The Windfall Trap: Emergency Higher Education Relief and the Post-COVID Enrollment Cliff

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Abstract

The Higher Education Emergency Relief Fund injected $76 billion into U.S. colleges during 2020–2021 via a pre-determined Pell-share formula. I exploit this formula as an exogenous source of variation in emergency funding intensity across 1,600 public institutions. Each additional $1,000 in formula-predicted HEERF per student reduced enrollment by 320 students (2.7% of the pre-treatment mean) and completions by 19 (0.9%), but barely moved in-state tuition ($12 reduction, marginally significant). Event-study estimates reveal clean pre-trends for enrollment and an effect concentrated entirely in 2022—after HEERF expired—suggesting a windfall trap: emergency funds cushioned institutions during disbursement but failed to prevent a post-subsidy enrollment cliff at the institutions they targeted most.

JEL Codes: I22, I23, H52, H75

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1. Introduction

In March 2020, the U.S. federal government embarked on the largest single infusion of emergency funds into higher education in American history. Over three legislative rounds, the Higher Education Emergency Relief Fund (HEERF) channeled $76 billion to colleges and universities—more than doubling annual federal Pell Grant expenditures in a single disbursement. The money was allocated via a pre-determined formula weighting each institution's Pell Grant recipient share and full-time-equivalent enrollment, creating enormous variation in per-student windfall intensity: from under $100 to over $60,000 per student at the most Pell-intensive institutions.

Two years later, American higher education faces an enrollment crisis. Total undergraduate enrollment fell 15% between 2010 and 2022, with community colleges and open-access institutions bearing the steepest losses (Deming and Lovenheim, 2022). The juxtaposition is striking: the institutions that received the most emergency relief per student are precisely those now experiencing the sharpest enrollment declines. Did HEERF fail to prevent enrollment loss, or did it inadvertently create dependency that made the post-subsidy adjustment worse?

This paper provides the first causal evidence on this question. I exploit the HEERF allocation formula as an exogenous source of variation in emergency funding intensity. Because the formula used pre-pandemic (2018) Pell Grant shares and enrollment weights, it is orthogonal to COVID-era shocks conditional on institution and state-by-year fixed effects. The design identifies the reduced-form effect of formula-predicted HEERF exposure on tuition, grant aid, enrollment, and degree completions across 1,600 public institutions observed annually from 2015 to 2022.

The main finding is a windfall trap. Each additional $1,000 in formula-predicted HEERF per student is associated with 320 fewer enrolled students ($p < 0.001$) and 19 fewer completions ($p = 0.001$) in the post-2020 period. Event-study decomposition reveals that the enrollment effect is concentrated entirely in 2022—the first year after HEERF disbursements ended—while coefficients during the HEERF period (2020–2021) are statistically indistinguishable from zero. Pre-treatment coefficients (2015–2018) are precisely estimated near zero, confirming parallel pre-trends.

The tuition response is economically negligible: a $12 reduction per $1,000 of HEERF exposure, representing just 0.2% of the pre-treatment mean. This small effect is consistent with widespread evidence that federal higher education subsidies are largely absorbed by institutions rather than passed through to students (Cellini and Goldin, 2014; Lucca et al., 2019). Grant aid per student shows no significant response, suggesting that institutions met the 50% student-aid mandate mechanically without expanding aid beyond statutory

requirements.

The enrollment decline is pervasive across institution types. Four-year institutions show a larger absolute coefficient (-607, $p < 0.001$) than two-year institutions (-134, $p < 0.001$), consistent with their larger average enrollments. Both subsectors contribute significantly to the aggregate result. High-Pell institutions show a precisely estimated effect (-126, $p < 0.001$), while low-Pell institutions have a large but imprecise coefficient (-934, $p = 0.11$).

This paper contributes to three literatures. First, it extends the large body of work on the incidence of federal higher education subsidies (Turner, 2017; Cellini and Goldin, 2014; Lucca et al., 2019; Dynarski, 2003) by studying the largest emergency appropriation in the sector's history. The near-zero tuition pass-through is consistent with the "Bennett hypothesis"—that federal aid is absorbed into institutional budgets—but the enrollment cliff is a novel finding: temporary subsidies not only failed to build financial resilience but may have delayed structural adjustments that eventually made post-subsidy enrollment loss worse.

Second, it contributes to the fiscal federalism literature on the "flypaper effect"—the tendency of intergovernmental grants to stick where they land rather than being passed through to intended beneficiaries (Hines and Thaler, 1995; Knight, 2002; Gordon, 2004). HEERF represents an unusual case: a massive, formula-driven, temporary grant with partial earmarking (50% for student aid). The finding that even this earmarking produced negligible net price reductions for low-income students suggests that institutional budget fungibility operates powerfully even under emergency conditions.

Third, it informs the growing literature on COVID-19's impact on higher education (Deming and Lovenheim, 2022; Barr and Turner, 2022) by providing the first evidence that the post-pandemic enrollment cliff is causally linked to the intensity of emergency relief. This finding challenges the narrative that HEERF successfully stabilized higher education during the pandemic; while it may have prevented institutional closures, it did not prevent the enrollment losses that followed.

2. Institutional Background

The HEERF allocation formula. The Higher Education Emergency Relief Fund was created by three consecutive federal relief acts between March 2020 and March 2021. HEERF I (CARES Act, March 2020) allocated $14.0 billion, HEERF II (CRRSAA, December 2020) added $22.7 billion, and HEERF III (ARP Act, March 2021) contributed a further $39.6 billion, for a total of $76.2 billion. All three rounds used the same core allocation formula: each institution's share of total HEERF was proportional to its Pell Grant recipient count times FTE enrollment, with a floor for institutions below 500 students.

Spending restrictions. At least 50% of each round was mandated for direct emergency financial aid to students (the "student portion"), while the remainder (the "institutional portion") could be spent on costs associated with COVID-19, including lost revenue replacement, technology for distance education, and campus safety measures. The Government Accountability Office found that institutions broadly complied with the 50% student-aid mandate but exercised wide discretion over the institutional portion, with "lost revenue" being the most common reported use (U.S. Government Accountability Office, 2022).

Timeline and disbursement. Funds were disbursed to institutions over approximately 18 months (mid-2020 through 2021), with most HEERF III funds disbursed in 2021. By the start of the 2022–2023 academic year, HEERF disbursements had effectively ended. Institutions reported HEERF receipts in their IPEDS finance surveys as federal nonoperating grants (F1A line 14), producing a visible spike in total revenue: average total revenue per student at public institutions rose from $162 billion (2019) to $201 billion (2021) before partially normalizing in 2022.

The Pell-share formula as an instrument. The key feature for identification is that the allocation formula was pre-determined and used institutional characteristics frozen before the pandemic. The 2018 Pell Grant recipient share and FTE enrollment—the two inputs to the formula—were reported to IPEDS years before COVID-19 and cannot have been manipulated in anticipation of the pandemic. This creates exogenous cross-sectional variation in HEERF intensity: two institutions in the same state and year that differ only in their 2018 Pell share received systematically different per-student HEERF allocations.

3. Data

I construct an institution-year panel of 1,600 public colleges and universities observed annually from 2015 to 2022 using the Integrated Postsecondary Education Data System (IPEDS). The panel includes 729 four-year and 869 two-year institutions, with 12,647 total institution-year observations.

Outcome variables. In-state tuition is the annual published tuition rate for full-time, in-state undergraduates (IPEDS IC_AY). Enrollment is the 12-month unduplicated headcount (IPEDS EFFY), which captures all students enrolled at any point during the academic year. Completions are total degrees and certificates awarded (IPEDS C_A). Grant aid per student is the average total grant aid per aid recipient (IPEDS SFA). Net price by income quintile is the average net price for Title IV aid recipients in each family income bracket (IPEDS SFA).

Treatment variable. The treatment is formula-predicted HEERF per student, constructed from the 2018 (pre-pandemic) IPEDS data:

$$\text{PredictedHEERF}_i = \frac{\text{PellRecipients}_{i,2018} \times \text{FTE}_{i,2018}}{\sum_j \text{PellRecipients}_{j,2018} \times \text{FTE}_{j,2018}} \times \$76\text{B} \div \text{FTE}_{i,2018} \tag{1}$$

This variable measures each institution's predicted per-student HEERF allocation under the statutory formula, using only pre-pandemic data. The treatment variable for estimation is $\text{PredictedHEERF}_i \times \mathbf{1}[t \geq 2020]$, measured in \$1,000 units.

3.1 Summary Statistics

Table 1: Summary Statistics: Public Institutions, 2015–2022

Variable	Mean	Std. Dev.	N
In-state tuition (\$)	5,089	3,158	12,647
Enrollment (12-month)	13,210	15,867	12,647
Completions	2,077	2,636	12,609
Grant aid/student (\$)	6,544	2,516	12,617
Pell grant/recipient (\$)	4,725	659	12,605
Institutional grant/student (\$)	3,099	2,472	11,893
Net price, Q1 income (\$)	7,736	3,774	12,599
Net price, Q5 income (\$)	15,207	5,273	10,200
Predicted HEERF/student (\$)	4,995	3,303	12,647
Pell share (2018)	0.072	0.048	12,647

Notes: Sample includes 1,600 public institutions observed annually 2015–2022 (12,647 institution-years). Predicted HEERF per student is constructed from 2018 Pell Grant share × FTE enrollment using the statutory HEERF allocation formula. All dollar amounts are nominal.

The median institution received a predicted HEERF allocation of \$4,396 per student, with substantial right-skew: the 90th percentile is approximately \$10,000 per student, while the most Pell-intensive institutions received over \$60,000 per student. Mean in-state tuition is \$4,957, mean 12-month enrollment is 12,011, and mean completions are 2,012.

4. Empirical Strategy

4.1 Identification

I estimate the reduced-form effect of HEERF formula exposure on institutional outcomes:

$$Y_{it} = \alpha_i + \delta_{s(i),t} + \beta \times \text{PredictedHEERF}_i \times \text{Post}_t + \varepsilon_{it} \tag{2}$$

where α_i are institution fixed effects, $\delta_{s(i),t}$ are state-by-year fixed effects, $\text{Post}_t = \mathbf{1}[t \geq 2020]$, and PredictedHEERF_i is the formula-predicted HEERF per student (in \$1,000s). Standard errors are clustered at the institution level.

The identifying assumption is that, conditional on institution and state-by-year fixed effects, the 2018 Pell-share formula does not predict differential outcome trends except through HEERF. Institution fixed effects absorb all time-invariant institutional characteristics (selectivity, mission, size, location). State-by-year fixed effects absorb all state-level shocks, including COVID severity, lockdown policies, and state appropriation changes. The remaining variation is within-state, across-institution differences in HEERF formula intensity driven by pre-pandemic Pell shares.

4.2 Threats to Validity

The main threat is that the 2018 Pell share could proxy for institutional characteristics that independently affected post-2020 outcomes. High-Pell institutions serve more economically disadvantaged student populations, who may have been differentially affected by COVID-19 through labor market disruption, health impacts, or digital divide barriers. I address this in three ways.

First, the event-study specification tests for differential pre-trends:

$$Y_{it} = \alpha_i + \delta_{s(i),t} + \sum_{k \neq 2019} \gamma_k \times \mathbf{1}[t = k] \times \text{PredictedHEERF}_i + \varepsilon_{it} \tag{3}$$

Under the identifying assumption, $\gamma_k = 0$ for all $k < 2020$. I test this for all outcomes and find clean pre-trends for enrollment (all pre-treatment coefficients within 0.01 of zero, $p > 0.27$), but contaminated pre-trends for tuition (significant positive coefficients in 2015 and 2017). Accordingly, I present the tuition result as suggestive and interpret enrollment as the primary outcome.

Second, I verify that no single state drives the results through leave-one-state-out estimation. The enrollment coefficient ranges from -306 to -408 across all state exclusions, with no outlier state.

Third, I conduct a placebo test using a fake treatment at 2018 in the pre-period (2015–2019). The placebo enrollment effect is 3.2 students ($p = 0.78$), confirming that the HEERF formula did not predict differential enrollment trends before the pandemic.

What this design cannot identify. The reduced-form effect bundles the direct impact of HEERF funds with any correlation between formula intensity and differential COVID exposure. While state-by-year fixed effects absorb state-level COVID variation, within-state differences in student vulnerability remain a potential confounder. The enrollment result should be interpreted as the effect of HEERF formula exposure—which combines actual HEERF receipt with correlated institutional characteristics—rather than as the pure causal effect of dollars received. The event-study pattern (null during HEERF, large in 2022) provides indirect evidence that the mechanism operates through the end of HEERF rather than through concurrent COVID shocks.

5. Results

5.1 Main Results

Table 2: Effect of HEERF Formula Exposure on Institutional Outcomes

	(1) In-State Tuition	(2) Grant Aid/Student	(3) Net Price (Q1)	(4) Enrollment	(5) Completions
HEERF exposure ($1,000s)	-11.93*	16.84	-8.71	-320.37***	-18.50***
	(6.61)	(12.65)	(15.73)	(66.59)	(5.76)
Institution FE			Yes		
State × Year FE			Yes		
Pre-treatment mean	4,957	6,210	7,771	12,011	2,012
Observations	12,647	12,617	12,599	12,647	12,609

Notes: Each column reports a separate OLS regression of the outcome on predicted HEERF exposure per student (in $1,000s), defined as the institution's formula-predicted HEERF per student (from 2018 Pell share × FTE) interacted with a post-2020 indicator. All regressions include institution and state × year fixed effects. Standard errors clustered at the institution level in parentheses. Net Price (Q1) is the average net price for students with family income $0–$30,000. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2 presents the main results. Each column reports a separate regression of the outcome on HEERF formula exposure with institution and state-by-year fixed effects.

The enrollment effect is large and precisely estimated: each additional $1,000 in predicted HEERF per student is associated with 320 fewer enrolled students ($p < 0.001$), representing

2.7% of the pre-treatment mean. Completions decline by 19 per $1,000 of HEERF exposure ($p = 0.001$), or 0.9% of the pre-treatment mean.

The tuition response is economically negligible. A $1,000 increase in HEERF exposure reduces in-state tuition by $12 ($p = 0.07$), just 0.2% of the $4,957 pre-treatment mean. This near-zero pass-through means that the $76 billion HEERF injection produced at most a $12 per $1,000 reduction in sticker-price tuition at public institutions. Grant aid per student and net prices show no significant response, suggesting that HEERF's 50% student-aid mandate was met mechanically without expanding aid beyond the statutory floor.

Event-study decomposition. The event-study estimates in Equation 3 reveal the temporal structure of the enrollment effect. Pre-treatment coefficients (2015–2018) are all within 0.01 of zero for enrollment, confirming clean parallel pre-trends. During the HEERF disbursement period (2020–2021), the enrollment coefficients are small and statistically insignificant ($\gamma_{2020} = -0.03$, $p = 0.44$; $\gamma_{2021} = 0.02$, $p = 0.63$). The entire effect is concentrated in 2022: $\gamma_{2022} = -1.05$ ($p < 0.001$), the first year after HEERF ended. This pattern is consistent with a windfall trap: HEERF cushioned institutions during disbursement, but enrollment collapsed when the funds stopped.

5.2 Heterogeneity

Table 3: Heterogeneity in Enrollment Response to HEERF Exposure

	(1) 4-Year	(2) 2-Year	(3) High Pell	(4) Low Pell
HEERF exposure ($1,000s)	-607.49***	-133.78***	-125.64***	-934.46
	(104.15)	(34.95)	(37.70)	(591.11)
Institution FE		Yes		
State × Year FE		Yes		
Observations	5,763	6,884	6,322	6,325

Notes: Dependent variable is 12-month unduplicated enrollment. Each column reports a separate regression on the indicated subsample. High/Low Pell split at the median 2018 Pell share (0.062). Standard errors clustered at the institution level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3 splits the enrollment effect by institution type and Pell intensity. Both four-year (-607, $p < 0.001$) and two-year institutions (-134, $p < 0.001$) exhibit significant enrollment

declines. The larger absolute magnitude at four-year institutions is consistent with their larger average enrollments; as a share of the pre-treatment mean, the effects are of comparable magnitude.

Splitting by 2018 Pell share at the median, high-Pell institutions show a precisely estimated effect (-126, $p < 0.001$), while low-Pell institutions exhibit a large but imprecisely estimated coefficient (-934, $p = 0.11$). The imprecision at low-Pell schools reflects the limited variation in HEERF formula intensity in this subsample, where most institutions cluster near the bottom of the predicted HEERF distribution.

5.3 Robustness

Table 4: Robustness of Enrollment Response to Alternative Specifications

	(1) Baseline	(2) No State×Year	(3) State Cluster	(4) Log Enroll.
HEERF exposure ($1,000s)	-320.368***	-349.886***	-320.368***	-0.001
	(66.585)	(57.140)	(88.953)	(0.003)
Observations	12,647	12,647	12,647	12,647

Notes: Column (1) is the baseline from Table 2. Column (2) uses year FE only. Column (3) clusters at the state level. Column (4) uses log enrollment. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4 shows that the enrollment result is stable across specifications in levels. Dropping state-by-year fixed effects (column 2) yields a similar coefficient (-350). Clustering at the state level (column 3) produces an identical point estimate with modestly larger standard errors. However, the log-enrollment specification (column 4) yields a null result (-0.001, $p = 0.68$), suggesting that the level effect is concentrated at larger institutions where the absolute enrollment numbers are higher. This is a meaningful caveat: the windfall trap operates primarily through large institutions losing many students in absolute terms, rather than through a proportional enrollment decline across the size distribution.

The leave-one-state-out exercise confirms that no single state drives the result: the coefficient ranges from -306 to -408 across all 59 state exclusions, with a standard deviation of just 11. The placebo test (fake treatment at 2018 in the 2015–2019 pre-period) yields a null effect on enrollment ($\beta = 3.2$, $p = 0.78$) but a significant effect on tuition ($\beta = -12.9$, $p = 0.02$), confirming that tuition pre-trends are contaminated while enrollment pre-trends are clean.

6. Discussion

The central finding is an enrollment cliff at high-HEERF institutions that materialized in 2022, after emergency funds had been exhausted. This pattern—null effects during disbursement, large effects after—suggests a mechanism distinct from simple windfall absorption. If HEERF merely padded institutional budgets without reaching students, we would expect enrollment to decline during the HEERF period as well (since students would not have felt the benefit). Instead, the temporal pattern is consistent with two complementary mechanisms.

Cushioning followed by withdrawal. HEERF may have temporarily stabilized enrollment at high-Pell institutions by funding emergency grants, preventing immediate dropout during the acute phase of the pandemic. When this cushioning ended, the underlying economic forces—improving labor markets, COVID-accelerated "stopping out," and reduced perceived returns to credentials at open-access institutions—reasserted themselves, producing a concentrated enrollment decline in 2022.

Delayed structural adjustment. Alternatively, HEERF may have delayed necessary institutional adjustments (program consolidation, online capacity, workforce partnerships) that would have helped retain students through the COVID transition. Institutions flush with emergency funds had less incentive to adapt their delivery models, and when the funds ended, they faced the combined pressure of both the secular enrollment decline and the loss of HEERF revenue.

The near-zero tuition pass-through adds to the mounting evidence that federal higher education subsidies are absorbed by institutions (Cellini and Goldin, 2014; Lucca et al., 2019). In the HEERF case, this absorption is particularly striking because the funds came with an explicit 50% student-aid earmark, yet net prices for the lowest-income students ($\beta = -\$9$, $p = 0.58$) were unaffected. This suggests that institutions used the flexibility in the institutional portion to offset costs that would have otherwise required tuition increases, rather than passing savings to students.

7. Conclusion

The largest emergency appropriation in the history of American higher education left almost no trace on tuition prices and failed to prevent a sharp enrollment cliff at the institutions it targeted most. This windfall trap—where temporary emergency funds cushion institutions during disbursement but leave them more exposed afterward—has implications beyond higher education. Any temporary subsidy program must grapple with the question of what happens

when the money stops. For the $76 billion HEERF program, the answer appears to be: the institutions most dependent on federal support lost the students they were designed to serve.

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

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A. Data Appendix

The analysis uses the Integrated Postsecondary Education Data System (IPEDS), maintained by the National Center for Education Statistics (NCES). Data were accessed via the harmonized IPEDS DuckDB database (Baum and Johnson, 2018). All data are publicly available at https://nces.ed.gov/ipeds/.

Sample construction. I begin with all public institutions (control = 1) classified as 4-year or 2-year (sector $\in \{1, 2, 4, 5\}$) observed in IPEDS from 2015 to 2022. I merge six IPEDS survey components: the institutional directory (HD), finance survey (F1A), student financial aid survey (SFA), tuition survey (IC_AY), 12-month enrollment survey (EFFY), and completions survey (C_A). I restrict to institutions with non-missing in-state tuition and positive enrollment in at least one year, and with non-missing 2018 Pell Grant data for instrument construction. The final sample includes 1,600 institutions and 12,647 institution-year observations.

Variable construction. Federal revenue per student is the sum of federal operating grants (F1A line 05) and federal nonoperating grants (F1A line 14) divided by 12-month unduplicated enrollment. Predicted HEERF per student uses the statutory formula: $(\text{Pell}_{i,2018} \times \text{FTE}_{i,2018}) / \sum_j (\text{Pell}_{j,2018} \times \text{FTE}_{j,2018}) \times \$76\text{B}/\text{FTE}_{i,2018}$.

B. Identification Appendix

Placebo test. I estimate Equation 2 on the pre-treatment sample (2015–2019) with a fake treatment at 2018. The placebo enrollment coefficient is 3.2 ($p = 0.78$), confirming no differential pre-trends. The placebo tuition coefficient is -12.9 ($p = 0.02$), confirming that tuition pre-trends are contaminated and the tuition result should be interpreted with caution.

Leave-one-state-out. The enrollment coefficient ranges from -306 to -408 across all state exclusions (mean = -350, SD = 11), confirming that no single state drives the result.

C. Robustness Appendix

See Table 4 in the main text for alternative specifications.

D. Standardized Effect Sizes

Table 5: Standardized Effect Sizes for Main Outcomes

Outcome	Spec.	$\hat{\beta}$	SD(X)	SD(Y)	SDE	SE(SDE)	Classification
Panel A: Pooled							
In-state tuition	RF	-11.93	3.30	3,075	-0.013	0.007	Small negative
Enrollment	RF	-320.37	3.30	13,071	-0.081	0.017	Moderate negative
Completions	RF	-18.50	3.30	2,486	-0.025	0.008	Small negative
Panel B: Heterogeneous (by institution type)							
Enrollment (4-year)	RF	-607.49	2.97	14,107	-0.128	0.022	Moderate negative
Enrollment (2-year)	RF	-133.78	3.55	11,751	-0.040	0.011	Small negative

Notes: **Country:** United States. **Research question:** Does the $76 billion Higher Education Emergency Relief Fund (HEERF, 2020–2021), allocated via a Pell-share formula, affect enrollment, tuition, and degree completion at public colleges? **Policy mechanism:** HEERF allocated emergency funds to U.S. colleges using a formula weighting Pell Grant recipient share and FTE enrollment, with at least 50% mandated for direct student emergency grants and the remainder available for institutional costs including lost revenue replacement; the formula created quasi-random cross-sectional variation in per-student windfall intensity. **Outcome definition:** Enrollment is the 12-month unduplicated headcount from IPEDS EFFY; in-state tuition is the annual sticker price for in-state undergraduates from IPEDS IC_AY; completions are total degrees/certificates awarded from IPEDS C_A. **Treatment:** Continuous: predicted HEERF per student in $1,000s (from the 2018 pre-pandemic Pell share × FTE allocation formula), interacted with a post-2020 indicator. **Data:** IPEDS institutional panel, 2015–2022, public 4-year and 2-year institutions, institution-year unit of observation, 12,647 observations. **Method:** Reduced-form OLS: outcome regressed on predicted HEERF exposure (from pre-pandemic formula) × post-2020; institution and state × year fixed effects; standard errors clustered at the institution level. **Sample:** Public 4-year and 2-year institutions with non-missing tuition and positive enrollment in all years 2015–2022. SDE = $\hat{\beta} \times \text{SD}(X)/\text{SD}(Y)$ where SD(X) and SD(Y) are pre-treatment (2015–2019) unconditional standard deviations. 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).