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Get Real! Inflation Adjustments of Education Finance Data

Christopher A. Candelaria
Vanderbilt University

Kenneth A. Shores
Pennsylvania State University

Use of education finance data is ubiquitous. Yet, because the academic calendar circumscribes two calendar years, researchers have linked the Consumer Price Index to three different dates: the Fall, Spring and academic fiscal years. We demonstrate that linking the CPI to these different academic year results in identifying different trends in U.S. educational spending during the Great Recession. Descriptive inferences should not be sensitive to researcher discretion about merge years. We provide an easy-to-use software package to facilitate implementation of NCES guidelines in the hope that future analyses of education finance data will explicitly and consistently apply inflation adjustments.

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Get *Real!* Inflation Adjustments of Education Finance Data

Christopher A. Candelaria
Vanderbilt University

Kenneth A. Shores
Pennsylvania State University

Abstract

Use of education finance data is ubiquitous. Yet, because the academic calendar circumscribes two calendar years, researchers have linked the Consumer Price Index to three different dates: the Fall, Spring and academic fiscal years. We demonstrate that linking the CPI to these different academic year results in identifying different trends in U.S. educational spending during the Great Recession. Descriptive inferences should not be sensitive to researcher discretion about merge years. We provide an easy-to-use software package to facilitate implementation of NCES guidelines in the hope that future analyses of education finance data will explicitly and consistently apply inflation adjustments.

Keywords: School Finance, Consumer Price Index, Inflation Adjustment

Introduction

The National Center for Education Statistics (NCES) maintains a widely-used data repository of annual district-level finances, the Local Education Agency Finance Survey (F-33). Administered by the U. S. Census Bureau, the F-33 collects data from the universe of school districts in the United States, providing annual data on revenues and expenditures. To properly make comparisons about finances over time, one must account for changes in inflation, as the value of the dollar fluctuates across years. Typically, users of F-33 data transform nominally reported dollar values into so-called "real" dollars using the Consumer Price Index (CPI), which is reported monthly by the Bureau of Labor Statistics. The process is seemingly straightforward: first, average monthly CPI data into an annual series; second, index the series to a chosen base year or period; and third, divide nominal dollars by the series. Yet, these inflation adjustments have been inconsistently applied to school finance data, thereby affecting basic inferences about changes or trends in revenues over time, particularly during inflationary periods. In this brief, we describe this inconsistency, demonstrate the consequences of it using aggregated data around the years of the Great Recession as an example, and suggest guidelines for future analyses that use education finance data.

Inconsistency of CPI

The typical academic year straddles two calendar years (i.e., Fall in year *t* and Spring in year *t+1*); for this reason, most education finance data also encompass two calendar years. Thus, researchers have a choice about the months of the CPI they use to form annual averages, which can then be merged to an educational finance dataset, as illustrated in Figure 1.

<Figure 1 about here>

We have identified an inconsistency in the merge-year to which the CPI and school finance data are combined. As seen in Figure 1, there are at least three ways one can merge annual CPI to education finance data. In the first approach (e.g., Chingos and Blagg, 2017; Merge 1), one creates an annual CPI by averaging monthly CPI across all months in a calendar year and then merging these annual CPI data to the Spring academic year (e.g., average monthly CPI from January to December in calendar year 2008 and merge to the 2007-08 Spring academic year). In the second approach (e.g., Evans, Schwab, and Wagner, 2019; Merge 2), one creates an annual CPI by averaging monthly CPI across all months in a calendar year and then merging these annual CPI data to the Fall academic year (e.g., average monthly CPI from January to December in calendar year 2008 and merge to the 2008-09 Fall academic year). In the third approach (e.g., Snyder, De Brey and Dillow, 2018; Leachman, Masterson, and Figueroa, 2017; Merge 3), one creates an annual CPI by averaging monthly CPI across the months that overlap with the academic year's fiscal calendar—for most but not all states, the academic fiscal year begins in July in year *t* to June in year *t+1*. Thus, there are at least three possible merge-years, and, as we demonstrate below, inconsistency in merge-year approaches can result in different inferences about aggregate trends in school revenues, especially when there are year-over-year fluctuations in the value of a dollar (i.e., during inflationary and deflationary periods).

Implications of CPI Merge-Year Choice

In Figure 2, we illustrate one implication of inconsistent merge-years between the CPI and education finance data using district-level data aggregated at national and state levels. Across all subfigures, we plot real per-pupil total revenues for academic years 2005–06 to 2014–15 in baseline units, meaning that we normalize per-pupil total revenues to be 100 in the 2005–06 school year; therefore, per-pupil total revenues in subsequent years are expressed as percentage points relative to

2005–06. In the left panel, we plot per-pupil total revenues in terms of baseline growth for the entire U.S.; in the right panel, to exemplify heterogeneity in educational revenues due to the Great Recession, we generate similar plots for the two states with the greatest (Arizona and Nevada) and least (Alaska and North Dakota) percent change in employment during the recession (Connaughton and Madsen, 2012). Each line in Figure 2 corresponds to one of three merge-years described above. Vertical gray shading corresponds to the Great Recession period beginning December 2007 and ending June 2009.

<Figure 2 about here>

As illustrated in Figure 2, during the Great Recession, educational revenues in the U.S. appeared to peak in two different years, depending on whether we merged the calendar CPI to the Spring or Fall academic years. When the CPI is merged to the Fall academic year, per-pupil total revenues peaked in 2007–08 and declined by about two percentage points (roughly $300 per pupil) by 2008–09. In contrast, when the CPI is merged to the Spring academic year, per-pupil total revenues increased between 2007–08 and 2008–09 by about two percentage points (roughly $300 per pupil) and then began its descent in 2009–10. Between the two measures, the total per-pupil decline (peak to trough) is similar, at about eight percentage points (roughly $1,000 per pupil), though the Fall merge decline began one year later.

Comparing across states is useful as it illustrates that the behavior of the merge-year decision is not consistent. For instance, changes in per-pupil total revenues in Nevada mirror the national pattern, but in Arizona peak revenues occurs in the 2007–08 academic year, irrespective of merge-year. In contrast, for Alaska and North Dakota, states in which the Great Recession did not result in severe employment or educational revenues losses, the patterns of revenues changes are the same irrespective of merge-year.

Explanation for Merge-Year Discrepancies

Fundamentally, applying calendar-year CPI to an academic year means that only one-half of the academic year will be properly adjusted for the effect of inflation. In Figure 3, we visually show that time-varying differences in real revenues between the Fall and Spring merge-years can be attributed to increases or decreases in the rate of inflation.[1] To illustrate this relationship, we first plot the difference between (a) real per-pupil revenues adjusted by the Fall merge-year and (b) real per-pupil revenues adjusted by the Spring merge-year. These differences in revenues are represented on the left vertical axis. Second, we plot the annual inflation rate using the Spring merge-year, which is shown on the right vertical axis.[2] As shown in Figure 3, larger differences in real per-pupil revenues between Fall and Spring merge-years align with changes, both inflationary and deflationary, in the value of the dollar.

<Figure 3 about here>

Suggestions for CPI Merge-Year and Stata Program

Because education finance data overlap multiple calendar years, to correct for inflation we recommend following NCES guidelines by constructing an annual CPI index that corresponds to the months of the academic fiscal year. As shown in Figure 2, total per pupil revenues indexed to the academic fiscal year CPI generally fall within the Fall and Spring merge-years. Using the academic fiscal year CPI, per pupil total revenues for the U.S. peaked in 2008–09, although the change from 2007–08 to 2008–09 is not as dramatic as compared to the annual percent change using the Spring merge-year. To facilitate a consistent and explicit use of the CPI when evaluating education finance data, we are providing a Stata package called `cpiget` which obtains monthly CPI data directly from

[1] We thank an anonymous reviewer for this suggestion.
[2] We use the Spring merge-year because the time variable is the Spring of the academic year.

the Federal Reserve Economic Data (FRED) and then allows researchers to flexibly specify a desired fiscal-year period and CPI base period, which can then be used to convert nominal dollars to real dollars on a consistent basis. Software and help file can be downloaded through the Statistical Software Components (SSC) archive hosted by the Boston College Department of Economics.[3]

Conclusion

Generally, differences in the levels of per-pupil revenues between Spring and Fall academic merge-years will fluctuate according to fluctuations in the inflation rate (see Figure 3); however, trends in per pupil revenues between the two merge-years will be similar when the year-over-year change in the inflation rate is stable (see Figure 2). Yet, differences in trends can appear when there are large inflationary or deflationary shocks, such as observed during the Great Recession. And it is exactly in these situations of fiscal distress that our inferences about trends are most sensitive to merge-year decisions. Therefore, consistent or at least explicit application of these decision rules is necessary for future research using education finance data.

[3] To install in Stata, type `ssc install cpiget` at the command-line prompt. Program webpage: https://ideas.repec.org/c/boc/bocode/s458682.html

References

Chingos, M. and Blagg, K. (2017, August). *How has Education Funding Changed over Time? Technical Appendix*. Retrieved from http://apps.urban.org/features/education-funding-trends/Appendix.pdf

Connaughton, J. E., & Madsen, R. A. (2012). US state and regional economic impact of the 2008/2009 recession. *Journal of Regional Analysis and Policy*, *42*(1100-2016-90101).

Evans, W. N., Schwab, R. M., & Wagner, K. L. (2019). The Great Recession and public education. *Education Finance and Policy*, *14*(2), 298-326.

Leachman, M., Masterson, K., & Figueroa, E. (2017). A punishing decade for school funding. *Washington: Center on Budget and Policy Priorities*.

National Bureau of Economic Research. (2010). US business cycle expansions and contractions.

Snyder, T. D., De Brey, C., & Dillow, S. A. (2018). Digest of Education Statistics 2016, NCES 2017-094. *National Center for Education Statistics*. Table 236.55

Figure 1: CPI-to-School Finance Merge Options

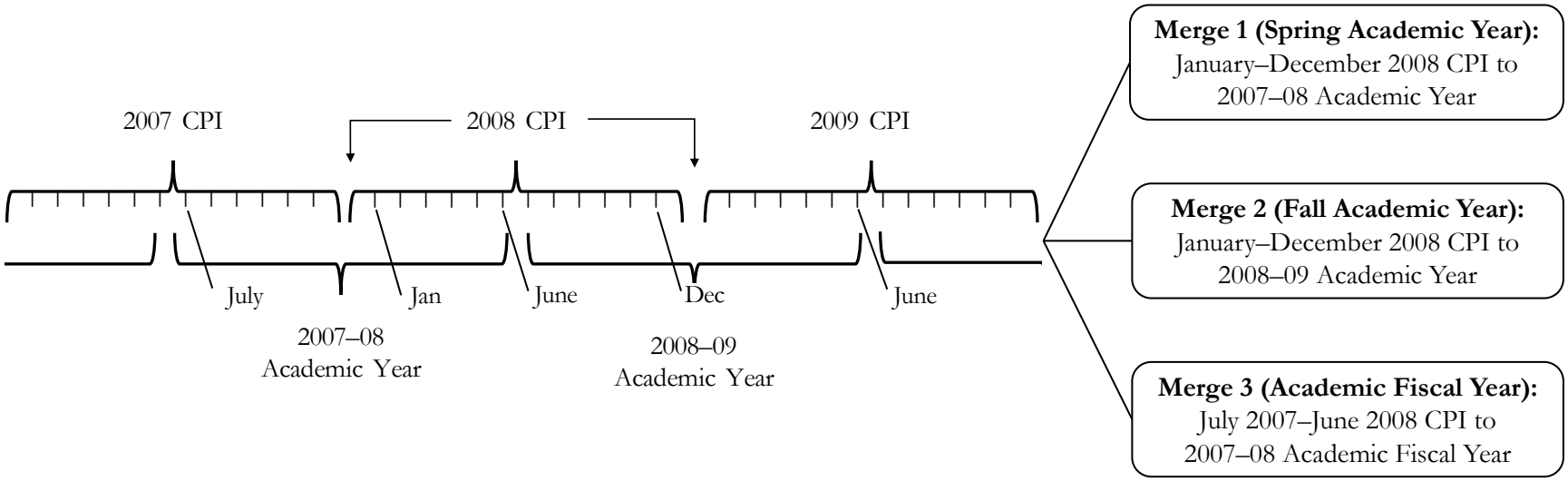

Figure 2: Normalized change in revenues, by CPI-to-School Finance Merges

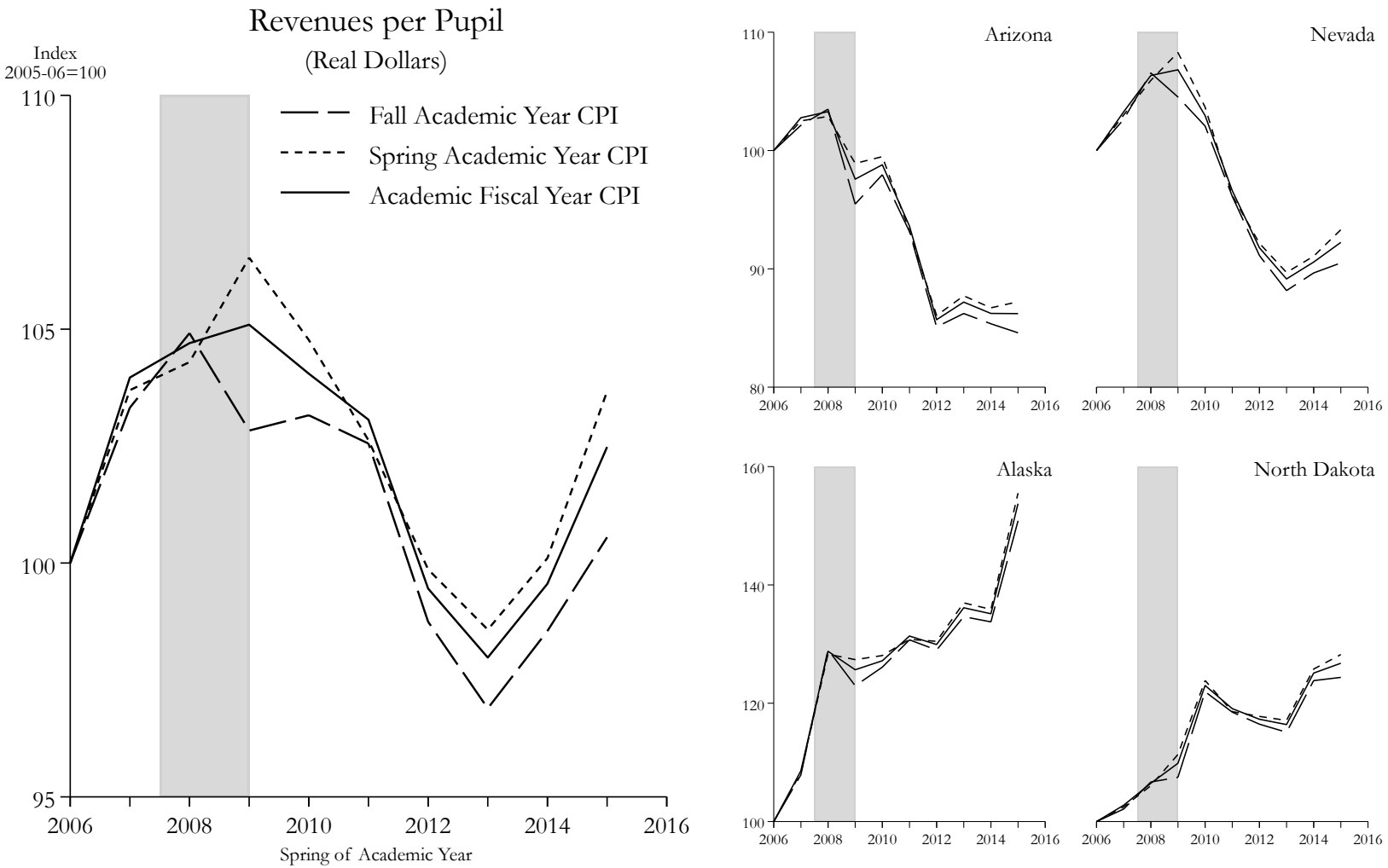

Figure 3: Trends in the Difference between Real Revenues using Fall and Spring Academic Merge-Years and the Inflation Rate