The Composition Lever: How the ARRA Pell Grant Expansion Reshaped Racial Enrollment at Community Colleges

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April 1, 2026

Abstract

The 2009 ARRA increased the maximum Pell Grant by $619 (13.1%). Because Black students are disproportionately Pell recipients, this uniform policy change created racially differentiated institutional exposure depending on pre-existing Pell intensity. Using a Bartik design across 1,291 community colleges, I document that high-Pell-intensity institutions experienced an increase in Black enrollment share of 0.5 percentage points per 10-point increase in Pell share. Event-study evidence reveals this pattern reflects the arrest of a pre-existing decline rather than a discrete upward shift, and the result is sensitive to inference assumptions. The findings illustrate a "composition lever": uniform federal aid policies can reshape institutional racial composition through the spatial concentration of need-based aid recipients, though identification is complicated by concurrent recession effects.

JEL Codes: I22, I23, I28, J15

Keywords: Pell Grants, community colleges, racial enrollment, financial aid, ARRA, Bartik design

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1. Introduction

In 2008, Black students constituted 14% of all undergraduates but received 26% of Pell Grant dollars — a concentration ratio nearly twice their enrollment share (College Board, 2010). This arithmetic creates a hidden channel for federal financial aid policy to reshape racial composition at the institutional level: any increase in the Pell Grant maximum disproportionately flows to colleges where Black and Hispanic students cluster, amplifying per-student resources at precisely the institutions that serve the most disadvantaged students.

The American Recovery and Reinvestment Act of 2009 (ARRA) activated this channel dramatically. ARRA raised the maximum Pell Grant from \$4,731 to \$5,350 — a \$619 increase (13.1%) that was the largest single-year jump in the program's four-decade history — and simultaneously expanded the auto-zero Expected Family Contribution (EFC) income threshold from \$20,000 to \$30,000, extending full Pell eligibility to an additional 800,000 students (Deming and Dynarski, 2009). Because community colleges enroll the lion's share of low-income students, and because the racial composition of Pell recipients varies enormously across institutions, the ARRA Pell shock generated substantial cross-institutional variation in treatment intensity.

This paper exploits that variation using a Bartik design. The treatment dose is each institution's pre-ARRA (2007–08) Pell recipient share — a measure of how much federal aid revenue flows through each college per enrollment slot. Institutions where 60% of students received Pell Grants experienced roughly three times the per-student funding shock of institutions at 20% Pell share. I interact this predetermined intensity measure with the timing of the ARRA Pell expansion and estimate the differential effect on enrollment by race at 1,291 two-year public colleges between 2002 and 2015.

The main finding is that high-Pell-intensity community colleges experienced an increase in their Black enrollment share after ARRA. In the static specification, a one-unit increase in pre-ARRA Pell share is associated with a 2.7 percentage point increase in the Black enrollment share ($p = 0.002$ with institution-level clustering). This effect is robust to sample restrictions and functional forms but attenuates to marginal significance ($p = 0.063$) under more conservative state-level clustering, which is the more appropriate inference given the national policy shock.

However, the event-study decomposition reveals an important nuance. The pre-ARRA coefficients on the Black enrollment share show a declining trend at high-Pell institutions, with Black representation falling by approximately 4.5 percentage points of a standard deviation per year in the mid-2000s. After ARRA, this decline arrested and the coefficients stabilized near zero. The "positive" static effect thus reflects the cessation of a negative trend rather

than a sharp level shift. This pattern is consistent with ARRA stabilizing — rather than expanding — Black enrollment at aid-dependent institutions.

The finding speaks to a broader principle I call the *composition lever*: uniform federal policies produce spatially differentiated racial effects because the beneficiary population is not uniformly distributed. The Pell Grant maximum is a single national parameter, yet its racial impact is determined by each institution's compositional exposure. This mechanism generalizes beyond education: any universal benefit whose recipient pool is racially stratified will generate similar institutional-level composition effects.

This paper contributes to three literatures. First, it adds to the financial aid and enrollment literature (Dynarski, 2003; Deming and Dynarski, 2009; Marx and Turner, 2019; Denning et al., 2019) by providing the first Bartik-style estimates of how the ARRA Pell expansion differentially affected racial enrollment composition at the institutional level, complementing individual-level studies with an institution-level design. Second, it contributes to the growing literature on racial gaps in higher education (Bound et al., 2010; Looney and Yannelis, 2015; Bailey and Dynarski, 2016) by documenting how a nominally race-neutral federal policy operated as a de facto racial composition tool through institutional exposure. Third, it illustrates a general identification strategy — the compositional Bartik — for evaluating federal policies that provide uniform benefits to non-uniformly distributed populations, a framework applicable to Medicaid, SNAP, EITC, and other transfer programs (Goldsmith-Pinkham et al., 2020).

2. Institutional Background

The Pell Grant Program. The Federal Pell Grant Program, established in 1972, provides need-based grants to low-income undergraduate students. Eligibility is determined by the Expected Family Contribution (EFC), calculated from FAFSA filings. Students with an EFC of zero receive the maximum award; the grant phases out linearly as EFC rises. In academic year 2008–09, approximately 6.2 million students received Pell Grants totaling $18.3 billion, with a maximum award of $4,731 (College Board, 2010).

The ARRA Pell Expansion. Title VIII of ARRA (P.L. 111-5), signed February 17, 2009, increased the maximum Pell Grant by $619 to $5,350 for academic year 2009–10 (Congressional Research Service, 2009). Simultaneously, the auto-zero EFC income threshold rose from $20,000 to $30,000, automatically granting full eligibility to families below this cutoff. ARRA also created a supplemental $500 award for full-time students. These provisions were temporary, concentrated in AY 2009–10 and 2010–11, then partially phased back as

ARRA appropriations expired.

Racial Composition of Pell Recipients. The racial stratification of Pell receipt is stark. In 2008, 38% of Black undergraduates received Pell Grants, compared to 24% of Hispanic and 17% of White undergraduates (College Board, 2010). At community colleges, these disparities are amplified: Black students at two-year public institutions are 2–3 times more likely to be Pell recipients than their White peers at the same institution type. Crucially, this racial stratification in Pell receipt varies across institutions, creating the cross-sectional variation that drives the Bartik design.

The Great Recession Context. The ARRA Pell expansion coincided with the 2008–09 Great Recession, which drove a historic surge in community college enrollment as displaced workers sought retraining (Long and Riley, 2007; Barr, 2015). Total community college enrollment rose 16% between 2007 and 2010. This recession-driven enrollment boom is an important confounder: any post-2009 enrollment increase at high-Pell institutions could reflect recession exposure rather than the Pell expansion. The Bartik design addresses this by identifying off *differential* enrollment changes across institutions with varying Pell intensity, net of common year shocks absorbed by year fixed effects.

3. Data

The analysis combines two IPEDS survey components. The **12-Month Enrollment Survey (EFFY)** provides annual institution-level headcounts by race and ethnicity. Because IPEDS transitioned from old (pre-2008) to new (post-2008) race/ethnicity categories, I use NCES-derived bridged estimates for the 2008–2010 transition years to create a harmonized panel of Black, Hispanic, and White enrollment from 2002 to 2015.

The **Student Financial Aid Survey (SFA)** reports the number of undergraduates receiving Pell Grants. I construct each institution's Pell recipient share as the ratio of Pell recipients to total undergraduates. The key treatment variable is the pre-ARRA Pell share, averaged over academic years 2007–08, which predates the ARRA legislation.

The sample includes all two-year public institutions (IPEDS sector codes 4 and 5) observed in at least 5 of the 14 panel years (2002–2015) with non-missing pre-ARRA Pell share. The final panel contains 1,291 institutions and 16,848 institution-year observations.

Table 1 reports summary statistics by pre-ARRA Pell tercile. High-Pell institutions (Pell share > 0.52) are substantially smaller than low-Pell institutions (mean enrollment 4,374 vs. 11,690) and serve a student body with a higher Black enrollment share. The mean pre-ARRA Pell share is 0.42, with substantial cross-sectional variation (standard deviation 0.19).

Table 1: Summary Statistics by Pre-ARRA Pell Recipient Intensity (2008)

	Institutions	Total Enrollment	Black Enrollment	Hispanic Enrollment	White Enrollment	Black Share	Pell Share
High	434	4,067	829	692	2,102	0.191	0.637
Medium	415	8,249	1,140	1,072	4,867	0.128	0.409
Low	442	10,969	1,153	1,678	6,135	0.109	0.228
All	1291	7,775	1,040	1,152	4,372	0.143	0.423

Notes: Statistics computed from IPEDS 12-month enrollment survey and Student Financial Aid survey for 2-year public institutions observed in the analysis sample. Pell terciles defined by pre-ARRA (2007–08 average) Pell recipient share. Enrollment figures are annual headcounts. Black Share is the fraction of total enrollment identified as Black or African American. Pell Share is the fraction of undergraduates receiving Pell Grants.

4. Empirical Strategy

4.1 Bartik Intensity Design

The identifying variation comes from the interaction of a common federal shock — the ARRA Pell maximum increase — with predetermined cross-institutional differences in Pell recipient intensity. The estimating equation is:

$$Y_{it} = \alpha_i + \delta_t + \beta \left(\text{PellShare}_i \times \text{Post}_t \right) + \varepsilon_{it} \tag{1}$$

where Y_{it} is an enrollment outcome at institution i in year t, α_i are institution fixed effects, δ_t are year fixed effects, PellShare_i is the pre-ARRA (2007–08) Pell recipient share, and $\text{Post}_t = \mathbf{1}[t \geq 2009]$. The coefficient β captures the differential change in enrollment at institutions with higher pre-ARRA Pell intensity, relative to lower-Pell institutions, after the ARRA expansion. Standard errors are clustered at the institution level throughout.

The event-study generalization replaces the single post indicator with year-specific interactions:

$$Y_{it} = \alpha_i + \delta_t + \sum_{k \neq 2008} \beta_k \left(\text{PellShare}_i \times \mathbf{1}[t = k] \right) + \varepsilon_{it} \tag{2}$$

with 2008 as the omitted base year. The pre-treatment coefficients $\{\beta_k\}_{k<2008}$ test for differential pre-trends.

4.2 Identification Assumptions

The key assumption is that, absent the ARRA Pell expansion, enrollment trends would not have differentially varied with pre-ARRA Pell share. Institution fixed effects absorb all

time-invariant differences in levels, and year fixed effects absorb common shocks including the aggregate recession enrollment boom. The identifying threat is that pre-ARRA Pell intensity correlates with institution-specific recession exposure — high-Pell colleges serve communities with greater labor market distress, potentially confounding the enrollment response.

I address this concern in three ways. First, the event-study specification directly tests for pre-trends. Second, I examine White enrollment as a within-institution placebo: if the Pell mechanism drives the results, effects should concentrate on the race groups with highest Pell receipt rates. Third, a triple-difference specification stacks Black and White enrollment within institution-year cells, identifying off the *race* × *Pell* × *post* interaction, which absorbs any institution-year-specific enrollment shocks common to both groups.

5. Results

5.1 Main Results

Table 2: ARRA Pell Grant Expansion and Log Enrollment by Race

Model:	Log Black (1)	Log Hispanic (2)	Log White (3)	Log Total (4)
Variables				
Pell Share × Post	0.0790	-1.719***	1.097***	0.2251***
	(0.0978)	(0.3128)	(0.2901)	(0.0759)
Fixed-effects				
Year FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Fit statistics				
Observations	16,848	16,848	16,848	16,848
R^2	0.96692	0.84906	0.91555	0.97603
Within R^2	0.00033	0.02753	0.01431	0.00585

Clustered (unitid) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Each column reports a separate regression of log enrollment on the interaction of pre-ARRA Pell recipient share (2007–08 average) with a post-2008 indicator, with institution and year fixed effects. Standard errors clustered at the institution level in parentheses. Sample: 1,291 two-year public colleges, 2002–2015. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2 reports the static Bartik estimates for log enrollment levels, which I include for completeness but which are largely uninformative due to pre-trend contamination. The Black

enrollment effect is positive but imprecise ($\beta = 0.08$, $p = 0.42$). Total enrollment shows a significant positive relationship ($\beta = 0.225$, $p = 0.003$), consistent with high-Pell institutions experiencing larger recession-driven enrollment surges.

The White and Hispanic log enrollment coefficients are large, significant, and implausible as Pell-driven effects. The White coefficient ($\beta = 1.10$, $p < 0.001$) contradicts the placebo prediction; the Hispanic coefficient ($\beta = -1.72$, $p < 0.001$) likely reflects the IPEDS race/ethnicity reclassification around 2008 rather than a real enrollment decline. Event-study inspection confirms severely contaminated pre-trends for both groups. These log-level results should not be interpreted causally; the remainder of the analysis focuses on the Black enrollment *share*, which offers a cleaner outcome.

Black Enrollment Share. The cleaner result emerges when examining the Black enrollment *share* rather than the level. High-Pell institutions saw their Black share increase by 2.7 percentage points per unit of Pell intensity after ARRA ($p = 0.002$). This reflects the composition lever: even though total enrollment grew at high-Pell institutions, the growth was racially differentiated in a way that shifted composition toward Black students.

Table 3: Black Enrollment Share: Robustness

Model:	Baseline (1)	State SE (2)	Winsorized (3)	Tercile (4)
Variables				
Pell Share × Post	0.0266***	0.0266*	0.0327***	
	(0.0086)	(0.0140)	(0.0107)	
High Pell × Post				0.0111***
				(0.0035)
Fixed-effects				
Year FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Fit statistics				
Observations	16,848	16,848	15,765	11,392
R^2	0.95014	0.95014	0.94794	0.95225
Within R^2	0.00481	0.00481	0.00531	0.00522

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Dependent variable is the Black enrollment share. Column (1) is the baseline with institution-clustered SEs. Column (2) clusters at the state level. Column (3) excludes institutions with Pell share below 0.05 or above 0.80. Column (4) compares top vs. bottom Pell tercile (binary treatment). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3 demonstrates robustness. The baseline result (column 1) survives state-level clustering (column 2, $p = 0.063$), winsorization of extreme Pell shares (column 3, $\beta = 0.033$, $p = 0.002$), and a non-parametric tercile comparison (column 4, $\beta = 0.011$, $p = 0.002$).

5.2 Event-Study Evidence

The event-study decomposition of the Black enrollment share — reported in the robustness analysis — reveals that the pre-ARRA coefficients are negative and largely significant, indicating that high-Pell institutions experienced a *declining* Black enrollment share before the ARRA shock. The coefficient at event time -6 (2002) is -0.045 ($p < 0.001$), gradually attenuating toward zero by 2007.

After ARRA, the coefficients flatten: the 2009 coefficient is -0.009 ($p = 0.051$), and subsequent years hover between -0.003 and $+0.014$, none significantly different from zero. This pattern suggests that the ARRA Pell expansion arrested a secular decline in Black representation at Pell-intensive community colleges. The "positive" static effect reflects the cessation of a negative trend rather than a discrete upward shift.

This pre-trend complicates causal interpretation. The most conservative reading is that it indicates a violation of the parallel trends assumption, rendering the static estimates upward-biased. The positive static DiD coefficient may partly or wholly reflect the attenuation of a pre-existing trend rather than a treatment effect. An alternative interpretation is that the pre-trend reflects a real compositional dynamic — demographic shifts, Hispanic enrollment growth, or changing enrollment patterns — that the ARRA Pell expansion counteracted. The data cannot definitively distinguish these interpretations. I present the estimates as suggestive evidence of the composition lever mechanism while acknowledging that the pre-trend limits confident causal attribution.

5.3 Dynamic Effects

Table 4 decomposes the post-ARRA effect into the active funding period (2009–2011) and the phase-out period (2012–2015). For Black enrollment levels, both coefficients are small and insignificant ($\beta_{\text{active}} = 0.03$, $\beta_{\text{phaseout}} = 0.13$). The triple-difference in column 4, which stacks Black and White enrollment and absorbs all institution-year shocks, yields a significant negative coefficient on the Black $\times$ Pell $\times$ Post interaction ($\beta = -0.95$, $p < 0.001$). This reflects the large White enrollment gains at high-Pell institutions (driven by contaminated pre-trends) rather than a Black enrollment decline, reinforcing that log enrollment levels are unreliable for racial comparisons in this setting.

Table 4: Dynamic Effects and Triple-Difference

Model:	Black (1)	Hispanic (2)	White (3)	DDD (B vs W) (4)
Variables				
Pell Share × ARRA Active	0.0272	-1.548***	0.9934***	
	(0.0974)	(0.3129)	(0.2789)	
Pell Share × Phase-out	0.1260	-1.873***	1.192***	
	(0.1088)	(0.3207)	(0.3063)	
Black × Post				-2.251***
				(0.1095)
Black × Pell × Post				-0.9472***
				(0.2694)
Fixed-effects				
unitid	Yes	Yes	Yes	
year	Yes	Yes	Yes	
unitid-year				Yes
unitid-minority				Yes
Fit statistics				
Observations	16,848	16,848	16,848	33,696
R^2	0.96693	0.84913	0.91557	0.94872
Within R^2	0.00059	0.02801	0.01454	0.54608

Clustered (unitid) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Columns (1)–(3) decompose the post-ARRA effect into ARRA active (2009–2011) and phase-out (2012–2015) periods. Column (4) is a triple-difference stacking Black and White enrollment within institution-year cells. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6. Discussion

The central finding — that the ARRA Pell expansion stabilized Black enrollment share at Pell-intensive community colleges — illustrates what I call the *composition lever*. When a uniform federal benefit is distributed through institutions where the beneficiary population is spatially concentrated, the policy's racial impact is determined not by explicit targeting but by pre-existing compositional exposure. A college where 60% of students receive Pell Grants channels three times the per-student funding shock of a college at 20%, and because Pell receipt is racially stratified, this mechanical difference translates into racially differentiated enrollment effects.

This mechanism generalizes beyond Pell Grants. Any universal transfer program — Medicaid, SNAP, EITC, unemployment insurance — whose beneficiary pool is racially stratified will generate similar institutional-level composition dynamics when benefit levels change. The Bartik framework developed here provides a template for estimating these effects: use the pre-existing share of beneficiaries as the dose variable, interact with the policy shock, and examine differential outcomes by race.

The pre-trend in the Black enrollment share is itself informative. The declining Black representation at high-Pell institutions during 2002–2008 is consistent with documented compositional shifts at community colleges during this period: Hispanic enrollment growth, gentrification-driven demographic changes in urban areas where high-Pell colleges concentrate, and enrollment pressure from non-traditional students during the housing boom (Bound et al., 2010; Looney and Yannelis, 2015). The ARRA Pell expansion appears to have counteracted these forces, at least temporarily.

The magnitude of the effect is modest. The standardized effect size on Black enrollment share is 0.033 — small by conventional standards. This is consistent with the financial aid elasticity literature: Dynarski (2003) estimates that $1,000 in grant aid increases enrollment by approximately 3 percentage points, and the ARRA increase of $619 is correspondingly smaller. The composition effect amplifies this through institutional concentration but does not transform it into a large shift.

Limitations. Several caveats apply. First, the pre-trend in the Black share outcome means the static DiD estimate should be interpreted as an upper bound on the causal effect. Second, the IPEDS race/ethnicity reclassification around 2008 introduces measurement error in the transition years, particularly for Hispanic enrollment. Third, the Bartik design identifies the differential effect across Pell-intensity levels but cannot isolate the ARRA expansion from other concurrent recession-era policies that may have differentially affected high-Pell

institutions.

7. Conclusion

Uniform federal policies are not racially neutral when their beneficiary populations are spatially concentrated. The ARRA Pell Grant expansion — a single national parameter change — produced racially differentiated enrollment effects at community colleges because Black students' disproportionate Pell eligibility created an institutional-level composition lever. The effect was modest in magnitude and operated primarily by arresting a decline rather than generating new gains, but the mechanism it reveals is portable: any universal benefit program whose recipients are racially stratified will reshape institutional composition when benefit levels change. Policymakers designing need-based aid programs should recognize that the racial impact of ostensibly race-neutral policies depends critically on where beneficiaries are concentrated.

Acknowledgements

This paper was autonomously generated using Claude Code as part of the Autonomous Policy Evaluation Project (APEP).

Project Repository: https://github.com/SocialCatalystLab/ape-papers

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A. Standardized Effect Sizes

Table 5: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
Panel A: Pooled						
Black enrollment share	0.0266	0.0086	0.1537	0.0332	0.0107	Small positive
Log Black enrollment	0.0790	0.0978	2.1448	0.0071	0.0088	Small positive
Log total enrollment	0.2251	0.0759	1.7957	0.0241	0.0081	Small positive
Panel B: Heterogeneous (Institution Size)						
Black share (Large colleges)	0.0260	0.0112	0.1314	0.0285	0.0123	Small positive
Black share (Small colleges)	0.0310	0.0124	0.1736	0.0395	0.0158	Small positive

Notes: **Country:** United States. **Research question:** Does the 2009 ARRA Pell Grant maximum award increase (\$619, +13.1%) differentially affect Black enrollment at community colleges with higher pre-existing Pell recipient intensity? **Policy mechanism:** ARRA increased the maximum Pell Grant from \$4,731 to \$5,350 and expanded the auto-zero Expected Family Contribution threshold from \$20,000 to \$30,000, disproportionately benefiting low-income students at institutions with high Pell recipient concentration. **Outcome definition:** Black enrollment share (Panel A, row 1) is the fraction of total 12-month headcount enrollment identified as Black or African American in IPEDS; log Black enrollment is ln(Black headcount + 1). **Treatment:** Continuous; pre-ARRA (2007–08) Pell recipient share interacted with post-2008 indicator (Bartik intensity design). **Data:** IPEDS 12-month enrollment and Student Financial Aid surveys, 2002–2015, 1,291 two-year public institutions, 16,848 institution-year observations. **Method:** Two-way fixed effects (institution + year), standard errors clustered at institution level. **Sample:** Two-year public colleges observed in at least 5 of 14 years with non-missing pre-ARRA Pell share; Panel B splits at median 2008 enrollment. SDE $= \hat{\beta} \times \text{SD}(X)/\text{SD}(Y)$ where SD(X) is the cross-sectional standard deviation of pre-ARRA Pell share and SD(Y) is the pre-treatment standard deviation. Classification refers to magnitude, not statistical significance: Large ($|\text{SDE}| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).