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From Gains to Losses and Back: Achievement Trends and Post-Pandemic Recovery in Arkansas

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From Gains to Losses and Back

Achievement Trends and Post-Pandemic Recovery in Arkansas

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Abstract

Arkansas experienced sizable post-pandemic learning losses and persistent inequities. Using state assessments (2009–2023), NAEP, and the NAEP–TIMSS link, we document declines of 0.25–0.33 SD in early grades and durable gaps by race and income. Oaxaca–Blinder decompositions attribute ≈97% of post-pandemic decline to reduced returns to inputs (coefficient effects), not compositional change. Historically (2009–2012), gains of ≈0.5 SD coincided with higher input productivity. We discuss implications for teacher quality, accountability, and the LEARNS Act. With evidence-based implementation, Arkansas can recover losses and narrow gaps.

Keywords: Arkansas; learning outcomes; learning loss; COVID-19; education policy

JEL Codes: I21, I22, I25, J24, H75

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1. Introduction

Arkansas's education system faces a dual challenge: recovering from pandemic-related learning losses while addressing long-standing inequities. Despite decades of reform, reading and mathematics proficiency remain below national averages, and achievement gaps by race, income, and school type have persisted (Duan et al., 2022). The COVID-19 pandemic exacerbated these disparities, erasing years of progress and leaving Arkansas trailing most of its border states in student achievement (Jakubowski et al., 2023; Kane et al., 2025). While high school graduation rates have remained stable, too many students are unprepared for postsecondary education or the labor market.

Early reading proficiency is widely recognized as a powerful predictor of later academic achievement and college readiness. Children who master foundational literacy skills by the end of third grade are more likely to succeed in subsequent schooling, attain higher standardized test scores, and complete secondary education (Lesnick et al., 2010; Hernandez, 2011). Research further demonstrates that third grade reading proficiency reliably forecasts later educational outcomes, including high school graduation (NRC, 1998) as well as college enrollment and completion (Lesnick et al., 2010). Conversely, nearly three-quarters of students who lag in reading by the end of third grade continue to experience difficulties into high school (U.S. Department of Education, 1999). Literacy also serves as a gateway to learning across the curriculum, with strong reading ability enhancing comprehension and access to content in every subject area, thereby creating a cumulative advantage over time (Cunningham and Stanovich, 1997). Evidence suggests that students with stronger third grade reading skills demonstrate more rapid progress in mathematics through eighth grade (Truckenmiller et al., 2016; Grimm, 2008), likely because reading comprehension supports both the conceptual understanding and application of mathematical knowledge. Longitudinal studies reinforce these findings, showing that early literacy achievement is associated not only with higher rates of high school graduation but also with greater likelihood of postsecondary enrollment and degree completion (Duncan et al., 2007).

Grade 4 reading comprehension is particularly critical. Research shows these scores are reliable predictors of academic trajectories and future outcomes, including income (Goldhaber et al. 2020; Hirsch 2005). Additionally, a longitudinal study found that first-grade reading ability strongly predicted 11th-grade outcomes—including reading comprehension, vocabulary, general knowledge, and exposure to print—suggesting that early reading skills not only shape long-term academic achievement but also foster lifelong reading habits, independent of later reading comprehension levels (Cunningham and Stanovich 1997). Unfortunately, these foundational skills have recently declined in Arkansas, raising concerns about long-term educational and economic consequences.

This paper provides the first comprehensive, data-driven analysis of post-pandemic achievement trends in Arkansas, situating the state within national and global comparisons. We use state, national, and international assessment data to document achievement trends and equity gaps in Arkansas. In particular, we distinguish between changes attributable to student and school composition (endowment effects) and those reflecting shifts in the productivity of educational inputs (coefficient effects). This approach draws on the education production function literature (Hanushek and Luque, 2003; Todd and Wolpin, 2003; Woessmann, 2003) and recent applications of decomposition techniques to education outcomes (Barrera-Osorio et al., 2011; Fortin et al., 2011).

Our results highlight three main findings. First, the pandemic led to substantial learning losses, particularly among disadvantaged groups, with declines equivalent to one-third of a school year in early grades. Nearly all of this decline is attributable to the coefficient effect, suggesting that diminished effectiveness of teaching and learning processes—rather than shifts in student demographics—drove the setback. These results echo national evidence on uneven recovery and widening gaps (Engzell et al., 2021; Cortés-Albornoz et al., 2023). Second, historical analysis reveals that Arkansas has previously achieved notable gains, particularly between 2009 and 2012, when third-grade reading scores rose by almost half a standard deviation. Unlike the post-pandemic period, these improvements were driven by stronger productivity of inputs, especially reduced pupil–teacher ratios that coincided with enhanced teacher effectiveness. Third, comparative evidence shows that Arkansas has the capacity to achieve global competitiveness: in 2011, its Grade 8 math score linked to TIMSS exceeded both the U.S. and international averages (NCES, 2013).

The contribution of this paper is twofold. Empirically, it documents how shifts in input productivity—rather than compositional change alone—explain swings in Arkansas's learning outcomes. Policy-wise, it situates current reforms, especially the LEARNS Act (2023), within the state's longer trajectory of school finance equalization (Ritter, 2005; Barnett et al., 2008; Jordan et al., 2014), accountability under No Child Left Behind (NCLB) (Dee and Jacob, 2011; Hansen et al., 2018), and recent national models such as Mississippi's literacy achievements (Spencer, 2024). Together, the analysis offers both a diagnosis of current challenges and a forward-looking framework for reform.

The remainder of the paper is structured as follows. Section 2 reviews trends in student achievement using state, national, and international assessments. Section 3 estimates education production functions and applies Oaxaca–Blinder decompositions to identify determinants of learning and sources of inequality. Section 4 discusses policy implications, emphasizing teacher quality, accountability, and the potential transformational impact of the LEARNS Act. Section 5 concludes with reflections on Arkansas's prospects to recover lost learning, reduce inequities, and emerge as a national model for post-pandemic education reform.

2. Data and Methods

2.1 Data Sources

This study draws on multiple data sources to examine student achievement in Arkansas from 2009 to 2023. The primary source is the Arkansas Department of Education's statewide learning assessments: the Augmented Benchmark Exam (2009–2014), the Partnership for Assessment of Readiness for College and Careers (PARCC, 2015), and ACT Aspire (2016–2023). All the students enrolled in a public school are required to write the state learning assessment. Since student characteristics are considered in the analysis, only those observations with a full set a socio-demographic characteristics are included in the sample. For comparability, scores are rescaled within each assessment period to have a mean of 500 and a standard deviation of 100. This approach allows analysis of within-period changes and cross-period decompositions while avoiding level misalignment between different test regimes.

We supplement these data with national benchmarks from the National Assessment of Educational Progress (NAEP) in reading and mathematics, which provide consistent measures over time and enable comparison to U.S. averages. International benchmarking is drawn from the NAEP–TIMSS linking study (NCES, 2013), which permits comparison of Arkansas Grade 8 mathematics performance to both national and international peers. In addition, we incorporate administrative indicators such as high school graduation rates (Adjusted Cohort Graduation Rate, ACGR) and postsecondary enrollment rates from the Arkansas Division of Higher Education, to provide a broader perspective on student outcomes.

Together, these sources yield a comprehensive view of Arkansas's achievement trajectory across grade levels, subject areas, and time periods.

2.2 Empirical Framework

Our analysis builds on the education production function literature (Hanushek and Luque 2003; Todd and Wolpin 2003; Woessmann 2003). Student achievement is modeled as a function of individual characteristics, school-level resources, and fixed effects:

$$Y_{is} = \beta X_{is} + \gamma Z_s + \alpha_s + \rho_t + \varepsilon_{is} \qquad (1)$$

where Y_{is} is the standardized test score of student i in school s; X_{is} includes individual socio-demographic characteristics (sex, race, free/reduced-price lunch, English learner status, special education status); and Z_s includes school-level factors such as pupil–teacher ratio and charter school status. School fixed effects (α_s) capture unobserved time-invariant school characteristics and year fixed effects (ρ_s) account for policy changes and shock affecting all schools at the same time.

To estimate the impact of the COVID-19 pandemic, we extend the model by including a binary indicator for the year 2021:

$$Y_{is} = \sum_{s=1}^{n} \alpha_s + \delta COVID + \beta X_{is} + \gamma Z_s + \rho_t + \varepsilon_{is} \quad (2)$$

where *COVID* is a dummy variable equal to 1 if year 2021 and 0 otherwise, and δ captures the change in student achievement after COVID-19.

2.3 Oaxaca–Blinder Decomposition

To explore the drivers of changes in achievement over time, we implement an Oaxaca–Blinder decomposition (Barrera-Osorio et al. 2011; Fortin et al. 2011; Rodríguez-Planas 2012). This partitions score differences into:

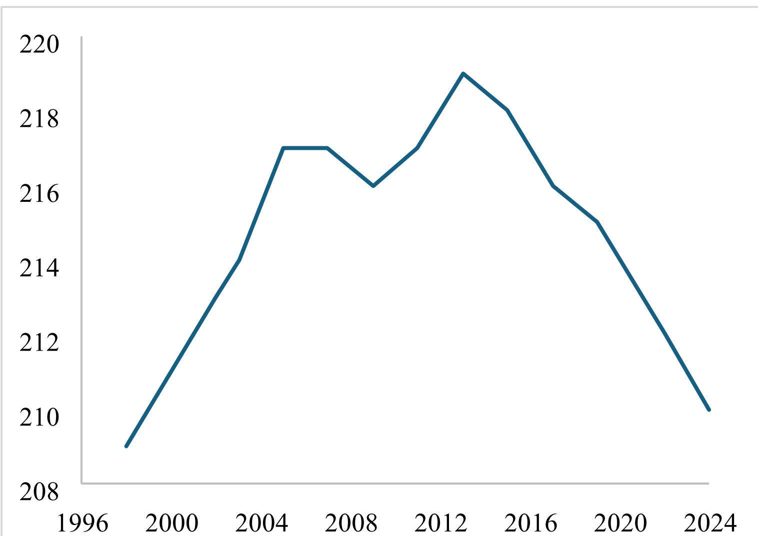
- Endowment effects: changes attributable to differences in observable characteristics of students and schools.
- Coefficient effects: changes in the returns to those characteristics, which may reflect shifts in teacher effectiveness, policy environment, or unobserved institutional factors.

This approach allows us to distinguish between compositional changes in the student body and structural changes in how resources translate into achievement.

3. Results

Many students are unprepared for post-secondary education or vocational pathways, as reflected in test scores and other indicators of academic readiness. Arkansas has seen periods of improvement—most notably between 2003 and 2013—but more recently has experienced declines in test scores, raising concerns about education quality (Figure 1). Scores increased considerably from the mid-1990s to 2005, with a stall and decline after that, and another rapid increase until 2013. Since then, scores have declined to pre-2000 levels.

Figure 1: Grade 4 reading scores, Arkansas



Source: NAEP

3.1 National and State Assessments

Following the 2005 Koret report (Brown and Ritter 2005), Arkansas experienced steady improvements in educational outcomes. NAEP Grade 4 Reading scores rose from 214 (2003) to 219 (2013), and Math scores increased from 229 to 240—approaching the national average (222 for Reading and 242 for Math). Yet by 2022, both metrics had declined, returning to pre-2003 levels (212 in reading and 228 in math). Arkansas's post-2003 school finance reforms improved equity in funding and led to partial convergence in student achievement, though districts serving poorer, non-white, and male student populations remained clustered in lower-performing groups (Duan et al. 2022).

Looking at state test scores, the learning outcomes of 3rd graders improved between 2009 and 2012 but began to decline thereafter (Table 1), as happened to 4th graders using NAEP and 8th graders using the state test. The peak in math achievement for 3rd (512 points) and 8th (510 points) graders also occurred in 2012, while that of 4th graders (508 points) happened one year earlier. The most pronounced drop in reading and math performance of 3rd graders occurred during the COVID-19 pandemic: 0.32 and 0.33 standard deviations (SD); or about 1.5 years of learning (assuming 0.20 SD = 1 year). This was also the case in reading and math for 4th graders (0.25 SD and 0.28 SD) and 8th graders (0.20 and 0.31 SD) using the state test.

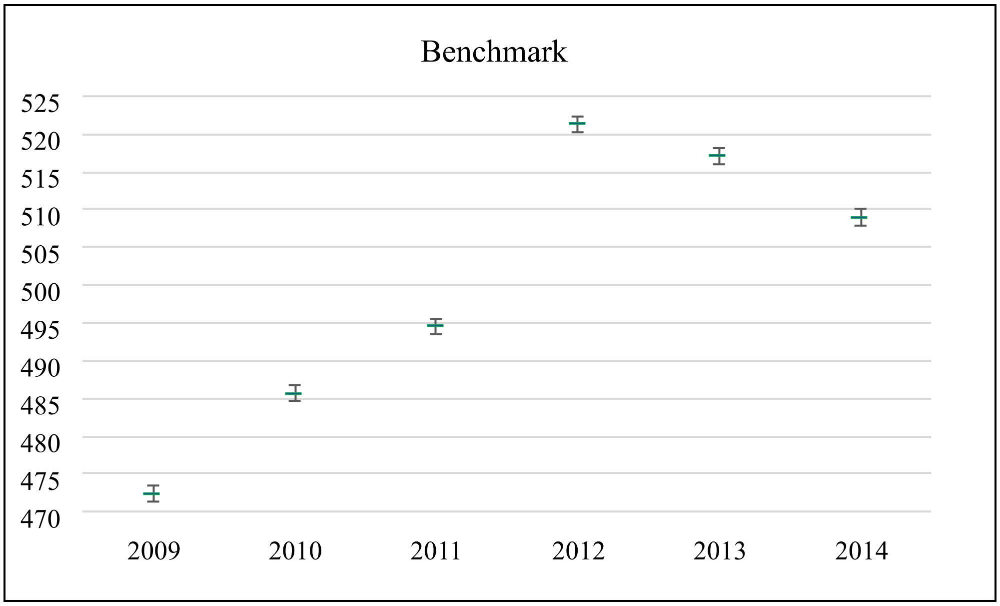
Table 1: State learning assessment results for grades 3, 4 and 8

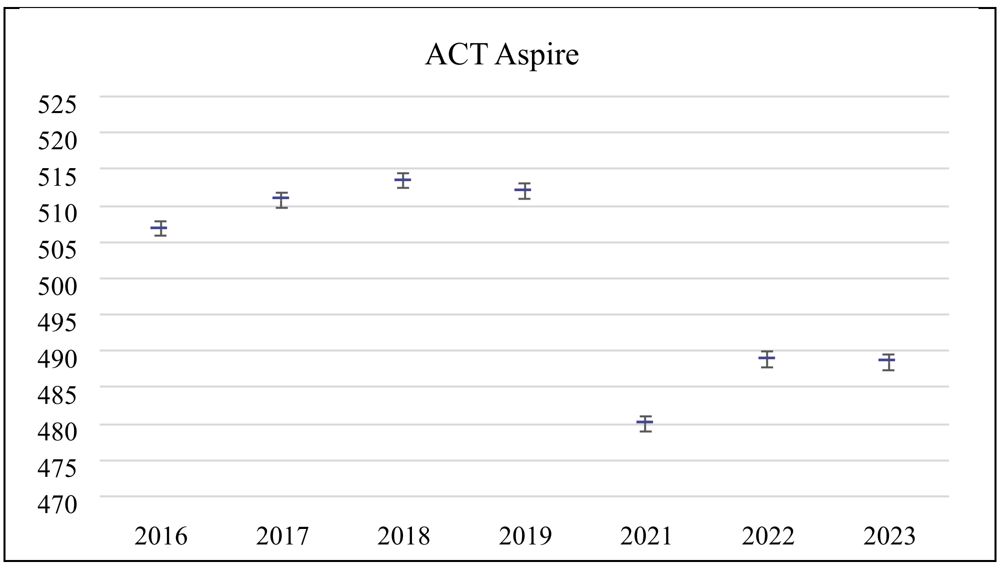
		Period 1						Period 2	Period 3						
Subject/grade		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023
Reading	Grade 3	472	486	494	521	517	509	500	507	511	513	512	480	489	488
	Grade 4	468	484	499	518	517	514	500	491	508	512	515	490	495	487
	Grade 8	482	499	499	513	506	500	500	487	497	500	516	496	506	497
Math	Grade 3	480	497	507	512	506	497	500	504	510	510	513	480	489	493
	Grade 4	496	504	508	503	504	486	500	510	514	509	509	481	482	494
	Grade 8	492	498	499	510	503	501	500	495	508	513	517	486	495	489

Notes: Period 1 (2009-2014): Augmented Benchmark Exam; Period 2 (2015): Partnership for Assessment of Readiness for College and Career (PARCC); Period 3 (2016-2023): ACT Aspire; since PARCC was implemented only once, no interpretation on the evolution of learning in 2015 can be provided; no scores provided for 2020 since the state learning assessment was cancelled during COVID-19 school closures
Source: Learning assessment databases from the Arkansas Department of Education (ADE).

For ACT Aspire, there was no significant change from 2017 to 2019, but the change was large from 2019 to 2021 (Figure 2), apparently due to COVID-19 pandemic, even if schools were not closed for very long.

Figure 2: Grade 3 reading scores according to Arkansas state assessments





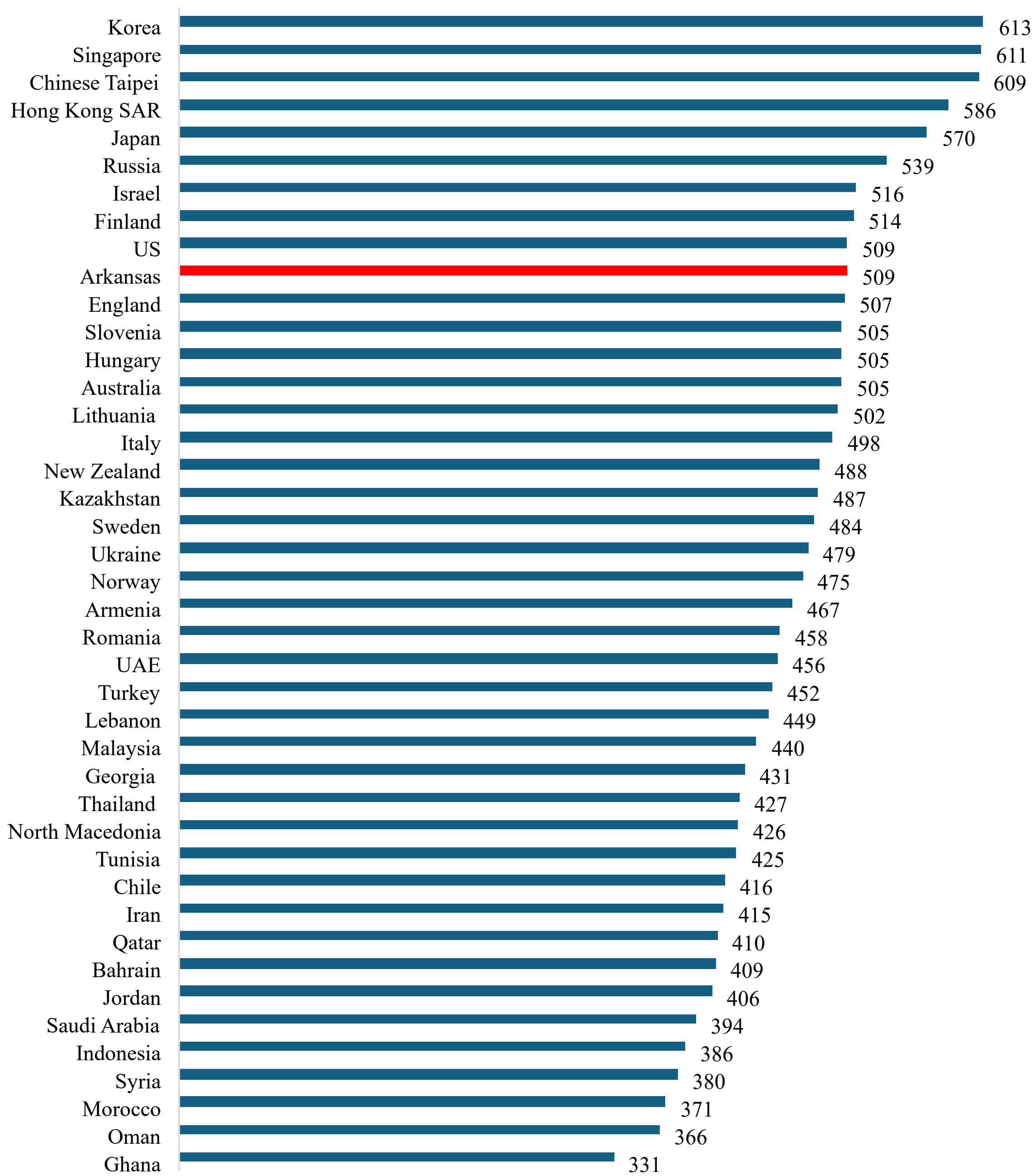
Note: Scores standardized within assessment period; no cross-period linking.

Source: Learning assessment databases from the Arkansas Department of Education (ADE).

3.2 International Benchmarking

A high-water mark came in 2011, when Arkansas' Grade 8 Math score—linked to the international TIMSS assessment—reached 509, exceeding the international average and placing Arkansas on par with the U.S. average (Figure 3). This placed Arkansas ahead of Australia and England, and just below Finland and Israel, demonstrating the state's potential for global competitiveness in education (NCES 2013).

Figure 3: NAEP-TIMSS linking study, grade 8 math, 2013



Source: NCES 2013

All changes in learning during Benchmark testing period were significant. Between 2009 and 2012 the significant increase in scores coincided with important state and national changes.

These include federal accountability through NCLB and state standards, which contributed to test score gains throughout the nation (Dee and Jacob 2011; Hansen et al. 2018).

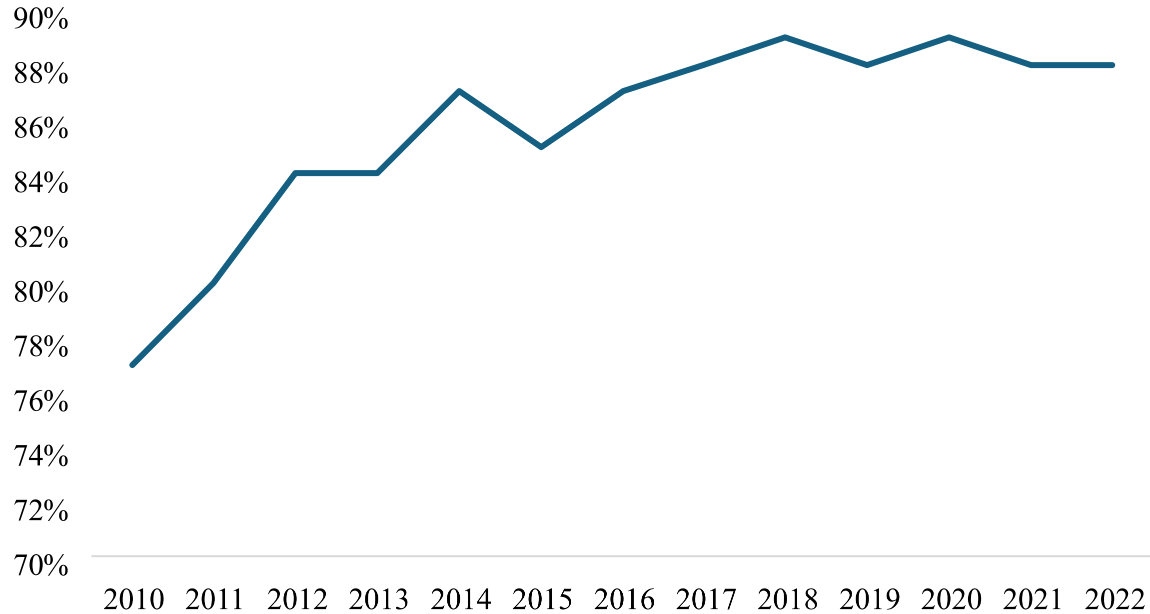
Another major development that reinforced, or worked in tandem with, NCLB was the Lake View case (Ritter, 2005), one of Arkansas's most consequential education reform catalysts. The case began in 1992, when plaintiff districts challenged inequitable state funding. It culminated in a landmark 2001 decision declaring that Arkansas had failed its constitutional duty to provide a general, suitable, and efficient system of free public schools. The Arkansas Supreme Court largely upheld this ruling in November 2002, assigning the legislature fiduciary responsibility for public education and mandating comprehensive reform by January 1, 2004. The Court pointed to systemic deficiencies—wide disparities in teacher pay, curriculum quality, school facilities, and per-pupil spending across districts. In response, Governor Mike Huckabee rejected the governmental, long-standing pattern of incremental adjustments and called for sweeping reform. Post-Lake View measures significantly increased per-pupil funding, improved adequacy, and narrowed equity gaps, especially in high-poverty and minority districts (Barnett et al. 2008). Subsequent analyses of school finance equalization confirm that low-wealth districts experienced marked reductions in property-tax burdens due to increased state aid (Jordan et al. 2014).

In the 2010s, charter school expansion and accountability reforms under Race to the Top introduced new dynamics in Arkansas's education system. Empirical studies by the Arkansas Center for Research in Economics find that open-enrollment charter schools generated positive spillover effects, improving test performance in traditional public schools (Kalulu et al. 2017; Kalulu et al. 2020; Snyder et al. 2019).

3.3 Other Attainment Indicators

Arkansas's on-time high school graduation rate, as measured by the Adjusted Cohort Graduation Rate (ACGR), rose from 77 percent in 2010 to a peak of 89 percent in both 2018 and 2020—an overall gain of 12 percentage points (Figure 4). The sharpest improvements occurred between 2010 and 2014, while rates have since leveled off, remaining relatively stable. These gains indicate that more students are completing high school within the expected four-year period.

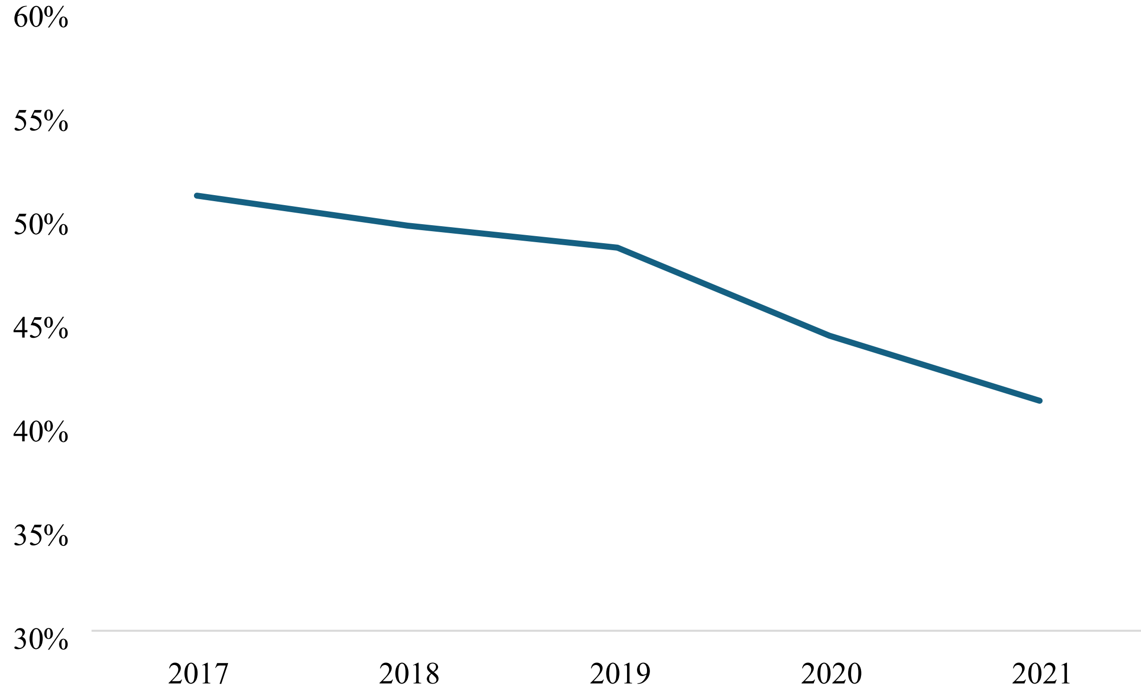
Figure 4: On-time high school graduation rates, 2010 -2022



Source: Aspire Arkansas: https://aspirearkansas.org/education/graduation-rate

The share of Arkansas public high school graduates enrolling in state higher education institutions the fall after graduation has steadily declined in recent years—from 51 percent in 2017 to just 41 percent in 2021 (Figure 5). This downward trend suggests that fewer students are making the immediate transition from high school to college, even as graduation rates have held steady.

Figure 5: Arkansas public high school graduates entering Arkansas higher education in the fall term



Source: Arkansas Division of Higher Education (2023): https://adhe.edu/File/College%20Going%20Rate.pdf

The proportion of Arkansas public high school graduates enrolling in state higher education institutions in the fall immediately following graduation has shown a consistent decline over the past several years. In 2017, just over half of graduates (51 percent) continued directly into higher education, but this figure fell to 49.6 percent in 2018, 48.5 percent in 2019, and dropped sharply during the pandemic years to 44.2 percent in 2020 and 41.1 percent in 2021. This downward trend indicates that an increasing share of students are either delaying postsecondary enrollment, pursuing alternatives outside the state system, or forgoing college altogether. The pattern stands in contrast to the relatively stable high school graduation rates, highlighting a growing gap between high school completion and college entry (ADE 2025).

3.4 Determinants of Learning

A regression analysis using the state reading learning assessment for 3rd graders shows how the student performance varies according to different socio-economic characteristics. Sample means are presented in Table 2.

Table 2: Sample means pooled regression

Variable	Mean	SD
State test score	500	(100)
Female	0.49	(0.50)
Pupil-teacher ratio	14.69	(4.37)
Race		
White		
African American	0.62	
Hispanic	0.20	
Native American	0.12	
Asian	0.01	
2 or more races	0.02	
Free lunch	0.02	
Charter school	0.64	(0.48)
English language	0.03	(0.16)
Special education	0.09	(0.29)

Note: The state test scores were re-scaled to a mean of 500 and a SD of 100 for comparison purposes.
Source: Learning assessment database from the Arkansas Department of Education (ADE).

The pooled and yearly regressions (Annex Table 1) show persistent gaps among disadvantaged students. African American and Native American students underperform compared to white students by 0.31 and 0.15 SD – equivalent to 1.5 and 0.75 years of learning (Avvisati and Givord 2021; Evans and Yuan 2019) (Table 3). Students from low-income household, as reflected by free reduced lunch (FRL) eligibility, are 1.7 years (0.34 SD) behind their better-off peers in learning. Charter schools, catering to the most disadvantaged students, also score nearly one year behind (0.19 SD), while a higher pupil-teacher ratio (PTR) is also associated with less learning. Of course, these are conditional correlations, not causal estimates. In contrast, Asian students outperform white students by 1.7 years (0.34 SD), while female students outperform male students by 1.15 years (0.23 SD).

Table 3: Learning production function: Grade 3 reading, 2009 - 2023

Female	30.213***	30.201***	30.432***	30.540***	23.033***
	(0.330)	(0.329)	(0.331)	(0.323)	(0.299)
PTR		-0.278**	-0.299**	-0.349***	-0.373**
		(0.123)	(0.117)	(0.130)	(0.145)
African American			-42.565***	-30.920***	-31.266***
			(1.175)	(0.917)	(0.851)
Hispanic			-27.930***	-15.594***	6.669***
			(1.068)	(0.890)	(1.028)
Native American			-37.492***	-28.679***	-15.012***
			(2.995)	(2.534)	(1.636)
Asian			20.830***	21.959***	34.468***
			(2.522)	(2.125)	(1.666)
2 or more races			-8.404***	-1.904*	-3.192***
			(1.240)	(1.136)	(1.068)
FRL				-42.090***	-34.560***
				(0.578)	(0.505)
Charter school					-19.484**
					(8.703)
LEP					-48.245***
					(1.346)
SPED					-97.523***
					(0.745)
Constant	460.126***	464.126***	475.447***	496.808***	508.016***
	(1.027)	(2.088)	(2.004)	(2.149)	(2.366)
Year effect	Yes	Yes	Yes	Yes	Yes
School effect	Yes	Yes	Yes	Yes	Yes
Obs.	474,839	474,581	474,581	474,581	474,581
R-squared	0.148	0.148	0.168	0.198	0.309

Notes: Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; errors clustered at school level.
Source: Learning assessment database from the Arkansas Department of Education (ADE).

3.5 COVID-19 Impact

The pandemic magnified existing educational inequities. Learning loss was especially acute for disadvantaged students, undoing years of progress. While enrollment and graduation rates held steady, learning outcomes—as measured by NAEP and ACT—have declined significantly. This learning loss associated with COVID-19 of 3rd graders was identified using a linear regression model based on a pooled cross-sectional panel with the learning achievement, as well as the school and sociodemographic characteristics, of 3rd graders enrolled in public schools from 2017 to 2021. Sample means for the over-time analysis are presented in Table 4.

Table 4: Sample means COVID-19 analysis

Variable	2017-2021		Before COVID (2017-19)		After COVID (2021)	
	Mean	SD	Mean	SD	Mean	SD
State test score	504	(98.98)	512	(97.93)	480	(98.20)
Female	0.49	(0.50)	0.49	(0.50)	0.48	(0.50)
PTR	15.01	(3.52)	15.29	(3.23)	14.16	(4.15)
Race						
White						
African American	0.60		0.60		0.60	
Hispanic	0.20		0.20		0.19	
Native American	0.14		0.14		0.14	
Asian	0.01		0.01		0.02	
2 or more races	0.02		0.02		0.02	
FRL	0.03		0.03		0.04	
Charter school	0.66	(0.47)	0.66	(0.47)	0.66	(0.48)
LEP	0.03	(0.18)	0.03	(0.17)	0.05	(0.22)
SPED	0.10	(0.30)	0.10	(0.30)	0.09	(0.29)

Source: Learning assessment database from the Arkansas Department of Education (ADE).

Although schools in Arkansas were closed for only the final third of the 2019–2020 academic year, the learning loss experienced by 3rd graders in reading was substantial — equivalent to between 1.6 (0.31 SD) and 1.7 (0.34 SD) years of learning (Table 5). These losses are broadly in line with national averages (NCES 2025). The lack of catch-up is also reflected in national data (Kane et al. 2025). These losses are consistent with global estimates of learning losses for grade 4 students. Linear trend analysis using PIRLS data over time shows that school closures due COVID-19 are associated with learning losses averaging 0.33 SD, equivalent to more than a year of schooling (Jakubowski et al. 2023). Globally it takes a year of school closure to produce learning losses of more than one year's worth of learning and school reopening usually reduced those losses (Cruz et al. 2025). Students experienced substantial academic setbacks during school closures, with remote learning and reduced in-person instruction causing declines in cognitive and academic performance, particularly among disadvantaged groups (Engzell et al. 2021; Cortés-Albornoz et al. 2023). These losses were amplified by unequal access to digital tools (Golden 2023) and lost peer-learning opportunities (Pinto 2023).

Table 5: The effect of COVID-19 on learning: Grade 3 reading, 2017-2021

Covid-19	-32.084***	-33.582***	-30.896***
	(0.611)	(1.068)	(1.064)
Female			20.393***
			(0.501)
African American			-30.727***
			(1.178)
Hispanic			6.233***
			(1.323)
Native American			-16.972***
			(2.188)
Asian			36.210***
			(2.417)
2 or more races			-5.868***
			(1.535)
FRL			-33.238***
			(0.754)
Charter school			20.267***
			(0.462)
PTR			-0.419
			(0.293)
LEP			-50.134***
			(1.538)
SPED			-95.032***
			(0.923)
Constant	512.048***	512.422***	551.786***
	-(0.306)	-(0.267)	(4.583)
School effect	NO	YES	YES
Obs.	137,110	137,110	136,852
R-squared	0.020	0.151	0.330

Notes: COVID-19 = 1 if year 2021, 0 if otherwise. * p-value <0.1, ** p-value <0.05,*** p-value <0.01; errors clustered at school level.
Source: Learning assessment database from the Arkansas Department of Education (ADE).

The decomposition results indicate that 97 percent of the decline is explained by the coefficient effect, implying that the reduction in learning was driven primarily by shifts in how observable characteristics translated into achievement rather than by compositional changes in the student body or schools (Table 6). The PTR emerges as the most salient factor: between 2019 and 2021, average 3rd grade reading scores declined by 32.0 points (from 511.9 to 479.9), with 16.7 points of this decline associated with reduced returns to teacher availability (Annex Table 2). Importantly, this occurred despite an improvement in average PTR (from 15.2 to 14.2), suggesting a post-pandemic deterioration in teacher effectiveness. This pattern is consistent with evidence of reduced teacher agency and self-efficacy stemming from pandemic-related policy constraints (Pressley and Ha 2022), elevated stress, and financial strain among educators (Zamarro et al. 2022), and diminished student engagement and attentiveness in classrooms (The Inverness Institute 2021).

Table 6: Decomposition of grade 3 reading achievement for selected periods

Component	COVID-19		Benchmark		ACT Aspire	
	2019	2021	2009	2012	2018	2021
Mean prediction	512.0	480.0	472.4	521.3	513.4	480.0
Difference due:	-32.0	100%	48.9	100%	-33.5	100%
endowments	-2.2	7%	-3.9	-8%	-2.8	8%
coefficients	-31.2	97%	52.6	108%	-32.7	98%
interaction	1.4	-4%	0.2	0%	1.9	-6%

Notes: All coefficients are significant at the 0.01 level, except for the interaction coefficient in the Benchmark period. The reference group is the last year of each period of analysis: 2021 for COVID-19, 2012 for Benchmark and 2021 for ACT Aspire.
Source: Learning assessment database from the Arkansas Department of Education (ADE)

A similar decomposition applied to the 2009–2012 period reveals that the dynamics operated in the opposite direction. During these years, Arkansas experienced notable improvements in 3rd grade reading performance, with average scores rising by almost 49 points – half a standard deviation or 2.5 years' worth of learning from 2009 to 2012. The Oaxaca-Blinder results attribute the vast majority of these gains not to compositional changes in student or school characteristics, but to the coefficient effect – that is, improvements in the returns to existing inputs. In particular, gains were concentrated in the impact of teacher availability, with declining pupil-teacher ratios. In contrast to the post-pandemic period, the earlier reforms of the late 2000s and early 2010s appear to have enhanced teacher productivity, potentially reflecting stronger instructional support systems, accountability reforms, and early investments in literacy initiatives. These findings underscore that shifts in the productivity of school inputs – rather than demographic or structural changes alone – can drive significant swings in student learning outcomes over time.

A key strength of this study is the integration of state, national, and international benchmarks with decomposition methods, providing a rare multi-level perspective on Arkansas's learning outcomes over time. At the same time, several limitations should be acknowledged. First, results rely on standardized test scores, which may not fully capture broader dimensions of learning or student well-being. Second, while decomposition methods shed light on shifts in input productivity, they do not identify precise causal mechanisms. Third, administrative and assessment data are subject to changes in testing regimes, limiting direct comparability across periods. Finally, although international benchmarking offers valuable context, Arkansas's education system operates within a unique institutional and demographic environment that constrains generalizability. These caveats suggest that findings should be interpreted as indicative rather than definitive, and they underscore the importance of complementary qualitative and causal research.

4. Policy Implications and Future Directions

The evidence presented in this study highlights both the urgency of addressing post-pandemic learning losses and the opportunity to build on past reform successes. Arkansas faces a choice between incremental adjustments and more ambitious, evidence-based strategies capable of reshaping student outcomes. Two areas stand out for policy attention. The first involves broad priorities—strengthening teaching, reaching marginalized populations, enhancing accountability, and establishing benchmarks—that provide a foundation for sustainable improvement. The second centers on the LEARNS Act, a comprehensive reform package with the potential to transform Arkansas's education system if implemented with fidelity.

4.1 Policy Priorities

Arkansas's path to recovery and long-term improvement will depend on targeted action across several priority areas. First, improving teaching quality remains essential. Persistent shortages, particularly in high-need subjects and underserved districts, continue to undermine progress (McKenzie et al., 2022). Programs such as the Merit Teacher Incentive Fund could be scaled to reward effectiveness, while complementary recruitment and retention strategies should focus on schools serving disadvantaged communities.

Second, reaching marginalized populations will be critical for narrowing achievement gaps. Expanding access to early childhood education and strengthening literacy interventions are particularly important, as early investments have long-term effects on learning trajectories. Equity can be further advanced by refining funding formulas, adopting flexible delivery models, and ensuring differentiated support for high-poverty schools.

Third, accountability and transparency must be reinforced. Arkansas has made strides in school ranking and evaluation systems, but continued refinement is needed to ensure that localized and timely data informs the decisions of educators, families, and policymakers. A stronger evidence base will enable targeted interventions and improve system responsiveness.

Finally, this study proposes the development of a State of Education Benchmarking Tool that would allow Arkansas to track progress relative to its own districts, other U.S. states, and international standards. Core metrics—such as reading achievement and average years of schooling—would provide a clear basis for assessing progress toward global best practices (Greene and McGee, 2012; Angrist et al., 2021). Such benchmarking would not only highlight areas for improvement but also signal when reforms are yielding meaningful returns.

4.2 The LEARNS Act: Potential for Systemic Reform

The LEARNS Act (2023) introduces one of the most comprehensive reform packages in Arkansas's recent history. Its provisions include:

- Raising teacher pay
- Expanding access to private schooling
- Requiring evidence-based literacy instruction
- Establishing performance incentives for educators

These measures build on earlier recommendations from the Koret Task Force (2005), which emphasized stronger accountability, measurable achievement, and more flexible delivery models (Finn 2005). Not all earlier proposals achieved the intended impact—district consolidation, for instance, produced mixed results (McGee et al., 2023)—but the LEARNS Act integrates lessons learned from past reforms. It also reflects contemporary priorities, such as the science of reading, teacher incentives, and school choice, which align with national evidence on effective education policy.

A cornerstone of the LEARNS Act is its restructuring of teacher compensation. In 2023, Arkansas raised the statewide minimum teacher salary to $50,000, eliminated rigid step schedules, and directed over $180 million to salary increases (Zamarro et al. 2023, 2024b). These measures aim to improve recruitment and retention in a profession facing significant shortages.

Equally significant is the Arkansas Right to Read Act, effective July 1, 2024, which mandates a statewide shift to structured, evidence-based literacy instruction grounded in the science of reading. The law applies to all public schools and open-enrollment charter schools and carries major implications for licensure, curriculum, student support, and accountability. Teachers in early grades and special education must demonstrate proficiency in the science of reading through approved training pathways, while all other educators must demonstrate awareness. Schools are required to adopt state-approved, evidence-based curricula, submit literacy plans aligned with the Act's standards, and abandon non-scientific practices such as three-cueing.

The Act also strengthens early intervention by requiring individualized reading plans for K–3 students not meeting benchmarks and introduces promotion requirements tied to reading proficiency beginning in 2025–2026. Literacy coaches will be deployed in low-performing schools, educator preparation programs will undergo audits to ensure compliance, and parental engagement will be reinforced through regular progress reports and access to tutoring grants. Enforcement measures include probation and funding sanctions for non-compliance, overseen by a new Education Ombudsman. Taken together, these provisions reflect a systemic effort to align instructional practice, teacher training, and accountability mechanisms around evidence-based literacy improvement.

Like earlier reform waves, the full impact of LEARNS will require careful, long-term evaluation (Zamarro et al., 2024a). Still, its scope and design suggest the potential to reshape Arkansas's education system in ways comparable to the post–Lake View reforms of the early 2000s. If Arkansas implements LEARNS with the same rigor and persistence that Mississippi applied to its literacy reforms (Spencer, 2024), the state could achieve the next step forward—showing that evidence-driven policies can raise achievement and narrow long-standing gaps. Mississippi's results have drawn national attention, particularly because they indicate the potential for meaningful improvements in early literacy within a low-income state context (Spencer, 2024).

5. Conclusion

Arkansas's recent history shows that meaningful reform is possible: finance equalization in the early 2000s and accountability and charter school reforms in the 2010s each contributed to periods of improvement. Yet the pandemic has revealed the fragility of these gains, underscoring the need for sustained investment in teaching quality, equity, and accountability.

This paper has shown that the state's achievement trajectory depends less on student composition than on how effectively resources are translated into learning. Moving forward, Arkansas must focus on broad policy priorities—strengthening the teacher workforce, addressing inequities, improving accountability, and benchmarking progress. At the same time, the LEARNS

Act provides a concrete vehicle for change. If implemented with the same rigor and persistence that Mississippi applied to its literacy reforms (Spencer, 2024), LEARNS could help Arkansas not only recover from pandemic setbacks but also chart a path toward national leadership in education reform.

With persistence, evidence-based practice, and fidelity in implementation, Arkansas has the opportunity to transform short-term recovery into long-term progress—demonstrating how a state can close equity gaps and raise achievement for all students.

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Table Annex 1: Learning production function: Grade 3 reading

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023
Female	30.922***	31.944***	26.321***	31.911***	28.416***	29.214***	16.078***	18.193***	22.820***	20.021***	20.552***	19.220***	16.309***	15.211***
	(0.969)	(1.001)	(0.942)	(0.851)	(1.062)	(1.085)	(0.968)	(0.989)	(0.951)	(0.914)	(0.890)	(0.958)	(1.011)	(0.959)
African American	-48.348***	-44.371***	-40.574***	-40.203***	-40.453***	-43.621***	-34.244***	-38.236***	-42.229***	-41.175***	-44.339***	-49.871***	-49.360***	-42.099***
	(2.360)	(2.376)	(2.618)	(2.544)	(2.394)	(2.696)	(2.409)	(2.265)	(2.290)	(2.477)	(2.492)	(2.170)	(2.428)	(2.668)
Hispanic	-2.819	5.419**	1.917	4.605	6.582**	4.505	1.777	4.861*	3.234	7.774***	13.180***	14.517***	21.633***	20.668***
	(3.086)	(2.692)	(2.894)	(2.818)	(2.873)	(3.012)	(3.269)	(2.619)	(2.616)	(2.633)	(2.750)	(2.336)	(2.785)	(2.603)
Native American	-8.012	-16.420***	-22.131***	-16.756***	-20.300***	-24.358***	-33.125***	-8.719*	-19.555***	-14.839***	-8.476*	-4.368	1.552	9.675**
	(7.514)	(4.580)	(5.663)	(5.180)	(4.328)	(6.025)	(6.286)	(5.268)	(4.701)	(4.579)	(5.126)	(3.780)	(4.341)	(4.244)
Asian	17.882***	34.341***	23.639***	34.166***	34.591***	30.397***	48.773***	38.512***	44.733***	40.288***	48.151***	49.954***	70.719***	52.642***
	(5.075)	(4.152)	(4.052)	(4.277)	(3.879)	(5.006)	(5.568)	(5.100)	(4.855)	(4.839)	(4.724)	(4.803)	(4.662)	(4.535)
2 or more races		-4.228	-1.613	-7.639*	-0.379	-1.802	-0.113	1.297	0.69	-6.706**	-5.063	-8.451***	-3.987	-2.086
		(5.161)	(4.566)	(4.192)	(3.604)	(3.475)	(3.553)	(2.807)	(3.190)	(2.895)	(3.164)	(2.787)	(3.101)	(2.814)
FRL	-43.076***	-42.524***	-37.571***	-39.736***	-42.190***	-44.171***	-47.828***	-44.083***	-49.824***	-41.158***	-43.501***	-39.078***	-38.945***	-47.242***
	(1.553)	(1.428)	(1.496)	(1.521)	(1.528)	(1.588)	(1.757)	(1.669)	(1.845)	(1.790)	(1.805)	(2.010)	(2.046)	(2.156)
Charter school	-14.476	-18.030**	-37.275***	-28.428***	-24.988***	-21.535**	-24.460**	-17.313*	-14.059	-17.425**	-16.276***	-3.44	-11.643	-5.594
	(10.055)	(8.986)	(9.380)	(8.436)	(6.631)	(10.680)	(11.994)	(9.210)	(9.614)	(7.514)	(5.717)	(6.732)	(7.501)	(7.754)
PTR	-0.003	-0.049	-0.303	-0.051	-0.286	-0.204	-0.286	0.022	-0.146	0.311	0.372	-0.721*	-0.151	-0.536***
	(0.456)	(0.442)	(0.481)	(0.067)	(0.321)	(0.369)	(0.384)	(0.513)	(0.445)	(0.489)	(0.473)	(0.369)	(0.583)	(0.086)
LEP	-45.915***	-38.616***	-31.178***	-27.410***	-36.170***	-35.110***	-39.327***	-32.506***	-26.913***	-43.105***	-59.790***	-65.269***	-76.742***	-77.080***
	(4.081)	(3.746)	(3.656)	(4.031)	(3.877)	(3.589)	(3.711)	(3.285)	(2.886)	(3.012)	(2.705)	(2.351)	(2.430)	(2.569)
SPED	-97.751***	-92.374***	-88.882***	-99.976***	-105.89***	-108.58***	-94.720***	-94.737***	-99.937***	-98.014***	-93.234***	-89.770***	-101.526***	-97.385***
	(2.154)	(2.126)	(2.102)	(2.326)	(2.430)	(2.303)	(1.887)	(1.746)	(1.552)	(1.454)	(1.736)	(1.566)	(1.721)	(1.591)
Constant	506.72***	519.86***	531.03***	553.82***	557.36***	550.81***	548.72***	547.48***	557.10***	550.08***	549.88***	533.56***	538.01***	549.75***
	(6.467)	(6.229)	(6.957)	(1.672)	(4.771)	(5.503)	(5.667)	(7.769)	(6.904)	(7.472)	(7.340)	(5.113)	(8.210)	(2.431)
Obs.	33,000	34,000	33,000	33,000	33,000	33,000	32,000	35,000	35,000	34,000	33,000	34,000	35,000	35,000
R-squared	0.259	0.248	0.233	0.253	0.259	0.260	0.227	0.241	0.259	0.262	0.253	0.270	0.279	0.288

Notes: The learning assessment results were re-scaled to a mean of 500 and a SD of 100 to simplify the interpretation of results. Arkansas implemented three different learning assessments during the period of analysis: Benchmark (2009-2014), PARCC (2015) and ACT Aspire (2016-2023). * p-value <0.1, ** p-value <0.05, *** p-value <0.01. Errors clustered at school level.
Source: Learning assessment database from the Arkansas Department of Education (ADE).

Annex Table 2: Difference in grade 3 reading achievement (Oaxaca decomposition) for selected periods

Variable	COVID-19 2019 - 2021			Benchmark 2009 - 2012			ACT Aspire 2018 - 2021		
	Endow-ments	*Coeff-icients*	*Inter-action*	*Endow-ments*	*Coeff-icients*	*Inter-action*	*Endow-ments*	*Coeff-icients*	*Inter-action*
Female	**-0.14**	-0.65	0.01	**-0.33**	0.52	-0.01	-0.05	-0.39	0.00
White	0.00	0.17	0.00	**-0.11**	**-3.13**	**0.06**	-0.02	-1.65	0.02
African American	0.21	**-1.04**	0.02	**0.50**	0.74	-0.04	**0.20**	**-2.26**	0.06
Hispanic	-0.01	0.22	0.00	**0.13**	0.27	0.07	-0.03	**0.57**	-0.01
Native American	**-0.02**	0.07	0.01	0.00	**-0.10**	**-0.05**	**-0.05**	**0.10**	0.03
Asian	**0.14**	0.03	0.01	**-0.05**	**0.20**	-0.02	0.06	**0.12**	0.01
2 or more races	**-0.04**	-0.09	-0.02				**-0.05**	-0.12	-0.05
FRL	**0.44**	**2.94**	**-0.04**	**-1.34**	**2.03**	**0.11**	0.10	1.37	-0.01
Charter school	**-0.24**	**0.45**	**0.19**	**-0.10**	**-0.15**	**-0.10**	**-0.38**	**0.40**	**0.30**
PTR	**-0.39**	**-16.63**	**1.16**	0.00	-0.54	-0.02	**-0.38**	**-15.87**	**1.26**
LEP	-0.11	**-0.50**	-0.01	**-0.67**	**1.39**	**0.27**	**0.25**	**-2.21**	**0.13**
SPED	**-2.08**	**0.45**	**0.08**	**-1.93**	-0.22	-0.04	**-2.41**	**1.06**	**0.20**
Constant		**-16.60**			**51.60**			**-13.78**	

Notes: Blue if p-value<0.01, green if p-value<0.05, orange if p-value<0.10. The gray area indicates that the option "2 or more races" was not available in 2009.
Source: Learning assessment database from the Arkansas Department of Education (ADE).