Tax progressivity and top incomes: Evidence from tax reforms

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Presentation at ECFIN, May 16, 2017

Point of departure

- Decrease in tax progressivity and top taxation

- Question: **How has the tax progressivity decline affected the income distribution?**

- Difficult to answer:
  - Post-tax distribution: quite clear
  - Pre-tax distribution: less clear
  - Interdependence of progressivity and inequality

- Previous studies: mostly correlational evidence
  - Slemrod (1996); Slemrod & Bakija (2000); Brewer, Saez & Sheperd (2010); Duncan & Sabrionova Peter (2016); Saez (2017); Roine, Vlachos, Waldenström (2009); Piketty, Saez & Stantcheva (2014)

This study

- **Tax reforms**
  - Sudden, large-scale, short-term (Data 1980s-2000s: WID, OECD)
  - Two measures: Average rate progression, Top marginal tax rates

- **Top income shares**
  - Annual, pre-tax, many countries (Data: WID)

- **Synthetic control method (SCM)**
  - Offers "causal" estimation framework
  - (We also run panel regressions)

- Main contribution: "Causal" (reduced-form) link

- Main problem: No microdata (lack of compositional info etc)

Outline of the presentation

1. Introduction

2. Empirical method: SCM

3. Main results

4. Robustness

5. Mechanisms

6. Conclusions

2. Empirical method: Synthetic Control Method (SCM)

- When to use the SCM?
  - Treatment (reform) in **one (or very few) unit**, ex. single-country occasion
  - Using a small number of controls to build a counterfactual

- Basic idea with SCM: Data-driven approach to create a **counterfactual country** (SCG), a weighted average of selected *non-treated* countries
  - Treated and non-treated countries should be *similar* in their economy, demography, politics, etc.
  - The control variables, the better (but all must not be used in the end)
  - NB: One must also account for the *likelihood of treatment*
    - Use variables that are important for this (here: top income shares, tax policy variables)

Pros and cons with the SCM

A. Advantages with the SCM

a)   When treatment occurs in only a single unit

b)   When pre-treatment characteristics in treated unit differs from the average of non-treated units (as in Diff-in-Diff)

c)   Transparent, data-driven process: control group clearly observed

d)   Flexible when treatment varies (SCG units may get zero weight)

B. Problems with the SCM

a)   No established inference (singificance, confidence intervals)

b)   Control variables may drive SCG selection; "theory-less"

c)   Assumption about parallel post-treatment trends

# Empirical strategy here: Tax progressivity and top incomes

- **Step 1:** Identify *significant* tax reforms in terms of how much they reduced income tax progressivity

  – Use change in $ARP = \frac{ATR^{top} - ATR^{ave}}{(Y^{top} - Y^{ave})/Y^{ave}}$

- **Step 2:** Estimate *synthetic control groups (SCG)*

- **Step 3:** Evaluate difference treated/non-treated series (main effect)

- **Step 4:** Robustness, inference of SCM
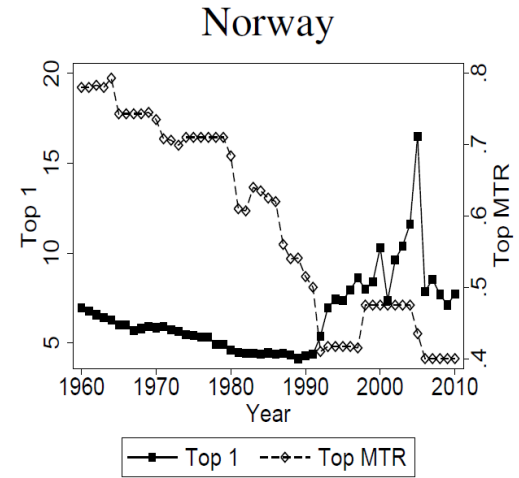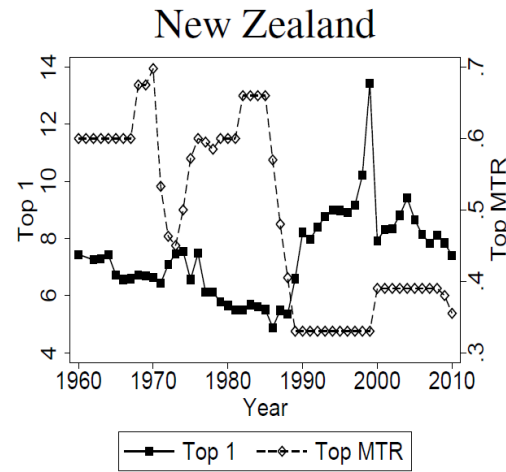
- **Step 5:** Mechansim analysis

Step 1: How much did progressivity decline during the reform? (Changes in *Average Rate Progression*)
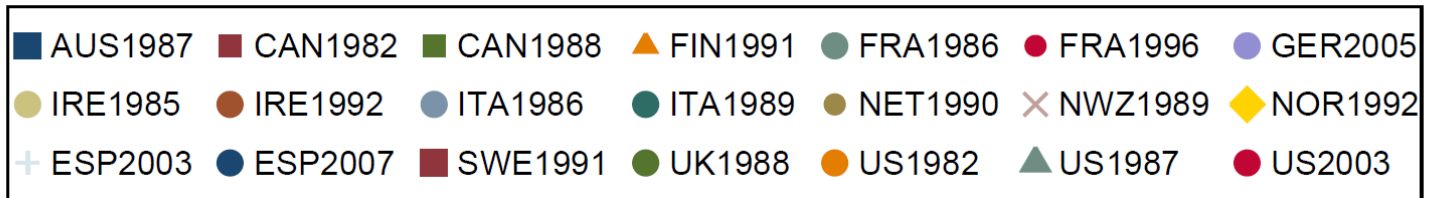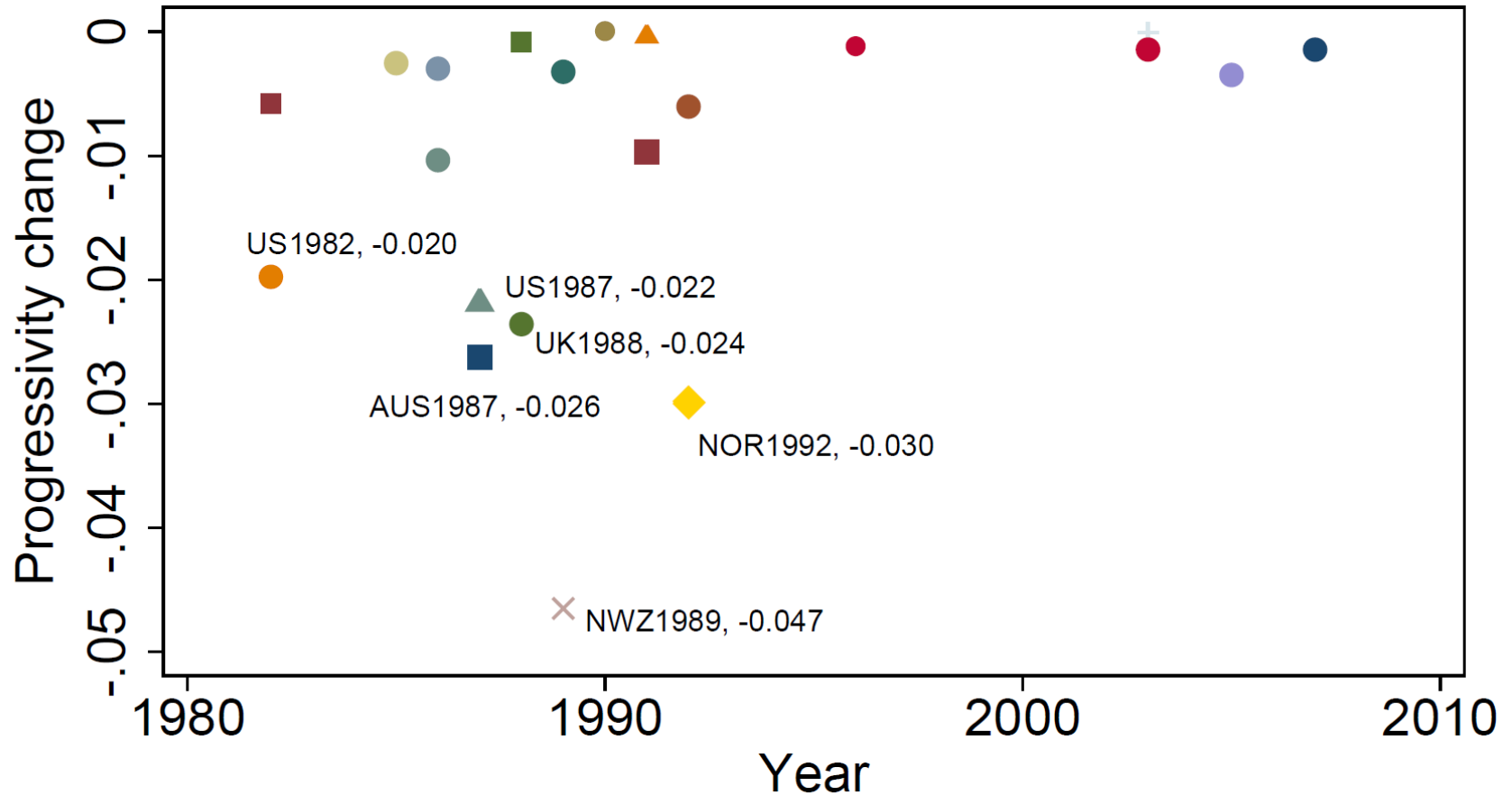
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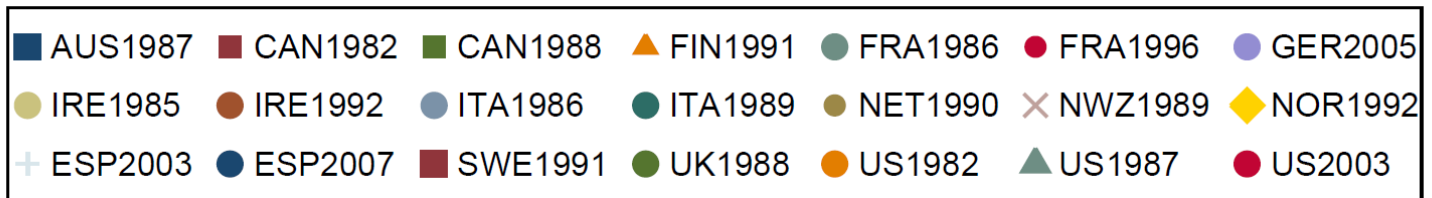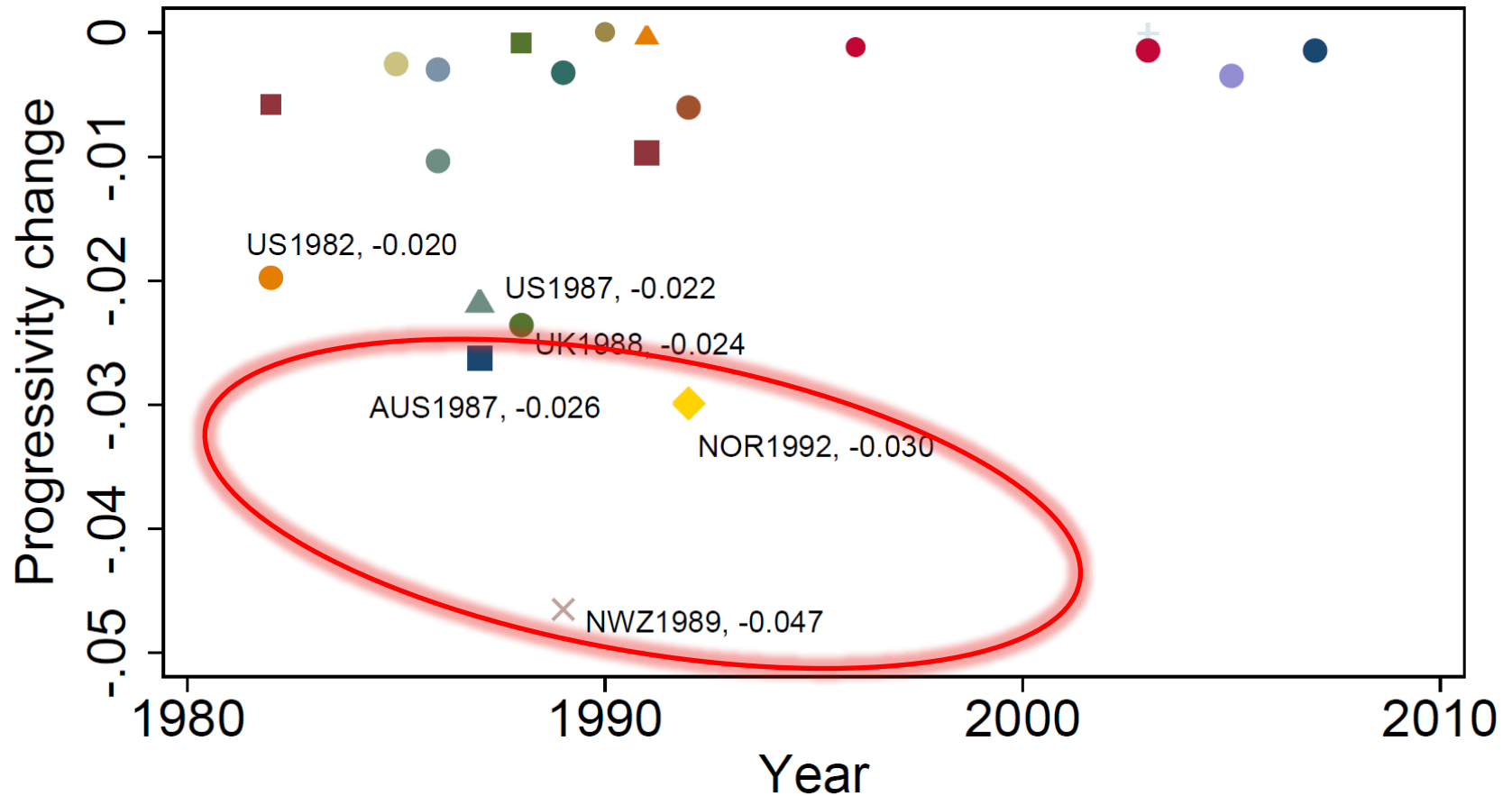
Inspecting the data: Top 1% vs. Progressivity (ARP, MTR)

a) Top 1 vs MTR^{top}
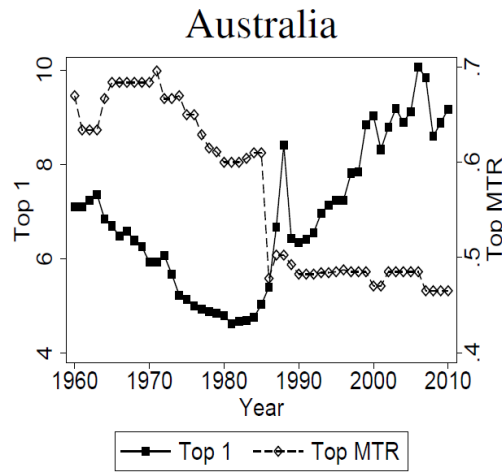
b) Top 1 vs ARP
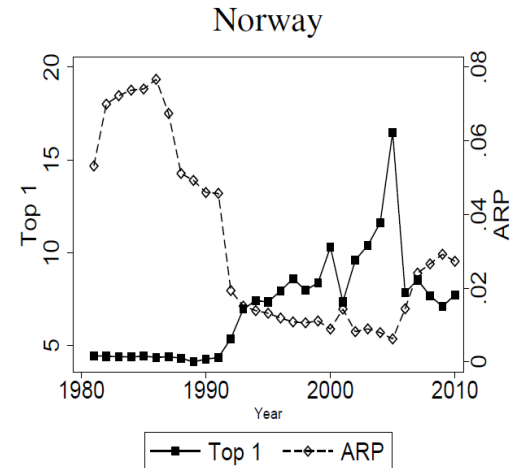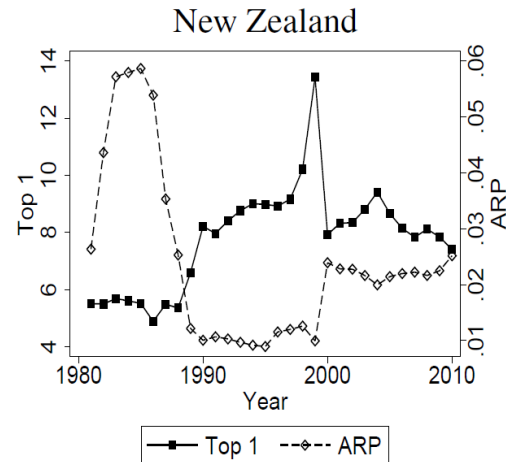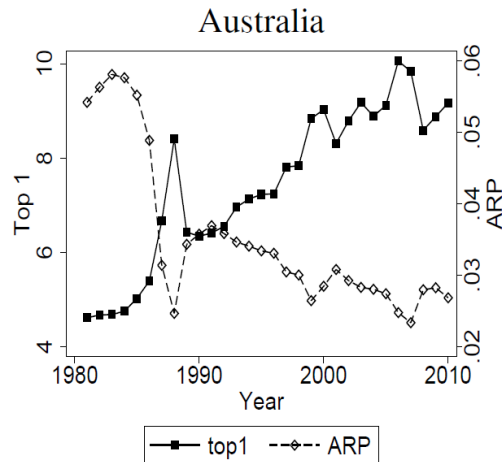
Synthetic control group (SCG) estimation

- **Step 2:** SCG estimation for the treated countries: AUS, NOR, NZL
  - Use method of Abadie, Diamon & Heinmuller (2010)
  - Use pool of control variables (economy, demography, politics, tax system etc) to choose the *optimal* SCG
    - Baseline: GDPpc, Trade, Finance, Hours, Union, Educ, MTR, Debt growth, ARP
  - Compute SCG outcome
    - Weighted average of SCG outcomes
    - Note: The SCG is specific for each top fractile-country

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- **Step 3:** Plot series of treated country and SCG.
  - Same outcome (top income share) in treated country and non-treated SCG.
    - Interpretation: *Effect of tax reform on top income share*
  - This difference is the main SCM estimate
    - NB: We control for tax levels, so even SCG may change their taxes

3. Results: Top 1% share – treated (tax reform) vs control

a. Australia

b. New Zealand

c. Norway

Results: Top 1% share – treated (tax reform) vs control

a. Australia

b. New Zealand

c. Norway

Reform effects:
1) Raises top share 10-30%
2) Lasting several years
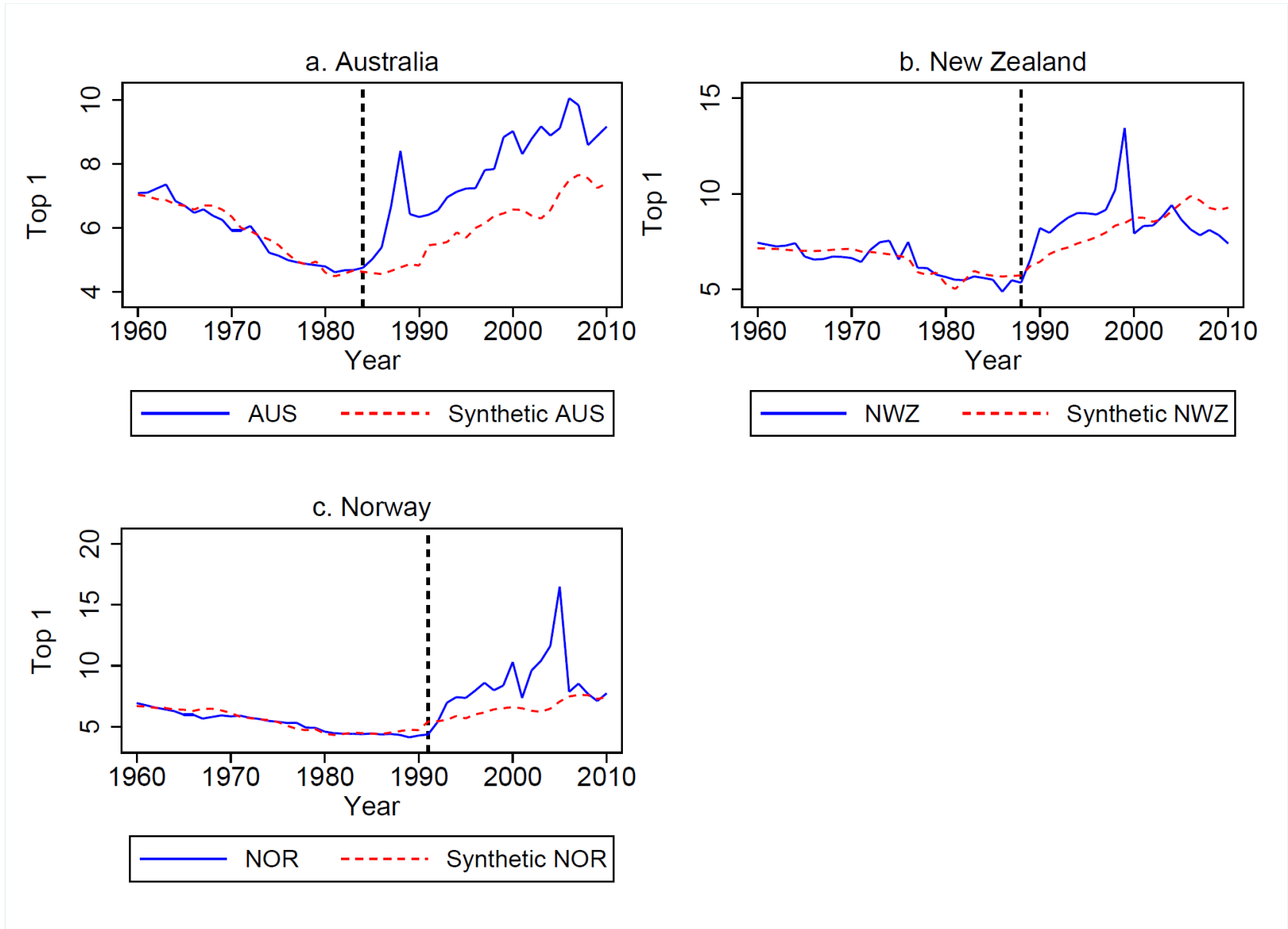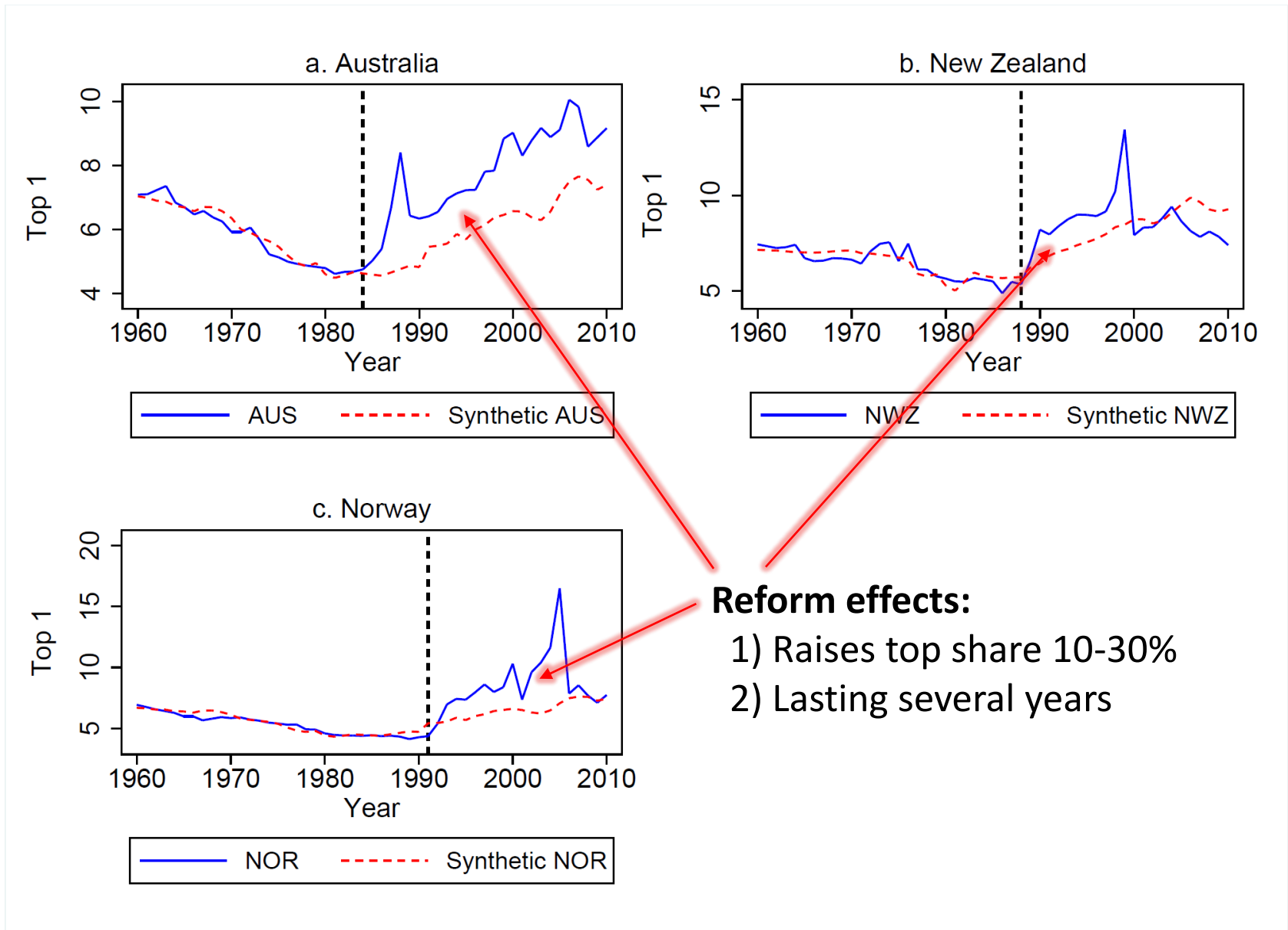
Heterogeneous responses: Australia
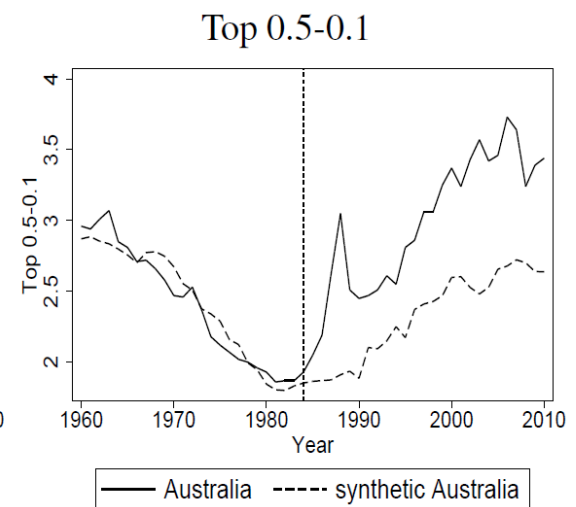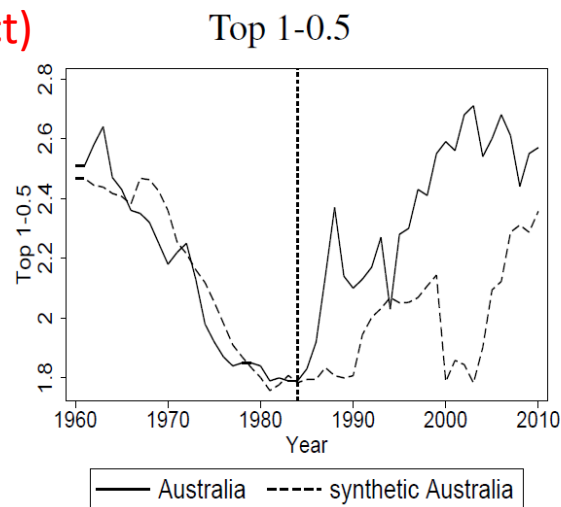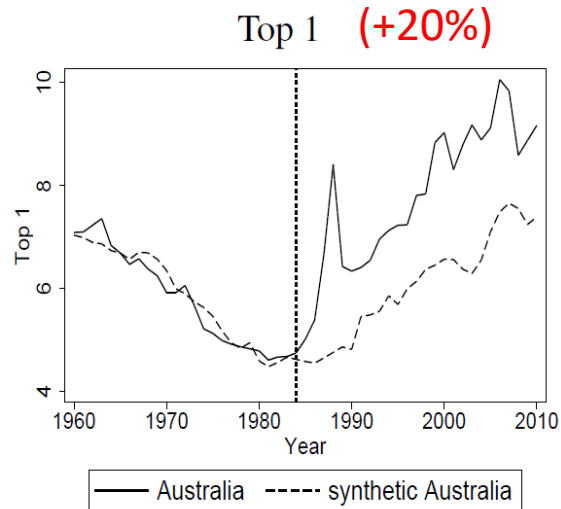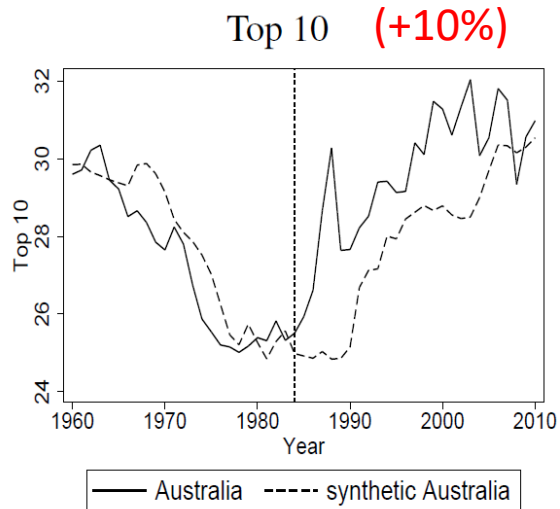
Heterogeneous responses: New Zealand
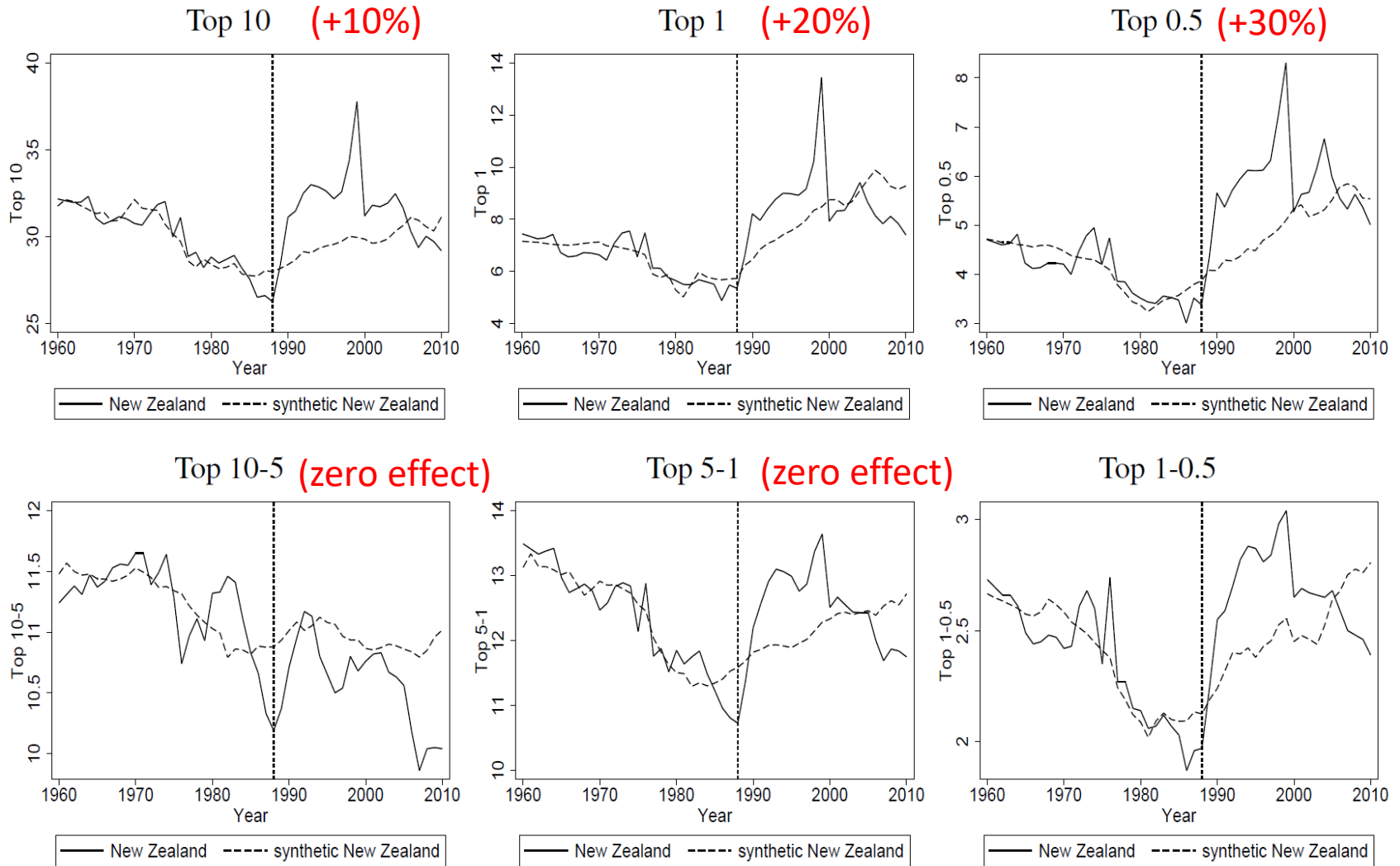
Heterogeneous responses: Norway
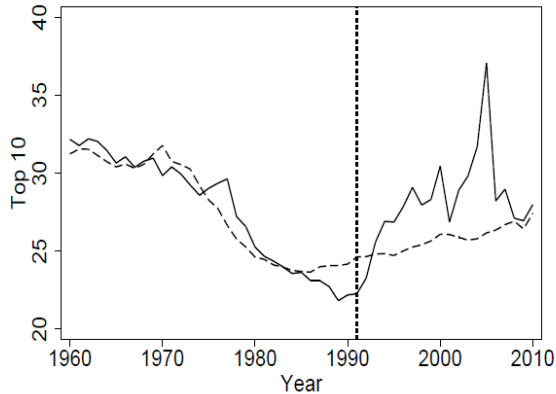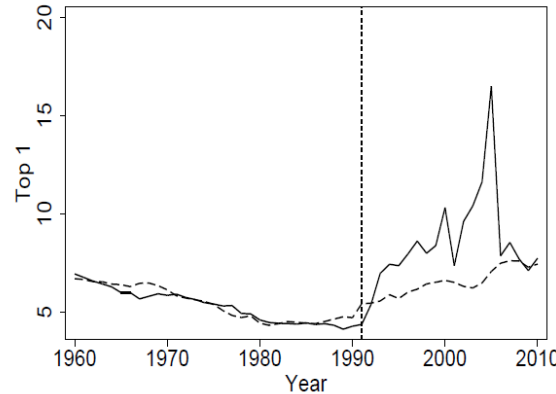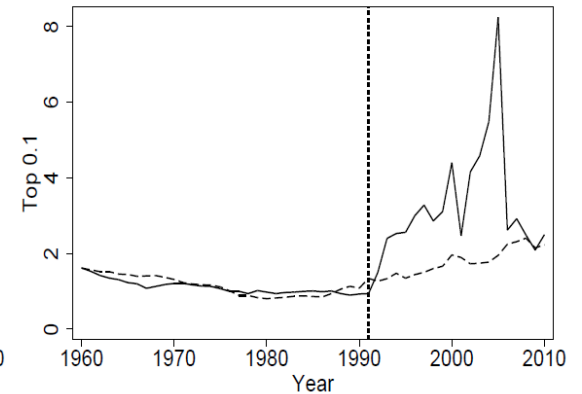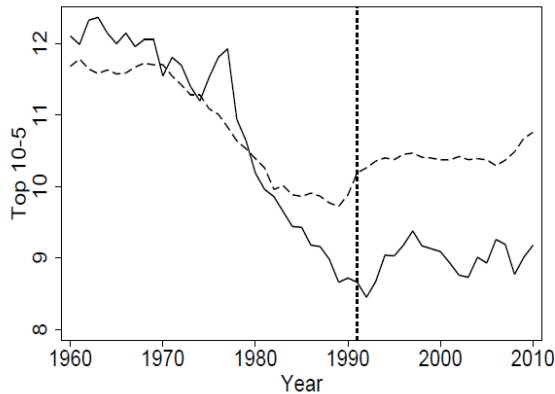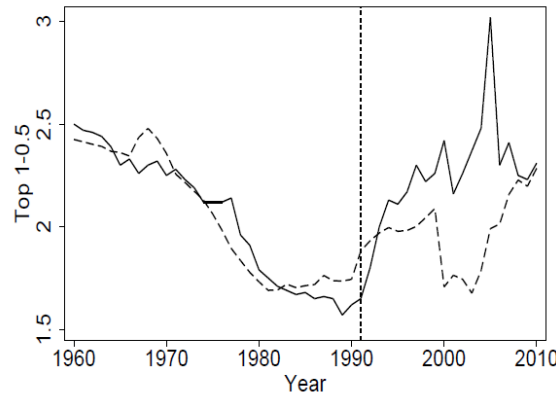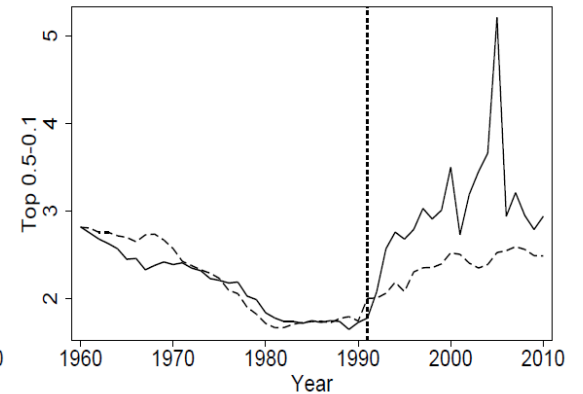
Inference: Pseudo *p-values* (from in-space placebo tests)

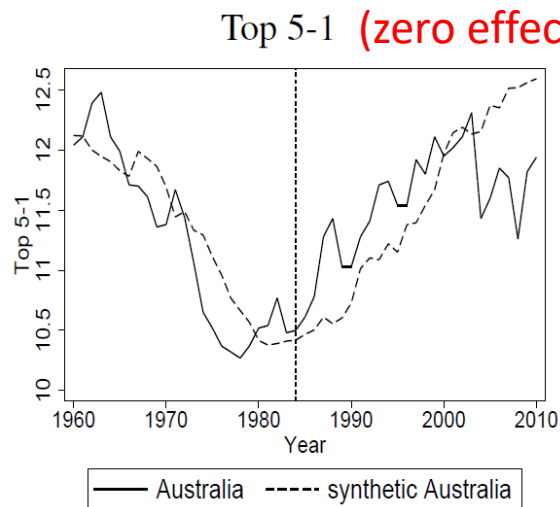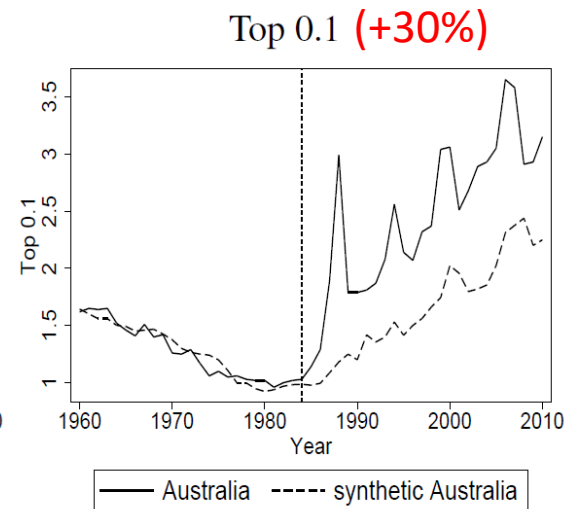|	a) Australia			b) New Zealand			c) Norway		
Year	Top 5-1	Top 1-0.5	Top 0.1	Top 10-5	Top 1-0.5	Top 0.5	Top 10-5	Top 1-0.5	Top 0.1
1985	0.4	0.27	0.11						
1986	0.3	0.09	0.11						
1987	0.1	0.09	< 0.01						
1988	0.2	< 0.01	< 0.01						
1989	0.3	0.09	< 0.01	0.8	0.2	0.1			
1990	0.3	0.09	< 0.01	0.9	< 0.01	< 0.01			
1991	0.3	0.09	< 0.01	0.5	< 0.01	< 0.01			
1992	0.3	0.18	< 0.01	0.1	0.1	< 0.01	0.91	0.45	< 0.01
1993	0.1	< 0.01	< 0.01	0.4	< 0.01	< 0.01	0.91	0.27	< 0.01
1994	0.3	0.18	< 0.01	0.5	< 0.01	< 0.01	0.91	0.18	< 0.01
1995	0.3	0.09	< 0.01	0.6	< 0.01	< 0.01	0.91	0.18	< 0.01
1996	0.3	0.18	< 0.01	0.7	0.1	< 0.01	0.91	0.18	< 0.01
1997	0.3	< 0.01	< 0.01	0.5	0.1	< 0.01	0.91	0.18	< 0.01
1998	0.3	< 0.01	< 0.01	0.4	0.1	< 0.01	0.91	0.18	< 0.01
1999	0.3	< 0.01	< 0.01	0.6	< 0.01	< 0.01	0.91	0.18	< 0.01
2000	0.3	< 0.01	< 0.01	0.4	0.2	0.3	0.82	< 0.01	< 0.01
2001	0.3	< 0.01	< 0.01	0.3	0.2	0.3	0.82	0.09	< 0.01
2002	0.3	< 0.01	< 0.01	0.3	0.3	0.2	0.82	< 0.01	< 0.01
2003	0.3	< 0.01	< 0.01	0.4	0.3	0.1	0.82	< 0.01	< 0.01
2004	0.4	< 0.01	< 0.01	0.4	0.3	< 0.01	0.82	< 0.01	< 0.01
2005	0.5	< 0.01	< 0.01	0.5	0.3	0.1	0.82	< 0.01	< 0.01
2006	0.5	< 0.01	< 0.01	0.5	0.5	0.2	0.82	0.27	0.22
2007	0.5	0.27	< 0.01	0.6	0.6	0.3	0.82	0.27	< 0.01
2008	0.6	0.36	< 0.01	0.7	0.7	0.2	0.82	0.36	0.22
2009	0.6	0.36	< 0.01	0.7	0.6	0.2	0.82	0.36	0.33
2010	0.6	0.36	< 0.01	0.7	0.7	0.3	0.82	0.36	< 0.01

Main effects: Summary

- **We find significant positive effects on top income shares**

- **Effects are larger for the highest top groups**
  - Approx. +20% in top 1 percentile
  - Approx. +30% in top 0.1 percentile
  - Virtually zero effect in lower half of top income decile

- **Role of tax avoidance as mechanism?**
  - Income shifting responses to tax reforms are documented (e.g,. Slemrod, 1996; Auerbach, 1988)
  - Capital income dominates also in AUS, NZL, NOR top 0.1 percentile
  - Potential mechanism for reform effect: Tax avoidance (?)

4. SCM robustness: Different controls; In-time Placebo

a) Test of control variables

Variable	Base	Combinations used in the control robustness test																															
GDP Per-Capita	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x				
GDP Growth Rate	x	x																												x	
MRP								x																					x	x	x
ARP	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		x	x	x			x
Party Orientation								x																					x	x
International Trade					x																								x	x
Globalization	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x		x		x	x				
Debt Growth Rate	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x		x	x	x	x				
Government Spending												x															x			
Gross Savings			x																											x
Gross Fixed Capital			x																											x
Bank Deposits				x																								x	x
UK Legal Origin							x																					x	x
Population Growth																											x		
Working Age Pop					x																						x		x
Annual Hours Worked	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x		x	x	x	x	x	x	x					
Trade Union Density	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Stock Market					x																					x			
Financial Development	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x					
Patents Growth Rate						x																				x			
High Education						x																					x		
Enrollment Ratio						x																					x		x
Human Capital	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
Tax Revenue							x		x																x			x

SCM robustness: Different controls; In-time Placebo

a) Test of control variables

b) "In-time" placebo test

Diff-in-Diff regression: Average effect on top shares

i) Top 10-1

	a) Panel data		b) Time-series		
	All reforms	Only "significant" reforms	AUS 1987	NWZ 1989	NOR 1992
Reform	0.027*	0.047**	0.016*	0.107***	0.041
	(0.015)	(0.024)	(0.009)	(0.011)	(0.051)
Obs.	713	713	51	50	51

ii) Top 1-0.1

	a) Panel data		b) Time-series		
	All reforms	Only "significant" reforms	AUS 1987	NWZ 1989	NOR 1992
Reform	0.132***	0.259***	0.148***	0.286***	0.298
	(0.03)	(0.042)	(0.037)	(0.042)	(0.179)
Obs.	713	713	51	49	51

iii) Top 0.1

	a) Panel data		b) Time-series		
	All reforms	Only "significant" reforms	AUS 1987	NWZ 1989	NOR 1992
Reform	0.286***	0.689***	0.505***	0.462***	0.862**
	(0.071)	(0.108)	(0.072)	(0.072)	(0.42)
Obs.	598	598	51	49	51

Other *drivers* (than prog/mtr): Tax brackets or Tax base

i) Tax brackets and top incomes

	Top 10-1		Top 1-0.1		Top 0.1	
Tax Brackets	0.005	0.008	-0.062***	0.013	-0.151***	-0.002
	(0.006)	(0.009)	(0.017)	(0.021)	(0.038)	(0.058)
$1 - MTR^s$		0.004		0.247***		0.9***
		(0.026)		(0.08)		(0.261)
Obs.	430	347	430	317	337	304

ii) Tax base and top incomes

	Top 10-1		Top 1-0.1		Top 0.1	
Tax Base	-0.032	-0.041	0.069	0.049	-0.269	-0.195
	(0.037)	(0.043)	(0.109)	(0.086)	(0.331)	(0.265)
$1 - MTR^s$		-0.004		0.236***		0.929***
		(0.023)		(0.062)		(0.168)
Obs.	376	339	376	309	298	296

- Result: When controlling for top tax rate, no direct effect from other tax reform-related outcomes

Rubolino-Waldenström: Tax progressivity and top incomes

Other *drivers* (than tax reform): Other policy reforms

- Two checks:
  1. Diff-in-diff controlling for other reforms (in Giuliano et al, AEJ Macro)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax reform	0.10***	0.09***	0.10***	0.10***	0.10***	0.09***	0.08**
	(0.034)	(0.036)	(0.035)	(0.034)	(0.033)	(0.034)	(0.036
Sig. tax reform	0.28***	0.27***	0.29***	0.28***	0.26***	0.28***	0.27**
	(0.052)	(0.053)	(0.052)	(0.051)	(0.052)	(0.049)	(0.049
Observations	472	472	472	472	472	472	472
Other reform	-	Product market	Trade	Capital Acc.	Current Acc.	Finance	All
Controls	YES	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES	YES
TE and t	YES	YES	YES	YES	YES	YES	YES

  2. SCM estimation including all other policy reforms
     - Highly similar as main results

5. Mechanism analysis: What accounts for the effects?

- Above: indications on a role of **tax avoidance** (non-real response)

- But what in the tax reform spurs such response?
  - Overall progressivity (ARP) or the top marginal tax rates (MTR)?
  - We run panel regression on each fractile:

$$y_{it}^s = \epsilon_1^s \pi_{it} + \epsilon_2^s \tau_{it} + \beta_1 Ref_{it} + \beta_2 Z_{it} + \gamma_t^s + \mu_t^s + \mu_i^s t + u_t^s$$

Mechanism: Average progressivity or Top tax rates?

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			iii) Top 0.1				
Reform	0.313***			0.251**		0.22***	
	(0.077)			(0.103)		(0.075)	
Sig. Reform		0.703***			0.473***		0.507***
		(0.112)			(0.117)		(0.08)
Rate Prog.			-0.336***	-0.161*	-0.185*		
			(0.091)	(0.097)	(0.102)		
$1 - MTR$						0.909***	0.731***	0.654***
						(0.172)	(0.166)	(0.165)

- Result: Reform effect works through *marginal taxation*.

Mechanism: Average progressivity or Top tax rates?

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Efficiency effects: Larger share or size of the cake?

- Is the boost in top income shares caused by increased economic efficiency?
  - Tax reforms may unleash productive capacity (e.g., increased effort)
  - Supply-side motivations for tax reforms

- A simple test: SCM on efficiency-related outcomes

- Three efficiency outcomes:
  - GDP per capita
  - Number of patents
  - Tax revenues as share of GDP

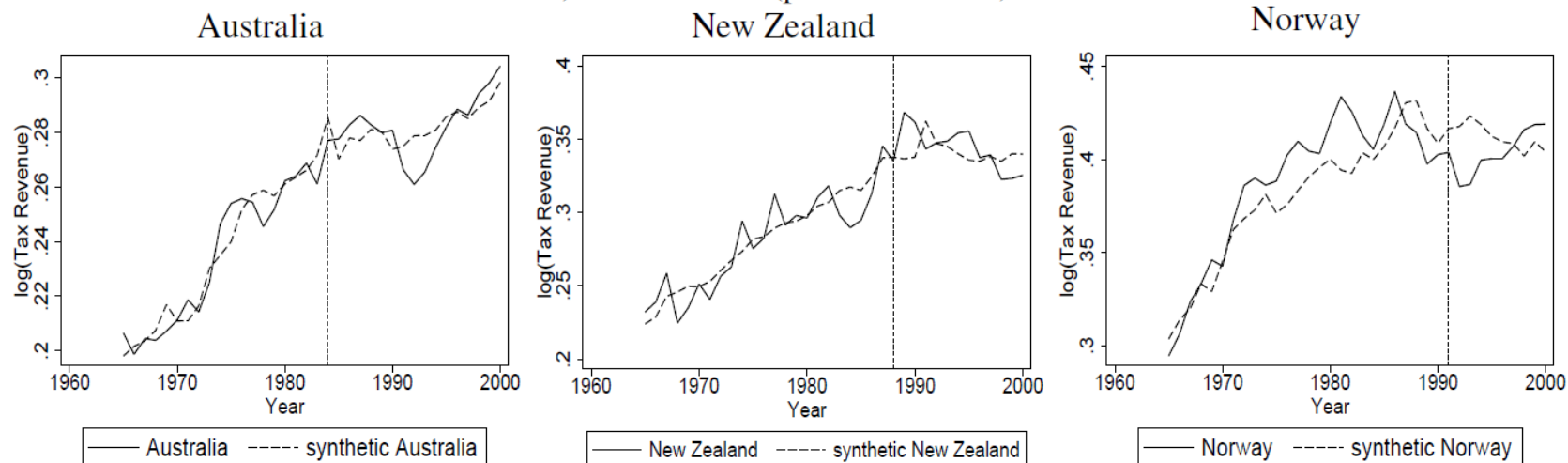# Efficiency effect: SCM on *GDP per capita*

a. Australia

b. New Zealand

c. Norway
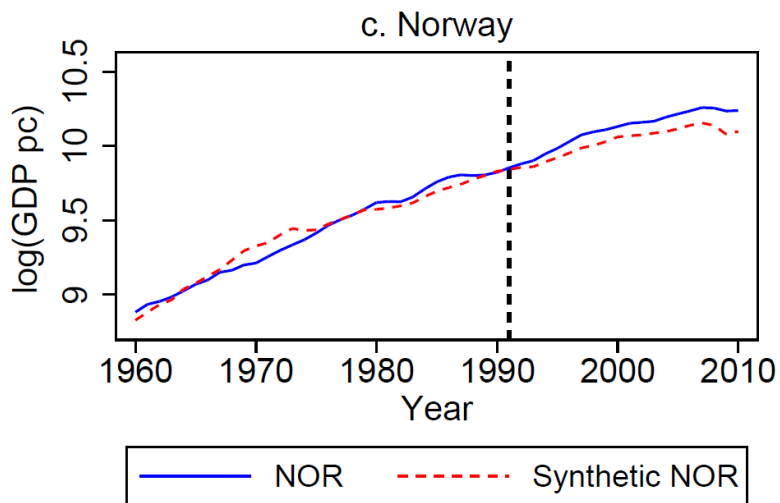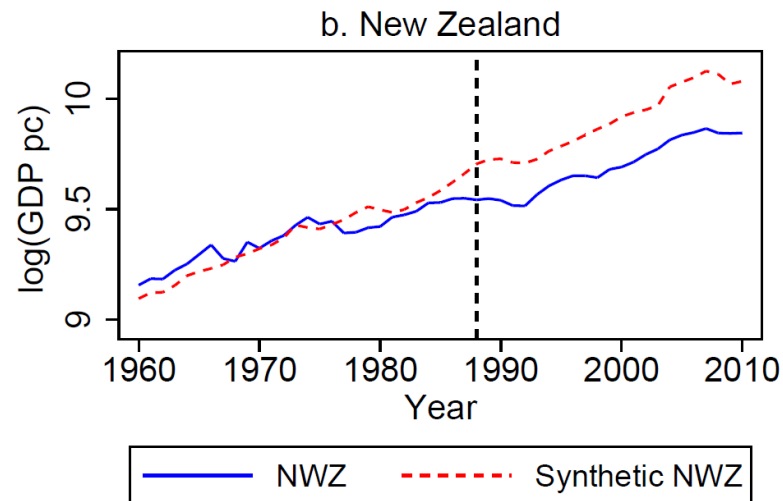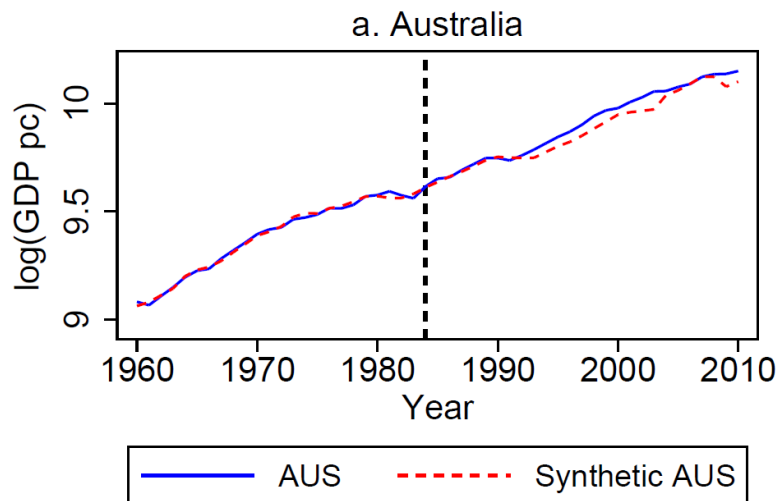
Efficiency effect: SCM on *Patents, Tax revenues*

b) Annual growth rate in number of patents
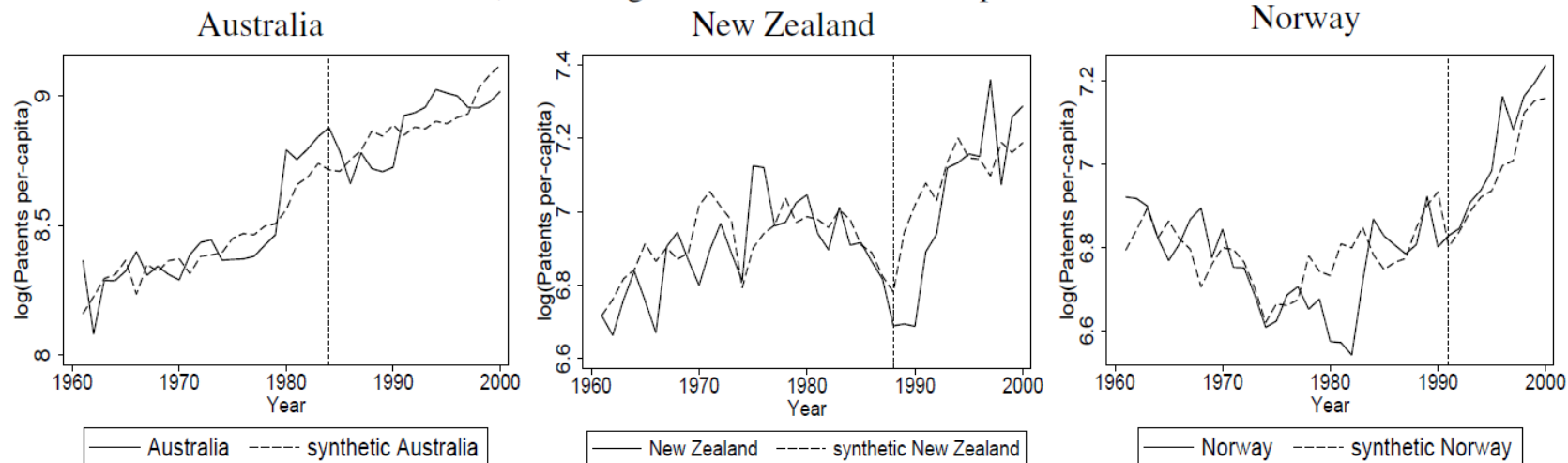
c) Tax revenues (percent of GDP)

6. Conclusions

- New approach to study tax progressivity effects:
  - **Tax reforms** in the 1980s and 1990s that lowered progressivity a lot
  - **Top income shares** observed annually in treated, non-treated countries
  - **Synthetic control methodology** offering causal estimation framework

- Main finding: Lower progressivity boosts top income shares
  - Size of effect: increases of 10-30%
  - Largest effect in highest top (top 0.1 percentile)
  - Patterns robust in several dimensions

- Mechanisms: Not entirely clear from our analysis
  - Tax avoidance (shifting income across tax bases) a likely mechanism
  - "Real responses" less probable