



# Do Investment Tax Breaks Work? Evidence from Australia

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AWPF

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# Motivation

- Business investment is crucial for economic growth
  - More cyclical component of growth
  - Investment and capital deepening contribute to labour productivity growth and living standards
- Recent decades increased use of investment tax incentives
  - Macro-stabilisation tool
    - GFC investment tax break
    - COVID Instant asset write off (IAWO) and Temporary full expensing
  - Broader structural policy tool
    - Changes in IAWO thresholds (asset and firm size) in 2012, 2015, 2016, 2019
    - Used against background of slowing productivity growth and lower investment

# Motivation

- Do these tax incentive work to stimulate investment?
- From a policy standpoint:
  - Policies are costly, so want a return
  - Are they better as stabilisation or structural policies?
- For a literature perspective
  - Broader literature on effect cost of capital on investment
  - Helps differentiate between different models of corporate financing

# Literature

# Literature

- **Hall and Jorgenson (1967):** bonus tax deductions for investment expenditure increases the present value of depreciation allowances and consequently reduces the cost of capital.

$$UC = P \times M \times \frac{1 - \tau Z}{1 - \tau}$$

- P is real price of investment goods
  - M is cost of finance
  - $\tau$  is tax rate
  - Z is present value of depreciation allowances
- 
- Investment tax incentives raise Z, so lower cost of investment, makes more viable
    - Permanent policy, burst of investment as move new higher  $K^*$
    - Temporary policy may more effective as potentially bring forward investment

**Table 1: Depreciation Schedule**  
**\$100,000 investment with a five-year effective life,**

	Years, (\$,000s)					Present Value	
	1	2	3	4	5	\$,000s	Share of purchase price
<i>Normal depreciation</i>							
Deduction	20	20	20	20	20	87.7	0.88
Tax benefit (at 30 per cent marginal tax rate)	6	6	6	6	6	26.3	0.26
<i>With 10 per cent bonus deduction</i>							
Deduction	30	20	20	20	20	97.7	0.98
Tax benefit (at 30 per cent marginal tax rate)	9	6	6	6	6	29.3	0.29

← Z  
 ←  $\tau Z$

# Literature

- Imputation system in Australia potentially complicates things
- Officer (1994)

$$UC = P \times M \times \frac{1 - \tau(1 - \gamma)Z}{1 - \tau(1 - \gamma)}$$

- $\gamma$  captures the value of the tax credit to end tax payer
  - For unincorporated business  $\gamma = 0$ , so larger impact
  - For company  $\gamma$  between 0 and 1, so smaller impact
    - Likely closer to 1 for smaller domestically owned businesses
    - Maybe lower for foreign owned and large businesses



# Literature

- Based on 'old view', where marginal source of funding is external
- 'New view' firms funding via retained earnings, making imputation irrelevant for investment (effectively  $\gamma=0$ )
- Policies allow us to test these views
  - Do outcomes differ for firms subject to imputation and not?

Paper	Policy	Methodology	Results
House and Shapiro (2008)	<p>Bonus depreciation in 2004 allowing firms to deduct 30% or 50% of the asset and depreciate the remaining under normal depreciation rules.</p>	<p>Match 36 asset types to IRS depreciation schedule to track eligible assets with short/long asset lives and ineligible investment between 1959 and 2005.</p> <p>A structural macro model is then estimated to provide a counterfactual baseline for investment without the bonus investment. Forecast errors are compared across asset types.</p>	<p>Investment in eligible investment increased sharply and the estimated elasticity is high (between 6 and 14).</p>
Zwick and Mahon (2017)	<p>Bonus depreciation in 2004 (same policy as above) and a second bonus depreciation of 50% in 2008 and 100% in 2010.</p>	<p>The authors compute the present discounted value of deductions for eligible investment and an average is taken for each industry.</p> <p>Firms in industries with most of their investment in short duration categories act as the control group because the bonus only modestly alters the depreciation schedules. Firms in 'long duration' industries form the policy group.</p>	<p>Similar estimates of high elasticity. Stronger impact for constrained, and those able claim now, suggesting role for constraints.</p>

Paper	Policy	Methodology	Results
Maffini, Xing and Devereux (2019)	UK 2004 policy that expanded the definition of SMEs, allowing some larger businesses to qualify for the more generous (40% upfront compared to 25%) depreciation allowances for the first time.	Difference in Difference approach. The treatment group are the companies that newly became qualified under the new threshold and the control group is defined as companies that never qualified either before or after the policy change.	Policy raised the investment in eligible assets. The implied elasticity of investment between 8.3 and 9.9.
Rodgers and Hambur (2018)	Analyse the effect of tax breaks Global Financial Crisis (GFC) where businesses with a turnover of under \$2 million received an extra deduction of 50%; other firms received an extra 10-30%.	Regression discontinuity and difference-in-difference methods around the small business turnover threshold to compare the investment of small and large businesses using business tax and CAPEX microdata.	Strong effects, but elasticities smaller than other studies. Stronger for unincorporated firms and closer to other studies. Some evidence of non-standard channels for companies.

# Data and Methodology

# Data and Methodology

Table 1: Investment incentive policies

<b>Policy</b>	<b>Turnover threshold</b>	<b>Asset threshold</b>	<b>100% write off</b>	<b>Extra deduction</b>
GFC policy 2009	\$2m	Uncapped; cost threshold	No	Yes
SBE 2012	\$2m	\$6,500	Yes	No
SBE 2015	\$2m	\$20,000	Yes	No
SBE 2016	\$10m	\$20,000	Yes	No
Medium 2019	\$50m	\$30,000	Yes	No
Large (COVID)	\$500m	\$150,000	Yes	No
Very large COVID)	\$5b	Uncapped	Yes	No

- Given turnover thresholds, identification focus will be based on eligible and ineligible firms

# Data and Methodology

- ABS BLADE data integrated with CAPEX survey
- Two investment datasets
  - CAPEX survey: Quarterly investment in eligible/ineligible assets, and investment intentions. Sample of firms
  - BAS investment data: Quarterly total investment for all firms

# Data and Methodology

- Two methodologies:
  - Differences in differences
    - Lower data requirements
    - Better sense of ‘global’ and macro effects
    - Stronger assumptions
  - Regression discontinuity design
    - More data intensive
    - More ‘local’ estimate of effect
    - Very limited assumptions

# Dif-in-Dif



# Dif-in-Dif

$$f(EQCAPEX_{i,s,n,t}) = v_i + \gamma_{n,t} + \tau_{s,calquarter}(t) + \eta * a_{s,t} + \varepsilon_{i,s,t}$$

$v_i$ : Firm fixed effect

$\gamma_{n,t}$ : Industry\*period effect

$\tau_{s,calquarter}(t)$ : Size-specific seasonal trends

$a_{s,t}$ : Tax credit receipt

$\eta > 0$  tax break increases investment

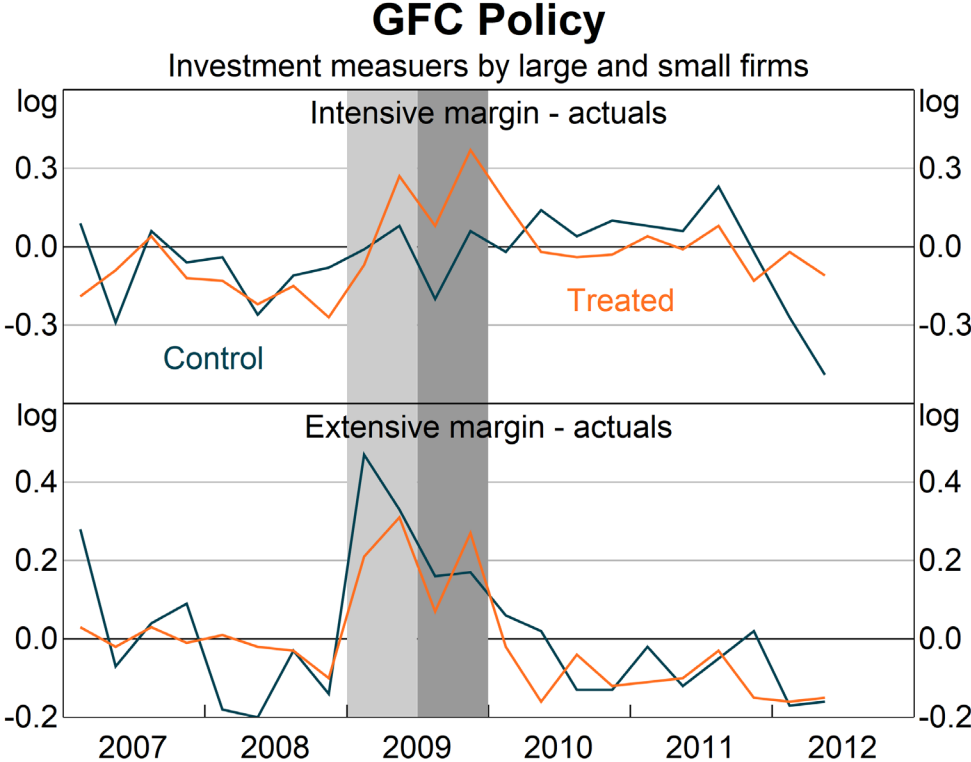
Investment measures:

- **Intensive margin** - Log(Investment in machinery and equipment)
- **Extensive margin** – proportion of firms in the industry\*size investing
  - Log-odd ratio

# Dif-in-Dif

<b>Policy</b>	<b>Treated</b>	<b>Control</b>	<b>Policy tested</b>	<b>Qtrs</b>
GFC policy 2009	TO < \$2m	\$2m < TO < \$5m	Extra deduction	2
SBE 2012	TO < \$2m	\$2m < TO < \$5m	Change in asset limit	6
SBE 2015	TO < \$2m	\$2m < TO < \$5m	Change in asset limit Tax rate cut (30% to 28.5%)	5
SBE 2016	\$2m < TO < \$10m	\$10m < TO < \$20m	Change in TO limit Tax rate cut (30% to 27.5%)	4
Medium 2019	\$10m < TO < \$50m	\$50m < TO < \$60m	Change in TO limit	3
COVID 2020	\$50m < TO < \$500m	\$500m < TO < \$600m	Change in TO limit	3
COVID 2021	\$500m < TO < \$5b	\$5b < TO < \$6b	Change in TO limit	4

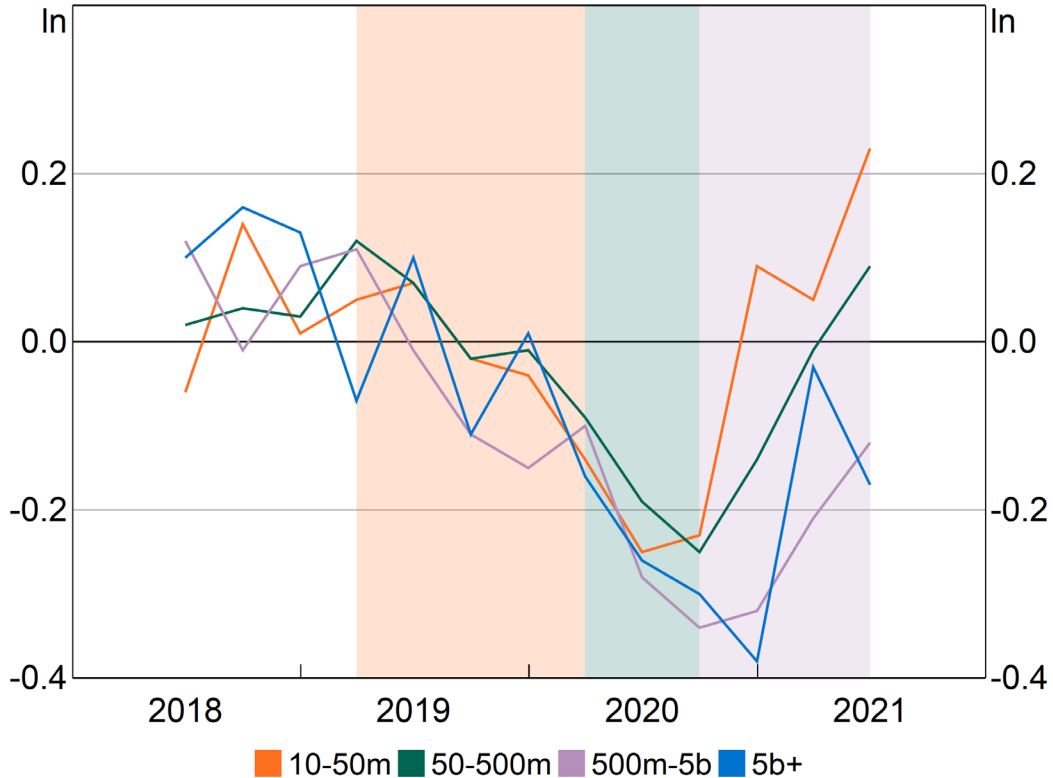
# Dif-in-Dif



Sources: ABS; Authors' calculations

# Equipment Investment

Average of firm-level logs average for investors, by size, seasonally adjusted and de-meanned



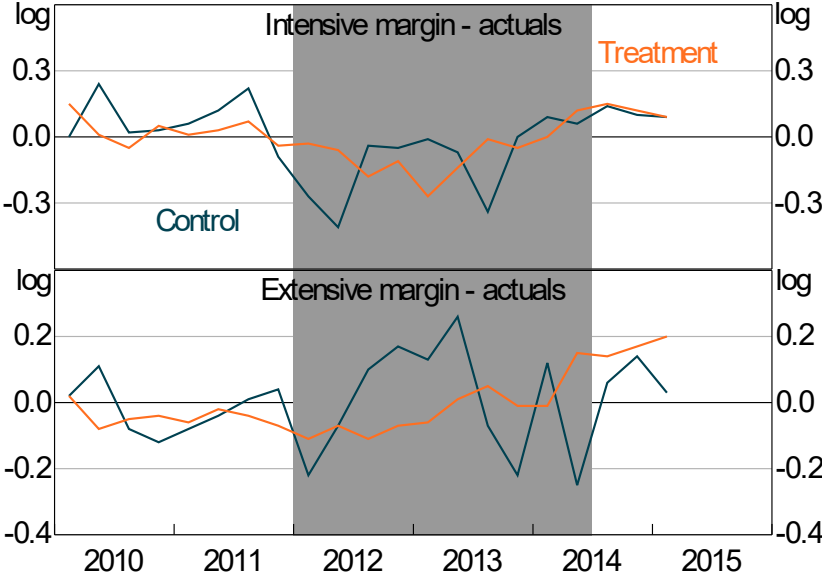
\* No population weights applied. Size based on income in 2018/19

Source: CAPEX microdata

# Dif-in-Dif

## 2012 Policy

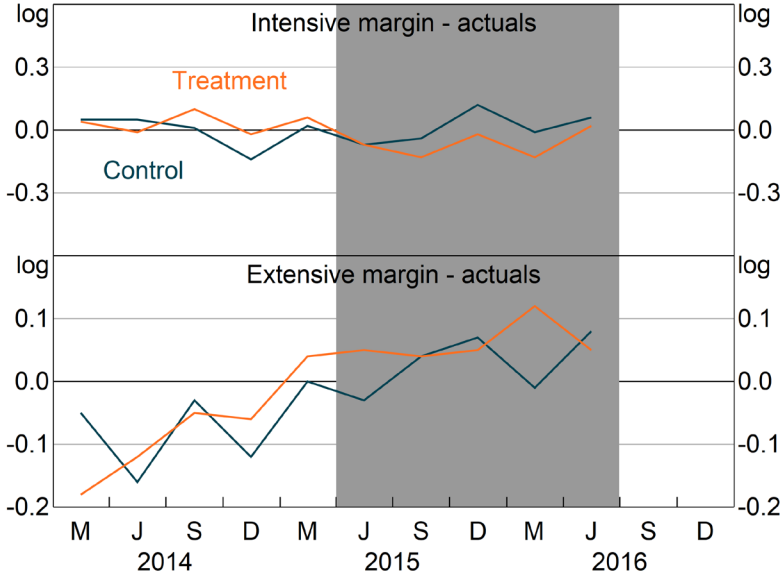
Investment measuers by large and small firms



Sources: ABS; Authors' calcautions

## 2015 Policy

Investment measuers by large and small firms

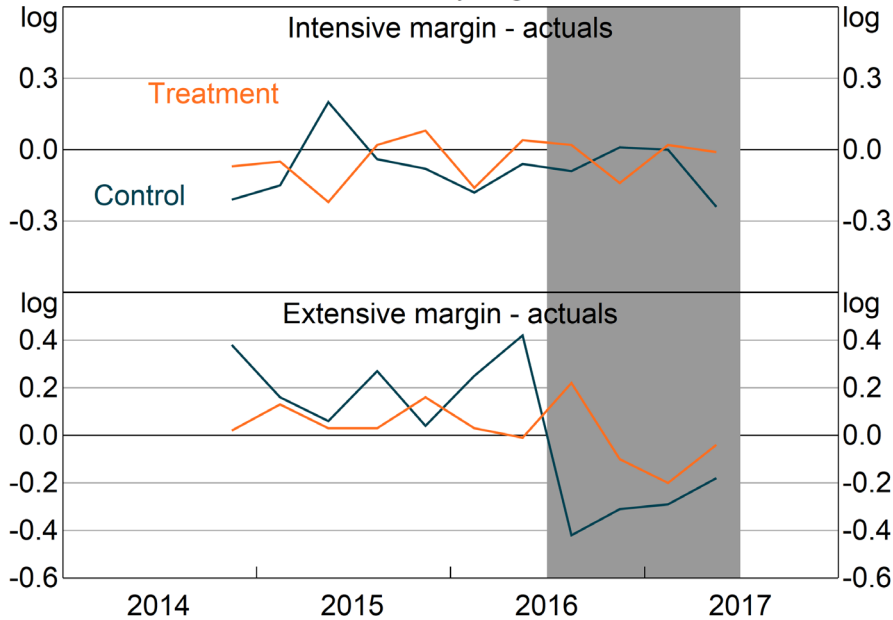


Sources: ABS; Authors' calcautions

# Dif-in-Dif

## 2016 Policy

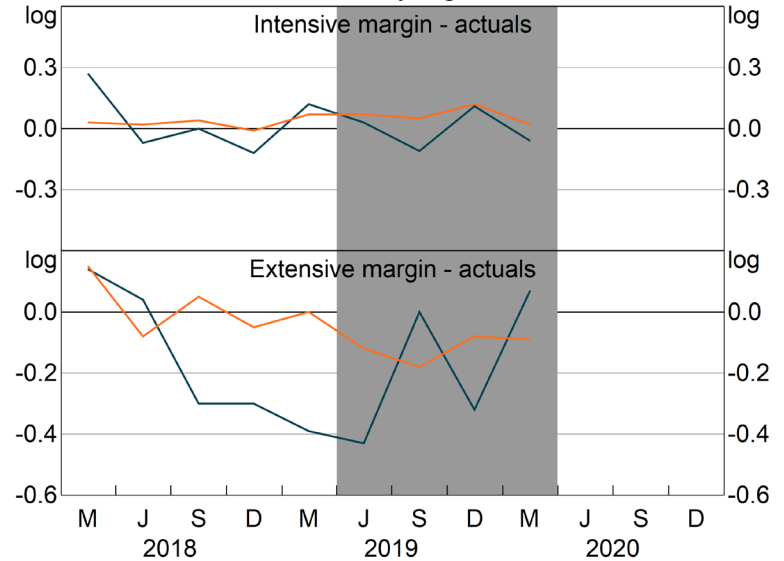
Investment measurers by large and small firms



Sources: ABS; Authors' calculations

## 2019 Policy

Investment measurers by large and small firms



Sources: ABS; Authors' calculations

# Dif-in-Dif

## Stabilisation policies:

- GFC significant effect, COVID policies not effect

## Small business policies (2012 and 2015)

- Some evidence of effect for unincorporated, but minimal overall

## Other structural policies

- Generally limited evidence of an effect
  - Some evidence for 2015 and 2016, but potentially reflects tax rate cuts as see also for buildings and structures

# Regression Discontinuity Design

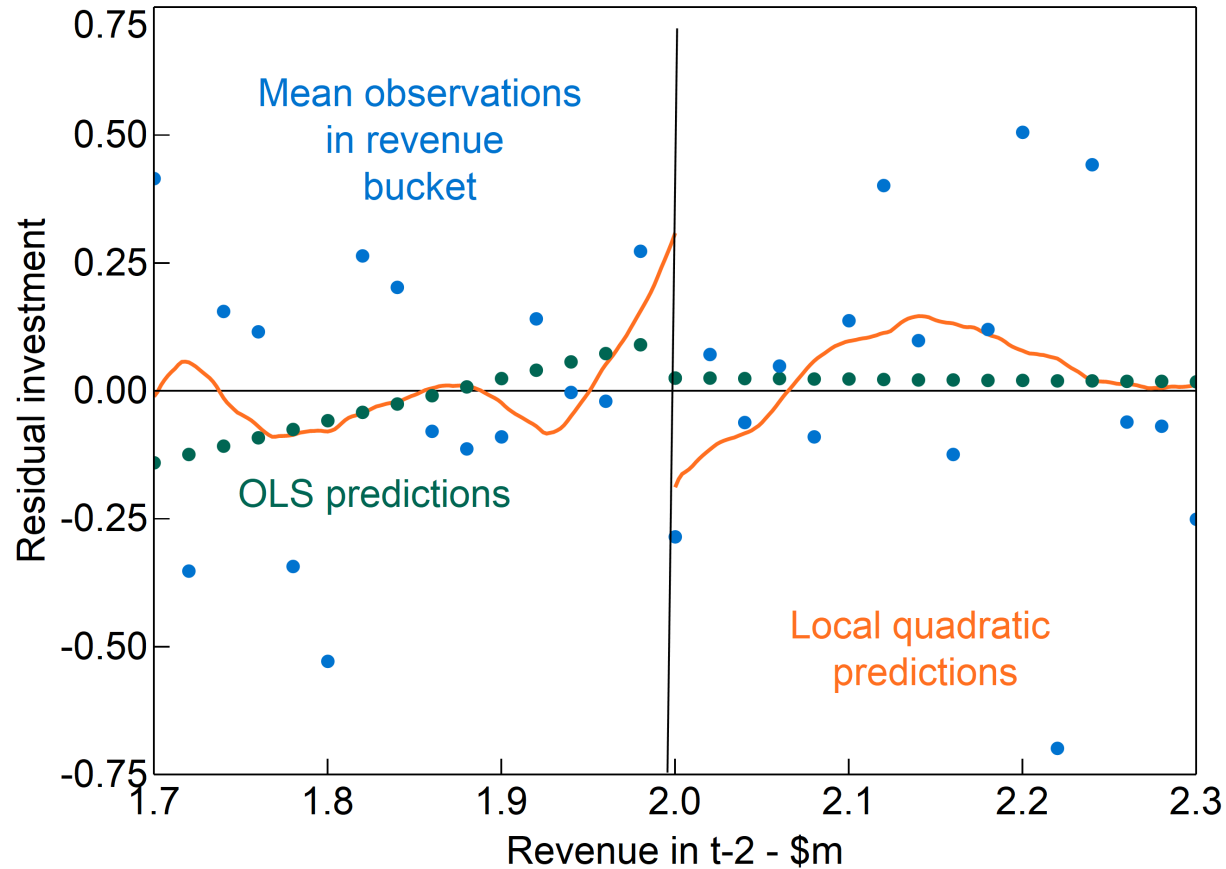


# Regression Discontinuity Design

- Compare outcomes just above and below a threshold
- Need a really neatly identified cut-off
  - Use same one from Rodgers and Hambr (2018)
  - Based on sales in  $t-2$ , focusing on firms with sales above the threshold in  $t$  and  $t-1$
- Classified as a small business in financial year  $t$  if:
  - Revenue in  $t-1 < \$2m$ ; or
  - *Revenue in year  $t-2 < \$2m$  and expected revenue in  $t < \$2m$ ; or*
  - Actual revenue in  $t < \$2m$

# Log Residual Investment and Revenue

Q1 2009/10

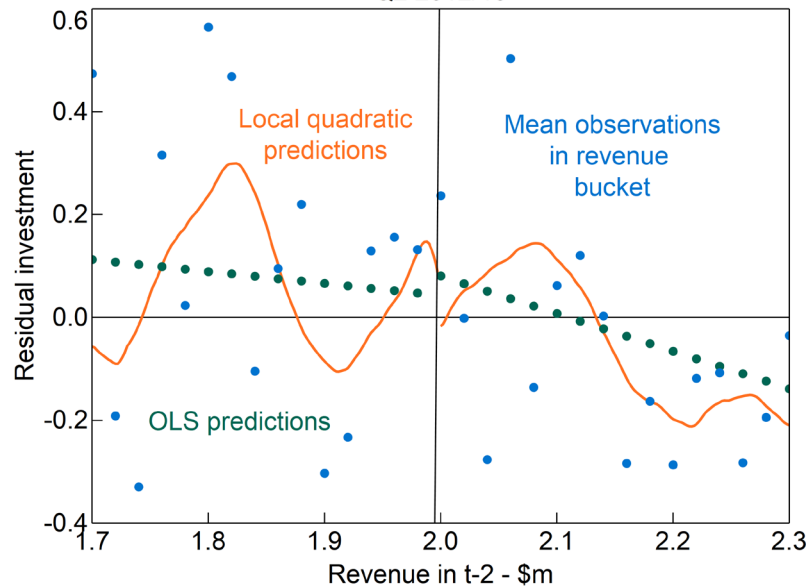


\* Residual from regression of log investment on industry fixed effects



## Log Residual Investment and Revenue

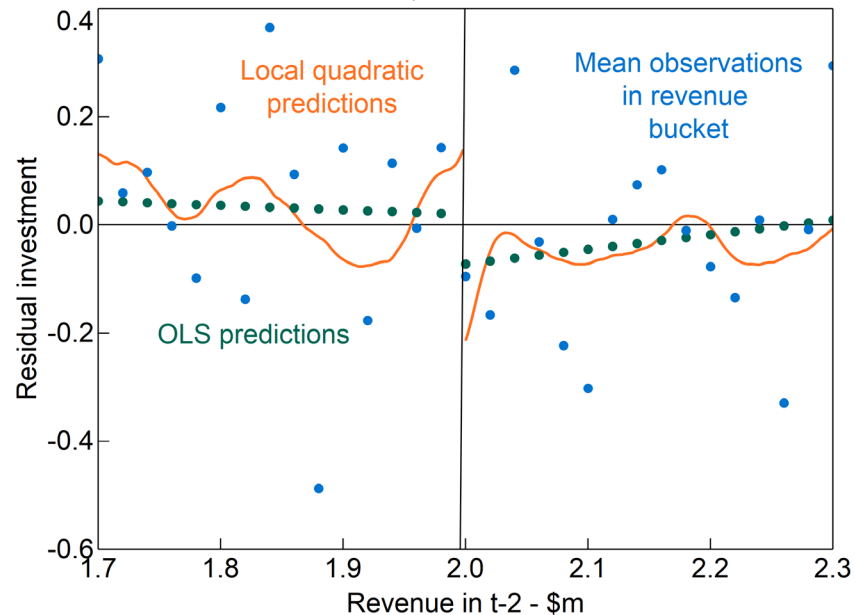
Q2 2012/13



\* Residual from regression of log investment on industry fixed effects

## Log Residual Investment and Revenue

Q3 2015/16



\* Residual from regression of log investment on industry fixed effects

# Regression Discontinuity Design

- Key findings are similar to DD:
  - GFC significant effect on investment
    - Only in first quarter of policy – occurred immediately
  - 2012 no evidence of any effects
  - 2015 some increase in investment
  - 2016 no estimated effect (sample likely too small)
- Effects are larger for unincorporated firms

# Regression Discontinuity Design

- Robustness/placebo
  - Test other bandwidths, not knife edge
  - No similar discontinuity in other aspects - not other policy
  - No similar discontinuity in past investment – not inherently different
  - No bunching/selection into treatment
  - No bias from firms selecting out of sample – doughnut RDD

# Conclusions

- GFC policies appear quite effective, but others do not.

## Stabilisation policies

- Nature of the shock may matter
- **Policy implication:** policy can be effective if tailored to the shock

## Structural policies

- Limited impacts, and stronger for smaller/unicorp
- **Policy implication:** potentially ineffective structural policy.

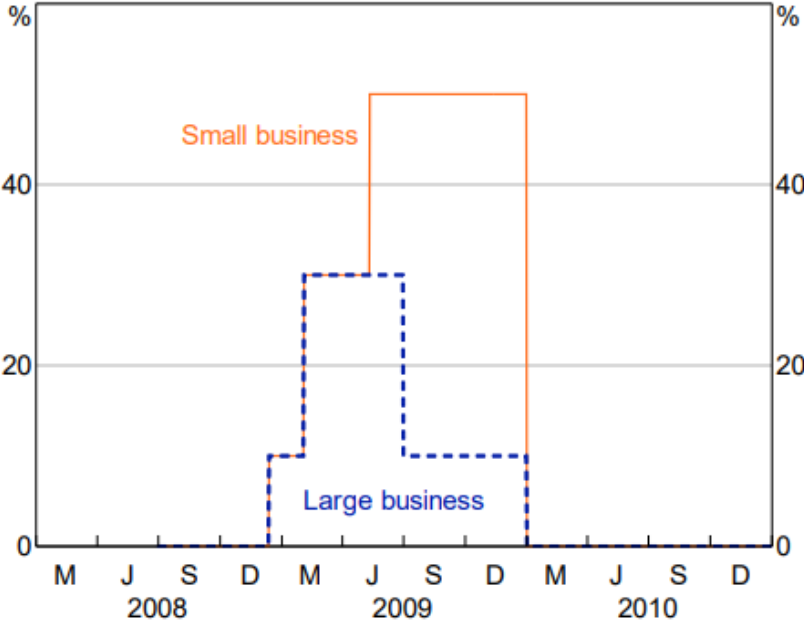
## Broader literature

- Support for user cost of capital affecting investment
- Support for the 'old view' of corporate finance
- **Policy implication:** Dividend imputation policy can affect investment

# Spares

# Back pocket

**Figure 1: Small Business and General Business Tax Break**  
Bonus tax deductions as a share of investment value, as announced



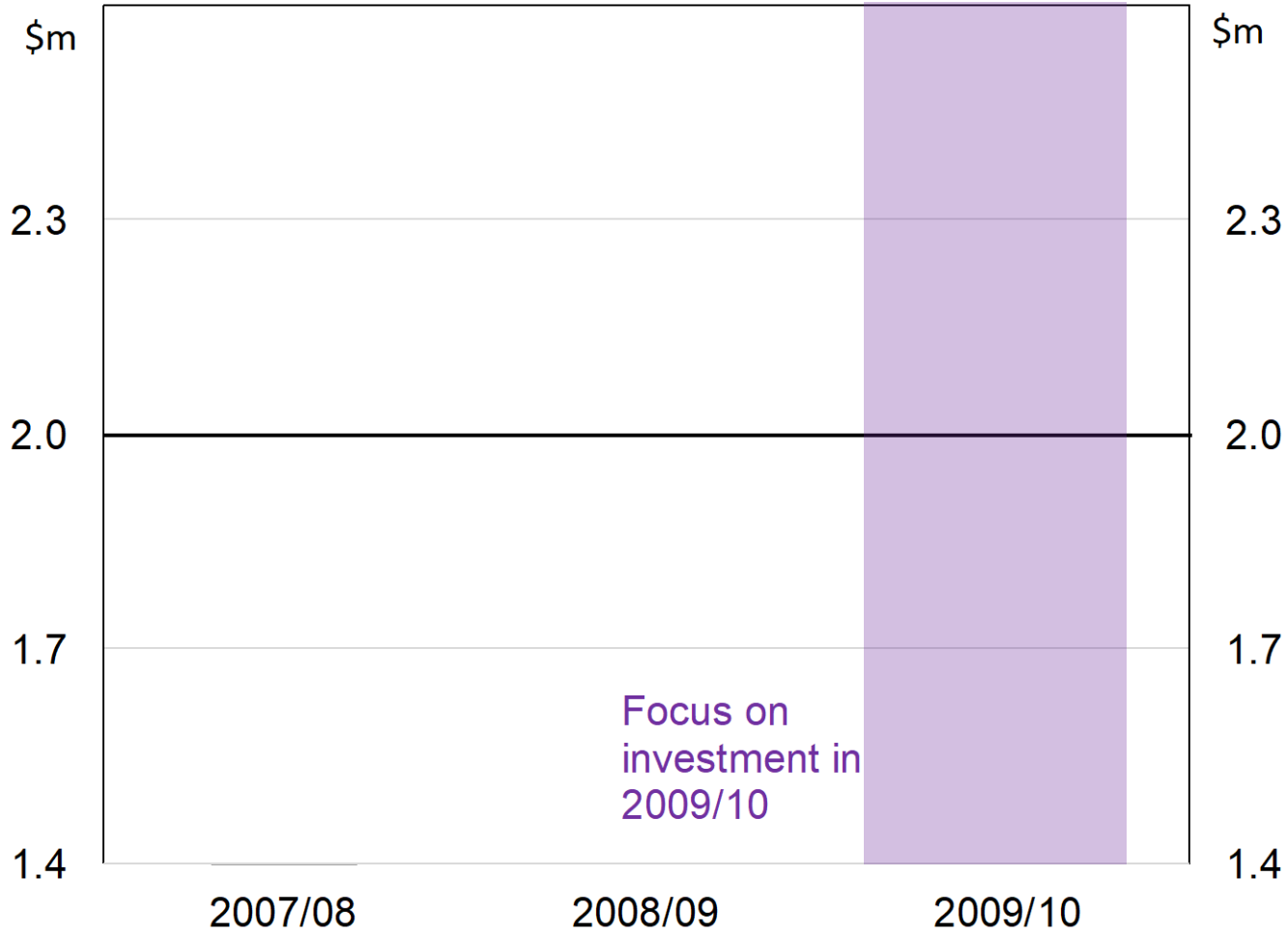


# RD - Methodology

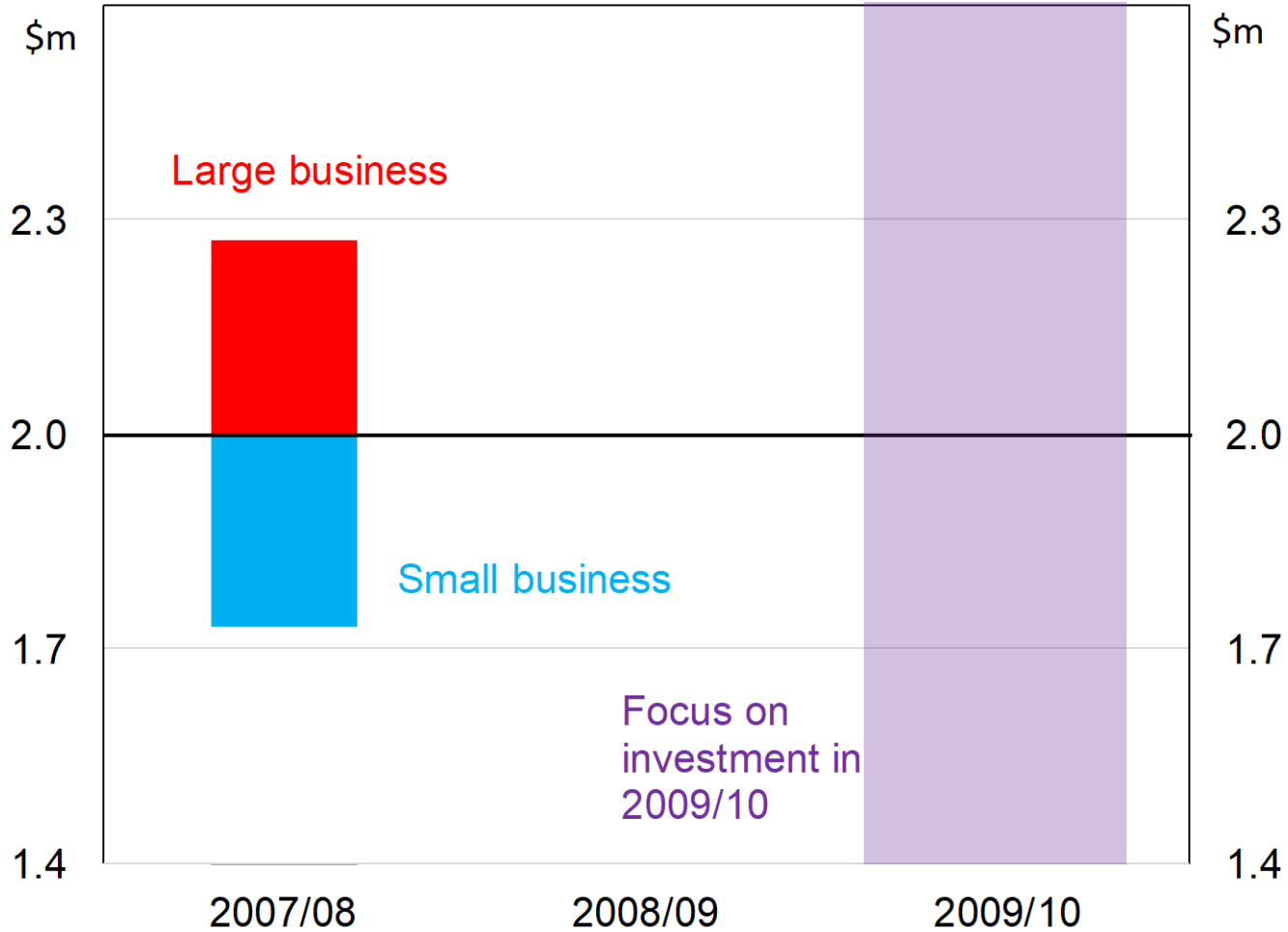
- Statistical model:

$$\begin{aligned} \ln(\text{Investment}_{i,t}) = & \alpha + \delta_1 * (\text{Revenue}_{i,t-2} - 2) \\ & + \delta_2 * (\text{Revenue}_{i,t-2} - 2) * I(\text{Revenue}_{i,t-2} < 2) \\ & + \beta * I(\text{Revenue}_{i,t-2} < 2) + \varepsilon_{i,t} \end{aligned}$$

# Financial Year Revenue in RD Sample

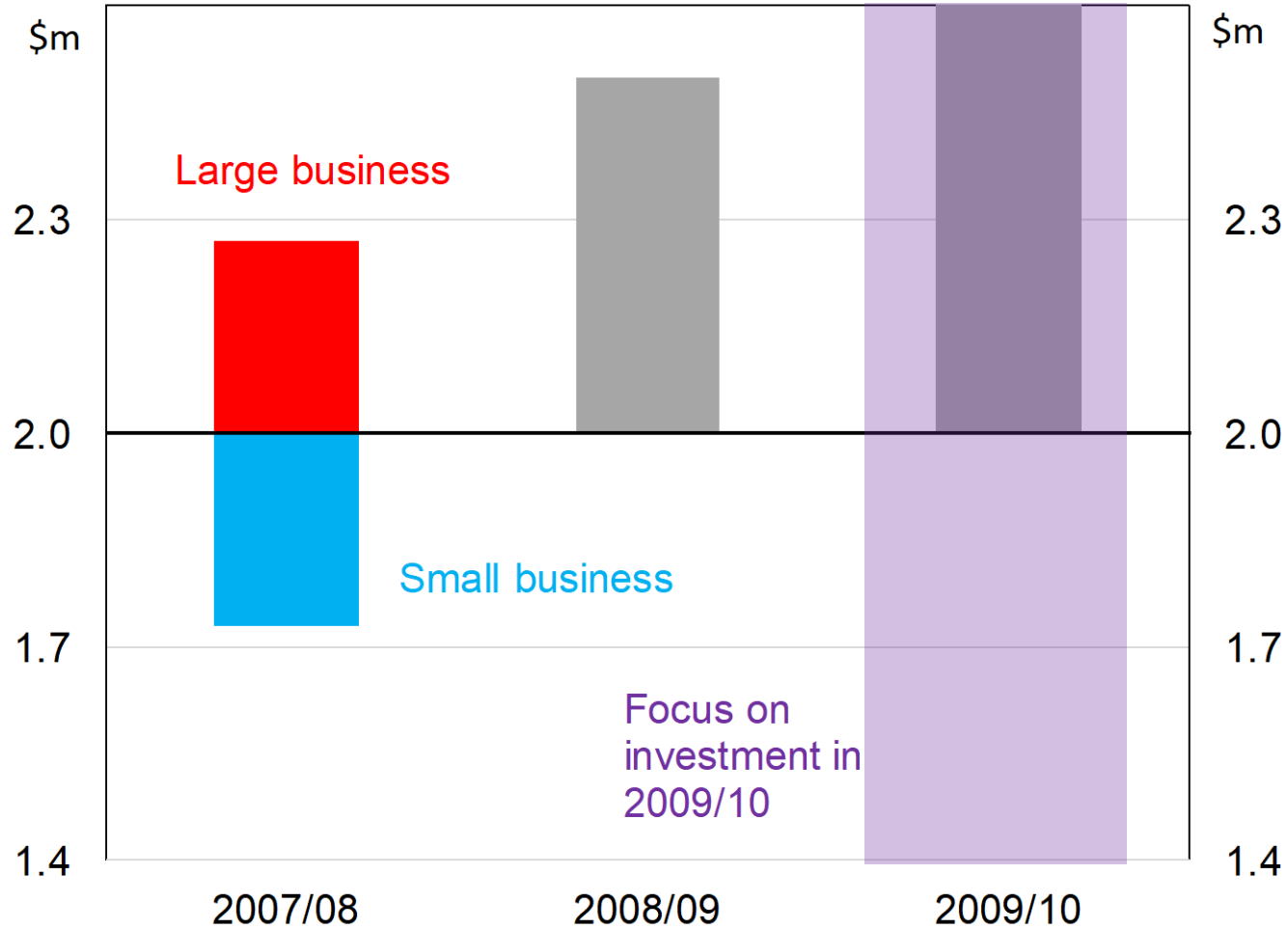


# Financial Year Revenue in RD Sample





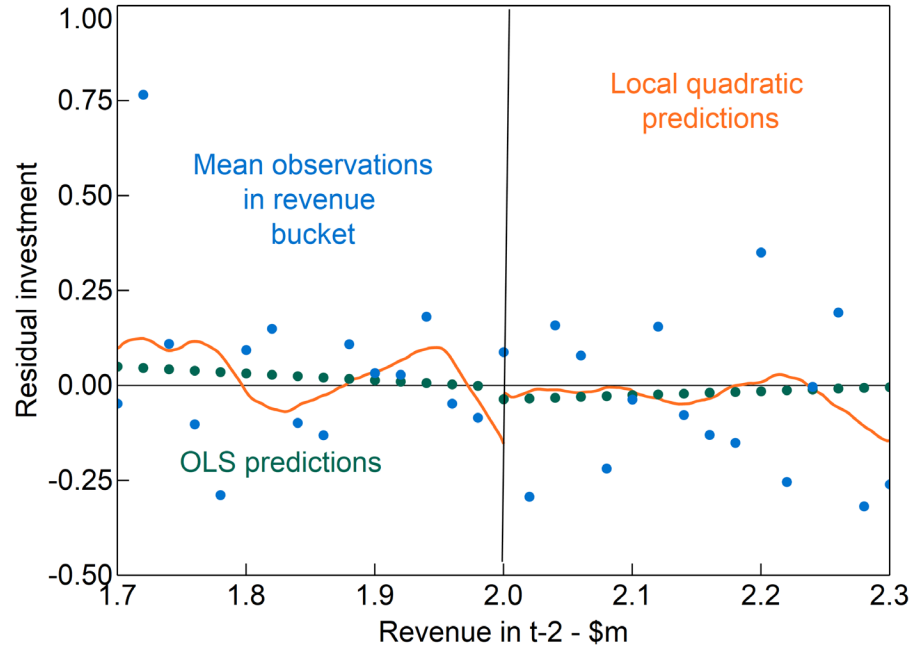
# Financial Year Revenue in RD Sample



# Back pocket

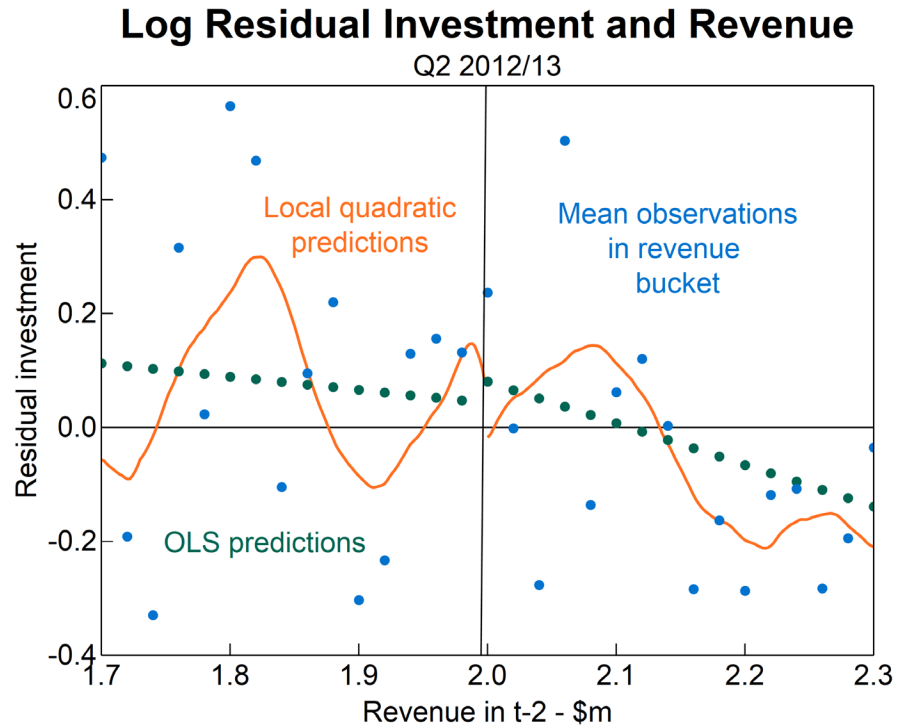
## Log Residual Investment and Revenue

Q2 2009/10



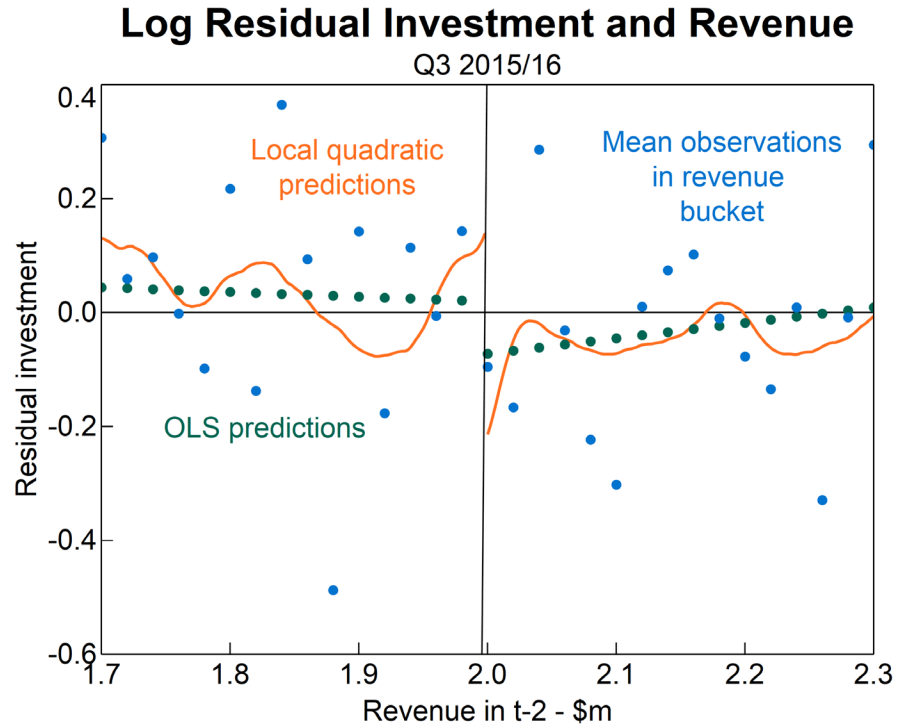
\* Residual from regression of log investment on industry fixed effects

# Back pocket



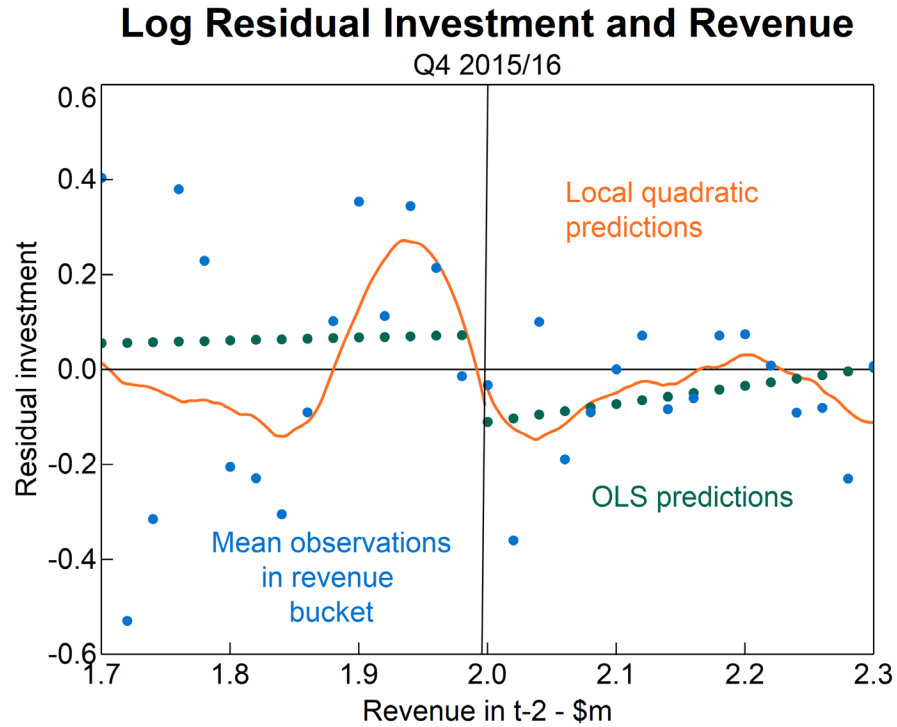
\* Residual from regression of log investment on industry fixed effects

# Back pocket



\* Residual from regression of log investment on industry fixed effects

# Back pocket



\* Residual from regression of log investment on industry fixed effects



# Back pocket -BAS

	Intensive margin	Extensive margin	Intensive (unincorps)	Extensive (unincorps)
2009 policy	0.528***	0.300***	0.551***	0.331***
SE	(0.03)	(0.03)	(0.05)	(0.04)
N obs	2,656,807	40,588,315	1,329,025	24,267,120
2015	-0.00567	0.0520***	0.00853	0.0472***
SE	(0.01)	(0.01)	(0.02)	(0.01)
N obs	1,334,197	21,397,924	628,659	12,024,047
2016	0.0275	0.674***	0.0888**	0.654***
SE	(0.02)	(0.03)	(0.04)	(0.04)
N obs	541,507	2,062,571	180,578	699,633

# Back pocket -ineligible

	Intensive margin	Extensive margin
2009 policy	0.354	-0.18
SE	(0.57)	(0.16)
N obs	764	181
2015 policy	0.944**	0.0606
SE	(2.34)	(0.38)
N obs	758	16484
2016 policy	0.297	0.301**
SE	(0.82)	(2.38)
N obs	1529	9804

**Table 2: Tax Implications for Company Shareholders**

	<b>Australian resident (<math>\gamma = 1</math>)</b>		<b>Non-resident (<math>\gamma = 1</math>)</b>	
	Without tax break	With tax break	Without tax break	With tax break
<b>Company level</b>				
Profit before depreciation	200	200	200	200
<i>Investment tax break deductions</i>	<i>0</i>	<i>20</i>	<i>0</i>	<i>20</i>
Taxable profit	200	180	200	180
Company tax (30 per cent flat rate)	60	54	60	54
Dividend paid	140	146	140	146
Franking credits distributed	60	54	60	54
<b>Shareholder level</b>				
Assessable income (in resident country) <sup>(a)</sup>	200	200	140	146
Income tax (30 per cent flat rate) <sup>(b)</sup>	60	60	42	44
Value of imputation credit received	60	54	0	0
Net tax payable	0	6	42	44
<i>After-tax income</i>	<i>140</i>	<i>140</i>	<i>98</i>	<i>103</i>
Notes:	(a) Dividends plus franking credits for resident; for non-residents, we abstract from Australian withholding taxes and associated foreign income tax credits			
	(b) This is a simplifying assumption; actual rates paid by residents and non-residents will vary			

# Dif-in-Dif: macro-stabilisation policies

Table 4: Actual investment, all businesses and unincorps, with controls and asset lives

	Intensive margin	Extensive margin	Intensive (unincorps)	Extensive (unincorps)
2009 policy	1.422***	0.913***	2.350***	1.332***
N obs	9925	9925	3356	3356
2020 policy	-0.347**	0.0584		
SE	(0.16)	(0.2)		
N	15720	23425		
2021 policy	0.217	-0.0555		
SE	(0.28)	(0.35)		
N	4222	4693		

GFC policy significant effect. COVID policy does not.

- Differing nature of shocks? Financial shock vs lockdown and supply chain disruptions.
- Target/focus on larger firms who might have different goals.

# Dif-in-Dif: small business incentives

Table 5: Actual investment, all businesses and unicorps, with controls and asset lives

	Intensive margin	Extensive margin	Intensive (unicorps)	Extensive (unicorps)
2009 policy	1.422***	0.913***	2.350***	1.332***
N obs	9925	9925	3356	3356
2012 policy	-0.158	-0.0217	0.432*	-0.203
SE	(0.19)	(0.12)	(0.22)	(0.14)
N	4714	71973	2260	32517
2015 policy	0.129	0.190*	0.695**	0.208*
SE	(0.17)	(0.11)	(0.28)	(0.12)
N	3602	44711	1150	14552

2012 and 2015 policies more limited effects (some for unincorporated).

- Value of policy to firm was much lower (fixed costs or noise)
- Heightened policy uncertainty (2012 MRRT and CPRS legislation, 2015 led to double dissolution election)

# Dif-in-Dif

Table 6: Actual investment, all businesses and unincorps, with controls and asset lives

	Intensive margin	Extensive margin	Intensive (unincorps)	Extensive (unincorps)
2015 policy	0.129	0.190*	0.695**	0.208*
SE	(0.17)	(0.11)	(0.28)	(0.12)
N	3602	44711	1150	14552
2016 policy	-0.105	0.311**	-0.292	0.436**
SE	(0.13)	(0.13)	(0.27)	(0.18)
N	7068	18646	1575	5085
2019 policy	0.0579	-0.189		
SE	(0.12)	(0.17)		
N	6835	13342		

More evidence for policies targeting smaller firms, but still limited  
- Stronger role of unincorporated firms.

# Dif-in-Dif

- Robustness:
  - Vary bucket sizes
  - Use BAS data as validation
  - Placebo tests with ineligible buildings and structures
    - GFC results supported – no increase in ineligible investment
    - 2015 and 2016 evidence of response of ineligible investment. Potentially reflects corporate tax cuts.

# Regression Discontinuity Design

- Equivalent estimating local polynomial either side of threshold
- Choices
  - Bandwidth
  - Kernel
  - Polynomial order
- Use the Calonico, Cattaneo and Titiunik (2014) optimal bandwidth



# Regression Discontinuity Design

Table 8: GFC RDD results

	Q3 2009	Q4 2009	Q1 2010	Q2 2010	Q3 2010
<b>All firms</b>					
Beta	-0.113	0.00319	-0.406**	-0.0333	-0.0119
SE	(-0.65)	(0.02)	(-2.28)	(-0.24)	(-0.09)
Bandwidth	324,221	331,275	245,103	454,597	490,639
Observations	4060	4644	4314	4599	4234
<b>Unincorporated</b>					
Beta	0.00650	-0.292	-0.583**	-0.0337	0.173
SE	(0.02)	(-1.11)	(-2.25)	(-0.14)	(0.75)
Bandwidth	313,984	365,476	270,872	388,882	478,986
Observations	1679	1916	1750	1869	1709

# Regression Discontinuity Design

Table 9: 2012 RDD results

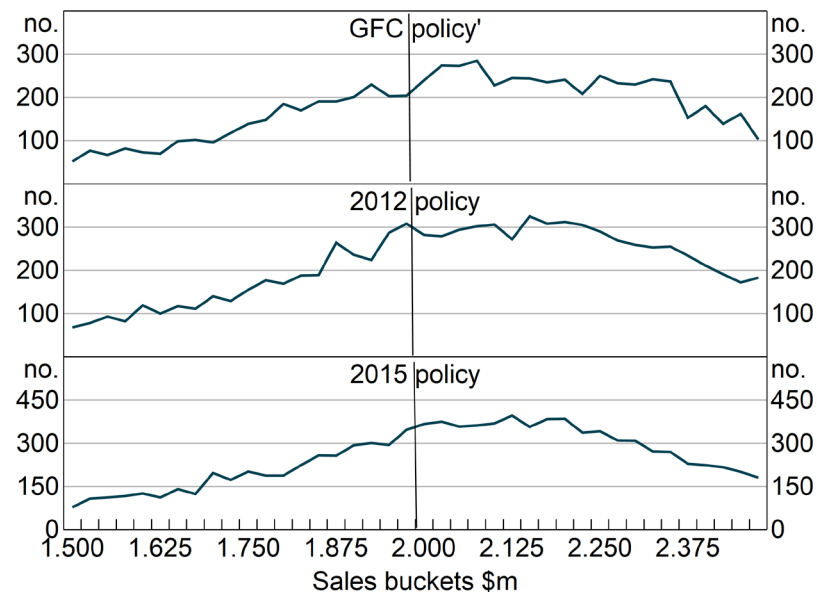
	Q3 2012	Q4 2012	Q1 2013	Q2 2013	Q3 2013	Q4 2013	Q1 2014	Q2 2014
<b>All businesses</b>								
Beta	-0.149	-0.0386	-0.0474	0.162	0.186	0.173	-0.0354	-0.115
(p-value)	(-0.98)	(-0.28)	(-0.32)	(-0.98)	-1.21	-1.22	(-0.22)	(-0.81)
Bandwidth	370017.9	422484	379499.7	345548.5	383013.8	400742.3	307503.1	406702.1
Observations	5022	5246	4855	4858	4699	4960	4992	5059
<b>Unincorporated</b>								
Beta	0.0303	-0.162	-0.15	0.0386	0.198	-0.119	-0.108	0.0134
(p-value)	(-0.13)	(-0.81)	(-0.71)	-0.17	-0.92	(-0.59)	(-0.46)	(-0.06)
Bandwidth	379869.1	489042.3	360412.2	322994.3	441541.1	393705.3	280517.7	363547.9
Observations	2205	2289	2165	2148	2128	2191	2206	2291

Table 10: 2015 RDD results

	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016
<b>All businesses</b>						
Beta	-0.128	0.226	-0.0124	0.0557	-0.308*	-0.278**
(p-value)	(-0.94)	-1.62	(-0.09)	-0.41	(-1.90)	(-1.98)
Bandwidth	390195.7	349874.5	372857.3	404775.8	321634.5	370227.3
Observations	5415	5791	5470	5666	5543	5860
<b>Unincorporated</b>						
Beta	0.0234	0.477**	-0.234	-0.361*	-0.520**	-0.571***
(p-value)	-0.11	-2.4	(-1.12)	(-1.74)	(-2.25)	(-2.77)
Bandwidth	369090.5	401487.3	371839	346542.1	308896.8	320026
Observations	2423	2523	2341	2474	2358	2486

# Regression Discontinuity Design

- Might be concerned about 'validity' if firms can manipulate sales to meet threshold
  - Not possible due to lags



\* Sales buckets are \$25,000 wide

# Regression Discontinuity Design

- Alternative is that firms with strong want to invest may have manipulated out of the sample
  - Lowered sales in  $t$  or  $t-1$  to be eligible, so drop out of our control group
  - Would bias towards finding and effect

# Regression Discontinuity Design

- Replace investment with investment in  $t-2$ 
  - Are the two groups examined inherently different? No
  
- Exclude firms with sales in  $t$  or  $t-1$  with sales between \$2m and \$2.1m
  - If sales is high, harder to manipulate out
  - No substantive changes