Report 0104. Did the 2010 Christie Budget Cuts Have an Adverse Effect on Education Outcomes?

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Executive Summary. This paper analyzes the impact of the 2010 Christie budget cuts on education outcomes in New Jersey, as measured by standardized test scores at the 3rd grade level. The analysis compares the changes in test scores across districts with large and small cuts and finds little to no evidence of significant changes in scores as a result of the 2010 budget cuts. These findings are consistent with prior research analyzing the effects of changes in education spending and changes in test scores. The findings support the claim that increased education inputs as measured by spending are somehow distorted, possibly as a result of poor incentives for teachers and school administrators.

Introduction

In 2010, Governor Chris Christie cut state education aid to a large number of New Jersey school districts because of a state budgetary crisis. His opponents argued that he should have closed the budget deficit by other means, such as raising taxes or cutting other state spending programs. These opponents contend that such a drastic cut in education could have long lasting consequences for student learning. Polling data suggests that most New Jersey residents also opposed the cuts. In 2010, a Rutgers-Eagleton poll found that 59 percent of registered voters in New Jersey opposed the Christie education cuts and agreed that the New Jersey education system was underfunded (Rundquist 2011). Hu (2010) referred to the budget cuts as "crippling," and claimed that the cuts would "probably mean laying off thousands of teachers."

With growing unfunded pension and health care liabilities, it is plausible that New Jersey could face another budgetary crisis in the near future. Even today New Jersey is in fairly poor financial shape, as the state's bonds were recently downgraded to A- by S&P in 2014 (Kuriloff 2014). Another budget crisis will force politicians to make more tough decisions on K-12 education spending. Thus, evidence regarding the impact of the 2010 cuts will likely have important effects on future budget negotiations. Moreover, the analysis will illuminate the causes of weak educational outcomes. If budget cuts have no effect on student learning, it suggests that factors other than funding levels explain weak educational outcomes.

Background

3.1 Education spending and student outcomes

Advocates for more education spending focus on the purported benefits of reducing class sizes and increasing the number of teachers with post-college education. However, the evidence suggests neither policy is terribly effective. In a review of 90 separately published articles, Hanushek (1996) found that less than 17 percent of analyses showed a significant positive relationship between education expenditures per pupil and student achievement at the K-12 grade levels, as measured by standardized test performance. In addition, aggregate United States data to show that from 1960 to 2000, expenditures per pupil and percent of teachers with master's degrees have both risen drastically while class sizes have fallen (Hanushek 2003). At the same time, national standardized test scores have largely remained stagnant (Hanushek 2003). This does not necessarily imply that class size and teacher training are irrelevant, but rather suggests that other important factors that may drive outcomes or offset the gains of increasing education inputs.

3.2 State aid equalization

While the evidence linking test scores and district spending is weak, some evidence supports state education aid to poor districts. In an analysis of the impacts of state education aid on poorer districts, Card and Payne (2002) measured the change in the gap of SAT participation rates between students from differing family backgrounds. They found that equalization spending across districts reduced the gap of SAT scores between students with highly educated parents and students with less educated parents by roughly 8 points. They also found that the reduction in the SAT participation gap between students from poorer and wealthier households was "modest," as the changes in participation gaps were mostly small and statistically insignificant.

Similarly, Marlow (2000) analyzes the effects of efforts in California to redistribute resources between rich and poor school districts. Marlow explains that beginning in the 1970s, California courts issued a number of rulings designed to equalize education spending. The rulings tied school finance to a "shared tax" system that transferred funds from high-income districts to low-income districts. The results show no statistically significant correlation between education spending per pupil and educational outcomes for all grade levels (fourth, eight and tenth graders).

As a point of comparison, Marlow (2000) also measured the effect of public school monopoly power on education spending, and test scores. The index measured school monopoly power based on the number of school districts within a given county. He found that higher monopoly power had a strong positive correlation with education spending per pupil and a strong negative correlation with test results for fourth and eighth graders. Marlow (2000) suggests that stronger monopoly power draws greater education funds. This is highly relevant, because more monopolistic schools are generally more bureaucratic. Thus, funds may flow to administrators and staff, resulting in diminished

Year	ELA		Math		Change in Aid/District Budget	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
2009	207.0497	0.7534	234.0611	1.4824	0.00554	0.00354
2010	207.2060	0.7399	233.4805	1.4171	-0.00814	0.00092
2011	208.3879	0.8227	235.7980	1.3577	-0.02038	0.00082
2012	205.6154	0.8799	235.0893	1.3458	0.03897	0.00065
2013	207.5772	0.8409	229.4020	1.3259	0.00529	0.00115

Table 1: Means and Standard Deviations for Math Scores, ELA Scores and Change in State Aid as a Percent of District Budget by Year

gains in student outcomes (Marlow 2000). If state funds flow to more monopolistic schools and those funds are squandered, the case for more education spending is clearly weaker.

An interesting test case for these claims occurred in Michigan. In 1993, Michigan enacted a proposal establishing a minimum level of district spending of $5000 per pupil. The policy immediately boosted state aid to all districts, and reduced the district spending gaps between higher and lower spending districts. To test the impacts of the Michigan policy, Chaudhary (2009) uses panel data from the 1990s . After controlling for the possibility that higher test scores might cause more spending, the paper finds a statistically significant positive correlation between spending and fourth grade test scores, and an insignificant negative relationship for seventh grade test scores.

Although fourth grade scores had a statistically significant relationship with spending, the effects are small; a 10% increase (roughly $580) in per-pupil spending would increase fourth grade test scores by only one-tenth of a standard deviation. Nevertheless, the findings in Chaudhary (2009) are highly relevant to assessing the impact of the Christie cuts, as Michigan's case was extremely similar to New Jersey in 2010. While state aid increased district revenue equity in Michigan, the New Jersey cuts were larger in poorer districts as a share of total district budgets because poorer districts are more reliant on state aid.

Similar to Michigan, Massachussetts also implemented an education equalization policy in 1993. Guryan (2001) found that the increased education spending resulted in significantly higher standardized test scores for fourth graders, and insignificantly changed scores for eighth graders. He also found that the rise in test scores was largely driven by improvements in districts that historically received lower scores. Thus,, both Guryan (2001) and Chaudhary (2009) show that improvements in test scores were statistically significant only for the youngest grades tested. It appears that if a change in state aid has a significant impact on education outcomes, these studies suggest that the effects would most likely be found in younger grades.

3.3 Concerns with specifications and controls

Hanushek (1996) raises concerns that many studies on the topic of education inputs and outcomes fail include necessary controls or use inappropriate statistical designs. In studies across individual states, most studies do not incorporate any control for differing state policy environments (Hanushek 1996). Some states are more efficient at allocating education aid resources than others, thus their estimates may be subject to bias. Measuring across different districts, family and peer influences may be important in predicting student achievement. Thus, studies not accounting for aforementioned variables may also be subject to bias (Hanushek 1996). Hanushek (1996) raises similar concerns about the analysis in Card and Krueger (1992) in that it, among other things, does not account for change in the political economy of schooling. This means that teacher's union bargaining power may have strengthened over time, and thus may have affected the productivity of new education inputs.

Robust Regression on Change in Aid/Budget in 2011	
Intercept	-0.01679**
Poverty Rates	-0.05575**
** Indicates significance at 2% level	

Table 2: Robust Regression with Change in Aid as a Percent of Budget as the Dependent Variable

Policy Context

Quality education is always a topic of major concern for caring parents, as they hope their children can live happy and productive lives. Many believe that education budget cuts as severe as those in 2010 by Governor Christie, even in a time of budgetary crisis, are unacceptable. Some policy experts believe that longer durations of pupil learning time, greater academic achievement of teachers and smaller class sizes improve student outcomes and thus enhance life prospects (Oliff and Leachman 2011). The argument is fairly simple. Fewer students per teacher means more time a teacher can spend helping each student and higher wages offered to teachers should attract more talented individuals to teach. Budget cuts, such as those enacted by Christie in 2010, are likely to reduce each of these inputs.

Although it appears logical that simply increasing education inputs will improve student outcomes, it is also possible that the incentives of the current public schooling model may be distorted such that the returns of education inputs are drastically diminished. Hanushek (1996) is not surprised by the lack of correlation between per pupil expenditure and student outcomes because public schools face minimal competition and have little to no performance incentives for teachers. The lack of performance accountability could plausibly reduce the productivity of additional education resources.

Governor Christie and others in the political arena are concerned about weak or misaligned incentives in the education system. In response, Governor Christie and others champion school choice and merit pay for teachers. A possible concern with merit pay is that test scores alone may be an incomplete measure of student outcomes, and thus students may become less well rounded.

Findings

5.1 Data and methods

The 2010 budget cuts, caused by a budget crisis, act as an exogenous shock on state aid to school districts. That is, test scores do not directly influence the size of cut. To quantify the magnitude of the cuts for each district, we begin by taking the base-year state aid and subtracting by the prior year state aid for each district to find the change in state aid (Δ in aid). We then divide the change in state aid by the total district budget in the base year to create the key independent variable (Δ in aid ÷ total district budget). We analyze data for Atlantic, Bergen, Burlington and Camden counties. These four counties include municipalities located near New York, Philadelphia, rural New Jersey and the Atlantic Ocean, resulting in a geographically heterogeneous sample. To measure student outcomes, we use standardized test scores in the English and Language Arts (ELA) and Math exams for 3rd graders (NJ ASK Test).

Change in Test Scores by Relative Size of Cut. 10th Percentiles			
Year	Largest 10% of Cuts	Smallest 10% of Cuts	Difference
2011 Math	0.0070084 (0.0459534)	0.0277906 (0.0369559)	-0.0299475
2012 Math	-0.0073458 (0.0418795)	-0.0123023 (0.0243447)	-0.0316905
2013 Math	-0.0212948 (0.0302212)	-0.0245487 (0.0329544)	-0.0542492
2011 ELA	0.0055866 (0.0334705)	0.0043549 (0.0202586)	-0.014672
2012 ELA	-0.0259769 (0.0256096)	-0.0168446 (0.0254038)	-0.0513807
2013 ELA	0.0138896 (0.0281585)	0.0107764 (0.0263256)	-0.012436
No t-tests significant at 10% level. Standard deviations in parentheses			

Table 3: Mean Comparison Test of Change in Test Scores by Change in 2010 Aid as a Share of District Budget, 10th vs 90th Percentiles

We use test scores for 3rd graders because of the cuts should be most visible for younger grades. As the duration of schooling is shortest for the youngest grades, a one-year cut represents a higher percentage of their academic career. This is also consistent with Guryan (2001) and Chaudhary (2009), as both studies find that changes in state aid had a statistically significant impact on fourth graders and not for older students.

We collected data from 2009 through 2013 to capture changes in test scores from prior years and possible spillover effects from the cuts into future years. Some districts were missing data for test scores, leaving the data set with 149 total districts for each of the five years. Table 1 shows the means and standard deviations of test scores, and changes in aid as a share of district budgets by year. The 2010 cuts were in effect for the 2010-2011 school year, thus the magnitude of the cuts can be seen in the row for year 2011. Since individual district test scores vary, we examine the changes in scores from the base year as compared to the prior year, by district. If the cuts did have an impact on test scores, we expect that the changes in test scores will be most visible where the cuts are the largest. To account for this, we conduct mean comparison tests to measure the changes in test score gaps between districts that received the largest cuts (as a share of total district budget) against districts that received the smallest cuts.

Another concern with the education cuts is that it may have disproportionately harmed the poor. Since poorer districts are more dependent on state aid for school funding, we expect that poorer districts will experience larger relative cuts. A regression with the change in aid as a share of district budget as the dependent variable, and poverty rates as the independent variable shows that poverty rates are a negatively correlated with the change in aid as a share of the budget in the year 2011 (see Table 2). This means that for every percentage point increase in poverty rates, the change in aid as a share of district budget decreases by roughly 0.055 percentage points. This confirms that, on average, cuts are relatively larger for poorer districts. If the cuts did have a harmful impact on students, we would expect the changes in test scores for poor districts to be worse in the post-cut years compared to the rich districts.

Concerns of specifications and controls mentioned in Hanushek (1996) are not a concern for these tests. There are no cross-state differences in policy environment, as this paper is only using data in New Jersey. Changes in political economy of schooling and family environments

should be relatively constant because we focus on the changes in scores within a district over a short time period. (If the analysis used test score levels rather than changes in scores, then adjustments for family backgrounds and other controls would be necessary.)

means of test scores for the same groups in 2012 and 2013. As seen in in Table 3, none of the years show any significant difference in the changes in scores. Because the sample size for the bottom and top 10 percent is rather small, we conduct the same tests for the 25th percentiles in 2011 and 2012. On this comparison, we find a significant difference (at the 5% level) in the means for the

Change in Normalized Scores, by Relative Size of 2010 Cut. 25th Percentiles			
Year	Largest 25% of cuts	Smallest 25% of cuts	Difference
2011 Math	9.992772 (15.3020)	6.254578 (20.22376)	3.738194
2012 Math	1.828327 (14.64152)	0.5408255 (17.66353)	1.2875015
2011 ELA	9.117627 (22.81537)	8.935516 (20.6129)	0.182111
2012 ELA	3.64979 (16.87903)	-9.08379 (16.56034)	12.73358
No t-tests significant at 10% level. Standard deviations in parentheses			

Table 4: Mean Comparison Test of Change in Normalized Scores by Change in 2010 Aid Share of District Budget, 25th vs 75th Percentiles

5.2 Results

Figure 1 displays time-series lines for each of the poorest districts in the sample (bottom 10 percent). The charts show the relation between change in aid as a share of district budget and change in math scores. The charts show no strong positive correlation between changes in aid and changes in math scores. Figures 2 and 3 show histograms of math and ELA score distributions for pre- and post-budget-cut years (2010 and 2011). In both histograms, it appears that the post-cut test score distributions are not significantly different from the pre-cut test score distributions.

The first series of tests compares the change in math scores for 2011 for the districts with the largest cuts (top 10 percent) and the districts with the smallest cuts (bottom 10 percent). In addition, we test for possible spillover effects of the cuts in future years by comparing the change in math scores in 2011, as the schools with smaller cuts showed higher scores.

We conduct the same mean comparison tests for changes in ELA scores. Table 3 compares the change in ELA scores for 2011 for the districts with the largest cuts (top 10 percent) and the districts with the smallest cuts (bottom 10 percent). The results show no significant difference in the means for 2011, 2012 and 2013. When we compare the means of the 25th and 75th percentiles, we find significant differences for 2012. However, the effect has the wrong sign, meaning schools with larger cuts improved more than schools with smaller cuts.

Since it is possible that test difficulty can change from year to year, we also test for differences using normalized test scores. To derive the normalized measure, we subtracted the district test scores by the test score mean and divided by the standard deviation for each test and year. If the significant difference in the raw

math score changes in 2011 was the consequence of a general shift in the distribution of test scores, then the difference in the means should disappear on a normalized scale.

Table 4 reports these results. In Table 4 we see that there are no significant differences in changes in normalized test scores between districts with the largest cuts and districts with the smallest cuts. In fact, the districts with the largest cuts improved their normalized score slightly more than the schools with the smallest cuts (25th percentile). In Table 4, we also see that the significant difference in the change in raw ELA scores found in 2012 disappears after adjusting for the normalized scores. The means analyzed for normalized ELA score changes show no significant differences for both years analyzed. Thus, the only statistically significant outcome in Table 3 (changes in raw scores) disappears when we normalize the test scores.

To test whether poorer districts were harmed disproportionately by the cuts, we perform a mean comparison test of the change in normalized scores based on poverty levels for both math and ELA score changes. In the year of the cuts, and up to two years after, there are no statistically significant differences in the changes in normalized test scores as seen in Table 5. It appears that the poorest districts did not see a drop in scores relative to rich districts.

Change in Normalized Scores, by Poverty Rate. 25th Percentiles			
Year	Poorest 25%	Richest 25%	Difference
2011 Math	3.921408 (13.80011)	1.78307 (16.88407)	2.138338
2012 Math	4.074594 (13.2362)	1.304285 (17.86776)	2.770309
2013 Math	-2.170117 (18.20776)	-3.365787 (13.27608)	1.19567
2011 ELA	7.118916 (16.07157)	7.84249 (17.18832)	-0.723574
2012 ELA	0.0914522 (12.99292)	0.1575802 (16.98512)	-0.066128
2013 ELA	7.254334 (19.42961)	2.967281 (16.23233)	4.287053
No t-tests significant at 10% level. Standard deviations in parentheses			

Table 5: Mean Comparison Test of Change in Normalized Scores by Poverty Rates, 25th vs 75th Percentiles

Recommendations

6.1 Implications from the results

After comparing changes in test score means of districts that were cut the most versus districts cut the least and the poor districts versus rich districts, there appears to be little to no empirical evidence to support the claim that the 2010 Christie cuts had an adverse effect on education. Although it is plausible that students were impacted in ways not measured by test scores, such as reduced opportunities in athletics or other memorable activities, the results of this paper are consistent with Hanushek's (1996) claim that changes in education inputs may not change student outcomes due to weak or misaligned incentives in the education system.

6.2 Policy proposals and recommendations

Weak student performance is a difficult issue to solve with a simple "silver bullet" solution. As Hanushek (1996) states, "Simply saying 'performance incentives,' however, is easier than implementing incentives that have

desired outcomes." The results of this paper provide evidence that cutting educational spending cuts is not as harmful as many believe. In addition, increases in spending will likely fail to improve education outcomes. Consequently, structural reforms are likely a more promising path to higher educational performance.

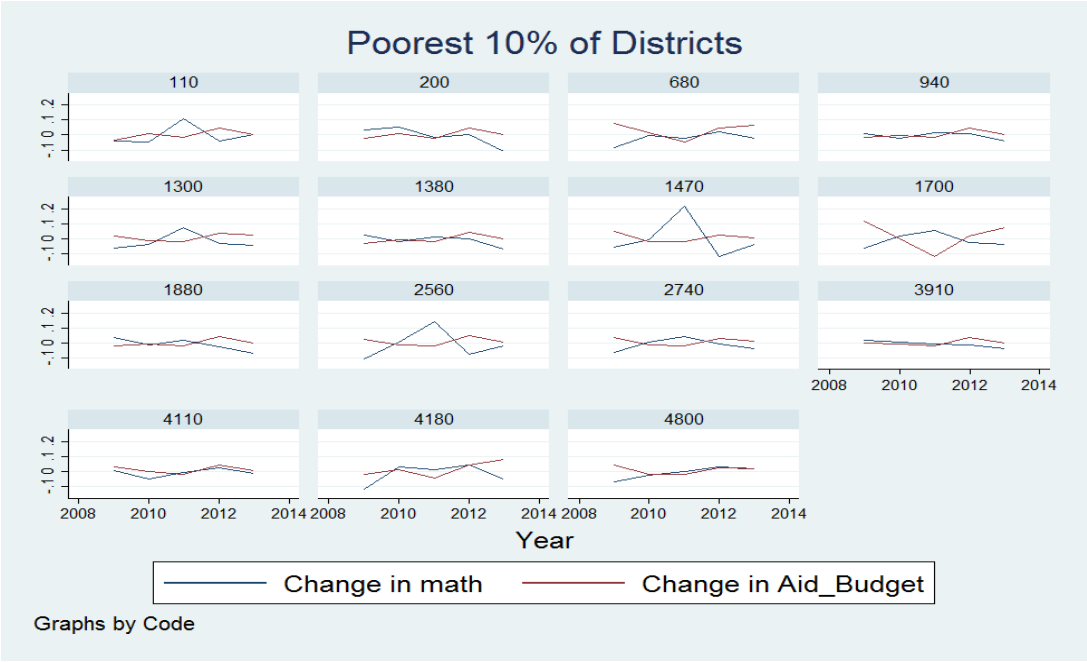

Figure 1: Change in Math Scores vs Change in Aid as Percent of Budget, Poorest 10% of districts

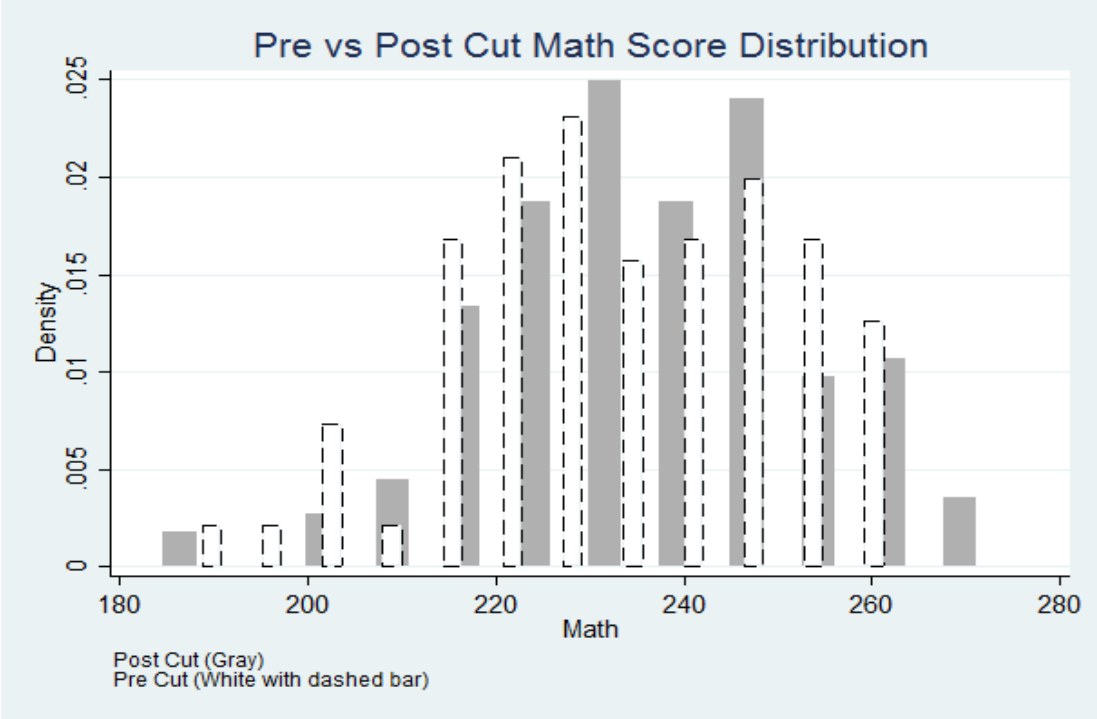

Figure 2: Histogram of 2010 Math Scores (Pre Cut Year, White with Dashed Bar, vs Post Year, Gray)

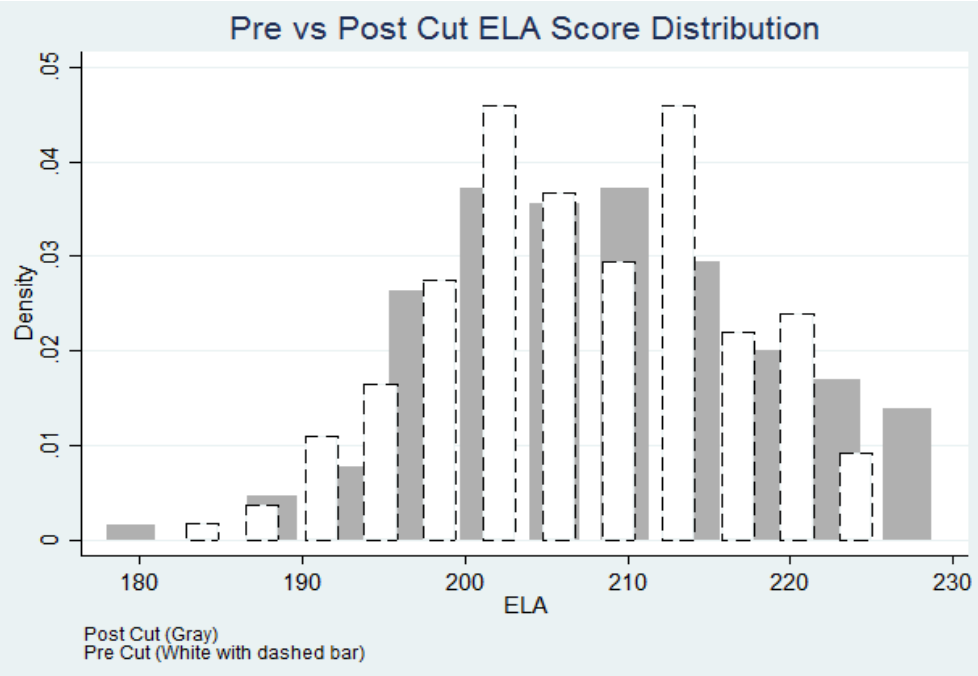

Figure 3: Histogram of 2010 Math Scores (Pre Cut Year, White with Dashed Bar, vs Post Year, Gray)

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