

# Reinterpreting productivity: New Zealand's surprising performance

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# Motivation

Adam Smith (1776):

*... consumption is the sole end and purpose of production*

So why measure productivity by outputs / inputs?

Instead: measure consumption possibilities / inputs

**= consumption productivity**

# Outline

## Consumption

Consumption more closely related to wellbeing than is income

New Zealand has high consumption levels for families

## Consumption Productivity

$\Delta\text{Income} = f(\Delta\text{Technical efficiency}, \Delta\text{Allocative efficiency})$

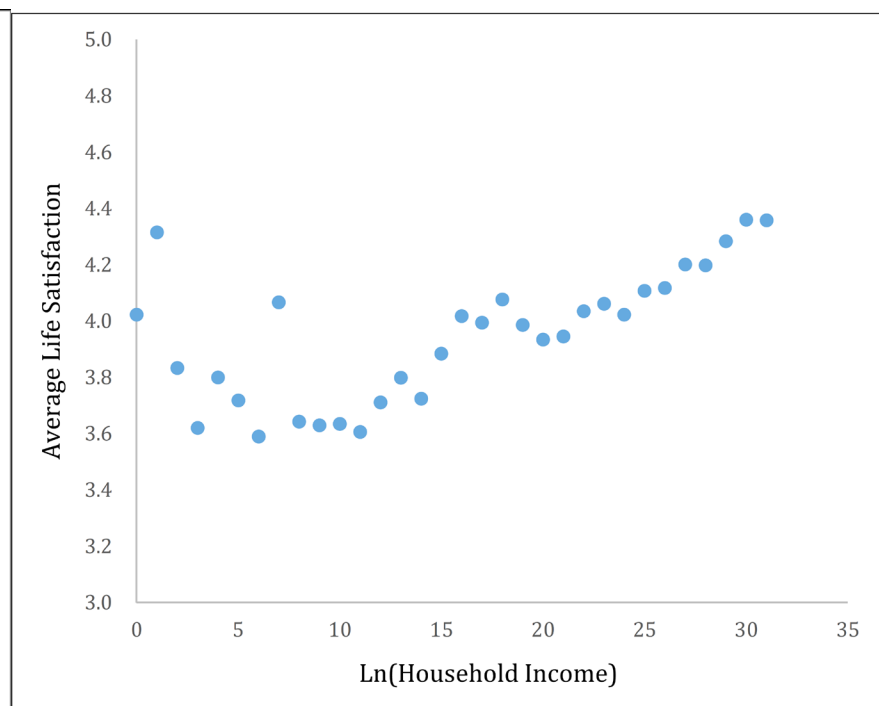
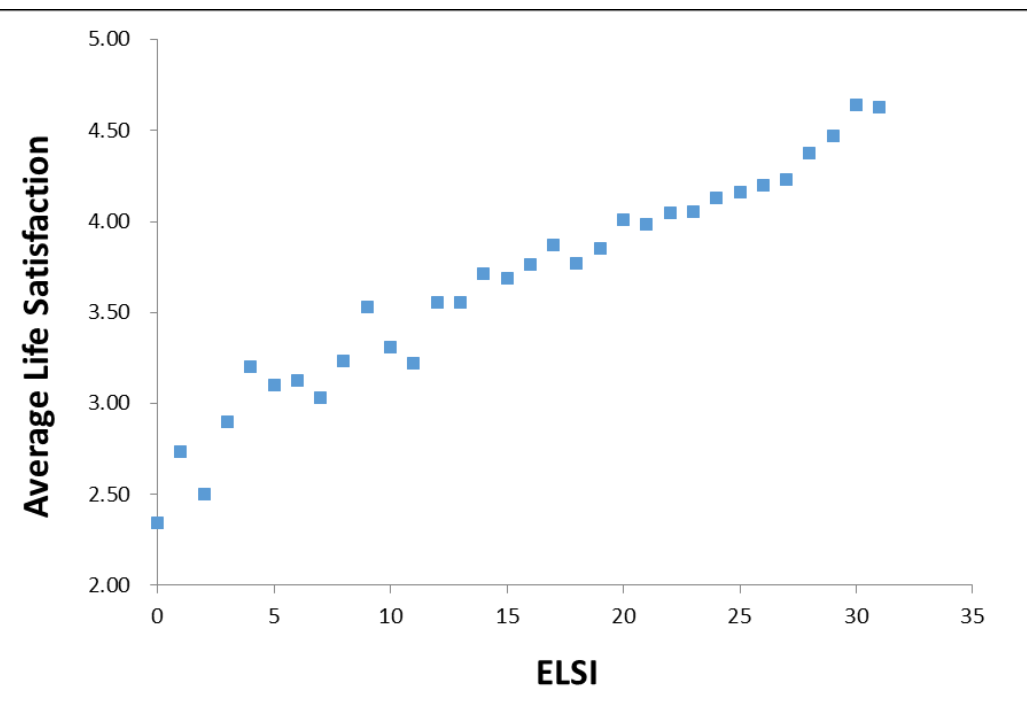
Illustrative examples + new measure

Historical paths (cross-country: 1970-1994; 1994-2018)

Comparison with real per capita GDP

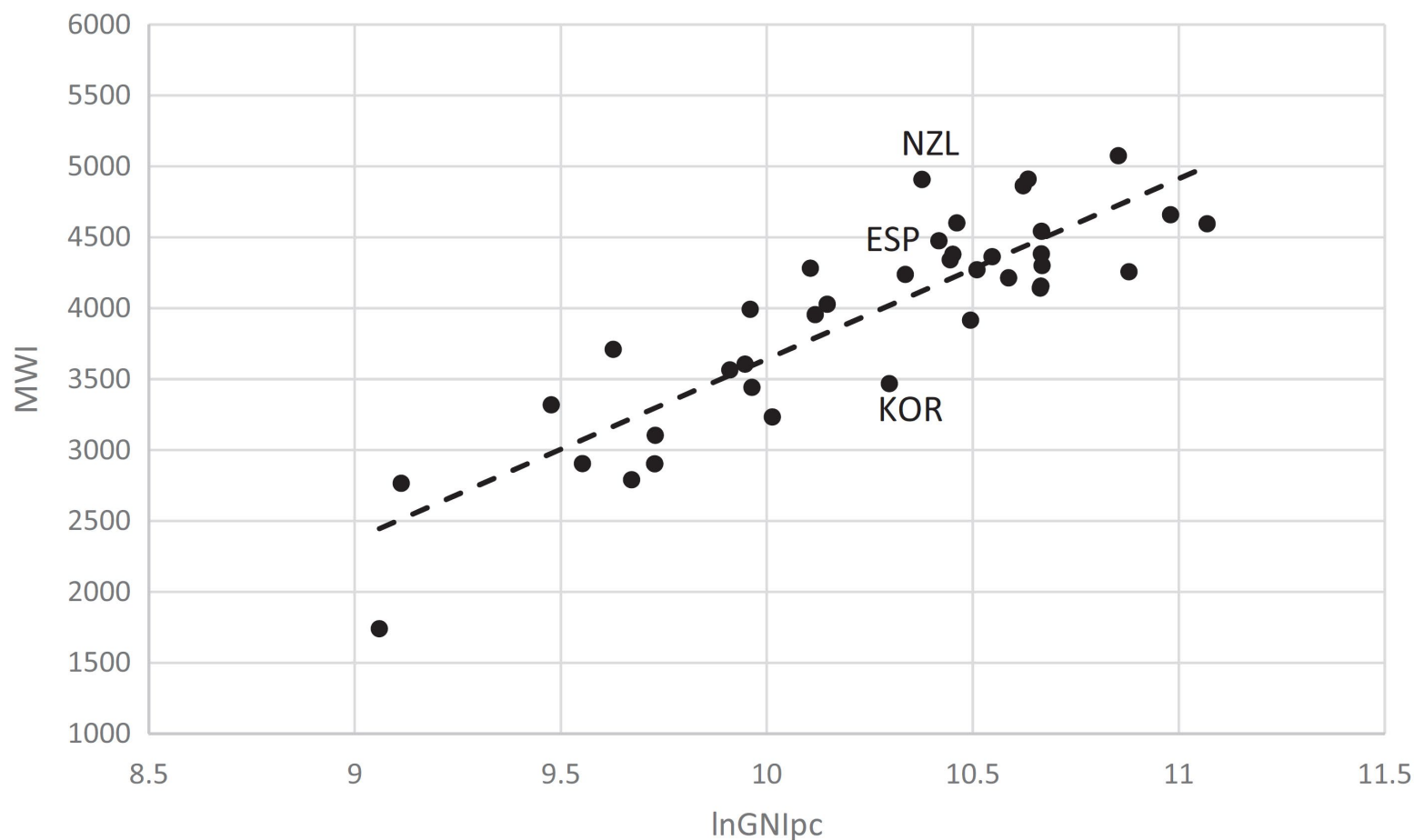
# Relationship of ELSI (consumption measure) & (ln)Income to life satisfaction

See: Carver & Grimes, *Review of Income & Wealth*, 2019



# MWI compiled for NZ households with a 15 yr old

- from PISA data on household belongings
- more closely related to some obj wellbeing indicators than per cap RGDP
- note MWI differences for 3 countries with same RGDP per cap (Grimes & Hyland, SJPE, 2020)



# Implications of 2 past studies

Consumption more closely related to wellbeing than is income

New Zealand has high consumption levels for families

## **BUT**

What if consumption is high because of (unsustainable) debt?

Approach here is to look at consumption productivity – being the income available for consumption while keeping capital stocks intact

**FIRST:** some stylised examples to illustrate key concepts

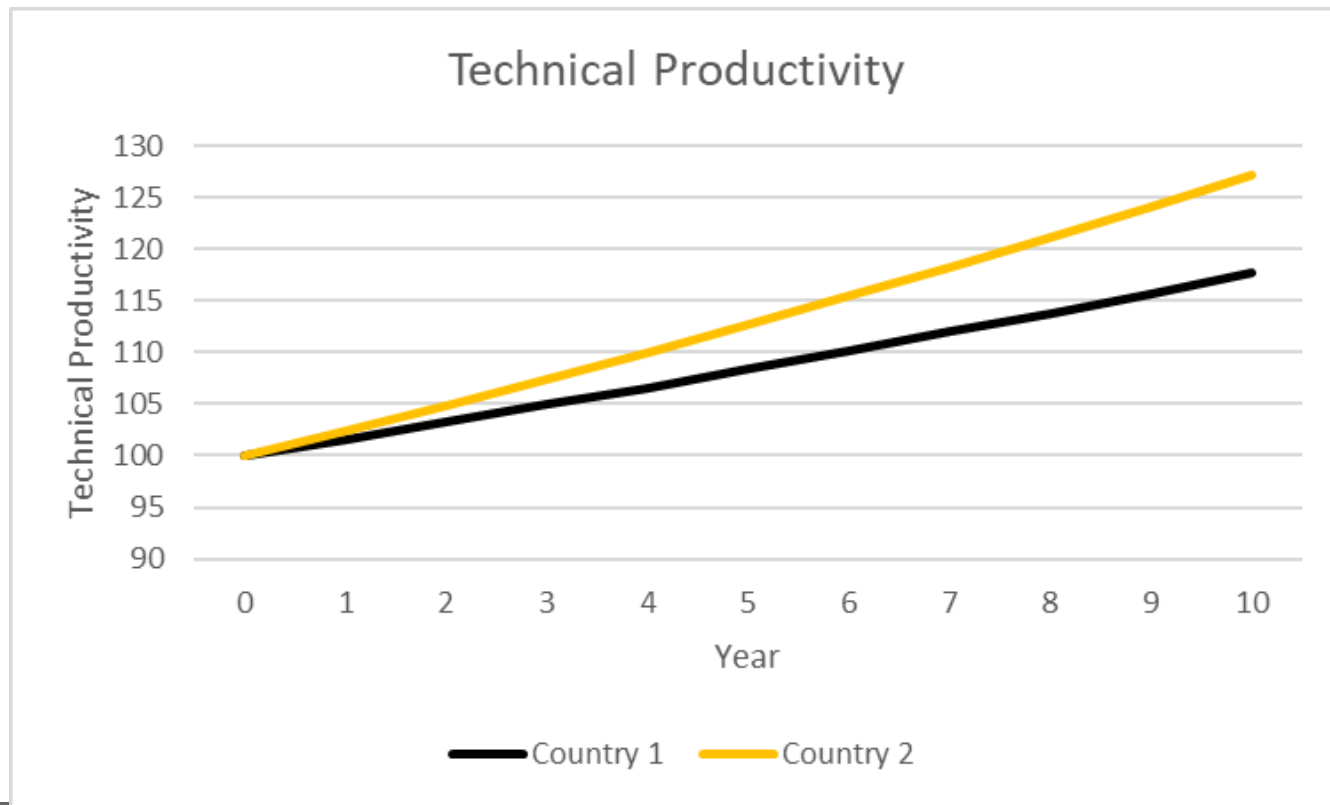
# Technical productivity growth

Two countries (1, 2) and two industries (A, B)

Industry A [B] has prod growth = 1% pa [3% pa]

Country 1 [2] has 30% [70%] labour in industry B

**Country 2  
prosper?**

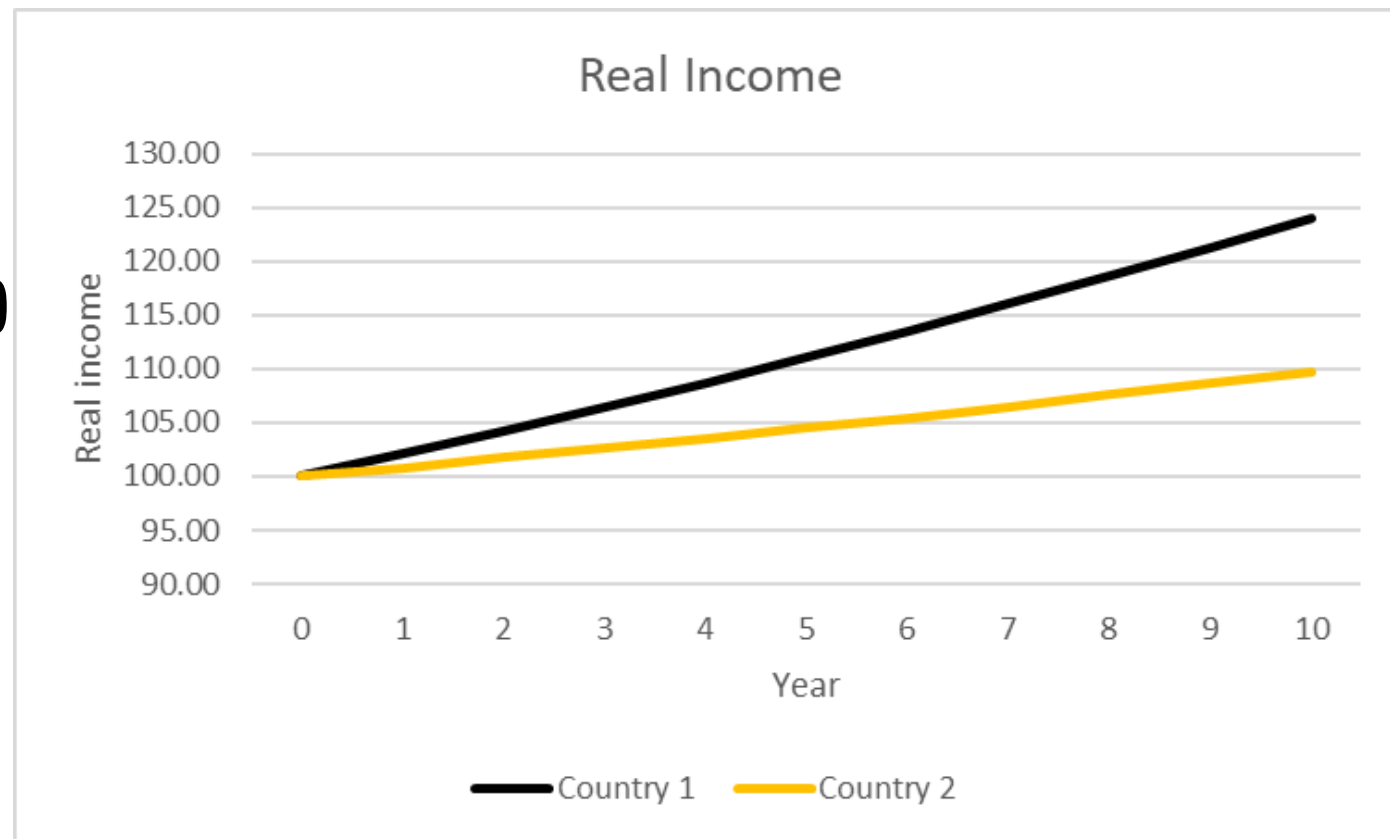


# Income growth

Same industries, productivity trends & labour allocations

Industry A [B] has real price growth = 2% pa [-3% pa]

**Country 1  
(with 'low'  
productivity)  
prosper!**





# Capital shallowness: gross vs net

**Country 3** has prod<sup>n</sup> f<sup>n</sup>:  $Y = K^{0.5}L^{0.5}$

**Country 4** has prod<sup>n</sup> f<sup>n</sup>:  $Y = (F+K)^{0.5}L^{0.5}$

where  $Y$  = gross output

$K$  = capital stock (depreciation = 10% pa)

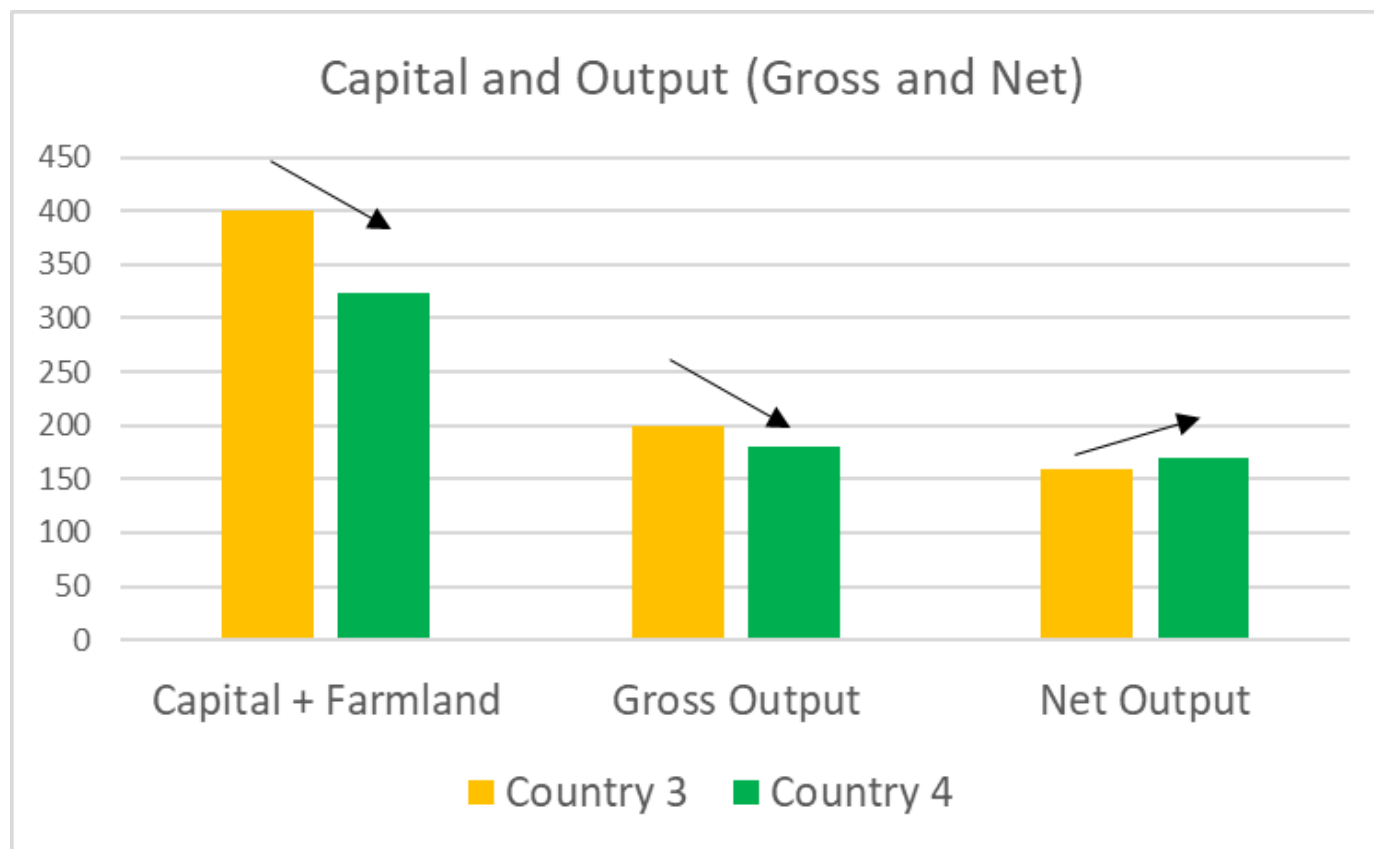
$F$  = farmland (depreciation = 0% pa)

$L$  = labour (= 100 in each country)

**Country 3 is capital deep:**  $K = 400$

**Country 4 is capital shallow:**  $K = 100, F = 224 (F+K=324)$

# Capital shallow country prospers (net!)



So must look at **net (after depreciation)** rather than gross  
Similarly must account for **resource depletion**

# GE model simulations

Use 2 sector GE (SOE) model from Grimes, NZEP, 2009

Tradable sector + non-traded sector, with imported K goods

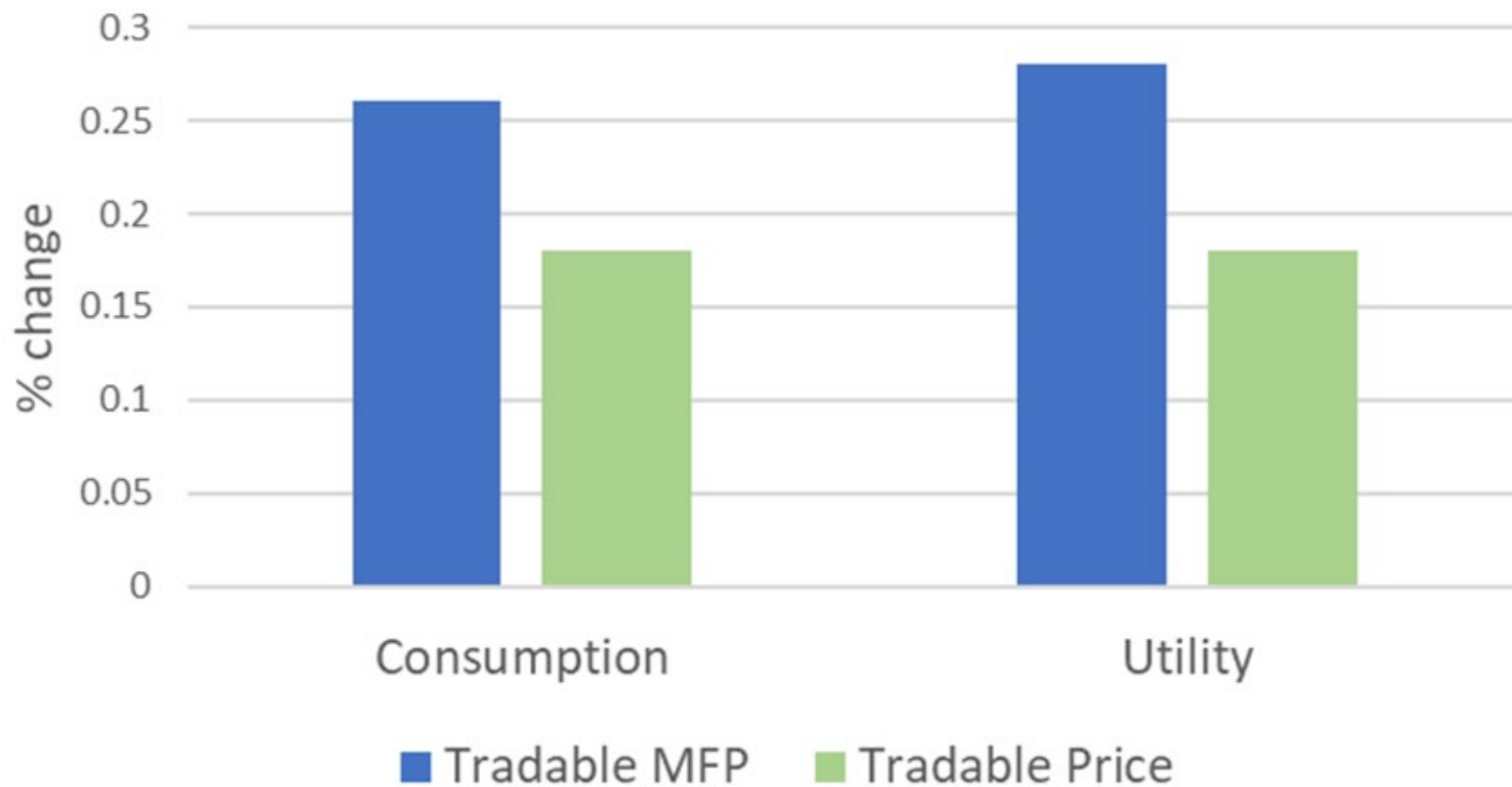
Each has Cobb-Douglas prod<sup>n</sup> with profit-maximising firms

Aggregate L fixed (but can move sectors); K endogenous

CES utility function

Key exog variables: MFP; export price; K price; r; dep rate

## Impact of 1% change in tradable MFP and price



# Lessons

(from illustrative examples & GE model)

Look at **income** (or consumption), not production

Look at **net** income, not gross

Hence, for national accounts, look at **NNI** not GDP

Adjust NNI for **resource depletion** → **ANNI** (World Bk)

# Measuring consumption productivity

World Bank measures ANNI in current USD

- convert to domestic currency by market fx rate
- divide by population
- deflate by domestic CPI (since ANNI is available for consumption while keeping capital stocks intact)

→ **Real ANNI per capita (pcRANNI)**

**pcRANNI measures real income available to be consumed after setting aside depreciation and resource depletion**

# Data

World Bank World Development Indicators, 1970 - 2018

'Early OECD': 24 countries excl Iceland & Luxembourg

- Iceland & Lux have data issues and are very small
- Early OECD avoids selection on later 'fast growers'
- All 22 are developed, except Turkey

Full sample and split samples at 1994

- half-way point
- after main economic reforms in NZ & Australia

NZ (green) & Australia (gold) highlighted

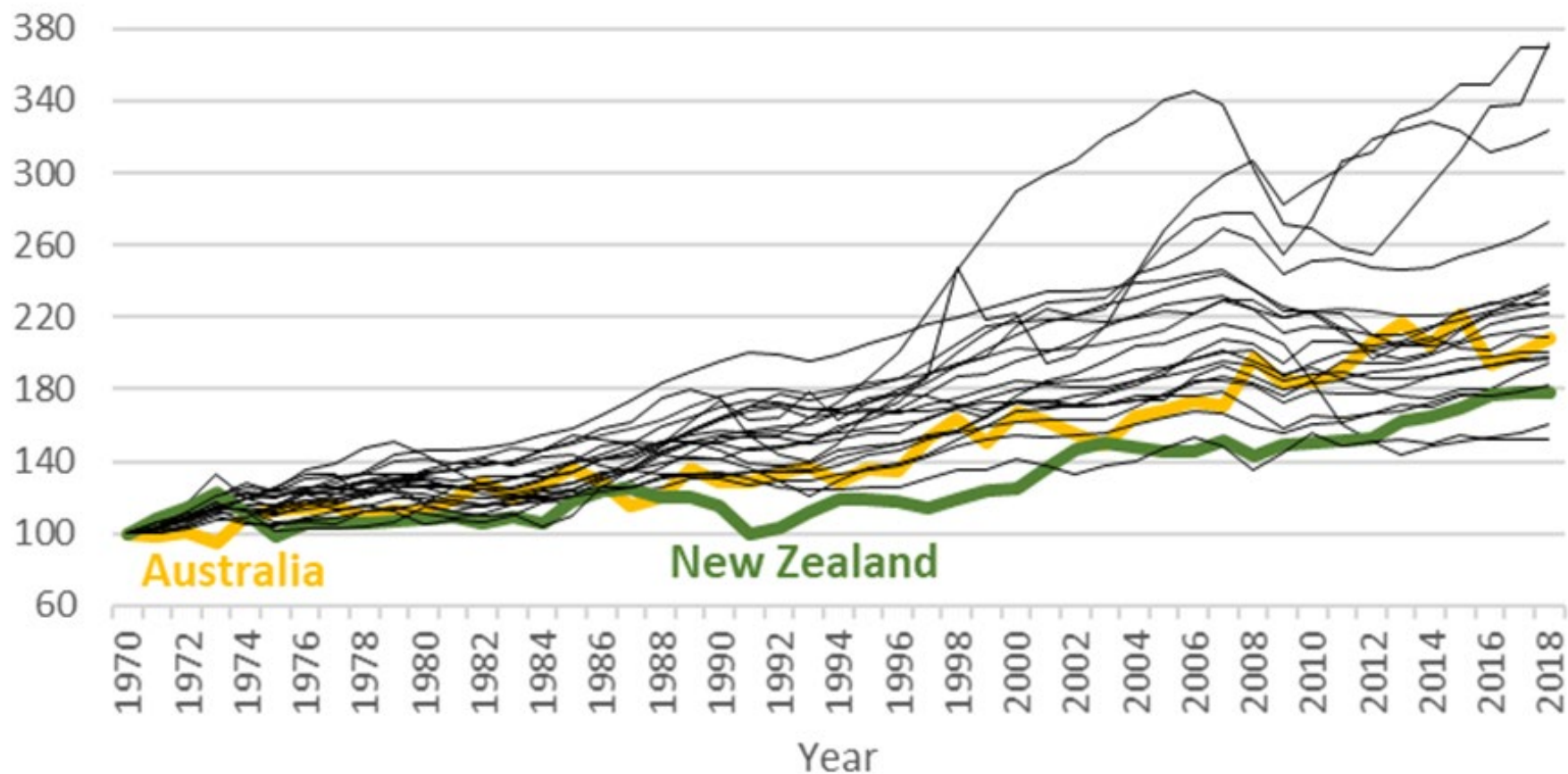
**Table 1: Per capita GDP in 1970 (PPP)** Source: Angus Maddison

<b>Country</b>	<b>Abbreviation</b>	<b>GDP (1970)</b>
Switzerland	SWI	16,904
United States	US	15,030
Sweden	SWE	13,011
Denmark	DEN	12,686
Canada	CAN	12,050
Australia	AUS	12,024
Netherlands	NETH	11,967
France	FRA	11,410
New Zealand	NZ	11,189
Germany	GER	10,839
United Kingdom	UK	10,767
Belgium	BEL	10,611
Norway	NOR	10,027
Austria	AUT	9,747
Italy	ITA	9,719
Japan	JAP	9,714
Finland	FIN	9,577
Spain	SP	6,319
Greece	GRE	6,211
Ireland	IRE	6,199
Portugal	PORT	5,473
Turkey	TUR	3,078

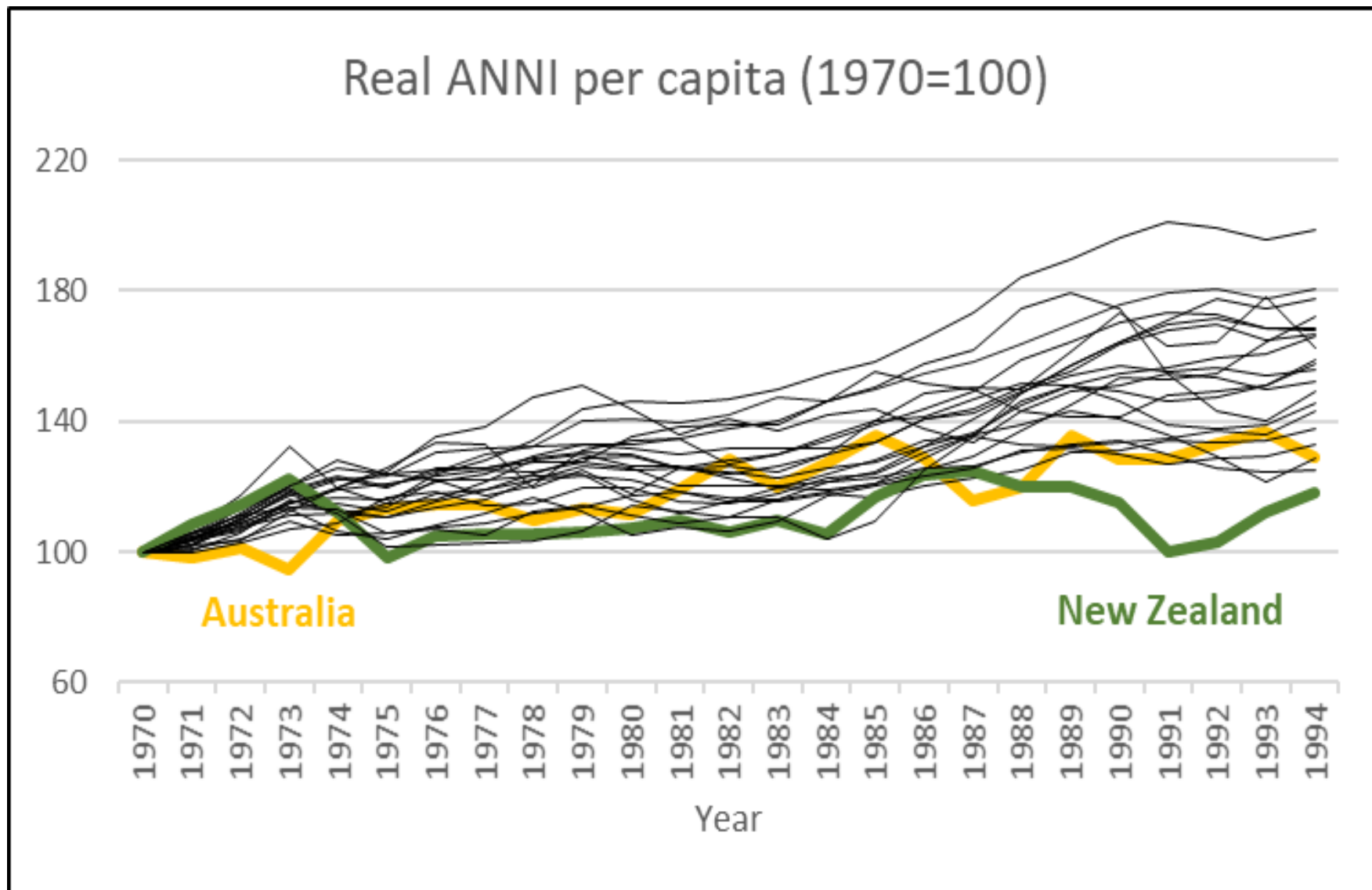


# Full period: NZ poor performer, Australia an also-ran

Real ANNI per capita (1970=100)

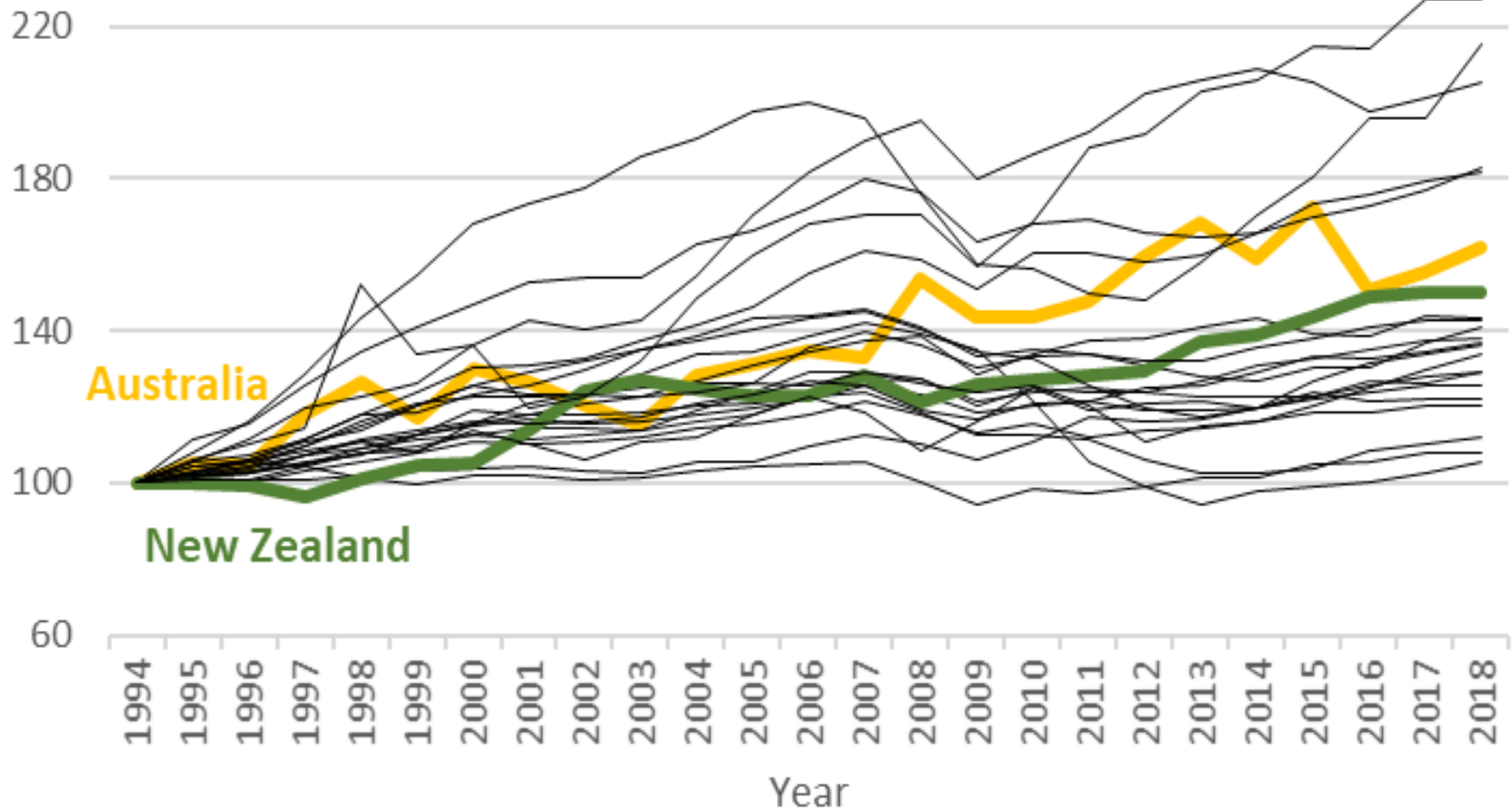


# First half: NZ a disaster; Australia close to it



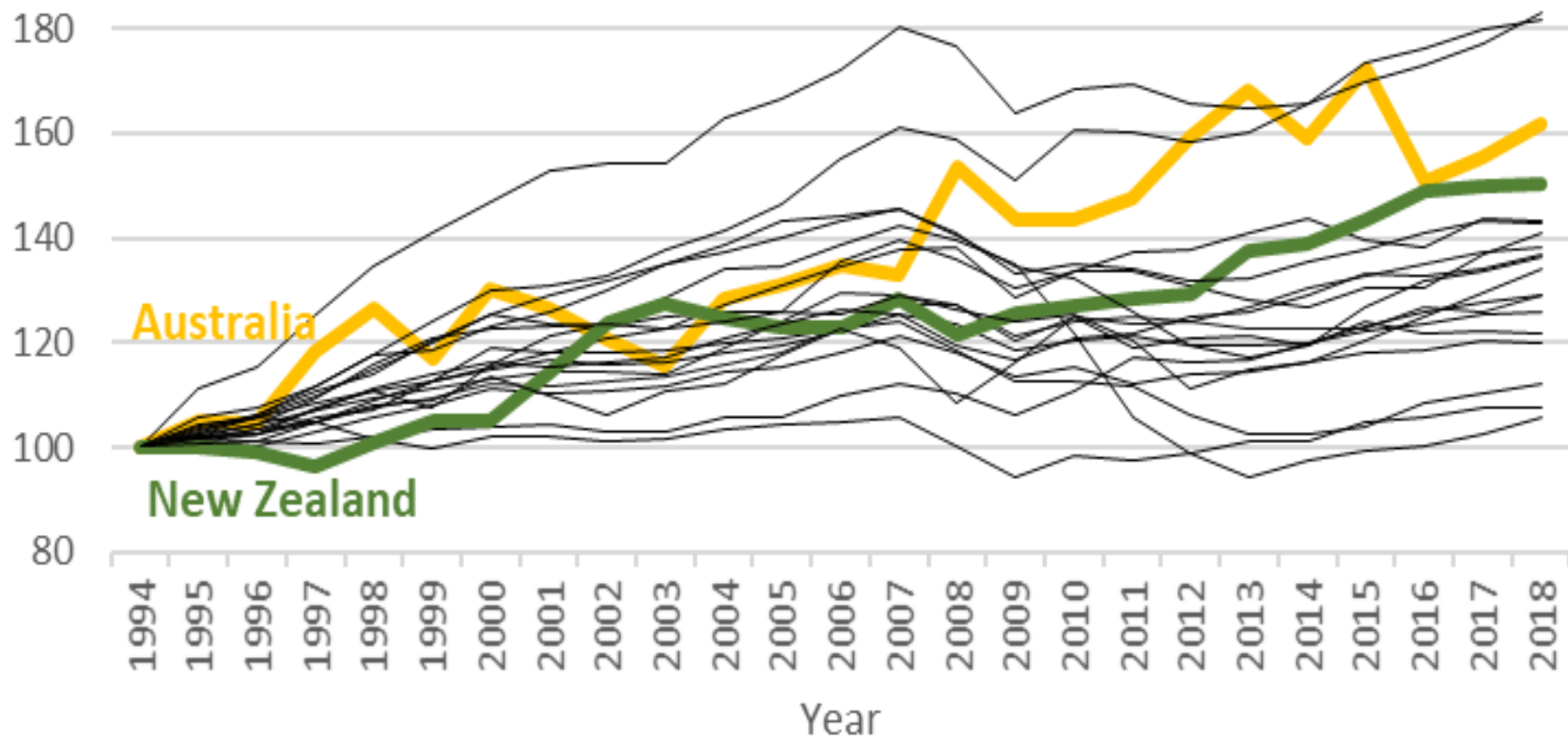
# Second half: Both countries in top third

Real ANNI per capita (1994=100)

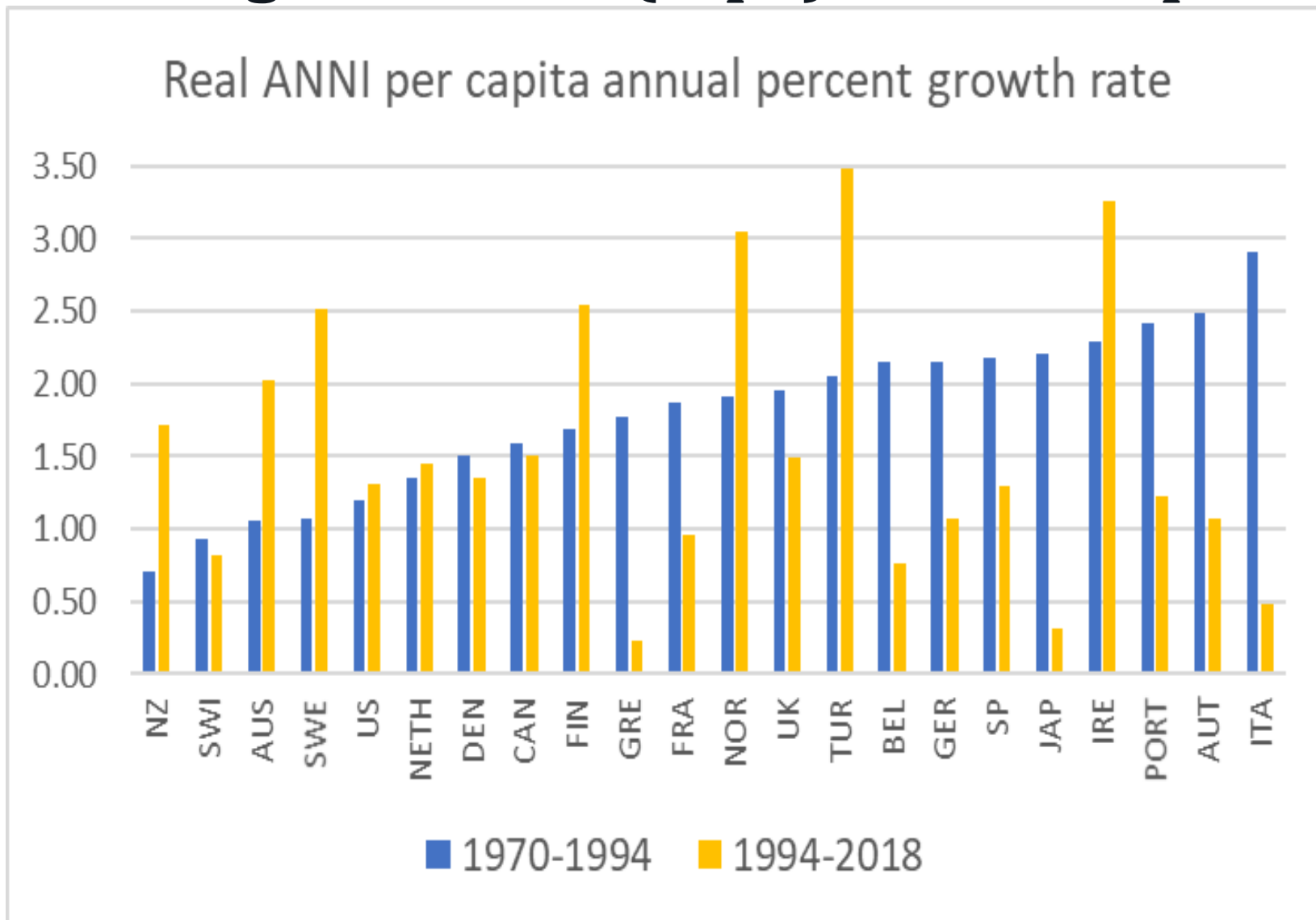


# Second half: Excl 3 special cases

Real ANNI per capita (1994=100)  
excl Turkey, Norway, Ireland



# *pcRANNI* growth rate (%pa), each sub-period



# What about real per capita GDP growth?

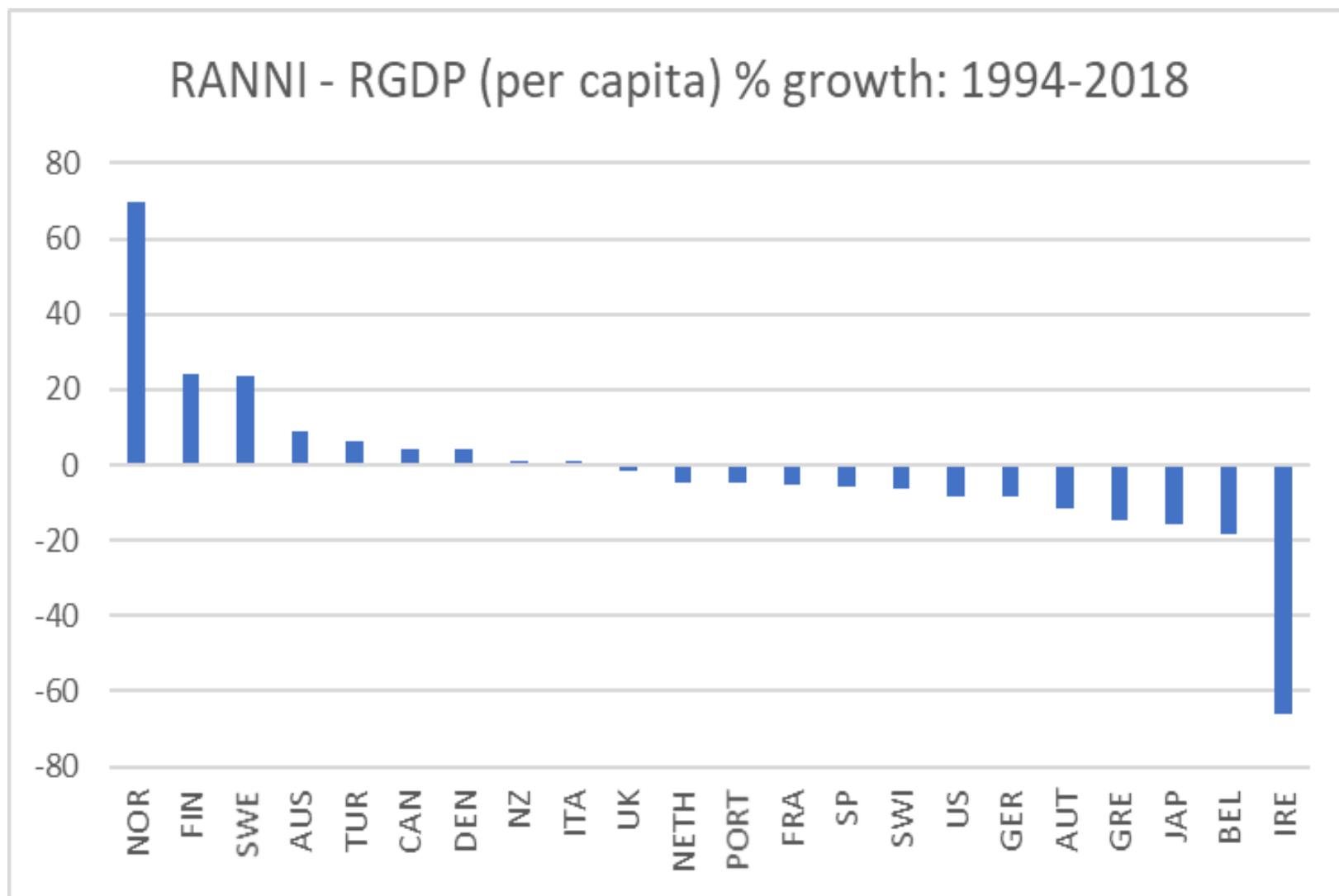
*Productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker. Krugman (1997)*

**How do *pcRANNI* and *pcRGDP* growth compare?**

**Corr = 0.78**

**but some key country differences**

# 1994 - 2018: *pcRANNI*, *pcRGDP* growth



# Key points

Allocative efficiency and technical productivity both important

Concentrate on income or consumption, not production

Concentrate on Net, not Gross

**Substantial differences btwn *pcRANNI* & *pcRGDP* growth**

- for some countries
- though not NZ



# Implications for NZ

**Poor diagnosis leads to poor policies**

**NZ & Australia both strong performers from early 1990s**

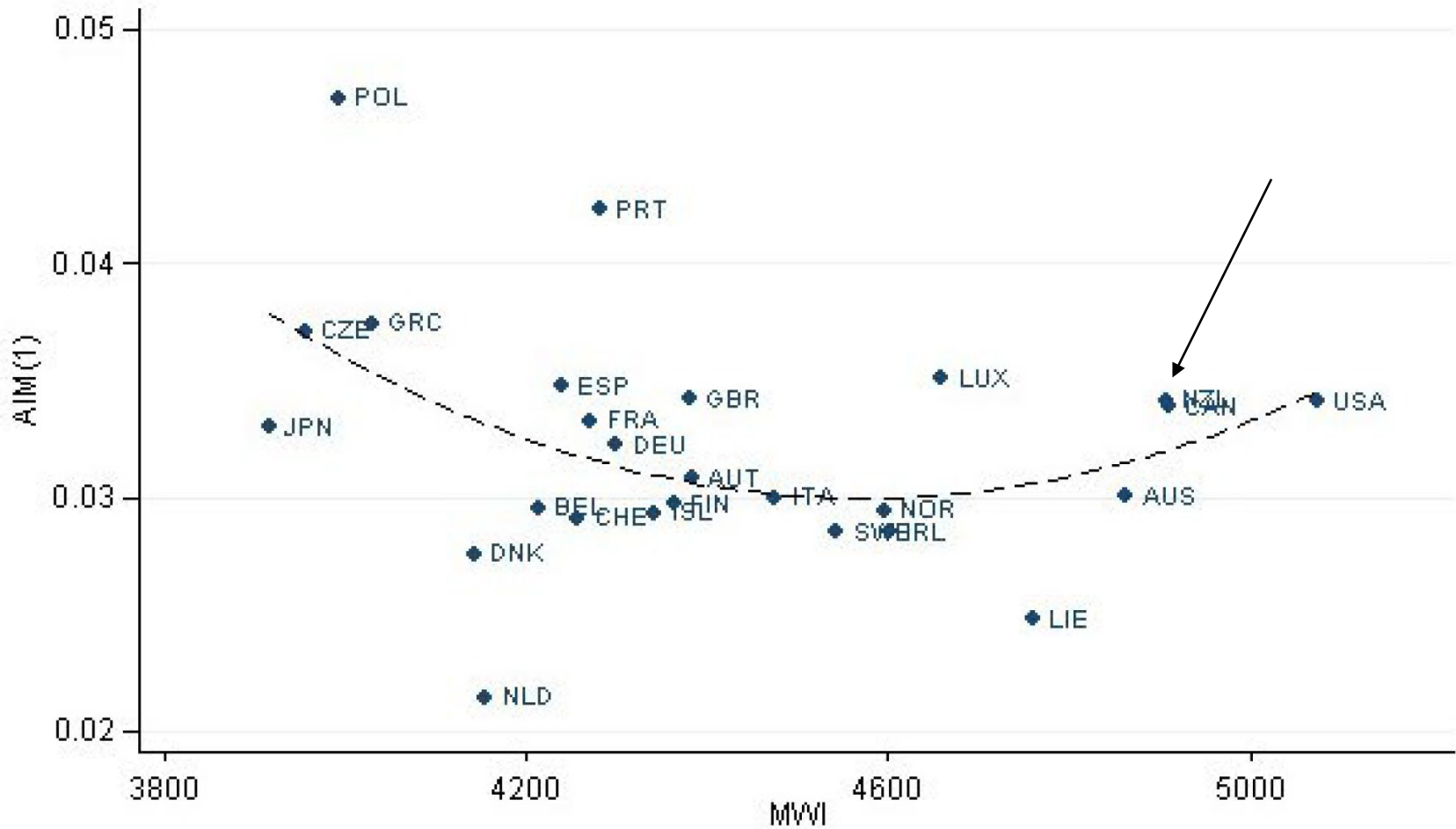
- For **aggregate** consumption productivity
- Though Grimes & Hyland show NZ has high consumption **inequality**

**Risk of advocating policies to “solve” non-existent problem**

**- or to solve the wrong problem**

# AIM (Atkinson inequality measure for MWI)

(Grimes & Hyland, SJPE, 2020)



# End of period index numbers (pcRANNI)

	AUS	AUT	BEL	CAN	DEN	FIN	FRA	GER	GRE	IRE	ITA
1970-2018	208	233	200	209	198	273	196	215	161	372	223
1970-1994	129	180	166	146	143	149	156	167	152	172	199
1994-2018	162	129	120	143	138	183	126	129	106	216	112
	JAP	NETH	NZ	NOR	PORT	SP	SWE	SWI	TUR	UK	US
1970-2018	182	194	178	323	238	229	234	152	369	227	182
1970-1994	169	138	118	157	177	168	129	125	163	159	133
1994-2018	108	141	150	205	134	136	182	122	227	143	137

# Annual percentage growth rates (pcRANNI)

	AUS	AUT	BEL	CAN	DEN	FIN	FRA	GER	GRE	IRE	ITA
1970-2018	1.5	1.8	1.5	1.5	1.4	2.1	1.4	1.6	1.0	2.8	1.7
1970-1994	1.1	2.5	2.1	1.6	1.5	1.7	1.9	2.2	1.8	2.3	2.9
1994-2018	2.0	1.1	0.8	1.5	1.4	2.5	1.0	1.1	0.2	3.3	0.5
	JAP	NETH	NZ	NOR	PORT	SP	SWE	SWI	TUR	UK	US
1970-2018	1.3	1.4	1.2	2.5	1.8	1.7	1.8	0.9	2.8	1.7	1.3
1970-1994	2.2	1.3	0.7	1.9	2.4	2.2	1.1	0.9	2.0	2.0	1.2
1994-2018	0.3	1.4	1.7	3.0	1.2	1.3	2.5	0.8	3.5	1.5	1.3