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6-9 JULY 2025, SYDNEY
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School Funding and Student Performance in Australia

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Preview of the Study

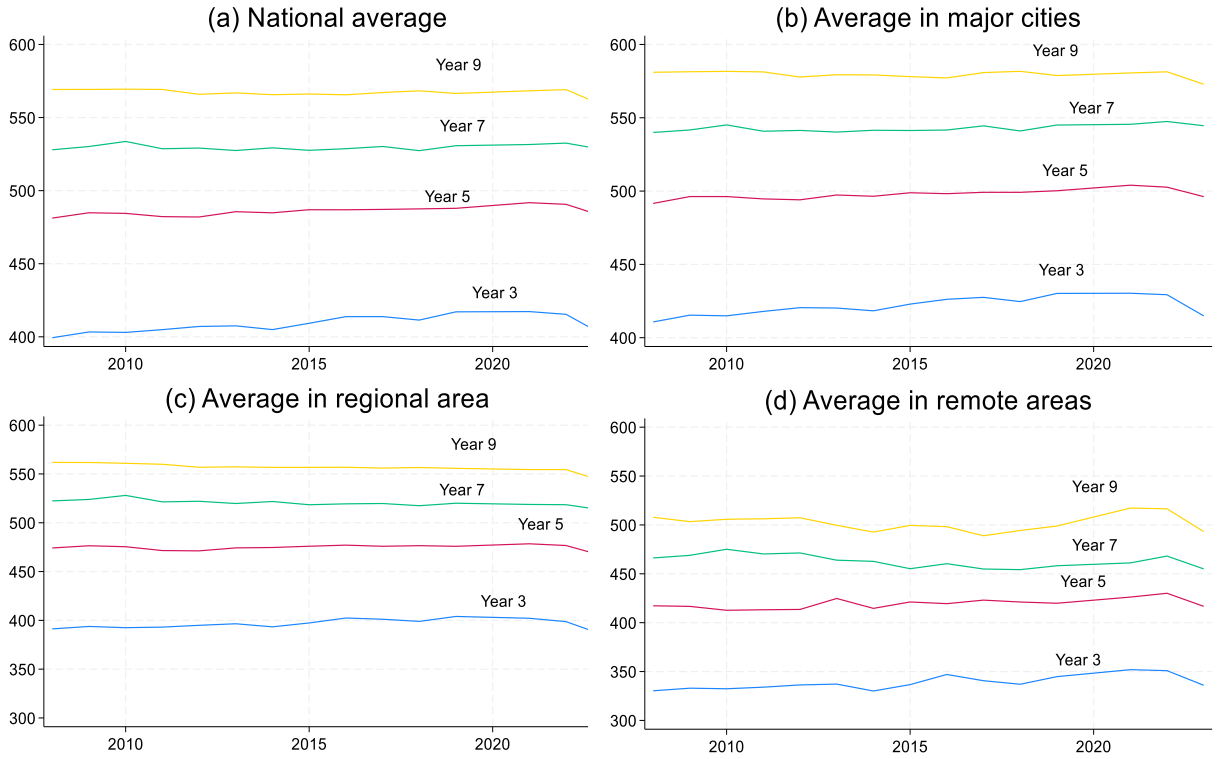
- The study uses both panel fixed effects models (2008–2023) and regression discontinuity design (2021–2023) to assess whether the significant increase in Australian school funding over the past decade improved student performance, as measured by NAPLAN scores.

- Results consistently show that increased funding has little or no positive impact on NAPLAN scores.

- The insignificant impacts are consistent across student cohorts, school sectors, regions and subjects. The results imply that further increasing government funding alone is unlikely to be effective to improve student NAPLAN outcomes.

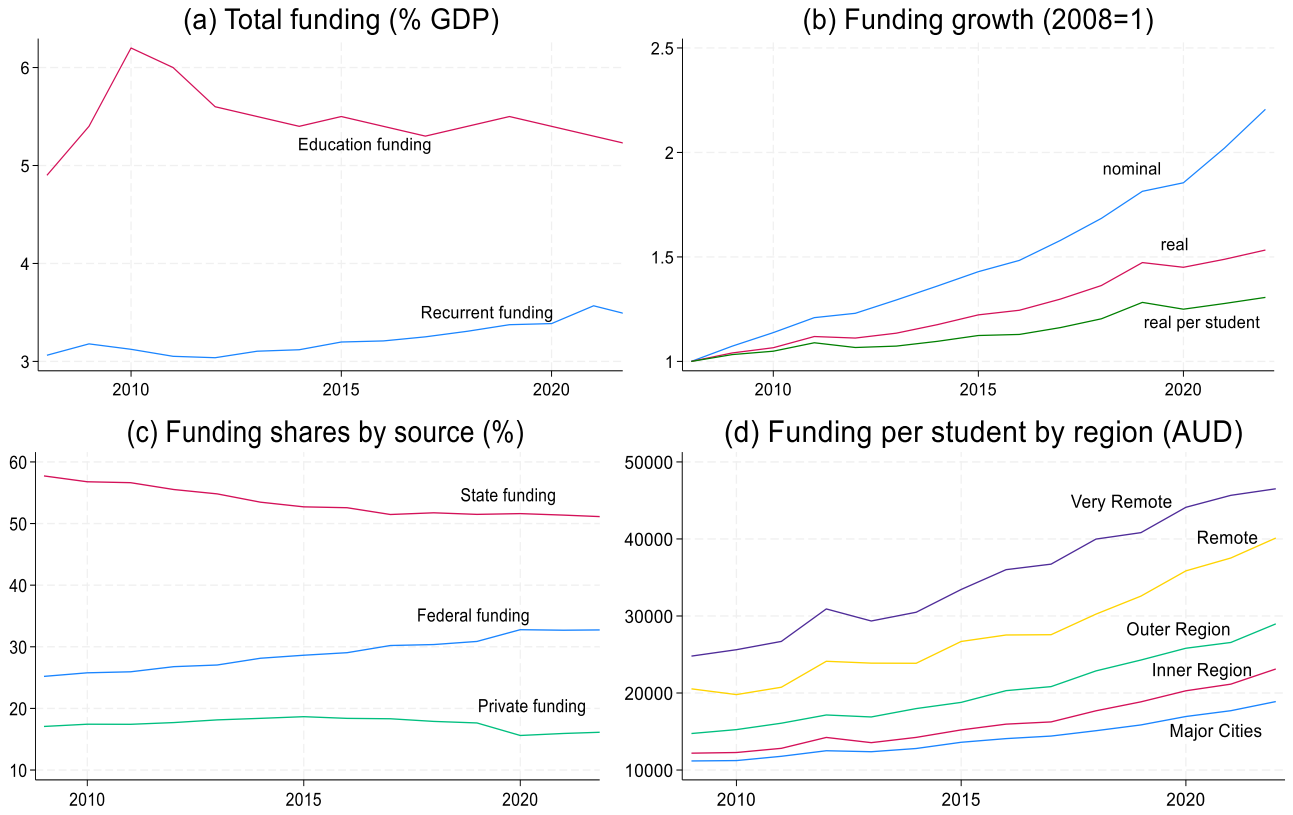
National Assessment Program – Literacy and Numeracy (NAPLAN)

- NAPLAN is Australia's nationwide standardised test, introduced in 2008.
- It assesses basic skills in reading, writing, spelling, grammar & punctuation, and numeracy.
- Tests are conducted annually for students in Years 3, 5, 7, and 9, with scores ranging from 0 to 1000.



Australian School Funding

- A large share of Australian education spending allocated to school-level recurrent funding (panel a).
- The recurrent funding per student in real term significantly increased over the decade (panel b)
- The share of public funding continuously increased while the share of private funding decreased over time (panel c).



Needs-based Funding Model

- The Gonski Report (2011) led to the Australian Education Act 2013, which introduced a needs-based funding model.
- The needs-based funding model calculates the Schooling Resource Standard (SRS), a national benchmark for estimating the total public funding required to meet each school's educational needs.
- SRS calculation includes a **base per-student amount** and **six loadings for disadvantage**, with non-government school funding adjusted based on **capacity to contribute**.
- In 2025, the estimated SRS base funding amounts are $13,977 for primary students and $17,565 for secondary students.

School Types and Funding Responsibilities in Australia

- Government school – (Commonwealth government provides *20%* of SRS funding while the state and territory governments provide the other *80%*)
- Non-government schools (Independent schools and Catholic schools) – (Commonwealth government provides *80%* of SRS funding while the state and territory governments provide the other *20%*)
- Actual funding often deviates from SRS entitlement.
- Government schools are under-funded on average, due to state and territory shortfalls in contributions
- Under the 2025 Full and Fair Funding Agreement, the Commonwealth increased its contribution to 25% of the SRS for government schools, where States and territories are required to maintain at least 75%.

School Funding and Student Performance

- The existing literature on the impact of school funding on student performance presents mixed evidence.
- Reply on US data, Jackson and Mackevicius (2024) find that increased school spending improves student outcomes, especially for low-income students.
- Hanushek (2006) reviews early studies and finds little consistent relationship between school resources (include fundings) and student achievement in both developed and developing countries.
- Other studies indicate that the effectiveness of school fundings on student performance is not how much the resources but how they are used (Hanushek and Woessmann, 2017; Woessmann, 2016; Glewwe and Muralidharan, 2016).
- Cobb-Clark and Jha (2016) find no apparent link between school expenditure and NAPLAN performance in Victoria using data from 2008–2011.

Conceptual Framework

- Educational outcomes are modelled using a production function, where student performance (e.g. NAPLAN scores) is the output of multiple inputs.

- The general form of the production function:

$$y = Zf(G, P, S, F, I, E)$$

- Inputs:

G: Government funding
P: Private funding
S: School-specific inputs (e.g. resource management, school culture, peer effects)
F: Family inputs
I: Individual student characteristics
E: Educational system and broader environment

Empirical Specification - Fixed effects model

- First, we estimate the effect of school-level funding on NAPLAN performance using:

$$y_{\{i,t\}} = \beta \ln\left(g_{\{i,t\}}\right) + \gamma \ln\left(p_{\{i,t\}}\right) + \rho X_{\{i,t\}} + A_i + \alpha_t + \epsilon_{\{i,t\}}$$

- $y_{\{i,t\}}$: NAPLAN outcome for school *i* in year *t*
- $g_{\{i,t\}}$, $p_{\{i,t\}}$: per-student government and private funding
- $X_{\{i,t\}}$: control variables
- A_i : school fixed effects
- α_t : year fixed effects

Regression discontinuity design (RDD)

- To estimate the causal impact from school funding on NAPLAN outcomes, we apply the RDD.

- We generate the running variable taking the fact that the actual school fundings tends to deviate from SRS entitlement.

$$R_{i,t} = F_{i,t} - F_{i,t}^{SRS}$$

$F_{i,t}$: actual per-student funding

$F_{i,t}^{SRS}$: the school's per-student SRS entitlement

$R_{i,t} = 0$ meaning schools at the threshold receive exactly the SRS

Regression discontinuity design (RDD)

- We estimate the following sharp RDD specification:

$$Y_{s,g,i,t} = \alpha + \tau D_{i,t-1} + f_{-}(R_{i,t-1}) \cdot 1(R_{i,t-1} < 0) + f_{+}(R_{i,t-1}) \cdot 1(R_{i,t-1} \geq 0) + \varepsilon_{s,g,i,t}$$

$Y_{s,g,i,t}$ is the change in NAPLAN scores for subject s, grade g, school i, year t.

$D_{i,t-1}$ equals 1 if a school receives more than the SRS entitlement in the last financial year and 0 otherwise.

This specification investigates whether receiving more than the SRS entitlement leads to improved school-level NAPLAN performance in the following year.

Follow the suggestion from Cattaneo et al. 2020,We apply polynomial degree one for the specification.

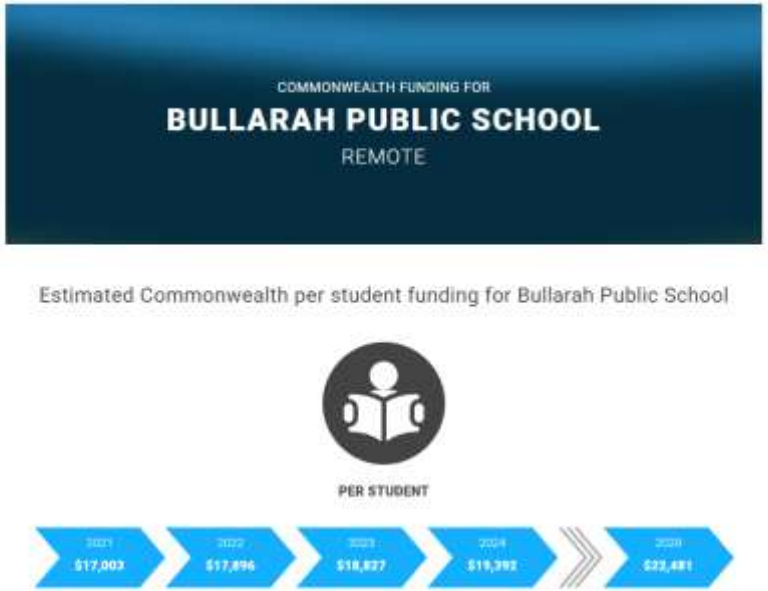
Data

- Main data are sourced from the Australian Curriculum, Assessment and Reporting Authority (ACARA).

- We obtain SRS entitlements (only-government schools) from the Department of Education's School Funding Estimator at: https://www.education.gov.au/school-funding/estimator

Variables	Descriptions
NAPLAN	The average NAPLAN score across students at the school level.
D-NAPLAN	The year-over-year difference in the average NAPLAN score.
GF	Recurrent funding per student from federal and state government.
PF	Private funding per student, including fees, charges and parental contributions, other private sources.
SF	Per-student school funding allocated based on the Australian government's SRS formula
ICSEA	Index of Community Socio-Educational Advantage.
Full-time enrollment	The total number of students enrolled in a school on a full-time equivalent basis.
Indigenous	The percentage of students in the school who identify as Indigenous.
Teacher	The number of students per full-time equivalent teaching staff member (teacher).
Admin	The number of students per full-time equivalent non-teaching staff member (administrator).
Language	The percentage of students who speak a language other than English at home.
Gender	The ratio of female to male students, where students include including both full-time and part-time enrolments.
Sector	Three school sectors: government, independent and Catholic.
Region	Three regions: major city, regional areas, and remote areas.

SRS entitlements



Both schools locate in NSW

First school's per student SRS entitlement in 2021: $2,754 / 20% = $13,770
Second school's per student SRS entitlement in 2021: $17,003 / 20% = $86,650

Descriptive Statistics – Fixed Effect Model

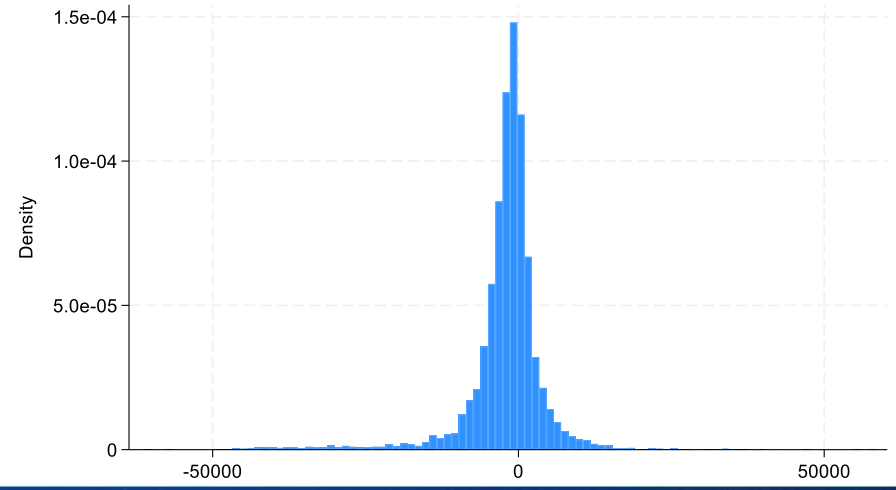
- In fixed effect model, we utilise panel data from 2008 to 2023.

	Year 3			Year 5		
	Observations	Mean	S.D.	Observations	Mean	S.D.
NAPLAN	76,443	409.07	43.43	76,647	486.23	39.3
GF	76,443	12194.59	5216.11	76,647	12165.49	5240.62
PF	76,443	1859.32	3804.73	76,647	1907.43	3886.45
ICSEA	76,443	1009.79	94.88	76,647	1010.41	94.72
Teacher	76,443	15.26	3.43	76,647	15.26	3.44
Admin	76,443	51.84	34.77	76,647	51.81	34.86
Language	76,443	20.21	24.16	76,647	20.14	24.1
Gender	76,443	0.49	0.08	76,647	0.49	0.08
	Year 7			Year 9		
	Observations	Mean	S.D.	Observations	Mean	S.D.
NAPLAN	38,750	529.75	43.46	28,127	567.42	45.97
GF	38,750	13084.46	6170.28	28,127	13831.44	7019.52
PF	38,750	3137.97	5247.03	28,127	4068.93	5916.67
ICSEA	38,750	1001.81	101.18	28,127	1006.31	99.47
Teacher	38,750	13.52	3.29	28,127	12.23	2.7
Admin	38,750	36.36	18.57	28,127	35.66	19.16
Language	38,750	18.84	23.84	28,127	20.35	25.05
Gender	38,750	0.49	0.15	28,127	0.5	0.18

Descriptive Statistics – RDD

- Due to the availability of SRS data, this study uses data from 2021 onward.
- From 2021 to 2022, 68.3% of cases show that government schools received less funding than their SRS entitlements.

Variable	Obs	Mean	Std. Dev.	Min	Max
NAPLAN	109,986	462.32	67.66	105.00	810.00
D-NAPLAN	109,986	-6.01	25.63	-204.00	207.00
SF	10,774	19,777.55	7,259.60	11,125.00	73,155.00
GF	10,774	17,749.75	6,030.43	8,551.30	109,624.30
ICSEA	10,774	990.15	90.12	540.00	1236.00
Teacher	10,774	13.90	7.37	2.72	219.39
Admin	10,774	45.06	37.48	14.21	252.3
Indigenous	10,774	11.22	15.55	0.00	100.00
Language	10,774	24.89	25.87	0.00	100.00



Results from Fixed Effect Model

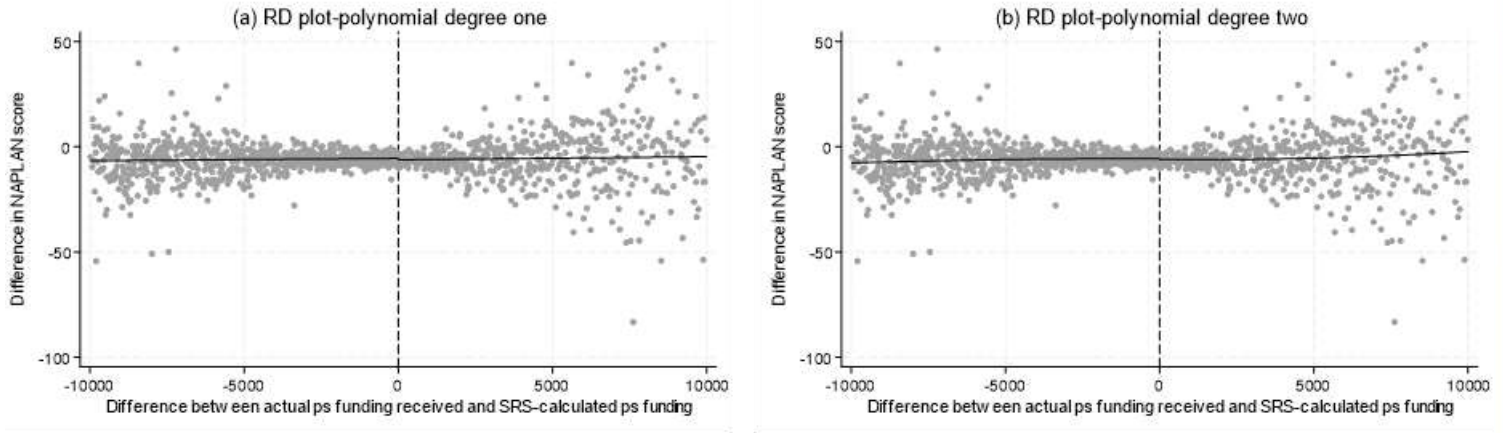
- Government funding–NAPLAN link is statistically insignificant or negative, especially in Years 7 and 9.

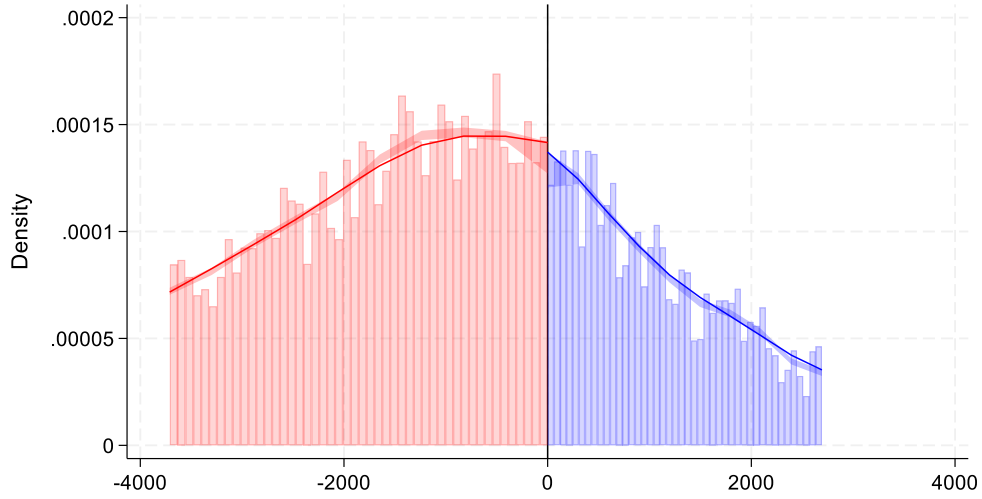
- Private funding shows a positive correlation with performance for Years 3 and 5, but not for higher year levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 3	Year 3	Year 5	Year 5	Year 7	Year 7	Year 9	Year 9
ln(GF)	-0.599	1.883	-3.749	-4.445	-9.736***	-7.676***	-10.01**	-7.668**
	(3.902)	(2.383)	(2.299)	(2.848)	(2.029)	(0.701)	(2.896)	(2.814)
L.ln(GF)		2.601		4.024*		-0.604		-4.407*
		(1.604)		(1.706)		(1.778)		(1.959)
ln(PF)	0.859*	1.143*	0.928***	0.994**	0.375	0.204	-0.392	-0.718*
	(0.424)	(0.551)	(0.204)	(0.347)	(0.370)	(0.367)	(0.331)	(0.335)
L.ln(PF)		-0.152		0.313		0.058		0.110
		(0.245)		(0.211)		(0.250)		(0.387)
ICSEA	0.250***	0.317***	0.215***	0.270***	0.125***	0.175***	0.151***	0.190***
	(0.014)	(0.015)	(0.011)	(0.014)	(0.008)	(0.010)	(0.013)	(0.010)
Teacher	0.028	-0.074	0.020	-0.037	-0.182	-0.213	0.142	-0.068
	(0.144)	(0.079)	(0.069)	(0.106)	(0.152)	(0.169)	(0.197)	(0.178)
Admin	0.027***	0.034***	0.023	0.011	0.033*	0.033	0.042	0.017
	(0.005)	(0.008)	(0.013)	(0.011)	(0.016)	(0.018)	(0.028)	(0.015)
Language	0.061*	0.065	0.084***	0.078**	0.026	0.018	0.075**	0.061**
	(0.031)	(0.047)	(0.017)	(0.026)	(0.025)	(0.017)	(0.028)	(0.025)
Gender	19.13***	17.91***	14.86***	13.53***	15.79***	17.52***	16.05**	14.81***
	(1.627)	(3.280)	(2.851)	(1.897)	(3.643)	(3.612)	(5.297)	(3.095)
Observations	76,443	61,166	76,647	61,307	38,750	30,836	28,127	22,718
R-squared	0.134	0.147	0.094	0.100	0.070	0.089	0.106	0.104
School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Results from RDD – Plot and Manipulation Test

- RD plots suggest no significant jumps at the threshold.
- McCrary (2008) test suggests no evidence of manipulation and thereby supporting the validity of the RDD approach.





Results from RDD

- No significant effect of receiving more than SRS on year-over-year NAPLAN changes across all specifications.

	(1)	(2)	(3)	(4)
Panel (a): whole sample				
D-NAPLAN	-0.187	-0.108	0.192	-0.051
	(1.146)	(1.164)	(1.266)	(1.042)
Bandwidth (AUD)	3,238.61	2,819.37	2,436.12	2,894.95
N	109,986	109,986	109,986	109,986
Panel (b): Year 3				
D-NAPLAN	-1.082	-1.026	-1.446	-1.154
	(1.477)	(1.557)	(1.473)	(1.308)
Bandwidth (AUD)	2,016.54	1,755.50	1,230.20	1,858.79
N	39,260	39,260	39,260	39,260
Panel (c): Year 5				
D-NAPLAN	0.227	0.192	0.052	0.546
	(1.208)	(1.254)	(1.234)	(1.160)
Bandwidth (AUD)	2,224.94	1,936.92	1,702.35	2,568.61
N	39,260	39,260	39,260	39,260
Panel (d): Year7				
D-NAPLAN	-0.362	-0.657	-1.389	-0.372
	(2.054)	(2.204)	(2.398)	(1.840)
Bandwidth (AUD)	2,690.36	2,349.66	1,626.65	2,511.42
N	15,733	15,733	15,733	15,733
Panel (e): Year 9				
D-NAPLAN	1.872	1.622	2.101	1.858
	(3.561)	(3.273)	(3.445)	(3.051)
Bandwidth (AUD)	2,261.59	1,975.19	1,749.11	2,650.77
N	15,733	15,733	15,733	15,733
MSE-optimal	Yes	No	Yes	Yes
CER-optimal	No	Yes	No	No
Controls	No	No	No	Yes
Kernel	Triangular	Triangular	Uniform	Triangular

Results from RDD – Heterogeneity Analysis

- No significant effect across geolocations, except in remote areas.

	(1)	(2)	(3)	(4)
Panel (a): Major city				
D-NAPLAN	-0.309	0.440	-0.584	-0.586
	(1.338)	(1.295)	(1.167)	(1.023)
Bandwidth (AUD)	2,603.02	2,298.89	1,113.07	2092.69
N	58,059	58,059	58,059	58,059
Panel (b): Regional Australia				
D-NAPLAN	0.860	0.809	0.583	0.734
	(1.073)	(1.021)	(1.084)	(0.914)
Bandwidth (AUD)	2,456.04	2,152.42	1,631.67	2340.71
N	39,775	39,775	39,775	39,775
Panel (c): Remote area				
D-NAPLAN	-10.70	-9.425	-15.580**	-15.684***
	(7.426)	(7.892)	(6.684)	(5.522)
Bandwidth (AUD)	2,260.89	1,996.73	1,647.24	2330.52
N	4,187	4,187	4,187	4,187
MSE-optimal	Yes	No	Yes	Yes
CER-optimal	No	Yes	No	No
Controls	No	No	No	Yes
Kernel	Triangular	Triangular	Uniform	Triangular

Results from RDD – Heterogeneity Analysis

- Panel (a) & (b): ICSEA bottom/top – schools with ICSEA values in the bottom/top 25th percentile.
- Panel (c): Indigenous > 20%: schools where more than 20% of students identify as Indigenous.
- No subgroup shows statistically significant effects.

	(1)	(2)	(3)	(4)
Panel (a): ICSEA bottom				
D-NAPLAN	-0.699	-0.938	-1.442	-1.139
	(1.378)	(1.449)	(1.377)	(1.302)
Bandwidth (AUD)	2,783.39	2,439.31	1,754.21	2385.83
N	32,189	32,189	32,189	32,189
Panel (b): ICSEA top				
D-NAPLAN	-0.114	0.091	0.141	0.505
	(0.875)	(0.911)	(0.801)	(0.771)
Bandwidth (AUD)	1,371.03	1,201.54	1,129.45	1147.84
N	20,027	20,027	20,027	20,027
Panel (c): Indigenous > 20%				
D-NAPLAN	3.424	3.660	1.663	3.244
	(2.891)	(2.824)	(2.851)	(2.812)
Bandwidth (AUD)	2,719.45	2,383.28	1,584.36	3020.41
N	14,712	14,712	14,712	14,712
MSE-optimal	Yes	No	Yes	Yes
CER-optimal	No	Yes	No	No
Controls	No	No	No	Yes
Kernel	Triangular	Triangular	Uniform	Triangular

Robustness Check

- **Placebo Cut-off Tests:** Artificially shift the RDD threshold to ±1,000, ±2,000, and ±3,000 AUD.

- **Group-Mean Running Variable**:

Schools grouped into 100 bins by SRS entitlement per student.

New running variable: actual funding minus group-mean SRS.

Placebo vut-off test	(1)	(2)	(3)	(4)	(5)	(6)
D-NAPLAN	0.806	-0.238	-0.212	0.217	-2.076	-2.832
	(0.736)	(0.939)	(1.053)	(1.141)	(1.704)	(2.067)
Bandwidth (AUD)	1546.95	2685.31	2192.56	2210.09	1816.78	2328.72
N	109,986	109,986	109,986	109,986	109,986	109,986
MSE-optimal	Yes	Yes	Yes	Yes	Yes	Yes
CER-optimal	No	No	No	No	No	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Kernel	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular

Group-mean of SRS entitlements	(1)	(2)	(3)	(4)
D-NAPLAN	-0.015	0.045	0.217	0.083
	(1.089)	(1.099)	(1.198)	(.983)
Bandwidth (AUD)	3,230.62	2,812.41	2,316.26	2855.32
N	109,986	109,986	109,986	109,986
MSE-optimal	Yes	No	Yes	Yes
CER-optimal	No	Yes	No	No
Controls	No	No	No	Yes
Kernel	Triangular	Triangular	Uniform	Triangular

Discussion – Why School Funding only May Not Improve NAPLAN Scores

- Diminishing returns: The education production function is likely concave.
- Low stakes of NAPLAN: Students and teachers have limited incentives to improve scores, as NAPLAN does not affect progression, teacher evaluation, or funding.
- Spending not targeted to NAPLAN-related areas: Increases in staff and funding may go toward non-NAPLAN subjects (e.g. STEM, arts, languages) or administrative roles.
- Teacher quality issues: Many new staff may be teaching out of field, particularly in remote areas, limiting the effectiveness of increased funding on learning outcomes.
- Resource allocation efficiency: How money is spent may matter more than how much.

Conclusion

- The paper shows that the impacts of government funding are little, or at best weakly positive and at worst negative.
- The results imply that further increasing government funding alone is unlikely to be effective to improve student NAPLAN outcomes.
- These findings do not suggest funding is unimportant—there are broader dimensions of schooling beyond NAPLAN.

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