measures reviewed above the ECR is not biased by 9th grade retention. Given that rates of retention are much higher after the 9th grade than after the 8th grade, the extent of downward bias in the ECR introduced by 8th grade retention is vastly smaller in magnitude than the extent of bias in other measures introduced by 9th grade retention. A fourth and final potential source of error in this procedure for estimating the number of first-time 9th graders has to do with students transitioning from private school to public school (or *vise versa*) between grades 8 and 9. This bias will only be large, however, when there are high rates of net migration between public and private schools between grades 8 and 9. Separate analyses of 2000 U.S. Census data (the results of which are not shown) indicate that in only 9 states did the percentage of 5th–8th graders attending private schools differ from the percentage of 9th–12th graders attending private school by as much as 2 percentage points. In the end this technique for estimating the number of first-time 9th graders is slightly downwardly biased by 8th grade retention and slightly biased (upwardly or downwardly) by net migrations of 8th graders into or out of private schools.

Adjusting for Migration

Similar to the ACR II, the adjustment for migration in the denominator of the ECR is based on a comparison of the total population of 17 year olds—the modal age of fall 12th graders—in a state on July 1 of one year to the total population of 13 year olds—the modal age of fall 8th graders—in that state on July 1 four years earlier. These estimates are derived from published, annual state-by-age population estimates produced by the Population Division of the U.S. Bureau of the Census (U.S. Bureau of the Census, 2001a, , 2001b, , 2002) which are readily available for all years between 1970 and 2003. For example, there were 402,721 people age 13 in California on July 1 of 1970. In that state in 1974 there were 407,812 people age 17—a +1.3% net increase. To improve the reliability of these estimates, I have computed three year moving averages.[10] The net migration estimate for California for the graduating class of 1980 thus represents the point estimates for the classes of 1979 through 1981.[11] Again, these migration estimates are subject to random error; however, their degree of systematic bias is small. In any case, these estimates are preferable to either ignoring migration or to using systematically biased estimates of migration.

There are three potential problems with this technique for estimating migration rates. The first issue is that these migration estimates pertain to the net change in the population size of *all* 13 year olds over the ensuing four years—not to net change in the population size of all 13 year old *students*. However, more than 98% of 13 year olds are enrolled in school; consequently, the empirical biases resulting from this conceptual issue are likely trivial. The second issue is that these estimates cover only four years of migration between ages 13 and 17 (and implicitly between the

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10 This is a tradeoff between statistical reliability and a lack of sensitivity of the ECR to short-term changes in migration patterns

11 Although I refer to these as estimates of net migration, these figures actually represent the influence of both net migration and mortality; indeed only migration and mortality can lead to differences between the numbers of 13 year olds in a state in one year and the numbers of 17 year olds in that state four years later.

beginning of grades 8 and 12). Surely there is some migration among high school students between ages 17 and 18 (implicitly during the senior year of high school), and this migration is missed in my estimates. Although it is possible to use the Census Bureau's population figures to estimate migration between ages 17 and 18, these estimates would capture a great deal of inter-state migration among 18 year olds who are moving for the purpose of attending college or taking jobs out of state. Consequently, my estimated migration rates are likely a bit conservative (although the direction of bias depends on whether net migration is positive or negative within states). The third issue is that this technique counts international in-migrants who come to the U.S. between ages 13 and 17—but never enroll in high school—as non-completers. As I show below, this exerts modest downward bias on the ECR, particularly in states with high levels of international in-migration.

Above and beyond the technical issues involved in estimating the number of first-time 9th graders and adjusting for migration, a potential technical weakness of the ECR more generally concerns its treatment of students who are made to repeat any high school grade other than grade 9. Students enrolled in the 9th grade in academic year X-3 who are made to repeat one grade during high school are not at risk of completing high school in the spring of academic year X—but they may still complete high school in academic year X+1. Consequently, the ECR may *seem like* a downwardly biased estimator of high school completion rates. However, consider the fact that students enrolled in the 9th grade in academic year X-3 who are made to repeat one grade during high school are at risk of completing high school in the spring of academic year X+1. What this means is that as long as grade retention rates do not change dramatically from year to year—regardless of their absolute levels—the ECR suffers from only a very small degree of bias.[12] What is more, the ECR is not biased by changes in 9th grade retention rates (as shown in Table 1)—only by changes in retention rates in grades 10 through 12. In short, *extreme annual changes* in grade retention rates in grades 10 through 12—but not the grade retention rates themselves—produce very small biases in the ECR (but very large biases in the other CCD-based measures reviewed above).

The ECR: An Example

To illustrate the computation of the ECR in practice, consider that there were 65,724 students in 8th grade in Massachusetts in the fall of 1995—and thus I presume that there were 65,724 first-time 9th graders in Massachusetts in the fall of 1996—and that there were 52,950 high school completers in that state in 2000 (all according to CCD data). However, the population of 17 year olds in Massachusetts on July 1 of 1999 was 3.18% larger than the population of 13 year olds in that state in 1995. Consequently, I estimate that 65,724 x 1.0318 = 67,814 individuals were actually at risk of completing high school in Massachusetts in the spring of 2000. The ECR thus equals

$$\text{ECR} = \frac{52{,}950}{67{,}814} = 78.1\%.$$

[12] For example, imagine that the 9th grade retention rate is 5% in one year and then goes up by 10% annually … from 5.00% to 5.50% to 6.05% to 6.66% to 7.32% and so on. Under this dramatic scenario (as can be shown in simulations like those in Table 1) the ECR is downwardly biased by just 1% after several years. In contrast, the CCD-based measures reviewed above are typically biased by an additional 1% *each academic year*.

Validating the ECR

Although the ECR is designed to produce valid estimates of *state-level* public high school completion rates, it is worth asking how *national* estimates derived from the ECR compare to high school completion rates derived from longitudinal surveys of students—surveys in which we actually observe the percentage of students who obtain a high school diploma among those at risk of doing so. For example, the National Educational Longitudinal Study of 1988 (NELS–88) is a longitudinal study of more than 25,000 students who were 8th graders in the spring of 1988 (U.S. Department of Education, 2002c). If I restrict the NELS–88 sample to public school students who were included in the 1994 follow-up survey, I find that 79.6% of respondents completed high school (except via GED certification) by 1992 (which is to say, within four academic years). For the graduating class of 1992 the ECR equals 74.4%. However, because the migration component of the ECR—which equals +5.35% in 1992—reflects patterns of international migration that are *not* captured in NELS–88,[13] a more reasonable comparison would be to the ECR *without* including the migration adjustment. For 1992, the ECR without including the migration adjustment equals 78.4%. That is, if we compare conceptually similar rates we observe that the NELS–88 figure and the modified ECR differ by about one percentage point; none of the other measures described above as closely approximate the experience of the NELS–88 cohort; the CPI, for instance, equals 71.2% in 1992.

State-Level High School Completion Rates, 1975–2002

Table 3 reports the ECR by state and year of high school completion. Figure 1 depicts national high school completion rates as reflected by the BCR–9 and by the ECR for the graduating classes of 1975 through 2002. Both estimators show that the high school completion rate in the United States has generally declined over this period. The ECR is 3.8 percentage points higher than the BCR–9 in 1975 and 4.2 percentage points lower by 2000. While one or two percentage points may seem substantively trivial, one should keep in mind that more than three and half million students are in the denominator nationwide each year. One percentage point in these rates is a difference of about 35,000 young people nationwide. This means that in 2002 the BCR–9 and ECR estimates of the number of non-completers differed by about 140,000 students nationwide.

For any particular state in any particular year, whether the ECR yields substantially higher or lower estimates than the BCR–9 or other measures is a largely a function of how much 9th grade retention and net migration those states experience. For states with low 9th grade retention rates and low net migration the ECR is virtually equivalent to the BCR–9 and to other measures. However, in states with high rates of 9th grade retention and/or high levels of net migration the ECR can produce very different estimates. For example, Figure 2 plots the BCR–9 and the ECR for Nevada for the graduating classes of 1975 through 2002. Because Nevada has experienced very high rates of net in-migration annually—the population of 17 year olds is often more than 15% larger than the population of 13 year olds four years earlier—the ECR is as much as five to ten percentage points lower than the BCR–9 in many years. In contrast, New York experienced moderate net out-migration until the mid–1980s and has experienced moderate net in-migration ever since then. The consequence, as shown in Figure 3, is a gradual narrowing of the gap between the ECR and the BCR–9 over time.

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[13] In-migrants who came to the U.S. after 1988 were not eligible to be counted among NELS–88 high school completers

Table 3
ECR by State and Graduating Class

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
US	78.4%	78.0%	77.5%	76.7%	75.4%	74.5%	75.1%	75.5%	76.9%	77.7%
AL	65.5%	67.5%	67.7%	68.9%	69.5%	67.4%	68.7%	70.2%	70.5%	69.5%
AK	65.7%	59.2%	62.1%	69.2%	76.2%	77.7%	78.0%	74.5%	73.8%	72.9%
AZ	69.7%	68.4%	74.0%	78.1%	72.9%	66.1%	64.5%	66.7%	66.1%	70.6%
AR	65.9%	66.9%	66.9%	72.1%	72.4%	73.6%	73.3%	74.4%	76.2%	76.1%
CA	76.7%	77.0%	74.2%	71.6%	67.6%	67.5%	67.0%	67.7%	71.1%	72.9%
CO	81.7%	80.2%	80.2%	79.6%	78.5%	78.6%	82.5%	77.5%	79.3%	79.4%
CT	87.6%	81.3%	78.6%	76.9%	74.2%	75.4%	75.7%	75.4%	76.3%	76.3%
DE	80.7%	80.3%	78.4%	80.0%	78.4%	78.2%	77.6%	77.7%	82.2%	84.9%
DC	47.9%	48.5%	50.4%	48.4%	49.2%	45.7%	48.4%	52.4%	54.7%	50.0%
FL	67.6%	69.8%	68.8%	70.6%	64.1%	62.8%	63.0%	62.5%	63.9%	65.9%
GA	62.6%	64.8%	65.7%	64.0%	64.2%	62.5%	64.7%	65.8%	64.9%	67.7%
HI	81.1%	80.7%	81.7%	79.6%	83.5%	84.4%	84.7%	91.4%	89.0%	90.7%
ID	79.6%	73.5%	79.2%	77.9%	79.0%	77.4%	78.1%	79.1%	79.0%	78.3%
IL	84.4%	84.6%	80.0%	78.4%	77.1%	78.0%	82.2%	85.5%	85.1%	84.7%
IN	78.6%	82.0%	79.9%	77.9%	78.0%	77.4%	79.2%	81.2%	84.2%	84.9%
IA	88.1%	88.5%	86.1%	87.0%	87.5%	87.5%	88.4%	89.7%	92.8%	93.7%
KS	79.2%	79.9%	81.1%	80.6%	82.6%	81.1%	81.3%	82.5%	84.6%	86.3%
KY	67.8%	67.1%	65.7%	65.5%	65.0%	67.0%	68.5%	70.5%	72.8%	75.4%
LA	70.0%	69.3%	68.6%	67.4%	67.6%	67.1%	68.6%	57.6%	58.5%	59.7%
ME	77.4%	77.3%	75.6%	75.9%	74.8%	74.6%	75.1%	73.3%	75.4%	76.2%
MD	80.8%	80.5%	78.1%	76.4%	75.4%	76.4%	75.1%	75.7%	78.4%	81.5%
MA	87.9%	87.6%	80.0%	82.3%	80.6%	76.0%	77.6%	78.7%	80.3%	77.8%
MI	89.1%	77.7%	81.6%	80.0%	77.8%	75.8%	77.7%	78.8%	81.4%	82.8%
MN	94.6%	93.8%	92.6%	90.9%	88.5%	87.2%	89.4%	91.6%	94.8%	95.5%
MS	59.3%	59.6%	59.3%	60.4%	61.3%	60.2%	62.3%	63.4%	63.8%	64.4%
MO	78.7%	79.8%	79.0%	77.2%	76.9%	77.3%	77.7%	79.6%	81.7%	82.5%
MT	85.0%	83.9%	84.6%	85.1%	82.4%	83.4%	84.1%	83.8%	84.9%	84.2%
NE	88.8%	90.0%	89.0%	89.3%	87.9%	86.9%	85.6%	86.9%	89.3%	88.9%
NV	70.0%	71.4%	73.1%	70.4%	66.8%	66.1%	71.3%	73.2%	73.8%	77.2%
NH	86.8%	79.6%	81.6%	77.9%	79.3%	78.6%	75.9%	78.5%	79.7%	80.2%
NJ	91.3%	89.1%	87.8%	88.0%	85.3%	83.4%	81.8%	83.6%	84.9%	85.3%
NM	79.4%	76.3%	74.9%	75.3%	75.2%	74.9%	73.4%	74.4%	74.1%	75.9%
NY	83.6%	83.6%	83.2%	81.8%	80.6%	79.5%	77.5%	76.9%	76.9%	76.7%
NC	68.8%	69.5%	69.7%	69.5%	69.7%	68.5%	68.6%	70.5%	72.2%	73.4%
ND	87.2%	87.6%	86.2%	87.2%	86.8%	85.0%	87.2%	89.0%	88.7%	90.8%
OH	85.5%	84.9%	84.3%	83.1%	83.7%	81.4%	84.0%	83.4%	86.2%	88.1%
OK	74.7%	74.0%	75.6%	76.6%	76.3%	76.0%	75.8%	75.4%	78.0%	78.5%
OR	77.2%	77.4%	76.3%	71.7%	70.8%	70.3%	70.4%	73.3%	76.4%	77.1%
PA	88.7%	88.9%	87.0%	86.0%	85.6%	84.0%	83.8%	84.3%	86.4%	87.9%
RI	79.2%	76.5%	75.4%	74.0%	76.0%	76.5%	77.9%	76.7%	78.6%	76.3%
SC	67.9%	67.8%	68.1%	70.6%	67.6%	69.6%	69.9%	70.4%	70.4%	70.9%
SD	88.4%	85.5%	84.7%	84.0%	83.1%	83.1%	83.2%	83.8%	85.6%	86.5%
TN	64.3%	66.1%	72.1%	65.1%	67.5%	66.7%	71.1%	69.7%	66.3%	67.2%
TX	67.5%	68.1%	71.6%	72.3%	71.3%	70.8%	69.9%	69.4%	70.7%	69.9%
UT	80.0%	80.2%	79.9%	81.3%	77.4%	77.8%	79.4%	80.5%	83.7%	85.1%
VT	73.7%	77.8%	75.7%	76.9%	72.2%	72.7%	70.0%	72.9%	72.8%	77.2%
VA	69.0%	69.7%	70.5%	69.7%	70.4%	71.2%	72.1%	72.2%	73.9%	72.5%
WA	77.4%	77.9%	78.0%	76.7%	75.3%	73.4%	74.0%	75.9%	75.4%	77.8%
WV	71.4%	72.0%	71.1%	70.8%	71.8%	73.1%	74.1%	74.1%	78.1%	78.8%
WI	99.6%	97.3%	96.3%	94.4%	92.6%	91.2%	92.3%	94.2%	96.7%	97.6%
WY	78.0%	80.6%	78.5%	80.3%	78.0%	79.1%	78.3%	77.7%	79.8%	80.8%

Table 3 (Continued)
ECR by State and Graduating Class

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
US	76.6%	76.0%	75.5%	75.1%	74.4%	74.5%	74.2%	74.4%	74.2%	73.1%
AL	67.0%	66.3%	70.5%	71.4%	70.5%	67.2%	66.4%	65.7%	61.5%	58.2%
AK	69.2%	73.1%	74.2%	73.4%	72.5%	77.1%	83.4%	81.2%	77.1%	71.1%
AZ	67.7%	64.9%	66.4%	63.7%	66.3%	68.0%	74.5%	71.0%	74.2%	68.1%
AR	75.4%	75.9%	76.0%	75.8%	74.1%	73.5%	73.0%	73.5%	73.0%	70.4%
CA	69.5%	67.7%	65.9%	66.3%	65.7%	65.8%	66.6%	69.6%	71.8%	71.4%
CO	76.1%	73.7%	75.6%	77.5%	78.7%	78.8%	77.9%	79.1%	76.6%	72.9%
CT	76.1%	81.4%	73.6%	76.9%	78.1%	77.9%	81.8%	83.4%	83.8%	84.1%
DE	85.5%	87.4%	78.1%	75.9%	77.6%	74.2%	72.9%	75.6%	75.6%	70.5%
DC	51.0%	52.3%	52.6%	52.6%	49.0%	55.1%	53.0%	61.0%	65.1%	69.3%
FL	62.5%	62.5%	59.6%	60.8%	59.9%	60.2%	61.0%	64.7%	62.5%	61.9%
GA	67.1%	66.7%	66.0%	64.8%	65.4%	67.1%	68.1%	67.2%	65.4%	62.9%
HI	93.3%	93.7%	91.9%	90.5%	90.2%	90.0%	83.0%	81.4%	79.2%	79.6%
ID	80.1%	78.9%	80.0%	78.2%	78.6%	78.6%	77.9%	76.9%	74.3%	72.2%
IL	84.6%	85.8%	86.3%	84.6%	84.8%	83.2%	83.4%	83.7%	83.6%	80.6%
IN	83.7%	80.7%	81.1%	82.3%	79.3%	78.4%	78.0%	76.8%	74.6%	72.6%
IA	93.4%	92.8%	91.7%	91.5%	90.3%	89.6%	86.2%	87.1%	86.7%	84.9%
KS	86.2%	86.0%	86.8%	83.5%	83.2%	82.9%	82.1%	80.1%	79.9%	78.9%
KY	74.6%	73.6%	72.2%	75.3%	72.6%	74.7%	75.2%	73.6%	74.9%	77.7%
LA	63.2%	65.0%	62.9%	66.7%	64.6%	65.6%	61.3%	59.8%	60.8%	64.0%
ME	76.7%	74.6%	76.2%	75.5%	73.8%	79.6%	79.1%	82.2%	75.5%	72.8%
MD	80.5%	79.9%	77.1%	77.6%	76.8%	75.9%	76.9%	79.8%	80.4%	79.8%
MA	75.4%	75.5%	77.2%	75.6%	76.4%	81.5%	78.7%	82.4%	81.9%	81.2%
MI	81.9%	80.1%	80.5%	79.6%	78.1%	77.4%	75.8%	76.3%	75.0%	74.4%
MN	93.0%	90.6%	90.7%	91.0%	89.2%	89.9%	89.0%	88.0%	88.5%	86.5%
MS	63.8%	63.1%	64.2%	67.3%	61.0%	67.0%	64.0%	63.7%	63.2%	61.6%
MO	81.7%	80.5%	80.2%	79.0%	78.7%	78.6%	77.9%	77.0%	76.2%	75.8%
MT	83.2%	84.6%	85.1%	86.4%	86.9%	85.1%	85.8%	84.4%	83.7%	81.4%
NE	89.3%	89.8%	89.2%	87.5%	87.4%	86.9%	85.4%	86.1%	85.2%	84.0%
NV	74.7%	75.4%	74.6%	71.4%	63.8%	66.4%	64.7%	59.1%	59.6%	59.4%
NH	79.2%	75.7%	74.3%	75.8%	72.7%	73.3%	75.5%	78.2%	80.8%	80.7%
NJ	84.4%	83.3%	82.9%	82.6%	82.5%	83.2%	85.2%	86.6%	89.0%	88.4%
NM	75.9%	75.7%	76.8%	77.7%	76.6%	74.0%	75.6%	73.1%	72.4%	70.2%
NY	76.5%	78.5%	78.5%	76.4%	75.5%	75.5%	73.7%	75.5%	75.1%	75.1%
NC	74.0%	72.5%	70.5%	70.5%	71.5%	69.6%	70.1%	70.1%	69.3%	68.0%
ND	90.5%	89.4%	90.5%	93.1%	92.4%	92.8%	91.1%	90.6%	87.1%	86.9%
OH	87.6%	87.2%	86.6%	82.4%	82.0%	80.4%	79.0%	78.0%	80.3%	80.1%
OK	77.0%	76.4%	75.6%	77.2%	79.3%	82.0%	79.3%	78.8%	76.9%	74.9%
OR	76.5%	74.2%	73.8%	73.1%	71.7%	71.7%	69.8%	69.9%	68.9%	66.9%
PA	87.6%	87.1%	86.7%	86.0%	84.4%	84.0%	83.6%	84.6%	85.0%	84.0%
RI	74.8%	75.5%	74.6%	71.8%	72.4%	71.1%	74.3%	79.0%	79.6%	77.7%
SC	68.1%	68.7%	69.9%	68.1%	67.3%	61.3%	64.2%	60.8%	62.2%	61.7%
SD	87.8%	83.9%	84.9%	85.0%	84.5%	83.5%	83.0%	83.0%	85.5%	86.1%
TN	66.8%	67.0%	66.9%	69.3%	68.8%	68.5%	68.7%	69.8%	68.7%	64.3%
TX	68.1%	66.8%	67.6%	67.4%	68.1%	69.9%	71.7%	66.5%	64.4%	63.2%
UT	81.9%	80.5%	82.0%	81.3%	81.8%	78.0%	76.3%	77.4%	76.0%	74.4%
VT	77.0%	76.7%	76.7%	75.3%	74.6%	81.9%	72.9%	73.7%	78.7%	75.3%
VA	73.7%	75.1%	75.9%	73.3%	75.1%	74.7%	74.9%	75.2%	76.2%	74.6%
WA	78.0%	76.4%	79.6%	78.7%	75.0%	75.9%	71.2%	73.1%	72.4%	74.1%
WV	79.5%	79.2%	79.2%	79.5%	80.2%	80.4%	78.9%	76.7%	77.1%	74.9%
WI	96.1%	96.5%	94.8%	94.2%	91.7%	93.6%	90.8%	89.4%	89.2%	87.2%
WY	82.0%	80.4%	82.5%	86.8%	85.8%	85.0%	85.6%	87.0%	82.6%	81.9%

Table 3 (Continued)
ECR by State and Graduating Class

	1995	1996	1997	1998	1999	2000	2001	2002
US	71.6%	70.6%	71.3%	71.0%	71.3%	71.9%	71.1%	72.2%
AL	58.5%	56.6%	56.4%	58.4%	56.6%	58.6%	59.1%	57.1%
AK	66.4%	64.0%	64.2%	64.8%	65.6%	64.3%	67.2%	68.0%
AZ	60.5%	56.1%	61.6%	60.2%	57.9%	61.0%	69.6%	70.7%
AR	66.6%	67.5%	65.4%	69.6%	70.7%	71.7%	70.0%	70.8%
CA	70.2%	70.8%	72.2%	71.5%	72.5%	71.9%	71.0%	71.9%
CO	69.8%	67.6%	67.2%	66.5%	66.3%	68.2%	68.6%	72.5%
CT	81.3%	79.5%	80.6%	81.3%	80.8%	85.0%	78.3%	79.4%
DE	67.0%	69.5%	69.3%	72.6%	70.1%	65.2%	67.4%	64.8%
DC	62.2%	57.2%	59.7%	58.0%	53.4%	53.2%	54.2%	60.5%
FL	61.5%	61.2%	63.2%	62.8%	62.7%	61.7%	61.1%	63.1%
GA	60.0%	58.3%	58.3%	54.9%	54.7%	56.9%	55.3%	57.8%
HI	78.2%	78.7%	72.3%	69.9%	68.7%	73.1%	70.2%	71.5%
ID	71.7%	71.7%	71.8%	72.3%	72.5%	74.1%	73.7%	74.4%
IL	78.2%	77.9%	78.4%	79.4%	80.2%	80.8%	74.8%	76.2%
IN	70.9%	70.3%	70.3%	70.0%	71.0%	68.7%	69.6%	71.6%
IA	83.4%	83.6%	84.3%	84.0%	83.8%	84.1%	83.9%	86.9%
KS	76.8%	74.9%	74.6%	72.4%	72.9%	74.8%	75.4%	77.5%
KY	72.3%	68.8%	68.6%	68.0%	68.9%	69.6%	71.2%	69.7%
LA	64.4%	62.5%	60.9%	63.0%	61.4%	63.0%	63.8%	65.2%
ME	72.9%	72.7%	73.3%	75.0%	70.8%	71.7%	72.3%	70.8%
MD	79.3%	79.4%	78.7%	78.2%	78.5%	78.5%	79.1%	79.6%
MA	79.2%	78.6%	78.5%	78.6%	78.1%	78.1%	78.1%	76.5%
MI	73.1%	71.9%	74.2%	75.2%	76.4%	79.5%	77.1%	78.7%
MN	85.6%	84.3%	84.5%	83.9%	86.0%	85.3%	83.5%	83.8%
MS	58.3%	56.7%	56.7%	57.3%	56.6%	57.2%	57.7%	58.7%
MO	74.6%	73.7%	74.0%	74.5%	75.9%	76.6%	75.6%	77.2%
MT	79.6%	76.6%	76.8%	76.0%	76.6%	77.3%	76.7%	77.3%
NE	83.2%	81.5%	81.7%	82.0%	84.5%	83.9%	82.7%	83.4%
NV	58.5%	58.9%	66.8%	64.0%	65.1%	64.3%	63.4%	65.8%
NH	78.9%	76.5%	76.1%	75.9%	75.0%	75.9%	76.7%	75.8%
NJ	87.2%	86.9%	88.1%	80.8%	82.6%	88.9%	88.6%	87.6%
NM	67.0%	66.2%	66.8%	62.1%	64.6%	66.5%	67.0%	67.6%
NY	72.0%	72.1%	74.5%	72.5%	71.1%	69.7%	67.3%	64.9%
NC	66.8%	64.4%	64.2%	65.0%	66.4%	67.6%	66.3%	68.3%
ND	84.3%	84.8%	83.2%	83.2%	83.1%	84.9%	83.2%	83.5%
OH	78.4%	73.3%	74.5%	75.2%	75.3%	76.2%	77.6%	78.5%
OK	74.7%	72.7%	72.7%	73.4%	75.1%	74.4%	74.0%	74.5%
OR	68.4%	64.0%	64.5%	65.1%	65.2%	67.2%	66.0%	69.6%
PA	82.9%	82.8%	83.0%	82.8%	83.0%	82.0%	81.6%	82.0%
RI	78.0%	76.0%	77.6%	77.0%	77.8%	76.8%	75.3%	75.4%
SC	58.8%	58.5%	57.0%	56.6%	56.4%	56.2%	54.3%	56.7%
SD	81.9%	81.1%	82.7%	75.9%	72.1%	76.4%	74.6%	74.0%
TN	65.2%	65.0%	60.4%	57.5%	58.1%	58.6%	57.2%	58.9%
TX	63.3%	62.6%	63.9%	65.8%	66.0%	68.0%	67.4%	70.4%
UT	72.1%	70.8%	75.0%	75.4%	77.6%	78.6%	77.8%	77.3%
VT	80.6%	78.7%	81.0%	82.0%	79.4%	80.2%	78.2%	80.1%
VA	73.2%	71.8%	72.8%	73.6%	73.2%	74.1%	74.9%	73.7%
WA	71.9%	72.0%	70.9%	70.4%	70.3%	71.7%	68.1%	72.1%
WV	72.1%	73.7%	74.3%	74.6%	76.0%	75.5%	75.4%	74.0%
WI	85.6%	85.0%	85.6%	84.5%	84.7%	86.1%	86.9%	89.1%
WY	74.1%	72.0%	73.4%	72.9%	73.2%	75.3%	71.5%	72.5%

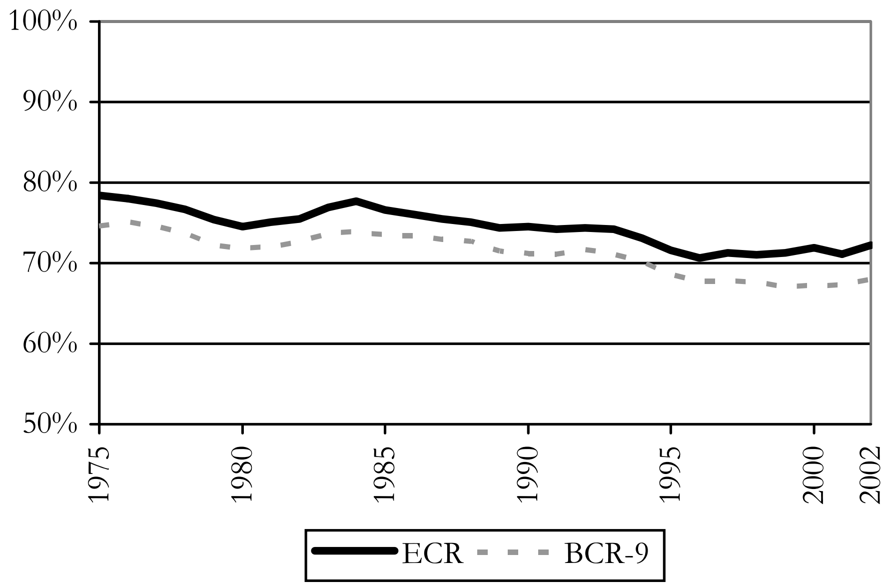

Figure 1
High School Completion Rates in the United States, Graduating Classes of 1975–2002

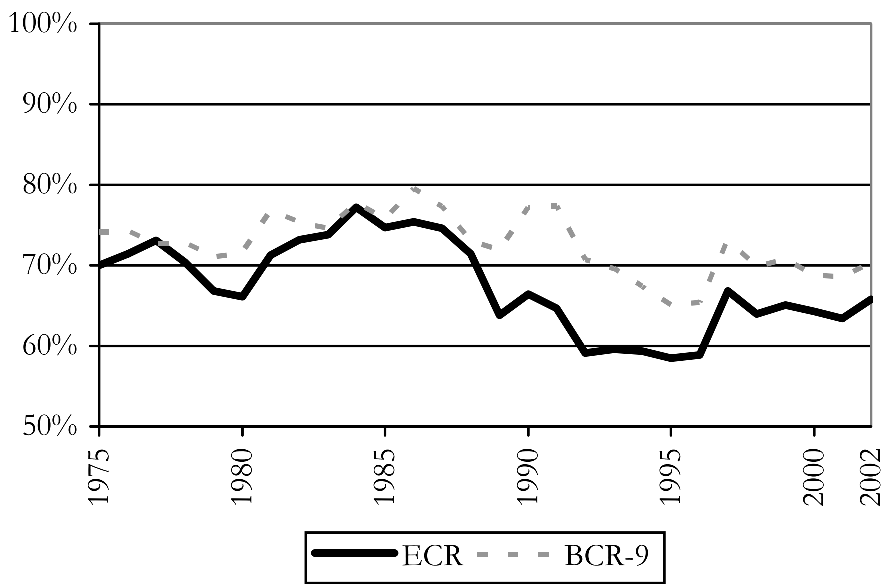

Figure 2
High School Completion Rates in the Nevada, Graduating Classes of 1975–2002

The BCR–9 equals the number of high school completers (not including GED recipients) in spring of academic year X divided by the number of 9th graders in fall of academic year X-3. The ECR adjusts the denominator to account for net migration and 9th grade retention. See text for details.

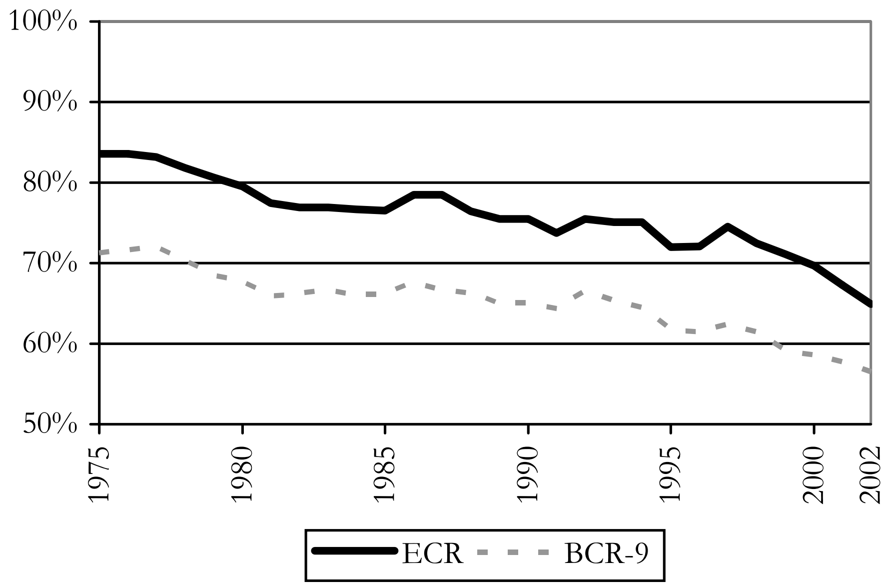

Figure 3
High School Completion Rates in the New York, Graduating Classes of 1975–2002

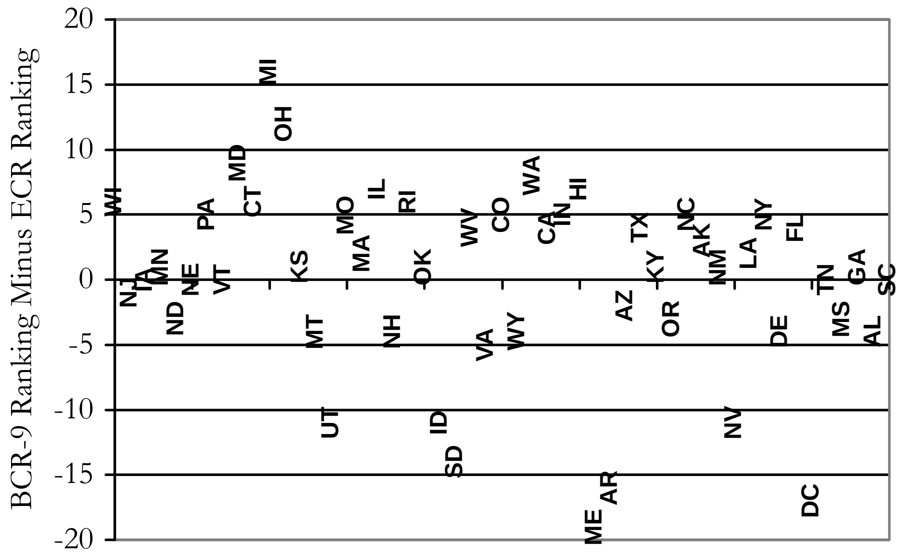

Figure 4
State Rankings on High School Completion Rate Measures, 2002

The BCR–9 equals the number of high school completers (not including GED recipients) in spring of academic year X divided by the number of 9th graders in fall of academic year X-3. The ECR adjusts the denominator to account for net migration and 9th grade retention. See text for details.

The point that the ECR can sometimes portray a very different picture about individual states' high school completion rates is made more dramatically by comparing states' relative rankings on the BCR–9 and the ECR. The X-axis of Figure 4 arrays states according to their ranking on the ECR for the graduating class of 2002, where 1 represents the highest completion rate in 2002 (in Wisconsin) and 51 represents the lowest completion rate (in South Carolina). The states' postal abbreviations are arrayed on the Y-axis according to the difference in relative rankings between the ECR and the BCR–9. For example, whereas Wisconsin ranked 7th on the BCR–9 in 2002, it ranked 1st on the ECR in that year—a difference of +6. If the BCR–9 and the ECR yielded the same relative rankings of states—regardless of differences in absolute rates[14]—then we would expect to see all of the postal abbreviations in a line on the X-axis. But this is not what Figure 4 shows. How are states like Michigan, Ohio, Maine, and Arkansas doing relative to other states with respect to high school completion rates? The answer depends on one's choice of measure.

Figure 5 depicts the ECR for each state for the graduating class of 2002. South Carolina, Alabama, Georgia, Mississippi, and Tennessee had the lowest public high school completion rates in 2002—all below 60%—while Wisconsin, New Jersey, Iowa, Minnesota, and North Dakota had the highest rates—all above 83%. Figure 1 above showed a modest but steady decline in the ECR over time in the U.S. as a whole, and this trend holds in most individual states as well. Figure 6 demonstrates that high school completion rates declined in 41 states between 1975 and 2002, but that the size of the decline varied tremendously across states. Most states saw a decline in high school completion rates of less than 10 percentage points, although New York and Delaware saw declines of more than 15 percentage points while Vermont and the District of Columbia saw gains of more than 5 percentage points.

The ECR and Private School Enrollments and Completions

The ECR represents the percentage of incoming *public* school 9th graders in a particular state and in a particular year who complete *public* high school by obtaining a diploma. The exclusion of *private* school students and graduates from the ECR could be problematic if there have been substantial changes over time in private high school enrollments and/or completions. This is particularly true if changes in private school enrollments and/or completions have occurred unevenly across socioeconomic and/or demographic groups or across geographic areas. For example, if racial inequalities in private school attendance and/or enrollment have widened over time, then the apparent decline in the ECR (and other public high school completion rates) over time may not be a reflection of real change in students' chances of completing public school.

To assess the extent to which changes in private school enrollments and completions are driving trends in the ECR, Figures 8–10 depicts trends in the percentage of 9th through 12th graders who are enrolled in private schools by race (Figure 7), household head's education (Figure 8), and region (Figure 9) and trends by geographic region in the percentage of high school completers who graduated from private schools (Figure 10). Data for Figures 7, 8, and 9 are derived from October CPS data for 1977 through 2000; estimates are based on weighted data and reflect three-year moving averages.

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[14] Although Figure 4 focuses on differences in rankings on the ECR and the BCR–9, the actual percentage point differences are often quite sizable. For example, in 2002 the ECR was as much as 5 percentage points higher than the BCR in 15 states and as much as 5 percentage points lower in three states.

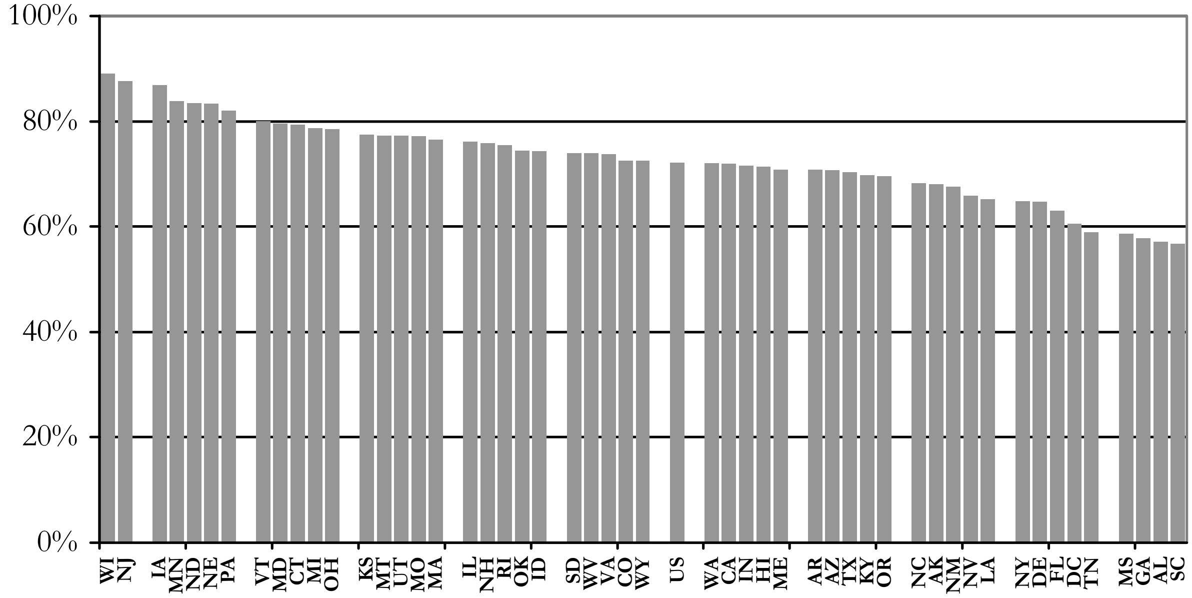

Figure 5
High School Completion Rates (ECR), by State, 2002

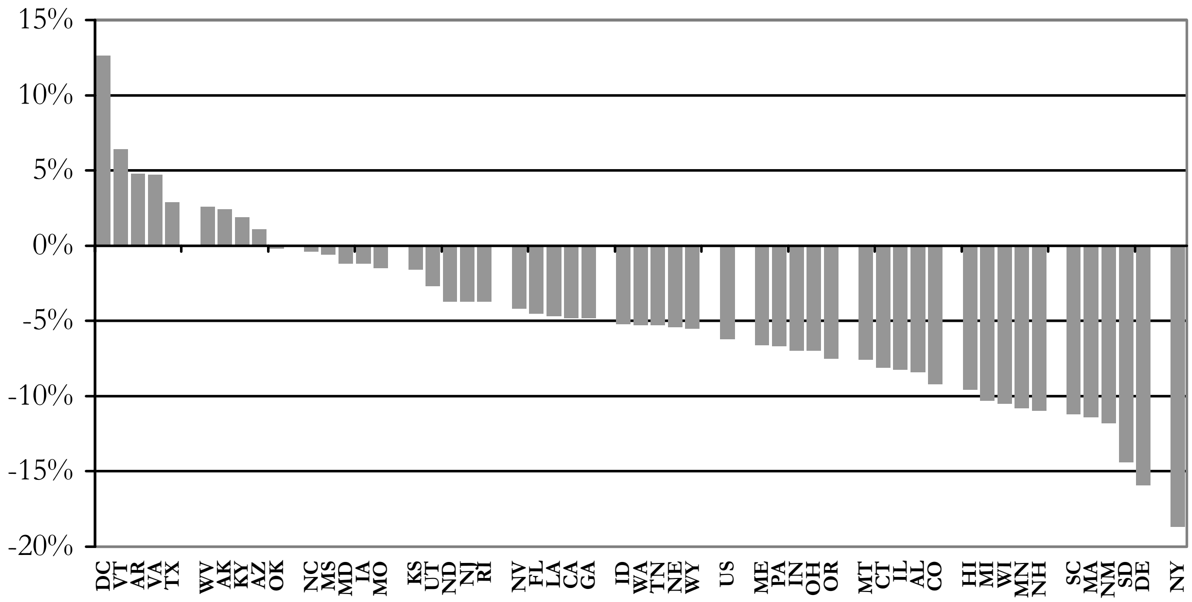

Figure 6
Changes in High School Graduation Rates (ECR) between 1975 and 2002, by State

The ECR equals the number of high school completers (not including GED recipients) in spring of academic year X divided by an estimate of the number of new 9th graders in fall of academic year X-3, with adjustment to the denominator to account for net migration. See text for details.

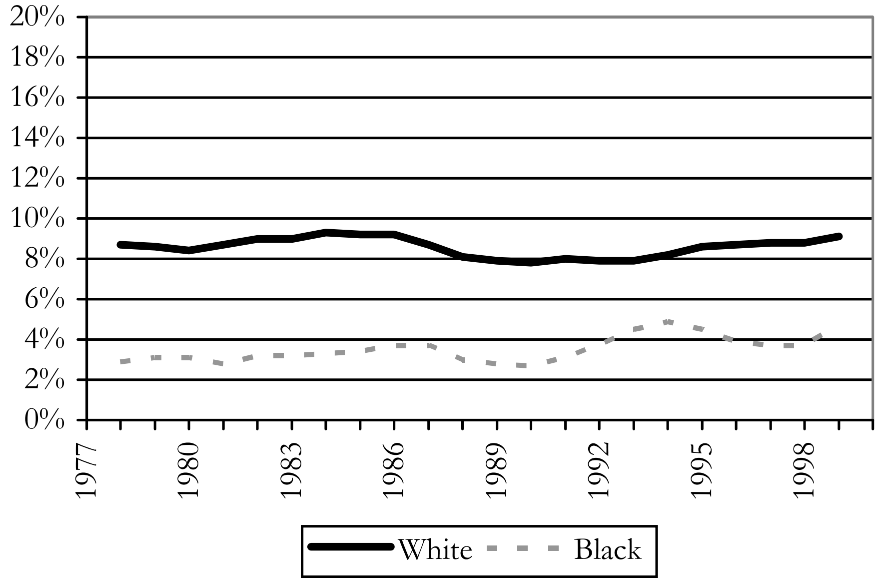

Figure 7
Percentage Enrolled in Private Schools, by Race, 1977–2000

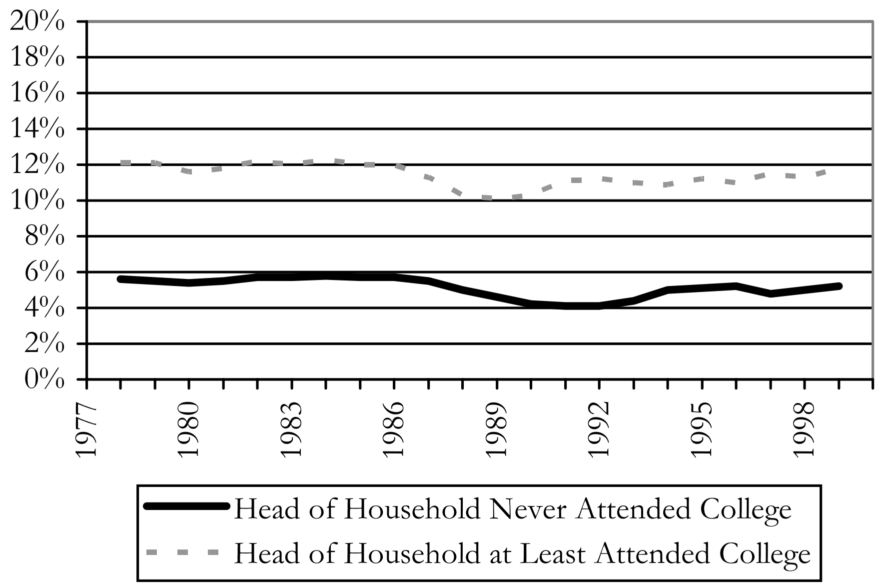

Figure 8
Percentage Enrolled in Private Schools, by Parent's Education, 1977–2000

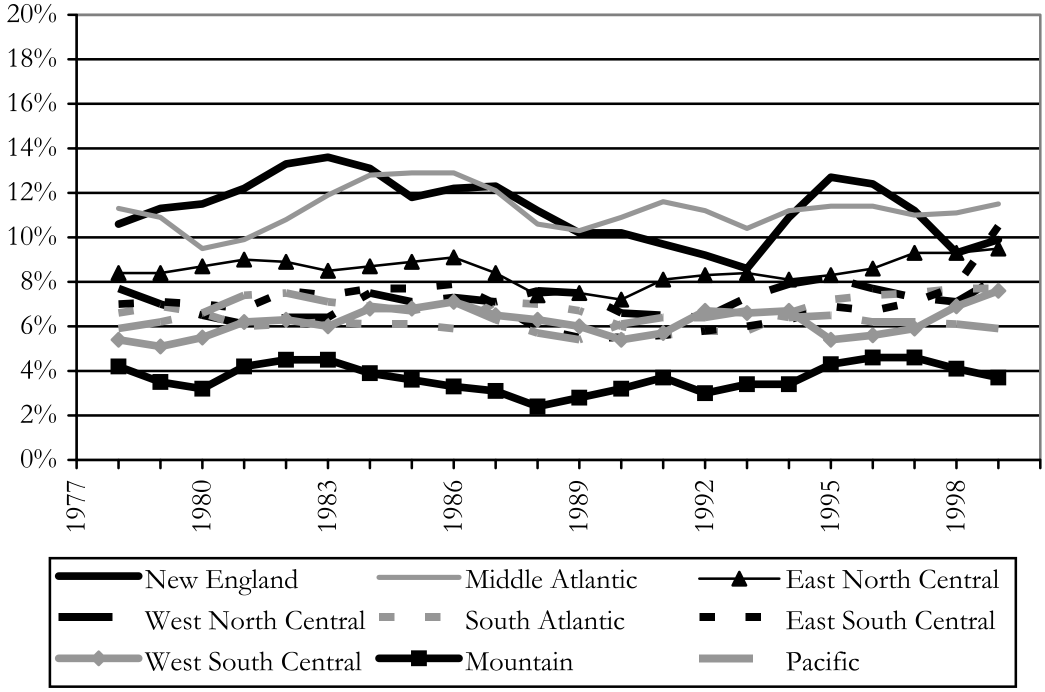

Figure 9
Percentage Enrolled in Private Schools, by Region, 1977–2000

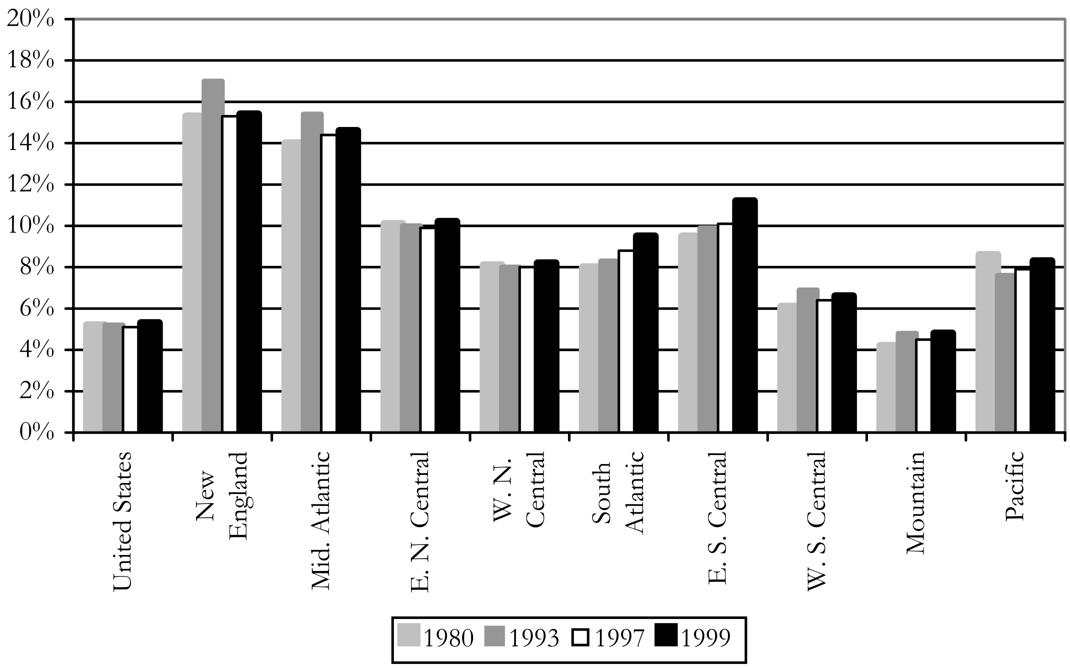

Figure 10
Percentage of High School Graduates from Private Schools, by Region, 1977–2000

Data for Figure 10 come from CCD counts of public school completers and counts of private school completers from various years of the Private School Universe Survey which is conducted periodically by the National Center for Education Statistics (U.S. Department of Education, 2001b).

About 9% of high school students are enrolled in private schools. This figure has not changed perceptibly since at least 1977. Whites, students whose household head attended at least some college, and students in the New England and Middle Atlantic states are more likely than their peers to attend private high schools; none of these disparities in rates of private school attendance have changed perceptibly since at least 1977. Finally, as depicted in Figure 10, there are notable regional differences in the rate at which high school completers graduate from private schools. However, neither the overall percentage of completers graduating from private schools nor regional differences in that percentage have changed since at least 1980. There are likely many factors behind changes over time and differences across states in public high school completion rates, but changes in private school enrollments and completions likely play a very small role.

The ECR and International In-Migration

The migration adjustment to the denominator of the ECR conceptually represents the net change in the size of a given cohort between ages 13 and 17; such changes can only be the result of migration and mortality. We begin with *n* 13 year olds in a particular state in a particular year. Over the next four years, some of the *n* die, some of the *n* leave the state, and individuals not counted among the original *n* move from outside of the state—either from other states or from abroad. A potential problem with this approach to adjusting for migration concerns young people who move to the U.S. from abroad between the ages of 13 and 17 but who do not enroll in public school. These students inflate the denominator of the ECR but can never appear in the numerator, and so they reduce ECR rates. To the extent that young people immigrate to the United States between ages 13 and 17 but do not enroll in school the ECR may unfairly understate the public high school completion rate; this bias may be especially pronounced in states that experience high levels of immigration. The size of this problem is an empirical question that is addressed in Table 4.

Columns 1 through 4 of Table 4 are based on data for 13 to 17 year olds from the 2000 U.S. Census 5% PUMS file. Column 1 reports the total number of 13 to 17 year olds in each state as of the 2000 enumeration. Column 2 reports the number of 13 to 17 year olds who were born outside of the U.S.—about 8.1% of all 13 to 17 year olds nationwide—and Column 3 reports the number of 13 to 17 year olds who were born outside of the U.S. *and who came to the U.S. after age 12*. About 20.3% of foreign born 13 to 17 year olds came to the U.S. after age 12. However, Column 4 shows that the vast majority of these young recent immigrants—about 73.5%—*were* enrolled in school in 2000. Nonetheless, in 2000 there were more than 87,000 people between the ages of 13 and 17 who immigrated after age 12 and who were not enrolled in school. If we assume that *none* of these young immigrants were ever enrolled in U.S. public schools, and remove them from the migration adjustment to the denominator of the ECR, the ECR in 2000 changes from 71.9% nationwide (Column 5) to 73.7% nationwide (Column 6)—an increase of 1.8 percentage points. The ECR understates the public high school completion rate by less than 1 percentage point for 28 states, but by more than 2.5 percentage points in 7 states—all of which experience high levels of international immigration.

Table 4
ECR in 2000, by State, Before and After Accounting for Immigrants Who Are Not Enrolled in School

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Age 13 to 17 in 2000 U.S. Census	Of (1), Foreign Born	Of (2), Age > 12 at Arrival	Of (3), Not Enrolled	ECR Original	ECR Adjusted	Net Change
US	19,978,798	1,622,278	330,741	87,777	71.9%	73.7%	-1.8%
AL	317,545	6,765	1,353	594	58.6%	59.1%	-0.5%
AK	52,645	2,965	417	84	64.3%	64.9%	-0.5%
AZ	358,360	42,341	8,740	3,466	61.0%	64.6%	-3.6%
AR	194,320	5,471	1,418	470	71.7%	72.6%	-0.9%
CA	2,432,111	434,935	76,798	20,503	71.9%	75.5%	-3.6%
CO	301,799	24,919	6,658	2,444	68.2%	71.3%	-3.1%
CT	226,214	16,580	4,139	763	85.0%	86.8%	-1.8%
DE	51,830	3,110	548	193	65.2%	66.6%	-1.4%
DC	28,676	2,874	871	205	53.2%	55.4%	-2.2%
FL	1,017,665	119,889	27,115	5,585	61.7%	63.7%	-2.1%
GA	578,801	37,107	10,642	4,418	56.9%	59.3%	-2.4%
HI	81,871	8,543	1,309	181	73.1%	74.1%	-0.9%
ID	107,171	5,327	885	246	74.1%	75.0%	-0.8%
IL	875,252	73,914	16,652	4,987	80.8%	83.9%	-3.0%
IN	439,851	11,383	2,683	726	68.7%	69.3%	-0.6%
IA	214,455	6,726	1,564	389	84.1%	84.9%	-0.8%
KS	205,690	9,519	2,113	710	74.8%	76.1%	-1.4%
KY	283,911	5,619	1,125	335	69.6%	70.1%	-0.4%
LA	356,135	6,497	1,217	131	63.0%	63.1%	-0.1%
ME	91,458	2,736	399	16	71.7%	71.8%	-0.1%
MD	372,324	27,724	6,106	905	78.5%	79.6%	-1.2%
MA	407,777	33,218	6,761	632	78.1%	78.8%	-0.7%
MI	719,235	27,413	5,779	991	79.5%	80.1%	-0.6%
MN	376,771	21,994	4,063	653	85.3%	86.1%	-0.8%
MS	219,934	2,658	559	240	57.2%	57.5%	-0.3%
MO	412,061	10,489	2,440	342	76.6%	77.0%	-0.4%
MT	72,404	1,658	271	51	77.3%	77.6%	-0.3%
NE	133,761	5,174	1,338	268	83.9%	84.8%	-0.9%
NV	129,894	16,449	3,117	1,190	64.3%	67.8%	-3.6%
NH	88,759	2,757	726	108	75.9%	76.4%	-0.5%
NJ	548,659	66,370	12,597	2,553	88.9%	91.7%	-2.8%
NM	149,122	9,817	1,680	467	66.5%	67.7%	-1.2%
NY	1,272,119	172,198	33,449	5,532	69.7%	71.6%	-1.9%
NC	524,338	27,629	7,177	3,162	67.6%	70.0%	-2.4%
ND	52,592	1,017	147	0	84.9%	84.9%	0.0%
OH	809,875	16,890	3,147	600	76.2%	76.5%	-0.3%
OK	256,749	8,868	2,504	1,066	74.4%	76.0%	-1.6%
OR	242,317	17,932	4,036	1,122	67.2%	68.9%	-1.7%
PA	843,099	27,232	4,655	547	82.0%	82.3%	-0.3%
RI	69,073	5,550	939	241	76.8%	78.5%	-1.7%
SC	280,888	7,697	1,724	455	56.2%	56.7%	-0.5%
SD	60,853	1,625	408	14	76.4%	76.5%	-0.1%
TN	388,873	11,912	2,613	779	58.6%	59.2%	-0.7%
TX	1,617,029	169,630	38,118	14,915	68.0%	71.4%	-3.4%
UT	202,640	10,886	2,767	868	78.6%	80.3%	-1.7%
VT	44,242	1,077	187	16	80.2%	80.4%	-0.2%
VA	477,320	34,702	6,833	1,430	74.1%	75.3%	-1.2%
WA	429,682	39,720	7,315	1,586	71.7%	73.1%	-1.4%
WV	120,538	1,014	154	0	75.5%	75.5%	0.0%
WI	399,801	12,813	2,260	584	86.1%	86.9%	-0.7%
WY	40,309	690	173	0	75.3%	75.3%	0.0%

The figures in Table 4 can only be reliably computed for 2000, and should serve as a cautionary note: The ECR—as well as the ACR II (Greene & Winters, 2005), which uses a similar migration adjustment—modestly understates public high school completion rates in states with many international immigrants who come to the U.S. between ages 13 and 17 and who do not enroll in school.

Does the Choice of Measure Drive Substantive Results?

As demonstrated above, conclusions about states' absolute and relative public high school completion rates differ depending on how states' high school completion rates are measured. Beyond these descriptive differences, it is worth considering whether different state-level measures of public high school completion perform differently in the sorts of empirical analyses in which researchers may use them. To address this issue I have estimated models of the effect of states' secondary school pupil-teacher ratios and states' unemployment rates on state-level high school completion rates using alternate measures of the dependent variable. Data on states' secondary school pupil-teacher ratios are derived from CCD data, and data on states' unemployment rates is derived from CPS data as computed by the Bureau of Labor Statistics. Briefly, we estimate a series of state and year fixed-effects models in which the 588 state-years between 1991 and 2002 are our units of analyses.[15] Our models include state and year fixed effects plus one time-varying covariate: either state secondary school pupil-teacher ratios or states' unemployment rates. These analyses are by no means complete substantive analyses; they are simply designed to investigate whether substantive conclusions might depend on how states' high school completion rates are operationalized.

Table 5
State and Year Fixed-Effect Models of High School Dropout/Completion Rates, 1975-2002

Variable	CPS *b* (s.e.)	BCR *b* (s.e.)	ACR II *b* (s.e.)	CPI *b* (s.e.)	ECR *b* (s.e.)
Model A. Fixed-Effect Model with State Pupil-Teacher Ratios as a Time-Varying Covariage					
Pupil/Teacher	-0.06	-0.05	-0.23	-0.37	-0.29*
Ratios	(0.09)	(0.13)	(0.13)	(0.23)	(0.12)
Model B. Fixed-Effect Model with State Unemployment Rates as a Time-Varying Covariate					
Unemployment	0.03	-1.38**	-0.32	-1.38**	-0.23
Rate	(0.14)	(0.20)	(0.20)	(0.35)	(0.20)

Because the ACR II does not include estimates for Arizona or Washington, D.C., for most years, these analyses are based on just 49 states.
* $p < .05$; ** $p < .01$

Table 5 reports the results of these models. The models in each column use a different measure of state-level high school completion rates: a CPS status dropout rate for 16-to–19 year-olds, the BCR–9, the ACR II, the CPI, and the ECR. Model A includes states' secondary school pupil-teacher ratios as the only time-varying covariate, and Model B includes states' unemployment

[15] The ACR II has only been computed for 1991 through 2002, and does not include estimates for Arizona or the District of Columbia. Thus the 588 state-years include 49 states over 12 years.

rates as the only time-varying covariate. The results of Model A show that states' secondary school pupil teacher ratios are related to high school dropout/completion rates only when the ECR is used to measure states' high school completion rates. The results of Model B show that state unemployment rates are associated with lower high school completion rates—but only when the BCR–9 or the CPI are the measure of high school completion rates. In general, the results in Table 5 suggest that substantive results may depend in important ways on how state-level high school completion rates are measured. This highlights the importance of utilizing a measure that is conceptually sound and as unbiased as possible.

Discussion

In this paper I reviewed and critiqued existing state-level measures of high school completion that use CPS or CCD data. Measures based on the CPS are conceptually inappropriate for present purposes and are typically statistically unreliable because of small sample sizes in many states. Measures based on Common Core Data (CCD) *dropout* information are unavailable for many states and have their own conceptual weakness. As shown in a series of simulations, existing measures based on CCD *enrollment* and *completion* data are systematically biased by migration, by changes in cohort size, and/or by grade retention. The BCR–8, the BCR–9, the ACR I, the ACR II, and the CPI systematically misrepresent absolute rates of high school completion, states' relative standing with respect to high school completion rates, and trends over time in rates of high school completion.

After critiquing existing CCD-based measures I went on to describe a new measure—labeled an Estimated Completion Rate (ECR)—that uses these data to produce state-level public high school completion rates for 1975 through 2002. The ECR conceptually represents the percentage of incoming public school 9th graders in a particular state and in a particular year who obtain any public high school diploma. This measure is not influenced by changes over time in incoming cohort sizes, inter-state migration, or 9th grade retention. While the ECR conceptually overcomes the key systematic biases in other CCD-based high school completion rates that are produced by changes in cohort size, migration, and 9th grade retention, its empirical accuracy hinges on the validity of the estimates of first-time 9th graders and the migration adjustment (and, of course, on the quality of the CCD data themselves). However, as described above the ECR does a good job of approximating high school completion rates observed in longitudinal studies like NELS–88. There is certainly some degree of random error in the ECR estimates. However, the systematic biases in the ECR are far less numerous and smaller in magnitude than the systematic biases in alternate measures; indeed all of the biases inherent in the ECR are also inherent in the BCR–8, the BCR–9, the ACR I, the ACR II, and the CPI. Because different measures paint very different pictures of states' absolute and relative high school completion rates, and because (as shown in Table 5) the choice of measure of states' high school completion rates can affect substantive empirical results, it is important for researchers to utilize a measure of state-level high school completion rates that is as conceptually sound and as unbiased as possible. I argue that the ECR is the best choice in this regard.

While the ECR does a better job of accounting for sources of systematic bias that plague other measures that use the CCD, the ECR is certainly limited in a number of respects and will not be useful for all purposes. First, because the ECR is a measure of the overall public high school completion rate (not of the four-year completion rate) and because I do not restrict the numerator to regular diploma recipients, the ECR is not in line with the guidelines for measuring AYP in No Child Left Behind. Second, I have not computed the ECR separately by race/ethnicity (or even gender) because the CCD data do not contain race/ethnic-group specific completion counts for some states and because of the difficulties involved in producing valid and reliable group-specific migration adjustments. Third, the ECR cannot readily be computed at the school or school-district level. As a result I have not computed the ECR at geographic levels below the state, despite the need for local-level measures presented by the annual yearly progress requirements of the 2002 No Child Left Behind legislation. Fourth, as described above, the ECR modestly understates high school completion rates in the presence of 8th grade retention and in states with high levels of international in-migration. Fifth, the ECR categorically treats GED recipients as individuals who have not completed high school. For many purposes this is a virtue of the ECR, but for other purposes it may be seen as a weakness. It is conceivable that the ECR could be amended to include GED recipients in the numerator using data from the GED Testing Service,[16] although it would be difficult to know which year GED recipients should be counted in the numerator of that revised ECR. Despite these limitations, the ECR is an improvement over other CPS- or CCD-based measures. It is subject to random error, it is modestly biased by 8th grade retention and international in-migration, and it cannot be computed at the sub-state level. However, the other measures reviewed in this paper are also subject to the same random errors, are in some cases biased by international in-migration, and are subject to larger systematic biases as a result of inter-state migration and 9th grade retention (which is much more prevalent than 8th grade retention). None of these measures is perfect, but the ECR minimizes systematic bias.

The ECR—like all other CCD-based measures of high school completion—shows a disquieting trend: Since at least the mid–1970s the rate at which incoming 9th graders have gone on to obtain a diploma has declined modestly but steadily. In the 2002, only about three of every four public school students who might have completed high school actually did so. In 10 states the public high school completion rate declined by more than 10% between 1975 and 2002; it increased in only eight states and the District of Columbia. Any number of factors may account for this trend, including (but not limited to) changes in the demographic composition of students, increases in GED certification rates, and/or changes in a wide variety of education policies. In any case, careful investigation of the sources and consequences of this trend requires a conceptually sound and empirically valid measure of high school completion rates.

[16] CCD data on numbers of GED recipients varies in quality from state to state and over time.

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