



*Centre for the
Study of Living Standards
Centre d'étude des
niveaux de vie*

Trends in Economic Well-Being in Canada 1981 - 2017

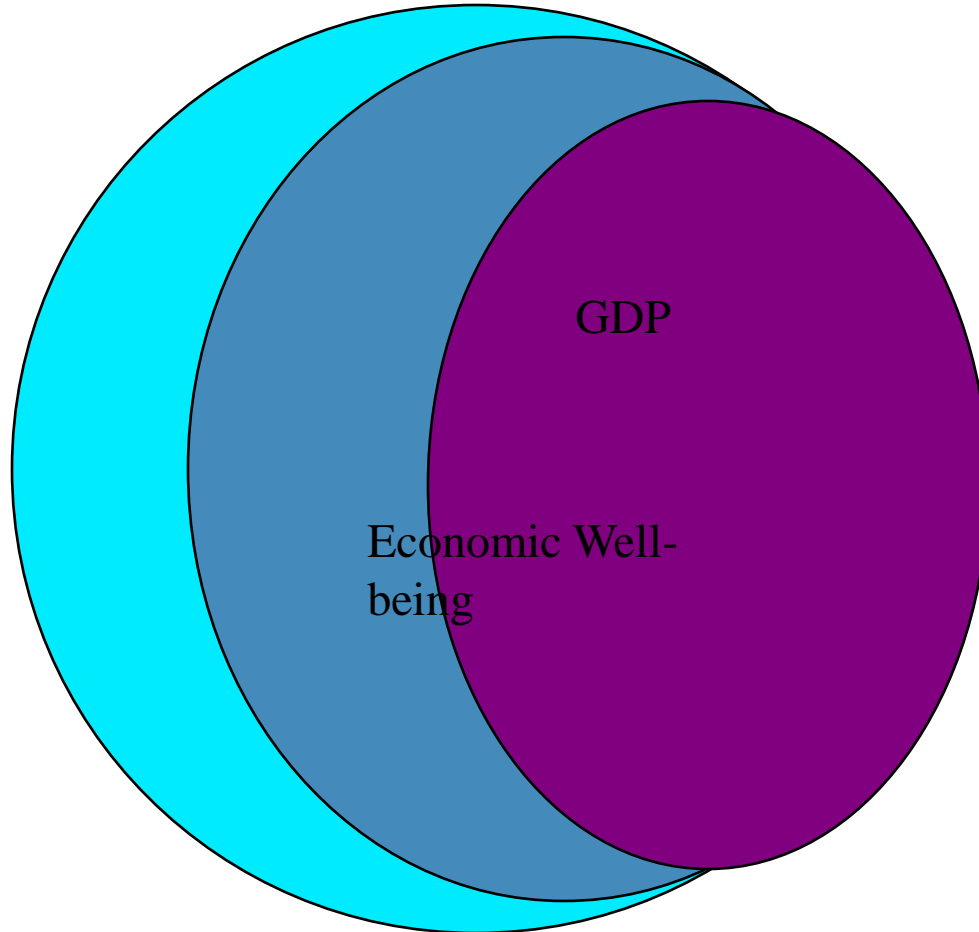
Alexandria Stephens, Andrew Sharpe & Lars Osberg

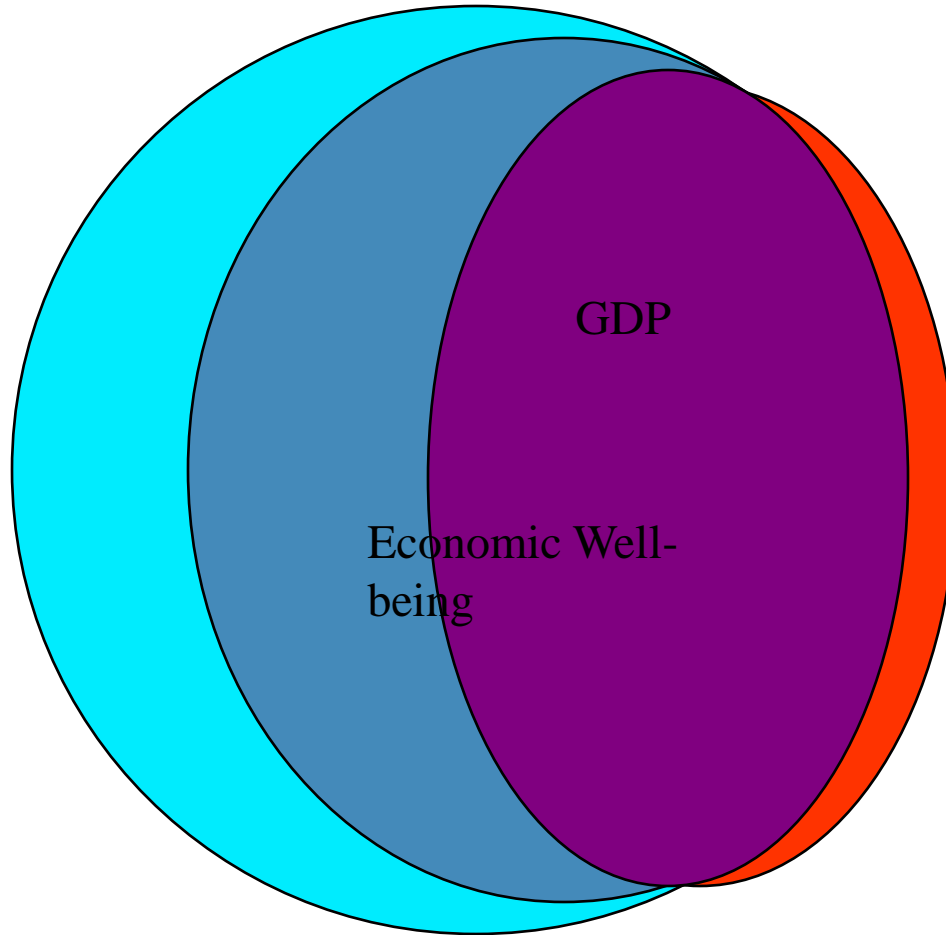
Centre for the Study of Living Standards & Dalhousie University

Thursday, September 12th, 2019

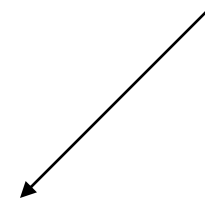
- Well-Being & Economic Well-Being: A Debate
- Overview of the IEWB
- 1981 – 2017: Canadian Trends
 - Consumption Flows Domain
 - Stocks of Wealth Domain
 - Income Distribution Domain
 - Security Domain
- Sensitivity to Values & to Costing of GHG
- Conclusion

Human Well-Being > Economic Well-Being > GDP





“Social regrettables”



Dimensions of Economic Well-Being

Concept

Present

“Typical Citizen”
(a.k.a. “Representative
Agent”)

Average Flow of
Current Income

Per Capita GDP
or “Adjusted”
Average Income
Flow

*Issues: Market
transactions only?
leisure & household
production? Length
of life?*

Concept

Present

“Typical Citizen”

Average Flow of
Current Income

Diversity of
Population

Distribution of
Current Income
- Poverty and
Inequality

*Diminishing $Mu_y \Rightarrow$
Less aggregate well-
being if same total
income is more
unequally
distributed*

Concept

Present

Future

“Typical Citizen”

Average Flow of
Effective Current
Consumption

Aggregate
Accumulation of
Productive Stocks
(broadly defined)

Issues:

*Average Income
does not reveal
savings rate*

*- assets include
environment,
Human Capital,
R&D, net foreign.*

*Aggregate Savings
– not automatically
optimal or sustainable
– intergenerational
altruism & preferences
for sustainability differ
among individuals*

Schematic of the Index of Economic Well-Being

Concept	Present	Future
"Typical Citizen"	Average Flow of Effective Current Consumption	Aggregate Accumulation of Productive Stocks
Diversity of Population	Distribution of Current Income: - Poverty and Inequality	Insecurity of Future Income

- INDEX OF ECONOMIC WELL-BEING (IEWB)

= α_1 PER CAPITA CONSUMPTION

+ α_2 SUSTAINABILITY / ACCUMULATION

+ α_3 INCOME DISTRIBUTION / POVERTY

+ α_4 SECURITY

- $\sum \alpha = 1$

- DIFFERING VALUES IMPLY DIFFERENT WEIGHTS

- $\alpha = 0$ is a (strong) value choice

- GDP per capita sets $\alpha_3 = \alpha_4 = 0$ and assumes α_2 is always optimal

FACTS & VALUES – BOTH MATTER !

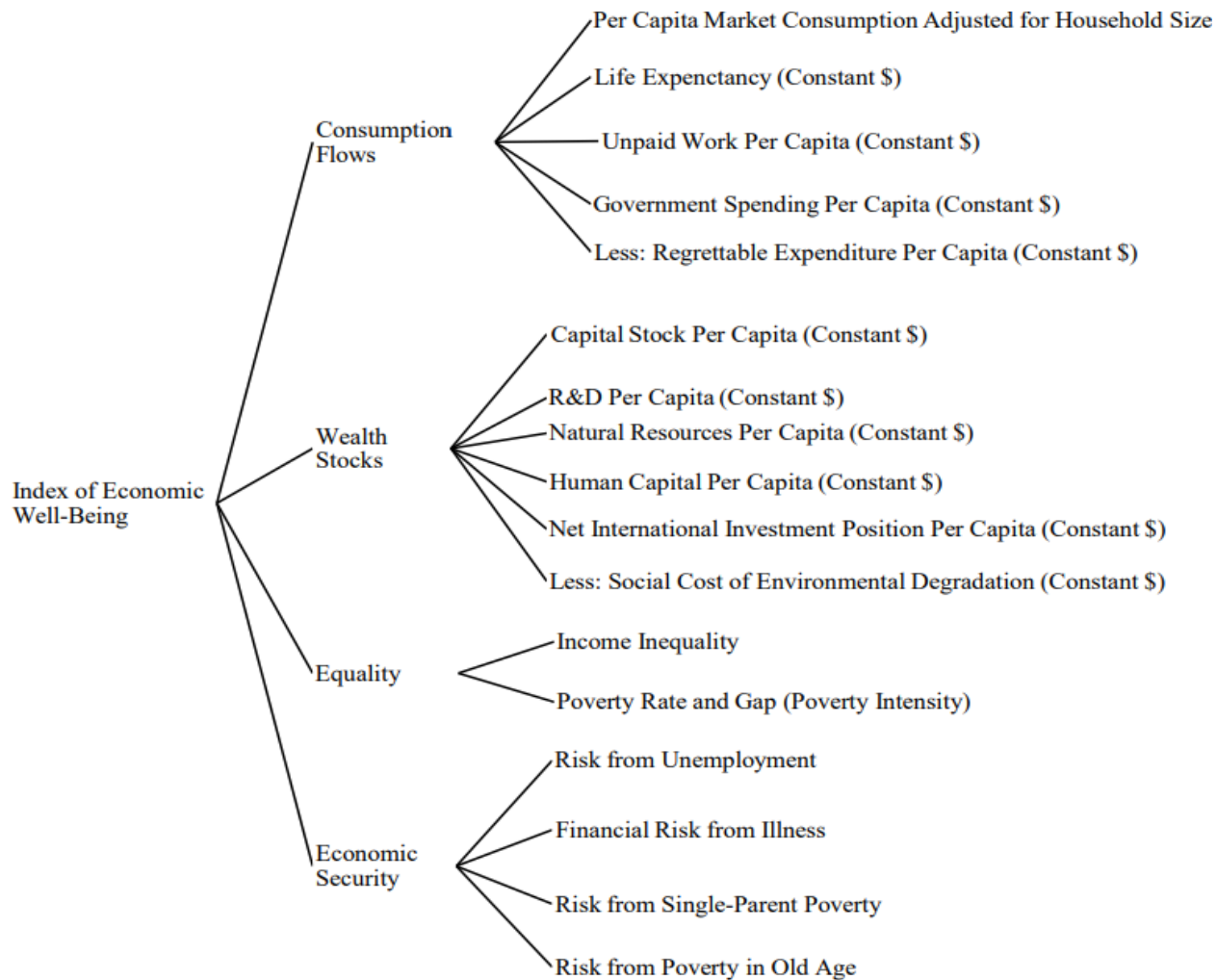
- ECONOMIC WELL-BEING =
 α_1 [CONSUMPTION]
+ α_2 [TOTAL WEALTH]
+ α_3 [DISTRIBUTION]
+ α_4 [SECURITY]
- DIFFERENT VALUES IMPLY DIFFERENT WEIGHTS, BUT DOES TREND CHANGE? DO POLICY CHOICES CHANGE?
 - How much does economic well-being actually depend on value weightings or on perceptions of fact trends?
 - WHERE is the disagreement if assessment of trends differs?

How to “Add Up” across Dimensions of Well-Being?

Linear Scaling Procedure

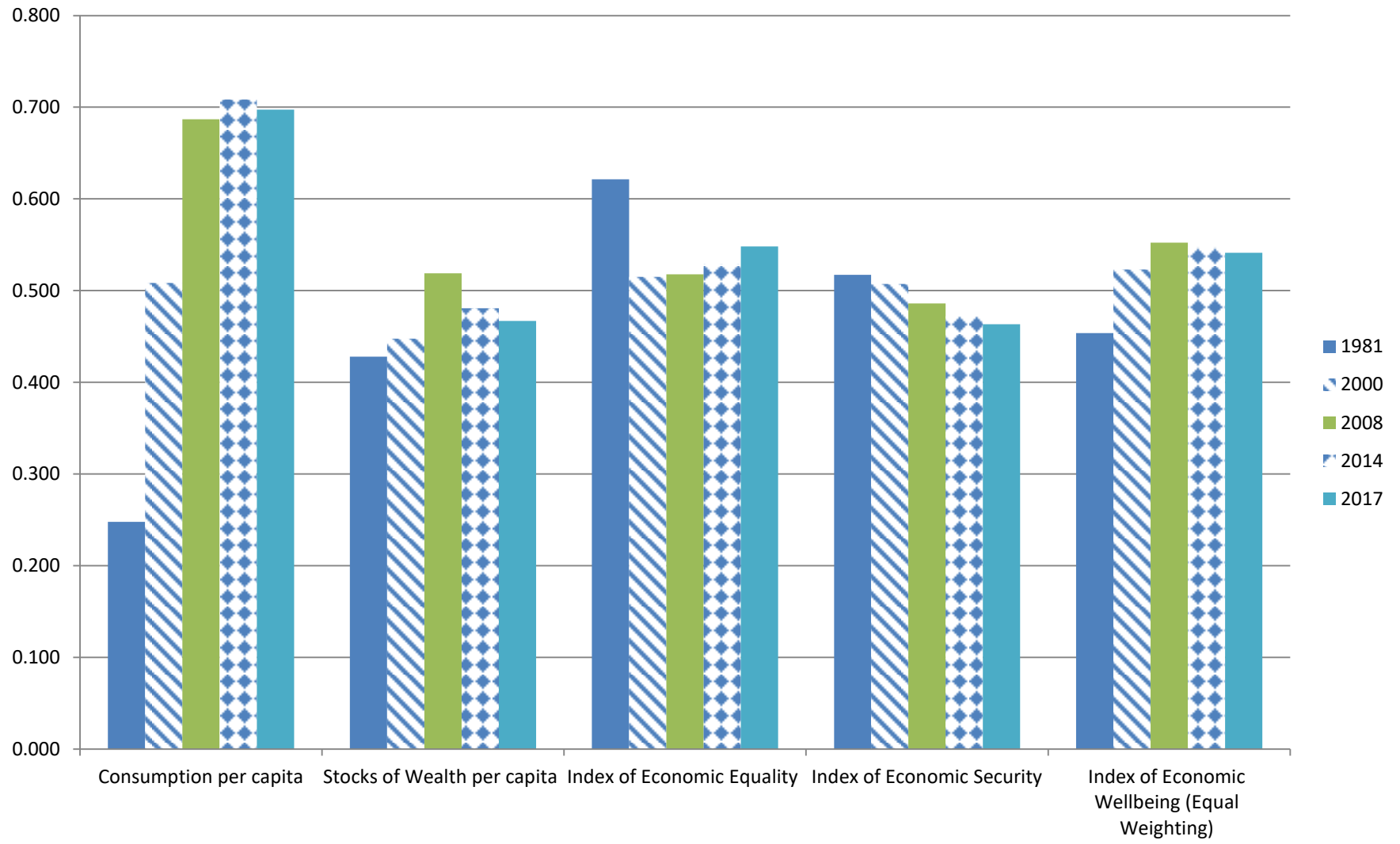
- Normalized to Unit Interval - Linear Scaling
 - $(1.05 * \text{Max} - \text{value}) / (\text{Max} - \text{Min}) * 1.1$

Schematic of the Index of Economic Well-Being

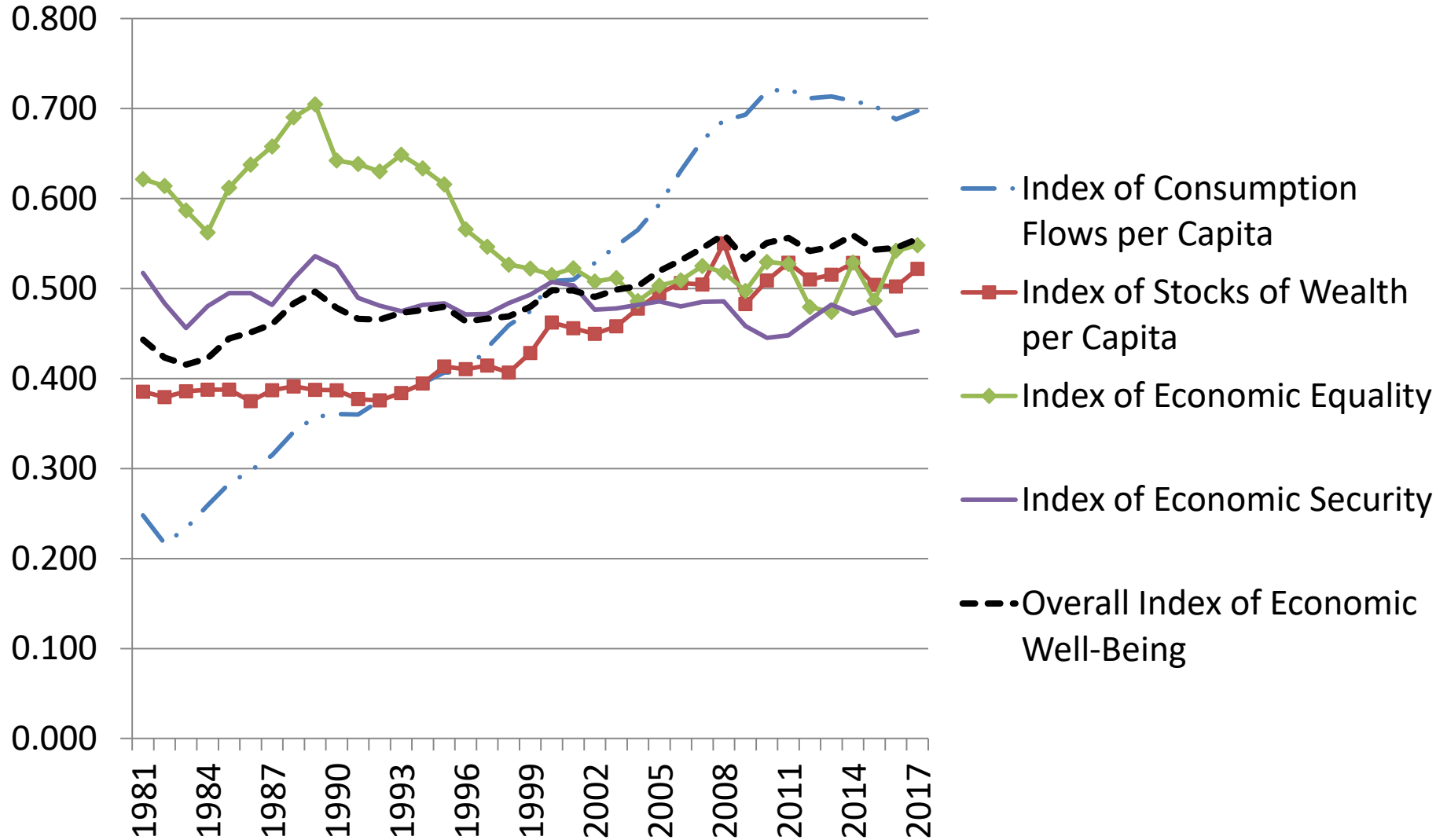


Source: CSLS

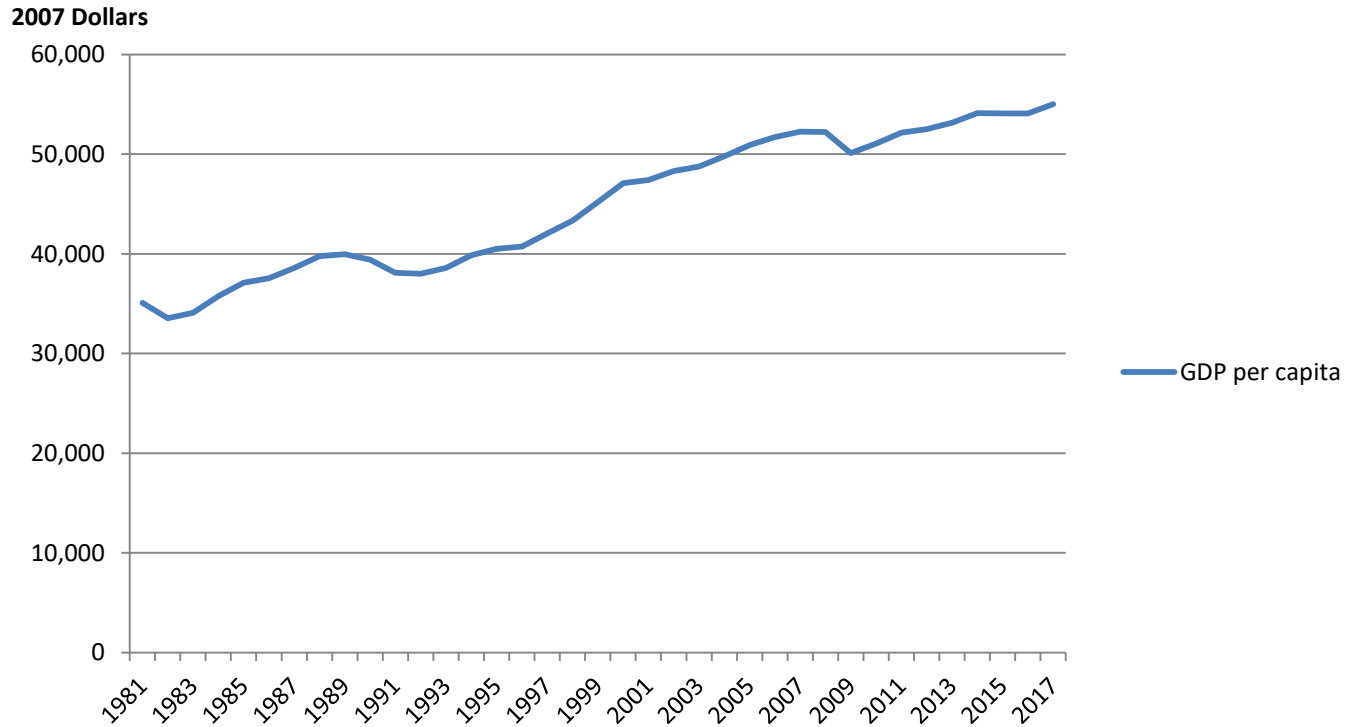
Levels of the Index of Economic Well-Being and its Domains in 1981, 2000, 2008, 2014, and 2017



Trends in The Index of Economic Well-Being and its Domains, 1981 - 2017



GDP per Capita, 1981 - 2017



Source: IEWB Database

Canada

**GDP per capita \approx
linear - recessions**

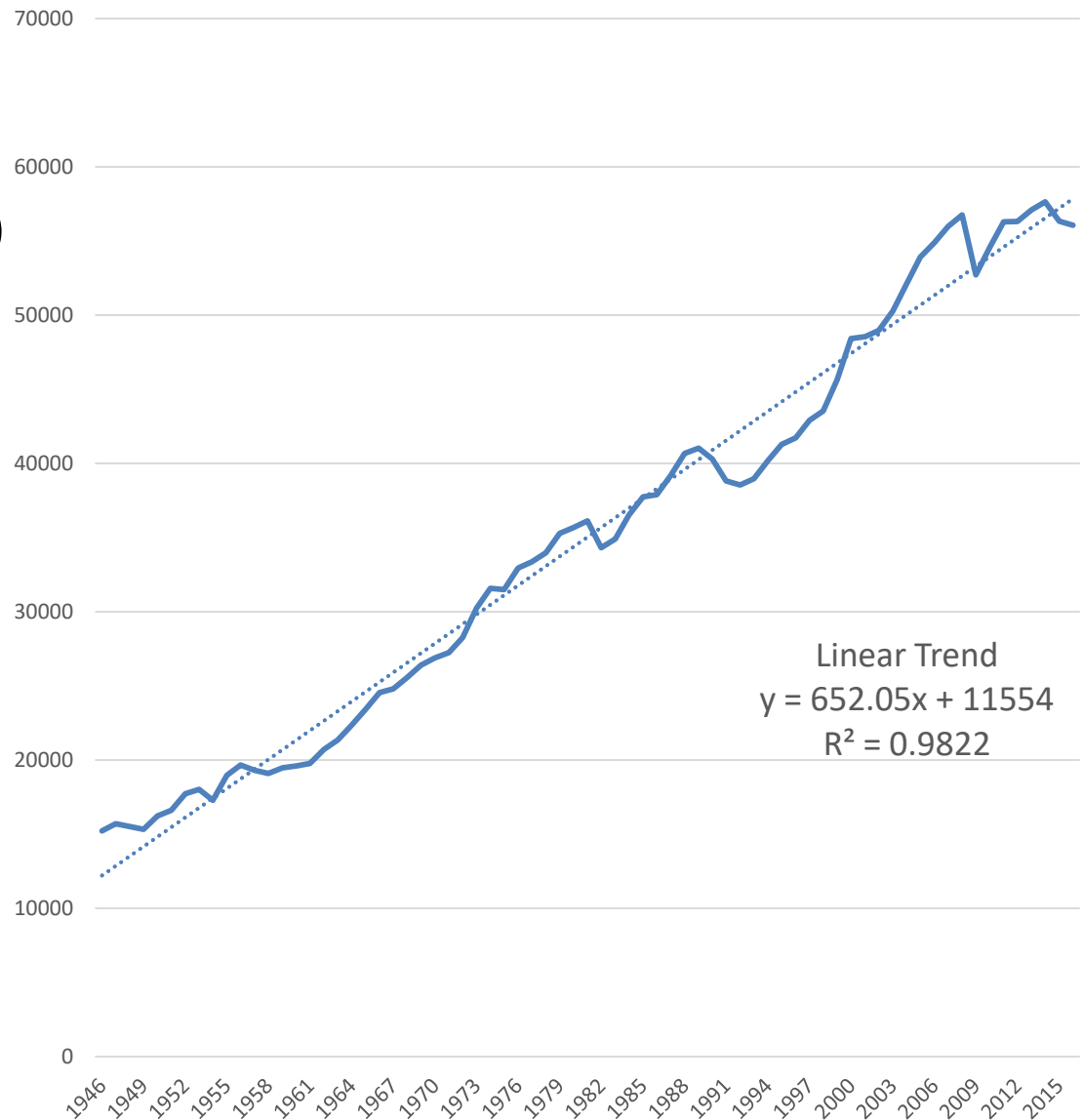
GDP per capita – (2015 \$)

1946 - \$ 15,400

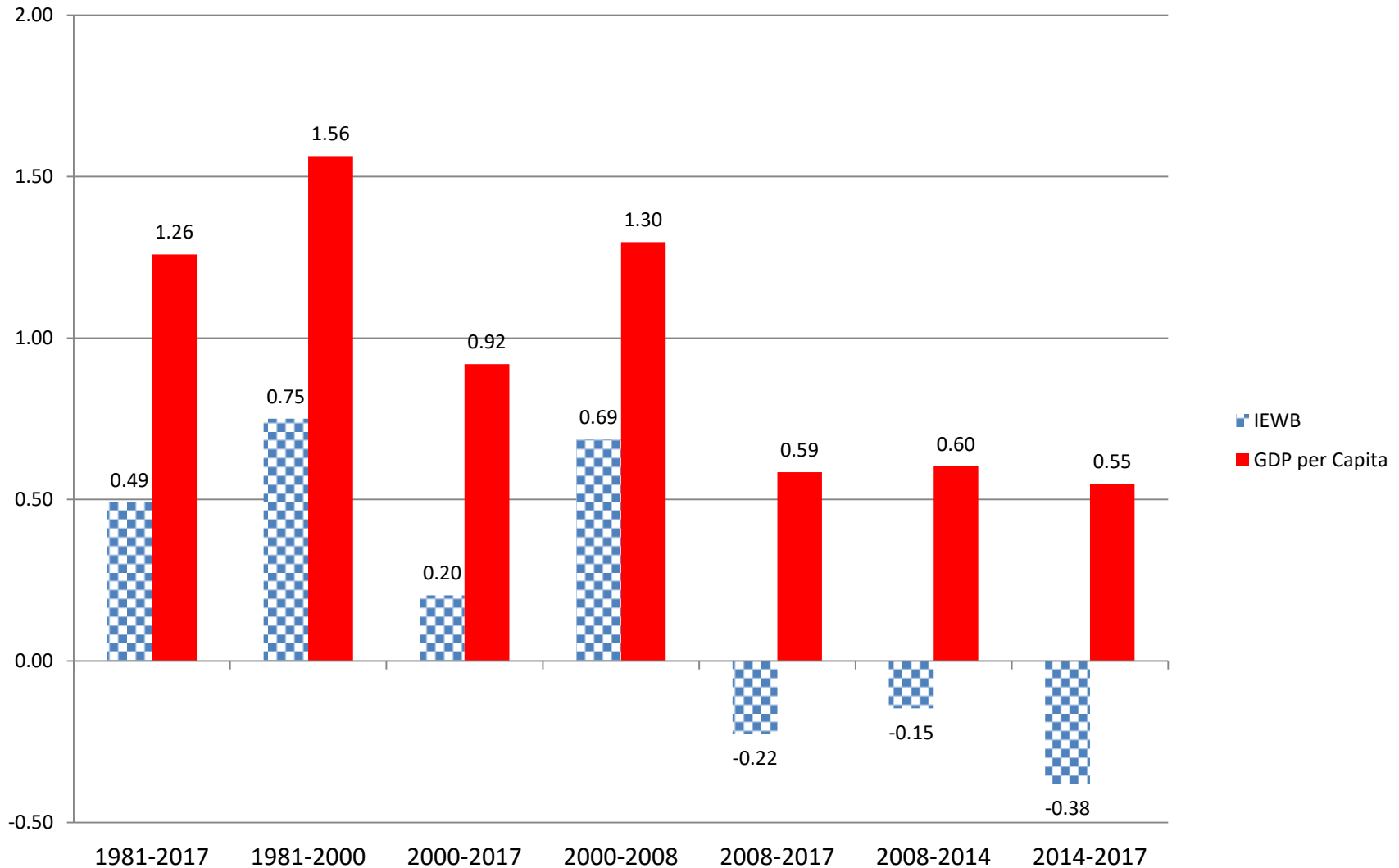
1981 - \$ 36,400

2016 - \$ 56,100

Real GDP per capita
Canada 1946-2016
CANSIM Table 383-0027, Series B



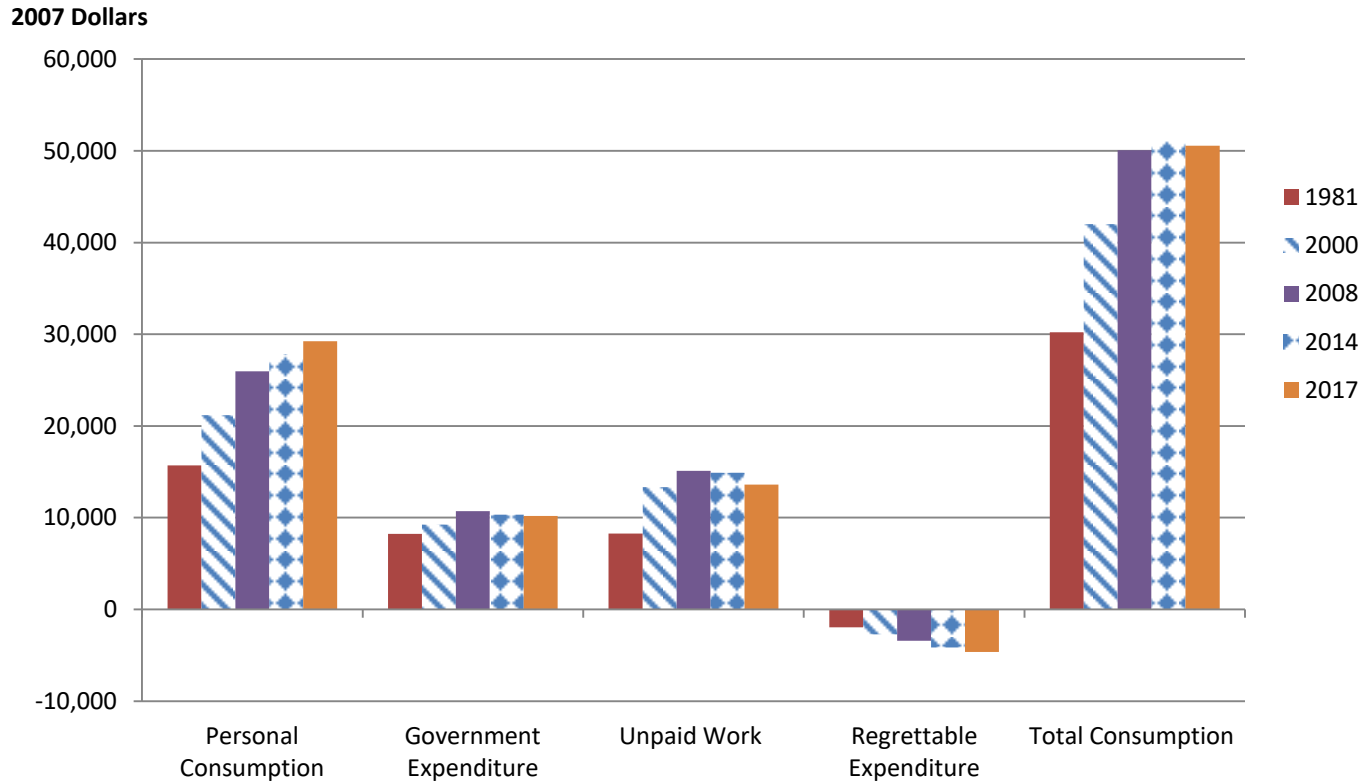
Compound Annual Growth Rates IEWB (Base Case) & GDP per Capita



Ranking by IEWB (Base Case) & GDP per Capita: Canada and the Provinces

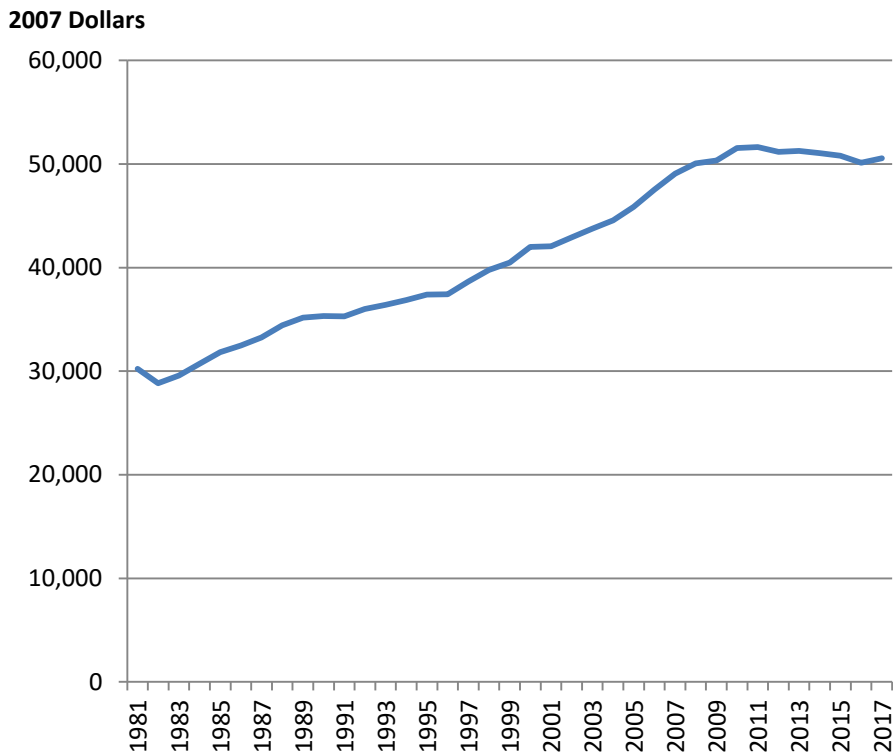
Level in 2017			Growth Rate, 1981 - 2017	
Rank	Index of Economic Well –Being	GDP per Capita	Index of Economic Well –Being	GDP per Capita
1	British Columbia	Alberta	Quebec	Newfoundland
2	Alberta	Saskatchewan	Newfoundland	Prince Edward Island
3	Ontario	Newfoundland	New Brunswick	New Brunswick
4	Quebec	Canada	British Columbia	Saskatchewan
5	Canada	Ontario	Ontario	Nova Scotia
6	Manitoba	British Columbia	Manitoba	Manitoba
7	Newfoundland	Manitoba	Nova Scotia	Canada
8	New Brunswick	Quebec	Prince Edward Island	Ontario
9	Nova Scotia	New Brunswick	Canada	Quebec
10	Prince Edward Island	Nova Scotia	Alberta	Alberta
11	Saskatchewan	Prince Edward Island	Saskatchewan	British Columbia

The Consumption Domain and its Components in 1981, 2000, 2008, 2014, and 2017, 2007 Dollars



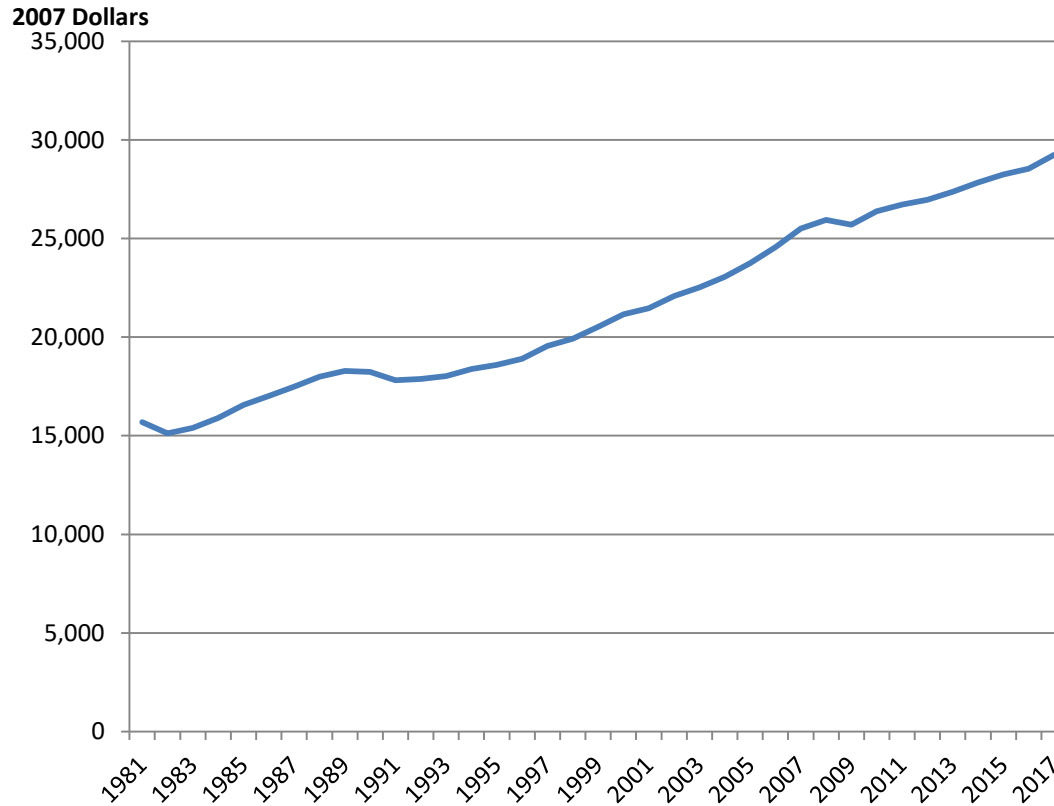
Source: IEWB Database

Actual Total Consumption Flows per Capita, 1981 – 2017, 2007 Dollars



Source: IEWB Database

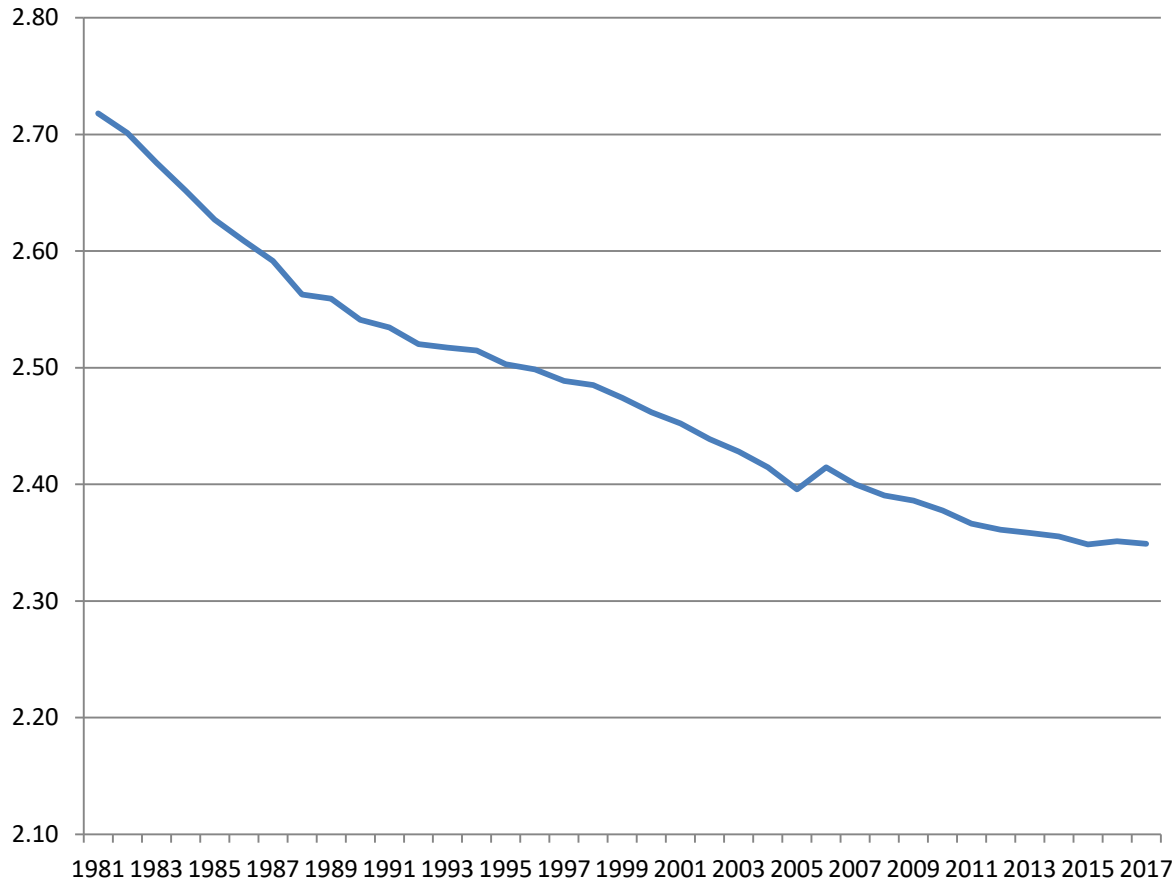
Personal Consumption per Capita (SNA) 1981 - 2017



Source: IEWB Database

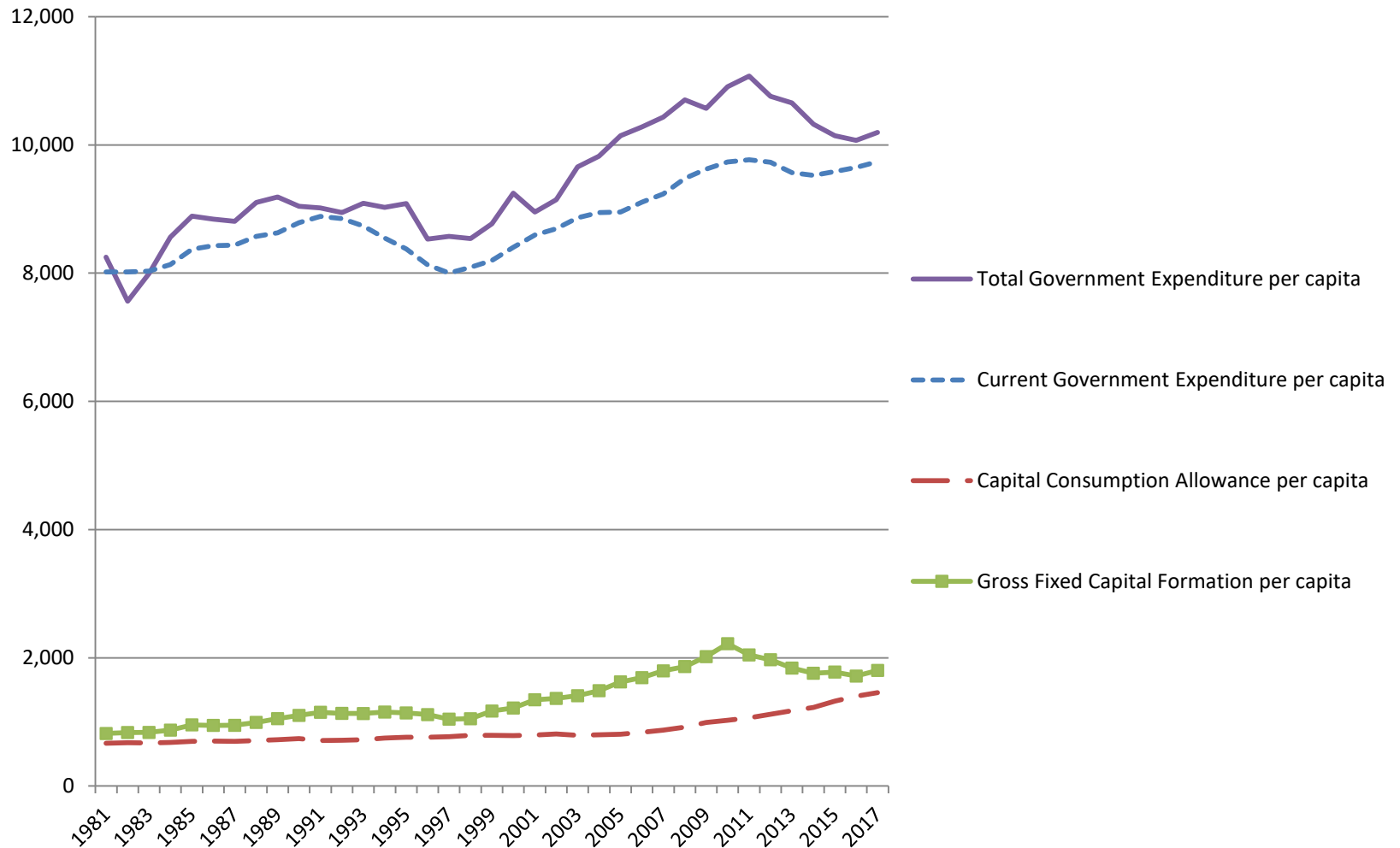
Declining Economies of Scale in Household Consumption

- Average Economic Family Size, 1981 - 2017



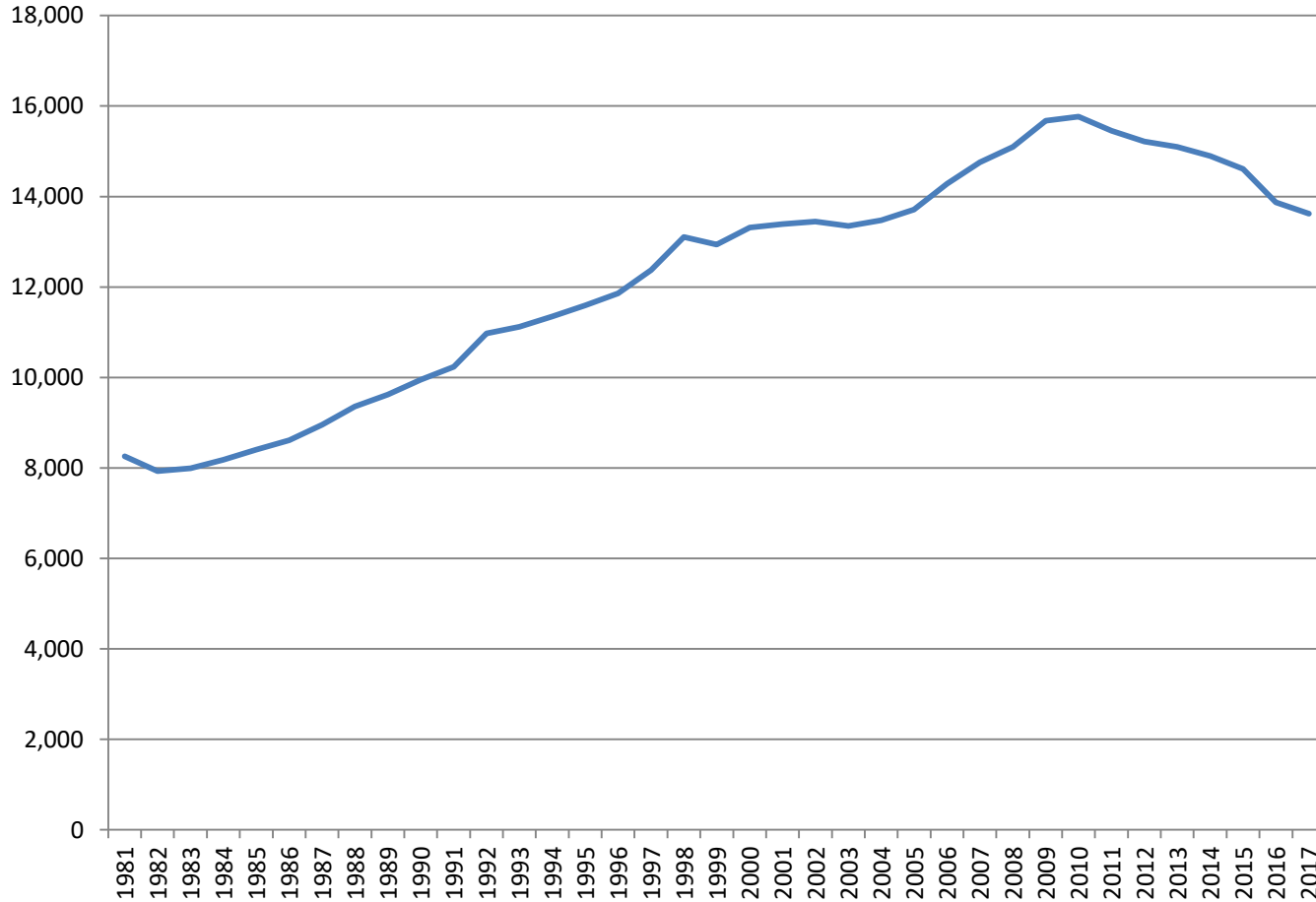
Government Expenditure per Capita & Components, 1981 – 2017

2007 Dollars



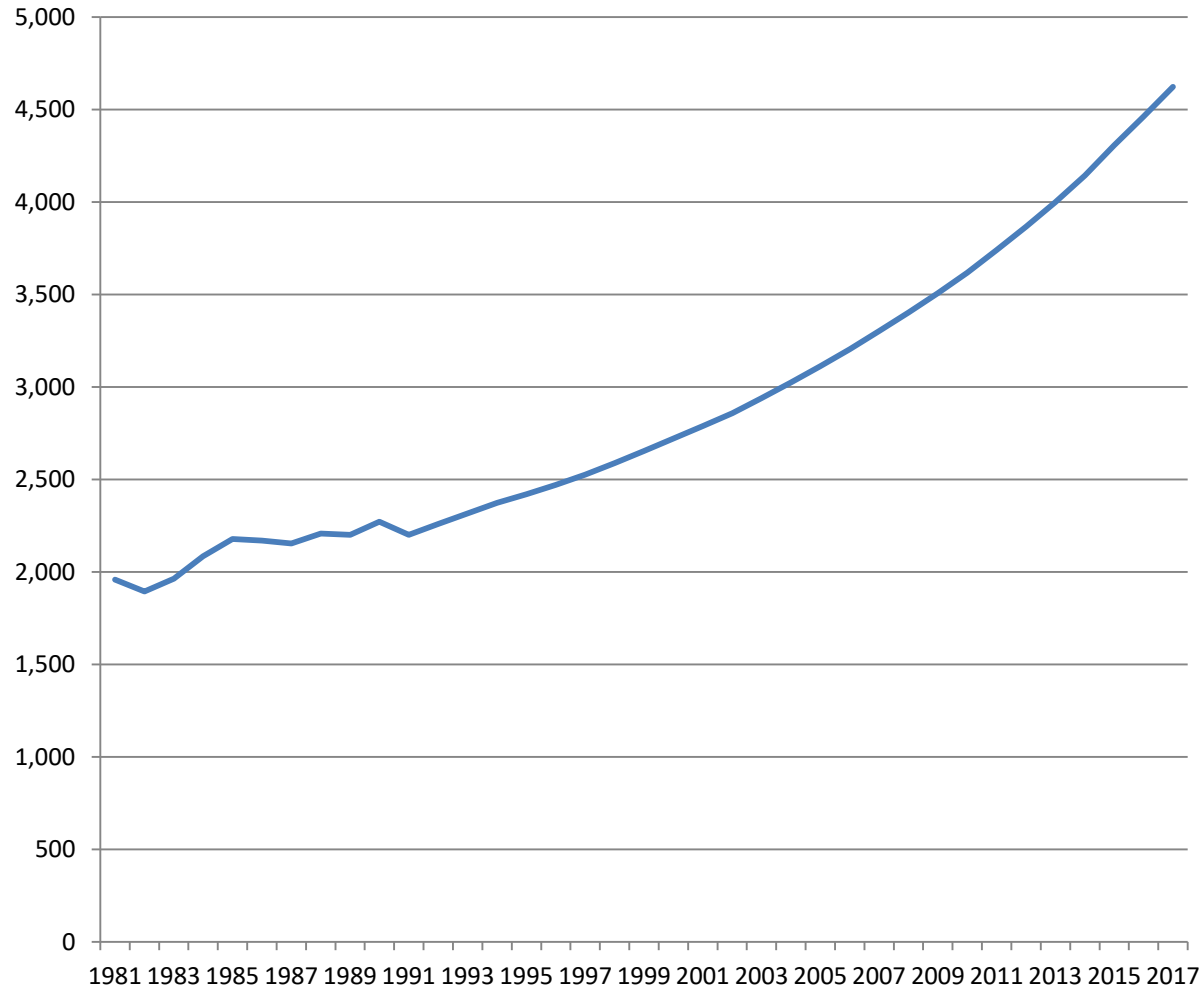
The Value of Unpaid Work per Working-Age Person 1981 - 2017

2007 Dollars



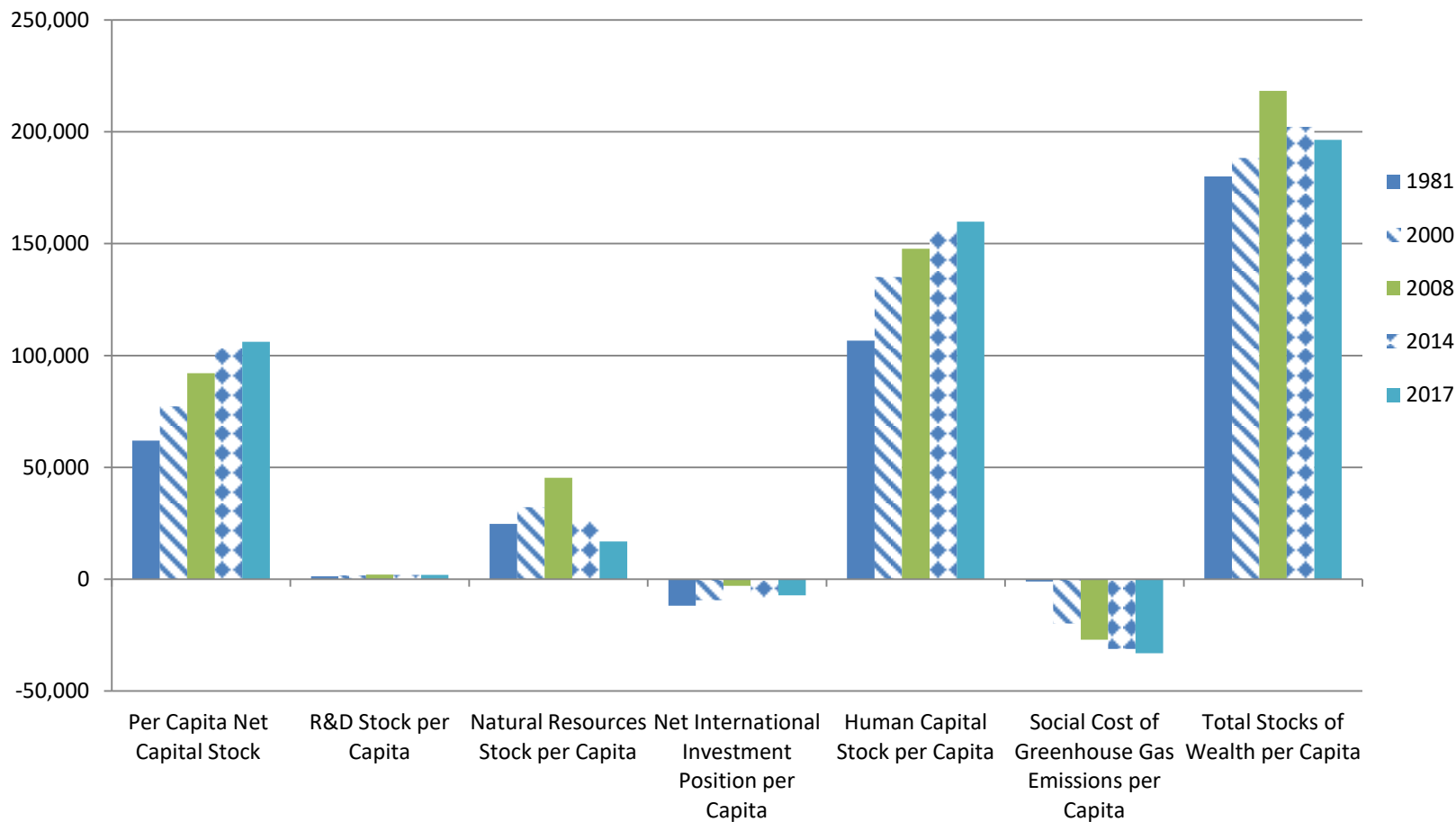
Regrettable Expenditures per Capita 1981 - 2017

2007 Dollars



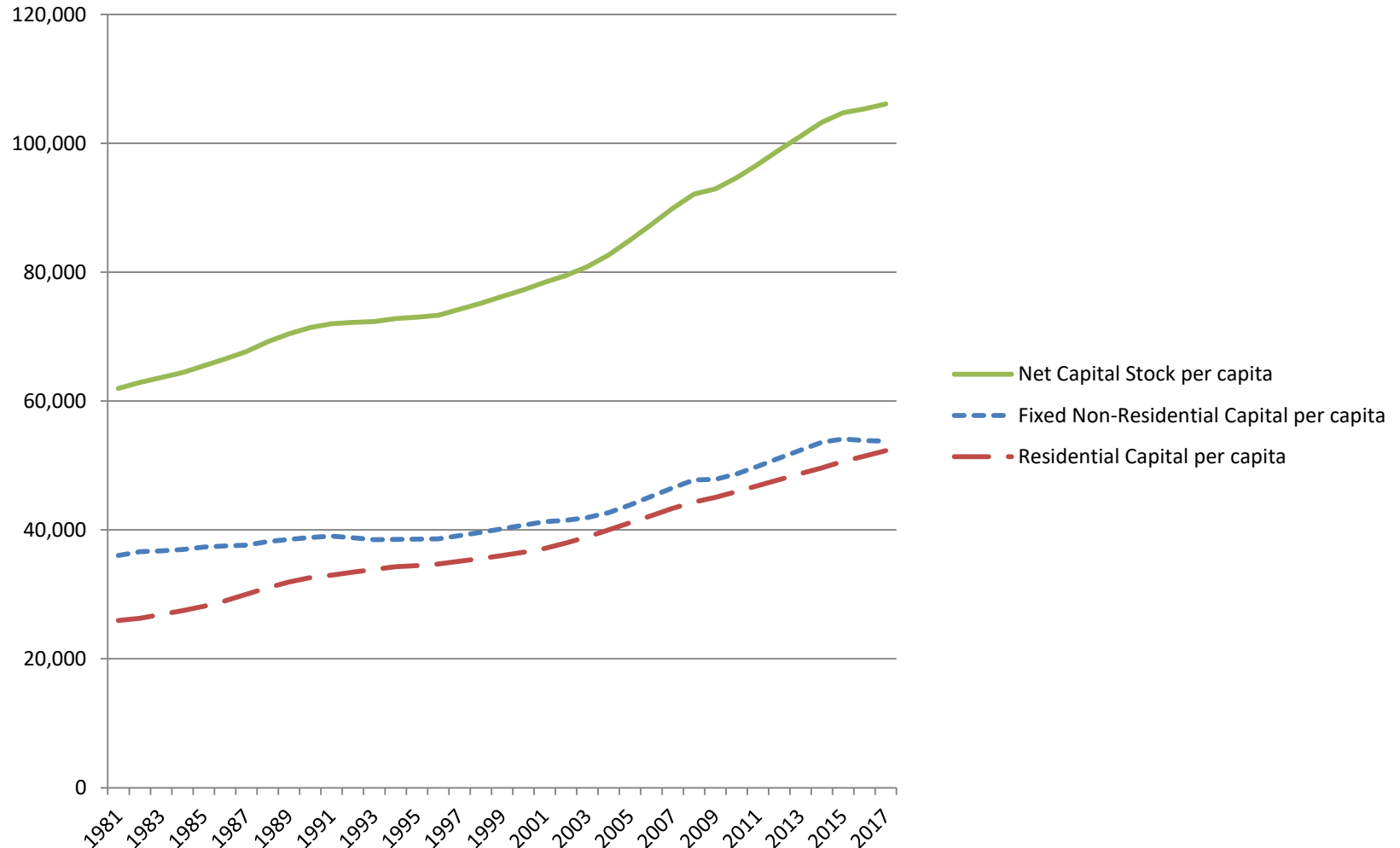
Levels of the Stocks of Wealth Domain and its Components in 1981, 2000, 2008, 2014, and 2017

2007 Dollars



Net Physical Capital Stock per Capita & Components, 1981 – 2017: Housing Stock Increases Important

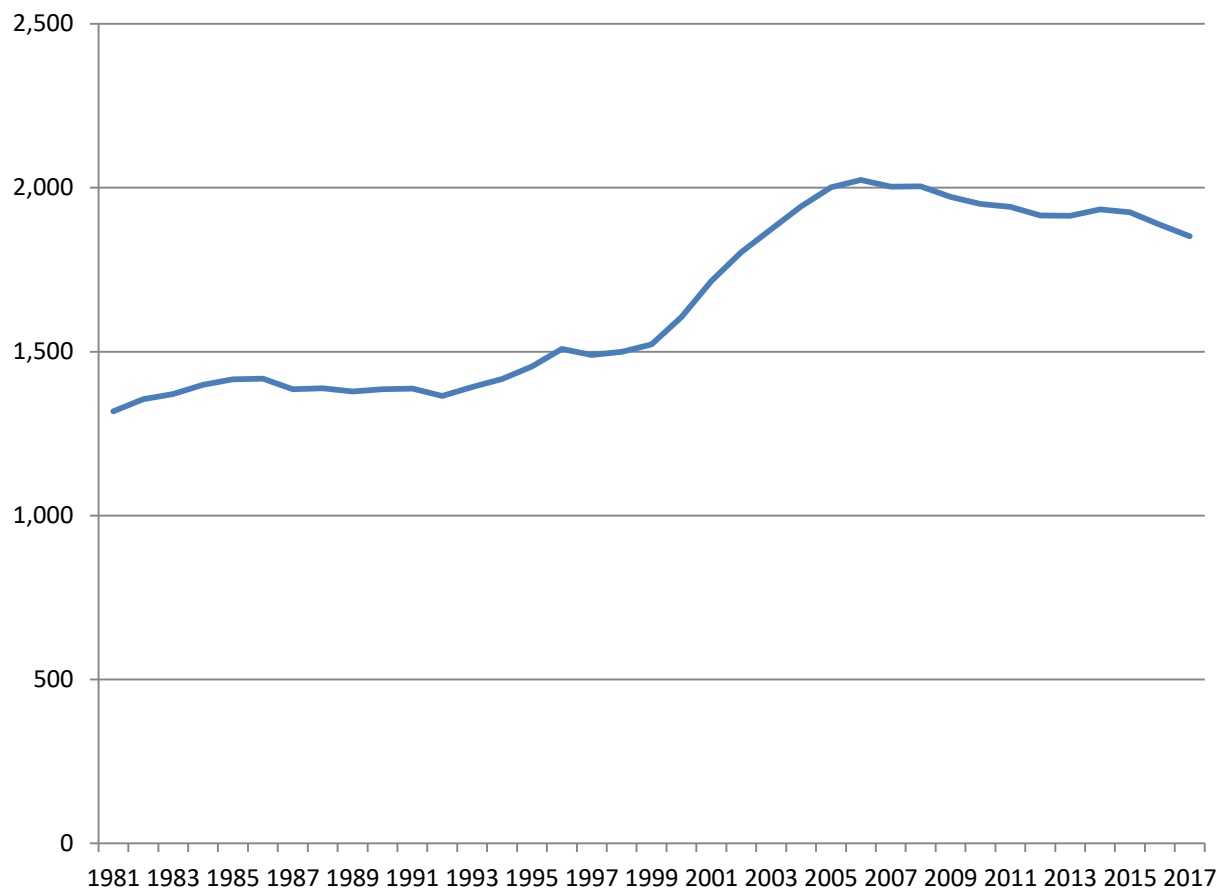
2007 Dollars



R&D Stock per Capita, 1981 – 2017

Levelling Off since 2008

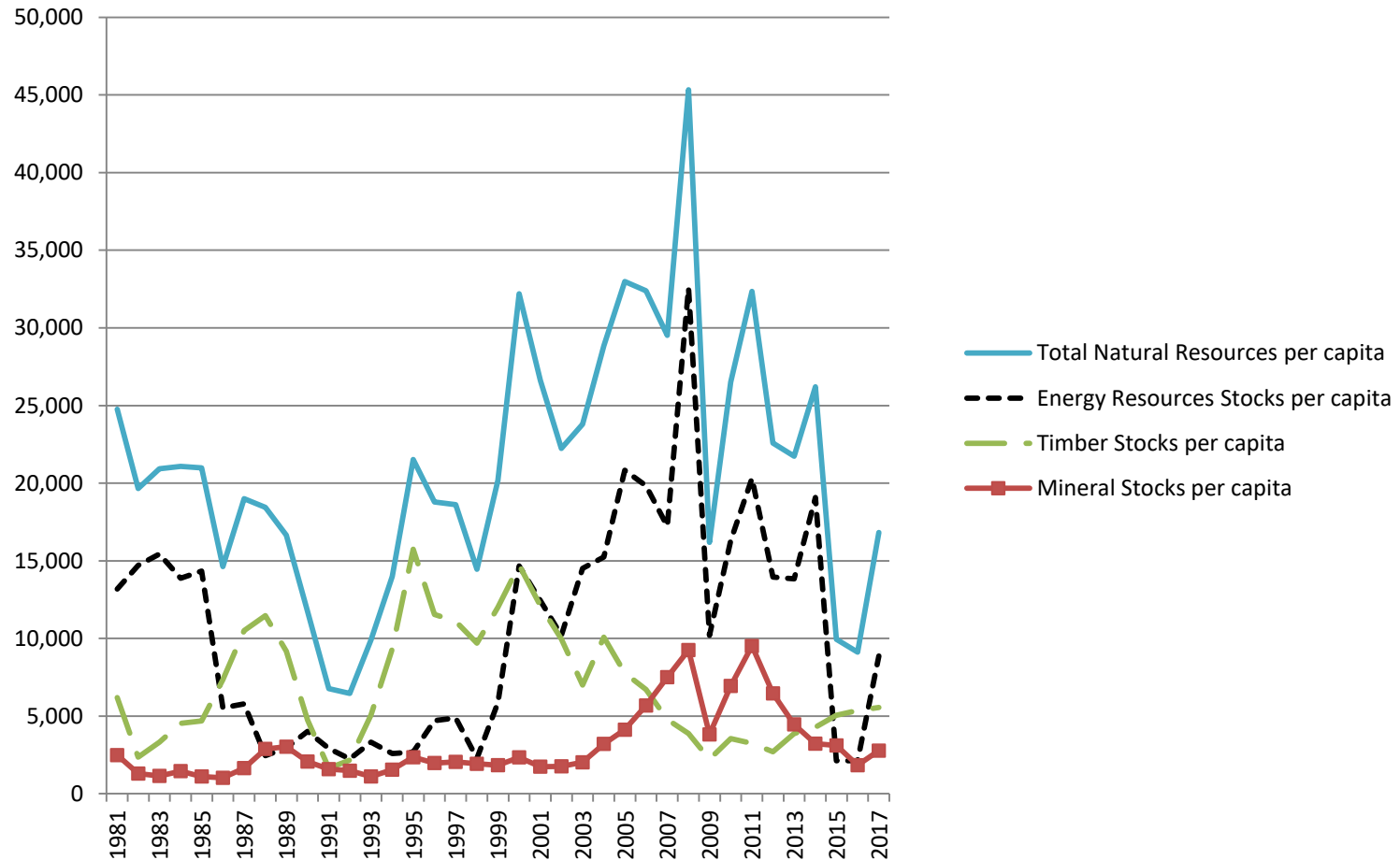
2007 Dollars



Volatility in Natural Resources Stock per Capita, 1981 – 2017

- Largely Driven by Energy Sector Volatility

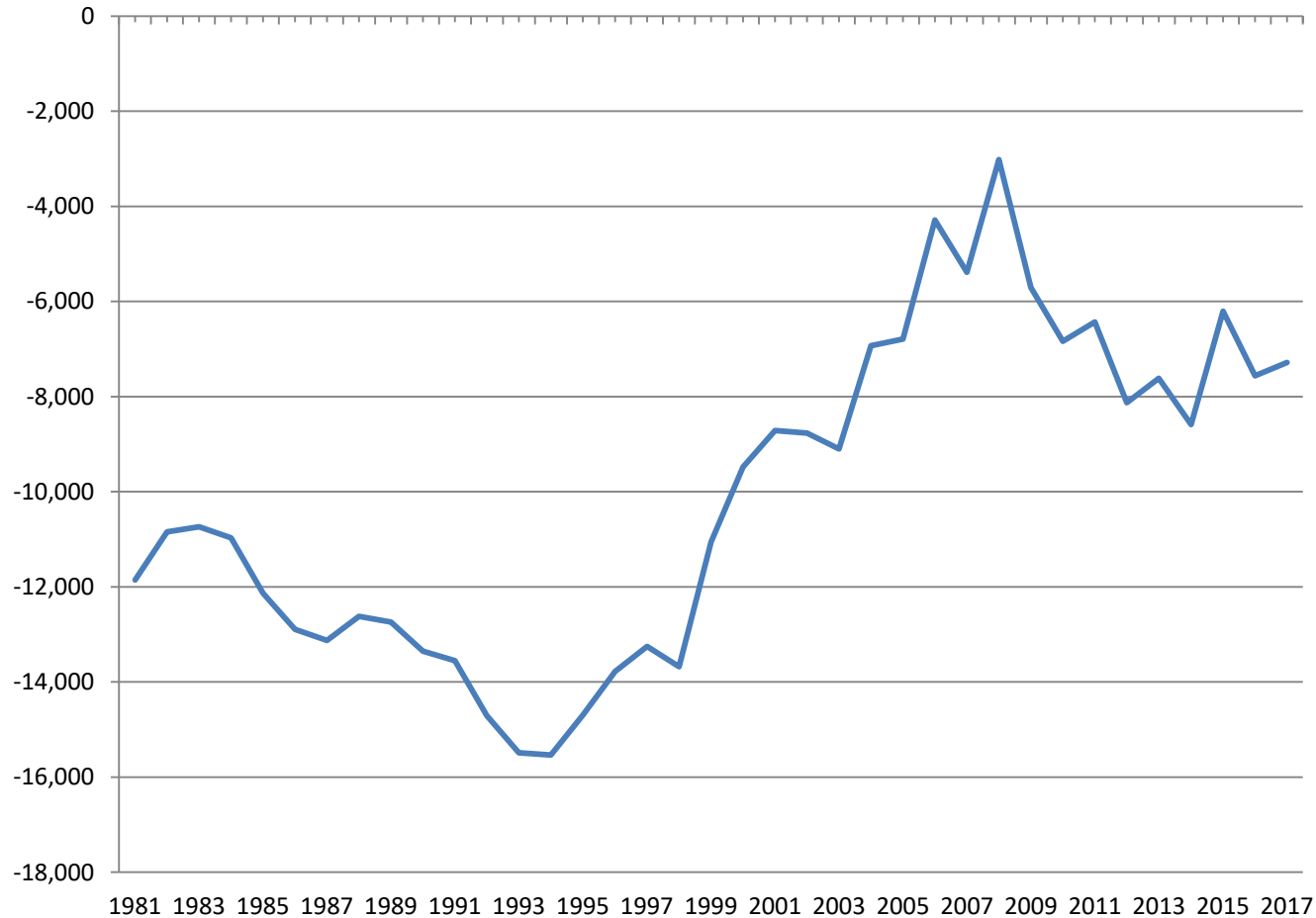
2007 Dollars



Net International Investment Position per Capita, 1981 – 2017

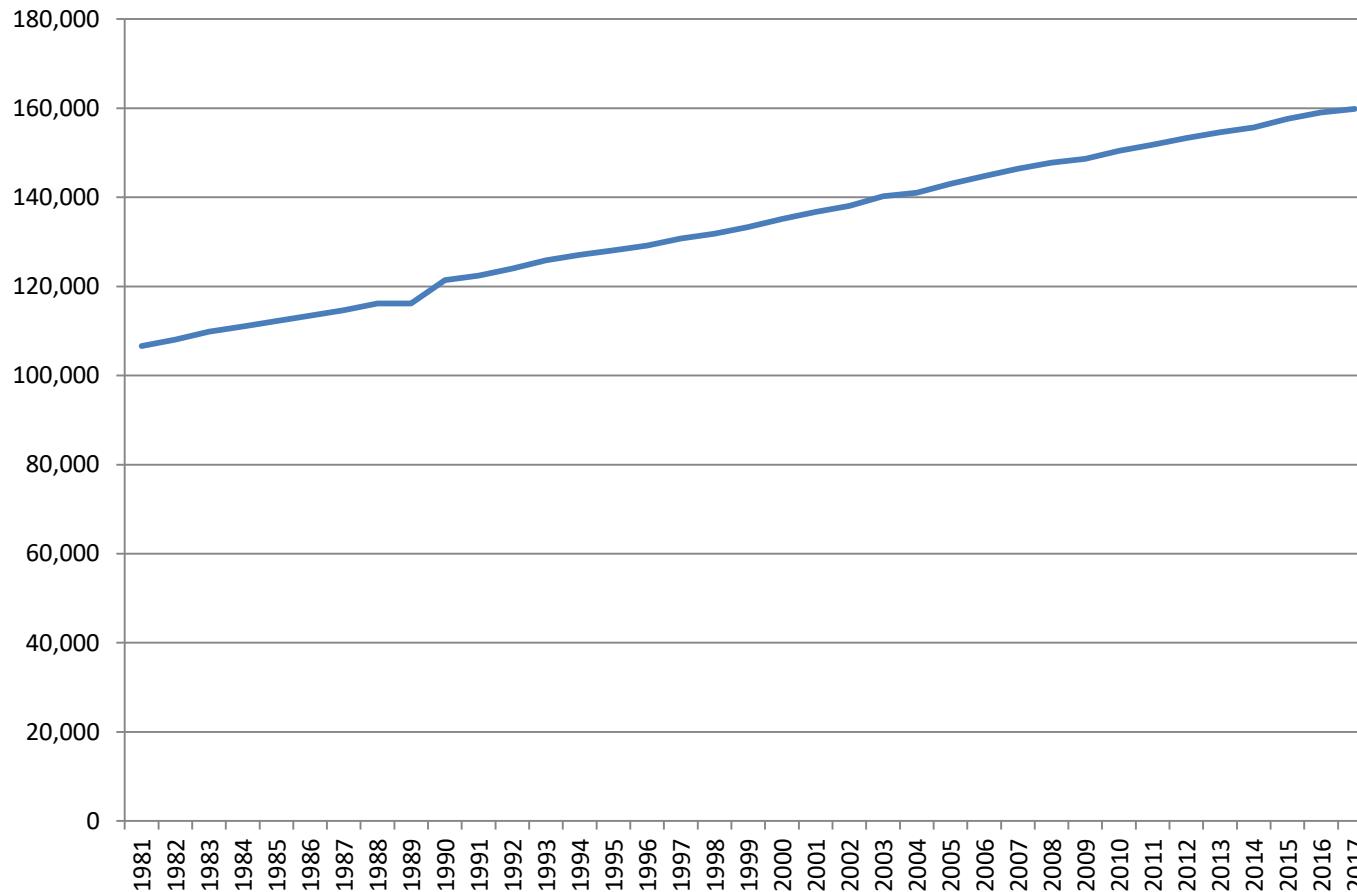
Increase to 2008, Decline since

2007 Dollars



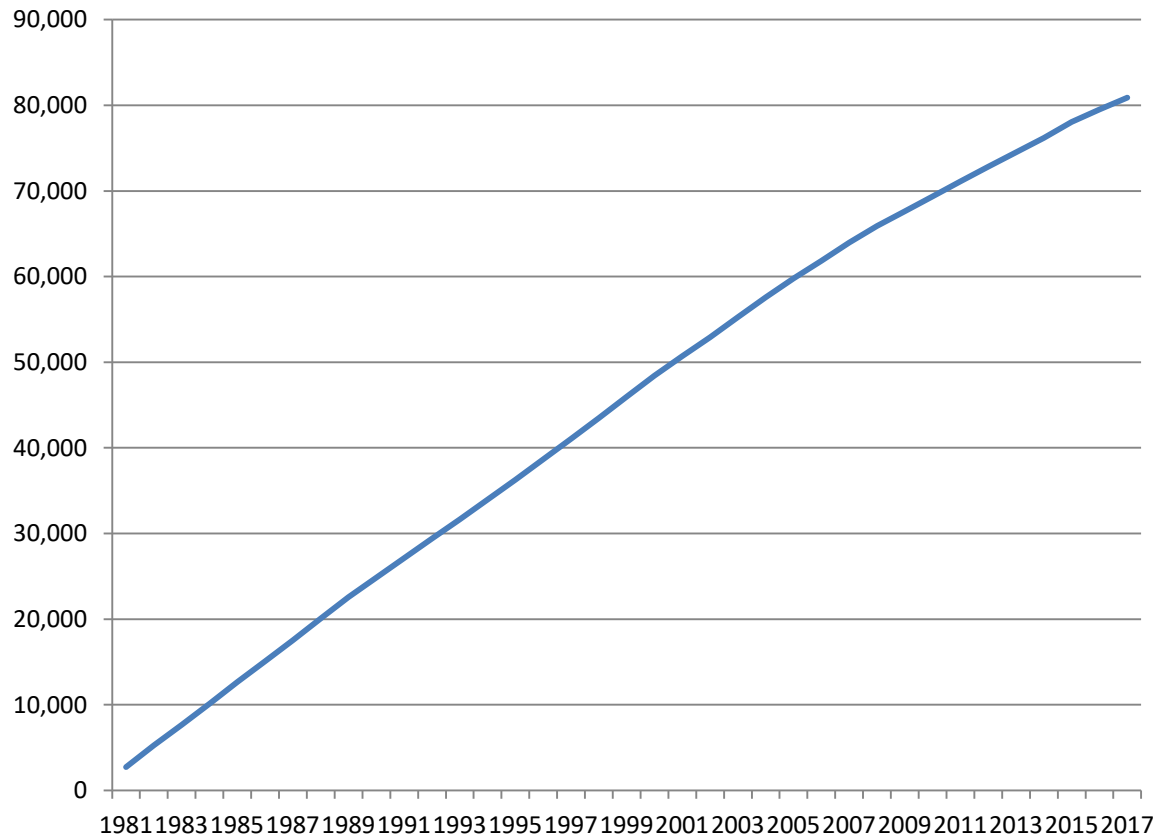
Steady Increase in Human Capital Stock per Capita 1981 - 2017

2007 Dollars



Stock Pollutant: The Social Cost of Greenhouse Gas Emissions per Capita @ Baseline Carbon Cost (\$125) 1981 – 2017

2007 Dollars



$$\Delta C \leq (\text{ECS}) * (\text{GHG/GDP}) * (\text{GDP/pop}) * (\text{pop})$$

Uncertainty exists in all major drivers

Non-linear interactions, accumulating stocks & varying GHG half-lives

- ECS = equilibrium climate sensitivity
 - = increase in surface temperature if CO₂ concentration doubled
- GHG/GDP = carbon intensity per \$ future GDP
 - Accumulated GHG stock Influenced by policy decided now
 - = ONLY policy influenceable variable available
- GDP/pop = future \$ output per capita
 - \leq productivity growth & unknowable future technologies
 - Higher incomes => greater current consumption & implied GHG
 - Higher incomes make future mitigation & coping more affordable
- Pop = Future Population (long time scales => cumulative impacts, but rapid changes seen)

Monte Carlo Simulations of [ECS, Pop, GDP/Pop] – randomly choose from each parameter distribution, run model, repeat 1,000,000 times

MODELING UNCERTAINTY IN CLIMATE CHANGE: A MULTI-MODEL COMPARISON (2015) Gillingham, Nordhaus et al September 2015, COWLES DISCUSSION PAPER NO. 2022

Temperature	0.1 %ile	1 %ile	5 %ile	10%ile	25%ile	50%ile	75%ile	90%ile	95%ile	99%ile	99.9%ile
DICE	1.60	1.97	2.38	2.64	3.12	3.76	4.51	5.29	5.80	6.88	8.28
FUND	1.96	2.30	2.68	2.88	3.19	3.64	4.17	4.74	5.12	5.92	6.96
GCAM	1.59	2.02	2.46	2.73	3.13	3.86	4.56	5.27	5.73	6.64	7.79
MIEM	1.30	1.82	2.31	2.58	3.05	3.58	4.13	4.65	4.97	5.58	6.29
MERGE	2.20	2.56	2.93	3.16	3.61	4.20	4.90	5.63	6.12	7.13	8.46
SWITCH	1.83	2.21	2.60	2.83	3.22	3.71	4.23	4.72	5.01	5.58	6.22
Average	1.75	2.14	2.55	2.79	3.24	3.79	4.42	5.05	5.46	6.29	7.33

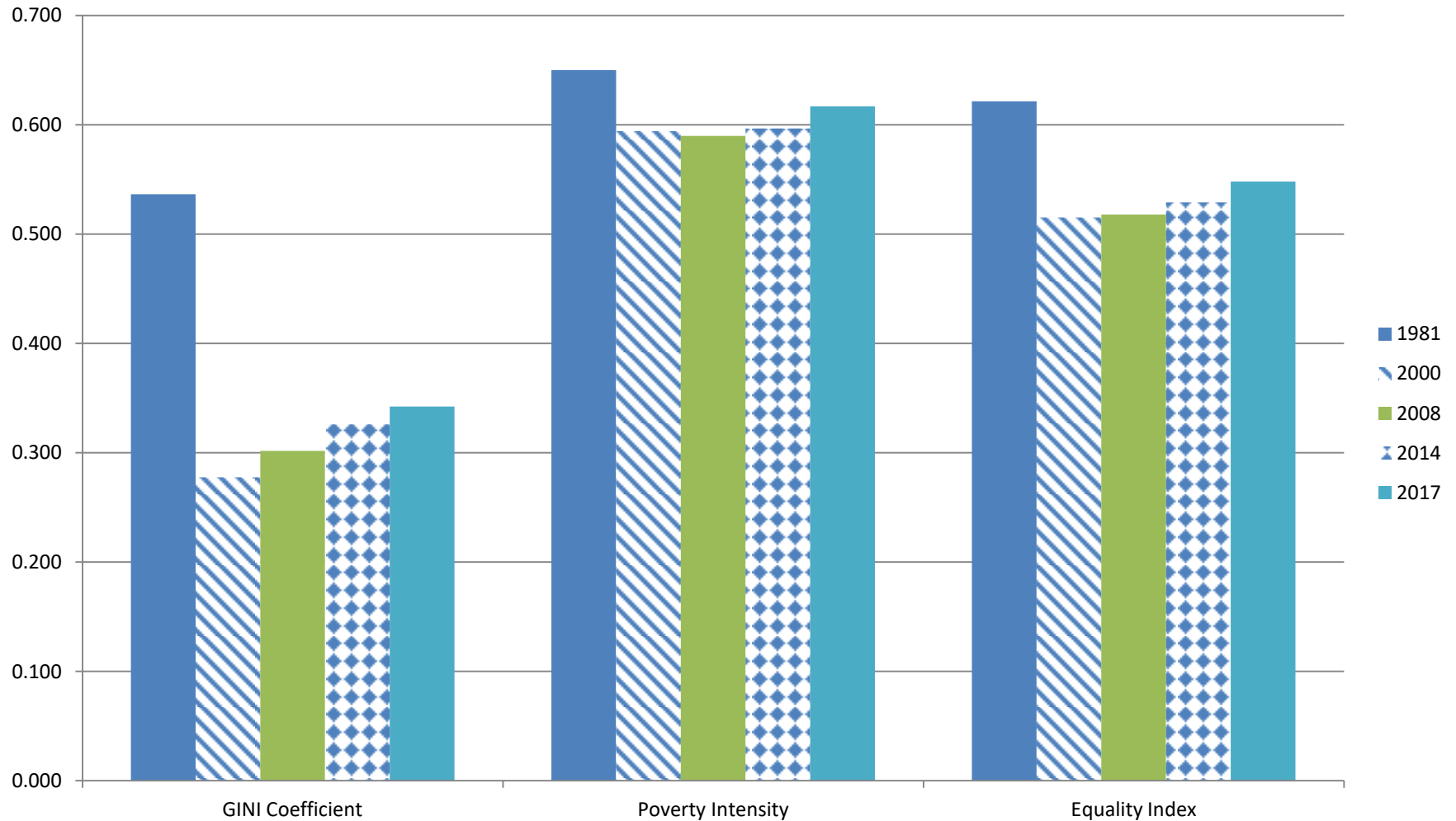
Table 4. Distribution of temperature change in the Base case, 2100, °C

Sensitivity of Compound Annual Growth Rates of the Stocks of Wealth Domain to Costs For Carbon, 1981- 2017

Pindyck *The Social Cost of Carbon Revisited* NBER Working Paper No. 22807 (Nov. 2016)

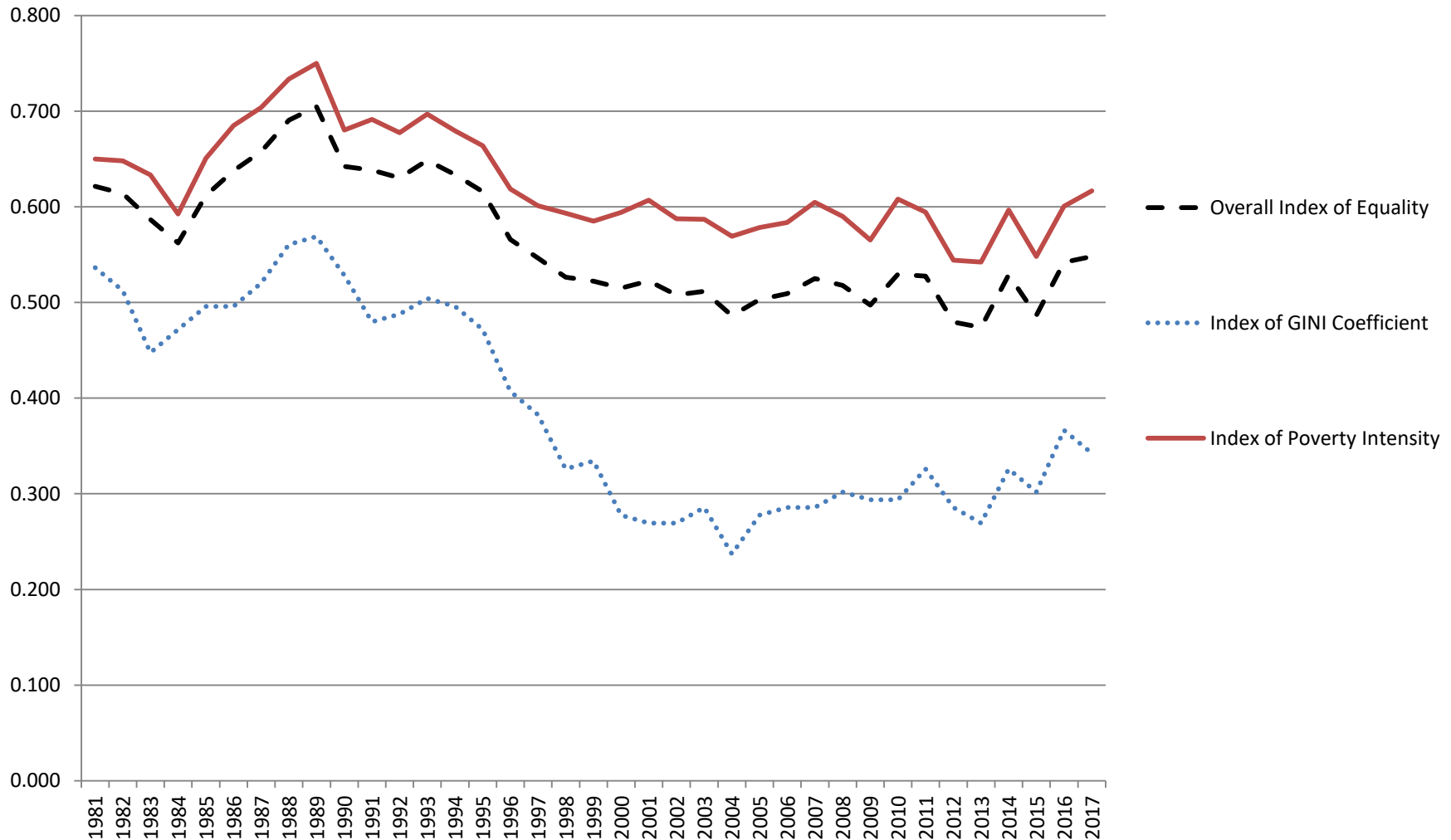
	1981- 2017	1981- 2000	2000- 2017	2000- 2008	2008- 2017	2008- 2014	2014- 2017
\$51.25 (CDN) in 2016	0.85	0.96	0.72	2.20	-0.59	-0.67	-0.42
\$125 (CDN) in 2016 (Baseline)	0.24	0.24	0.25	1.86	-1.16	-1.26	-0.97
\$250 (CDN) in 2016	-1.18	-1.24	-1.12	1.07	-3.03	-3.11	-2.86

Levels of the Index of Economic Equality and its Components in 1981, 2000, 2008, 2014, and 2017

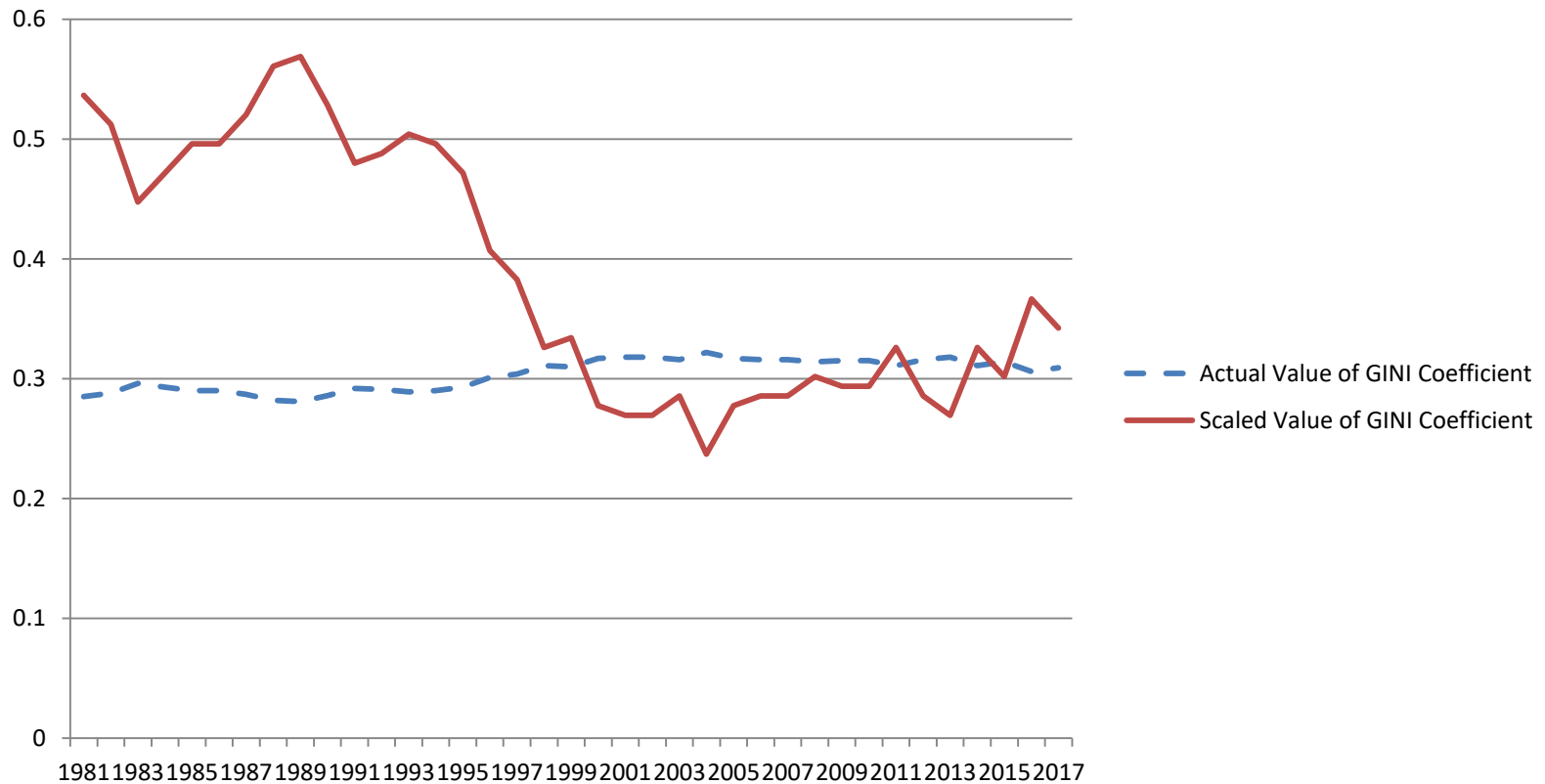


The Index of Economic Equality & Components, 1981 – 2017

Declining until 2000, thereafter stagnant

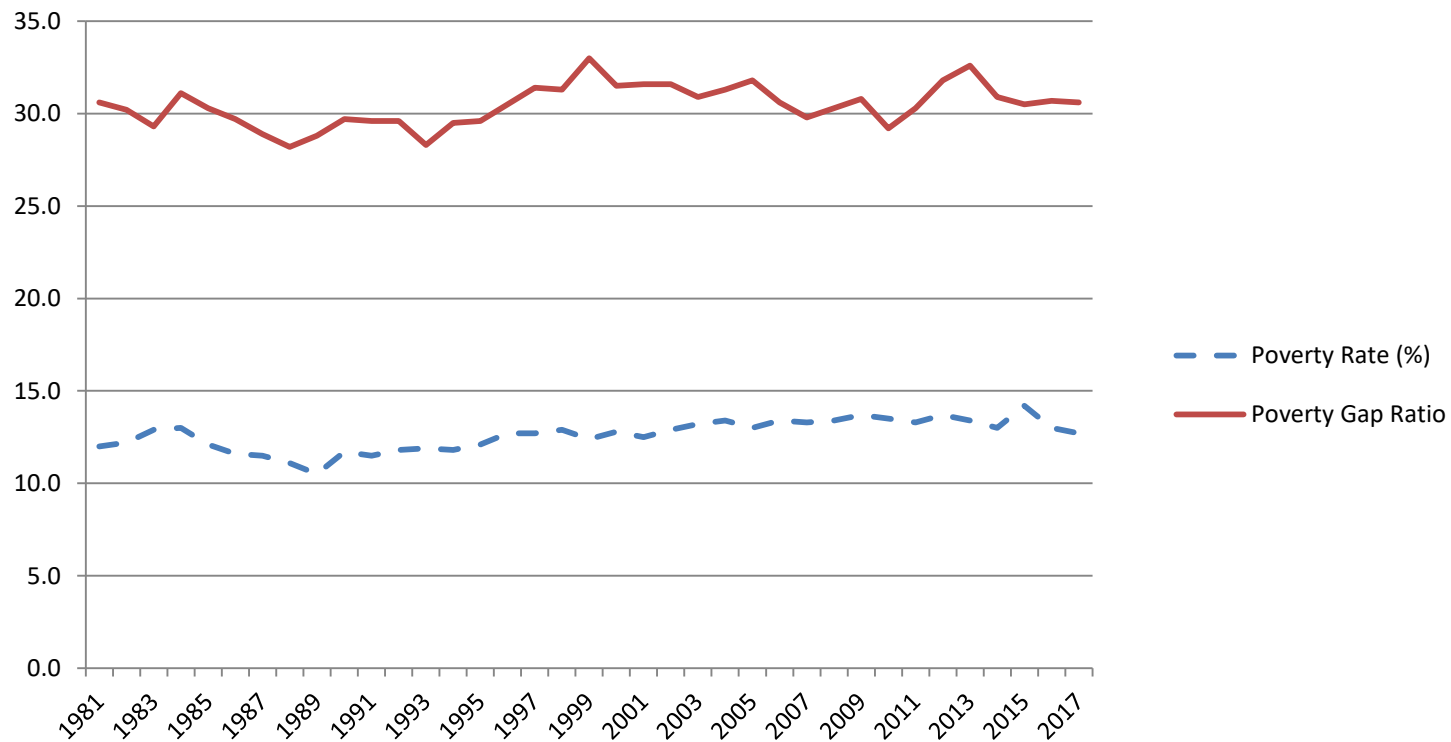


The Index of the GINI Coefficient, 1981 - 2017



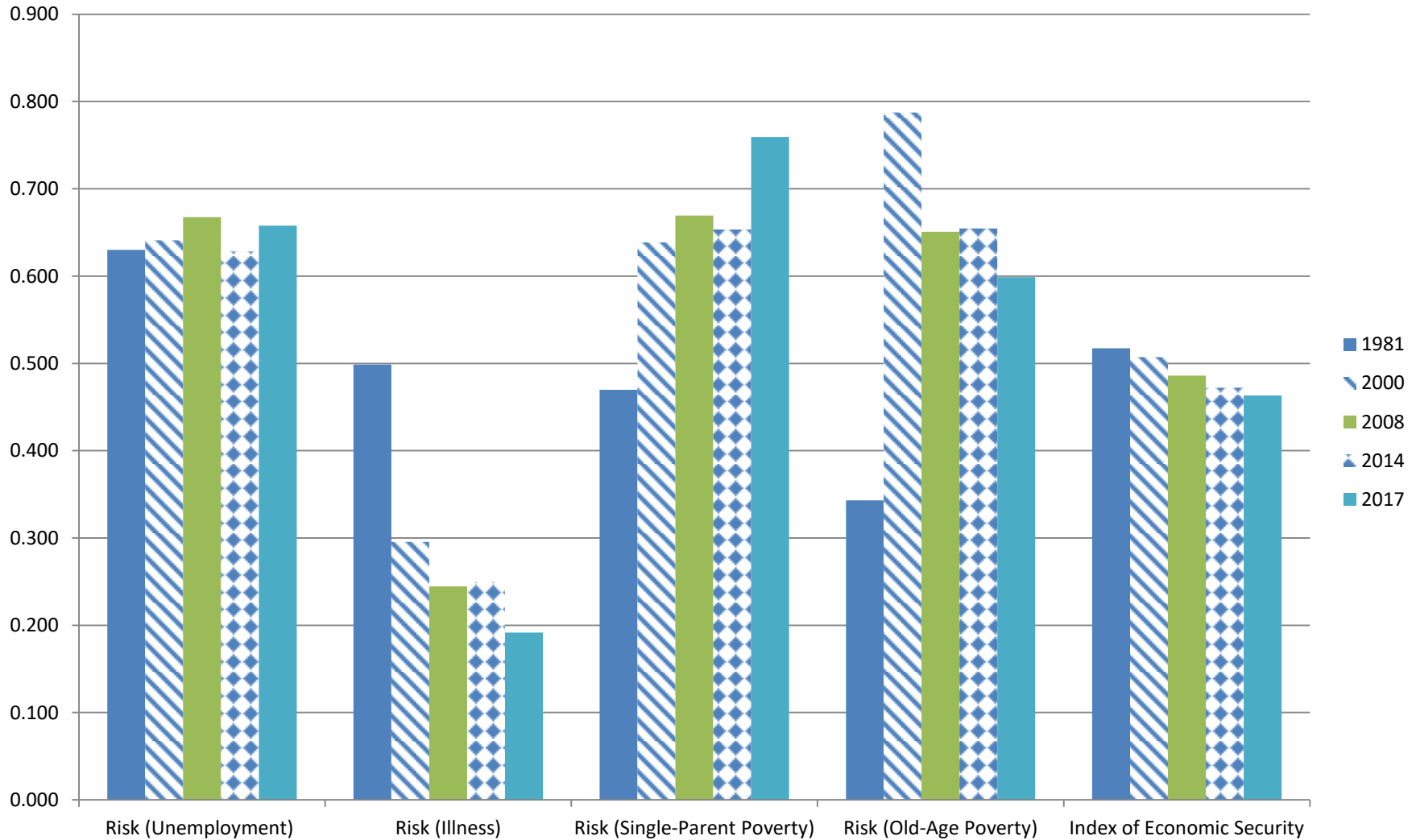
Source: IEWB Database

The Poverty Rate and the Poverty Gap Ratio, 1981 - 2017



Source: IEWB Database

Levels of the Index of Economic Security and Its Components in 1981, 2000, 2008, 2014, and 2017



Economic (In)Security: reasons to study

1. Worrying about the future subtracts from enjoyment of the present

- Economic (in)security = part of economic well-being
 - Security enables stability & the maintenance of social relationships
 - Economic Insecurity is bad for the health (more mental illness, obesity)

2. Risk averse individuals insure &/or change behaviour to mitigate costs

- Economic (in)security predicts public & private behaviour
- Welfare State Spending + Labour Market Regulation is largely about reducing insecurity

3. Economic Security = Human Right

“security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond control”

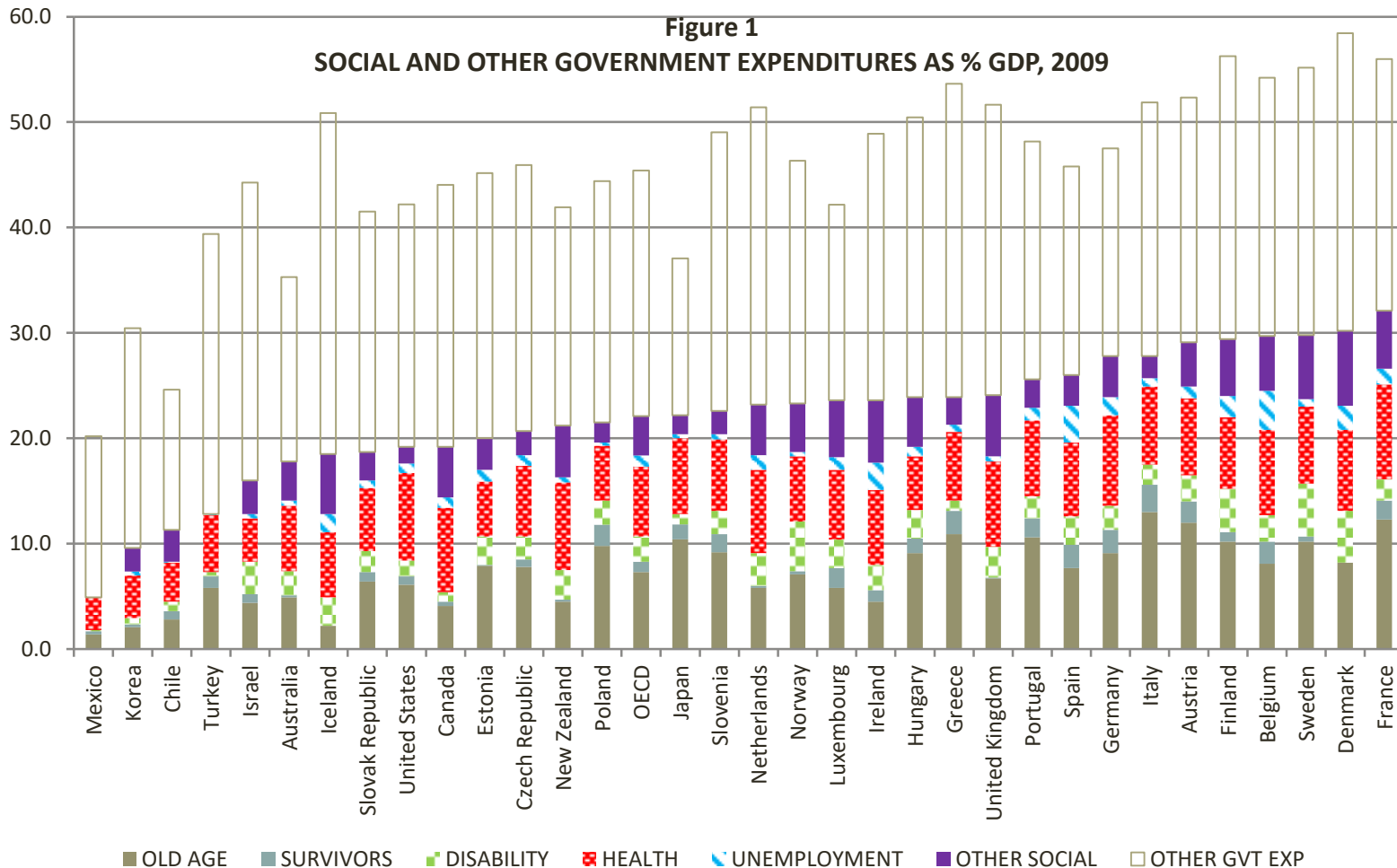
- Article 25: UN Universal Declaration of Human Rights

4. Political Economy Implications – the Nativism of the Insecure

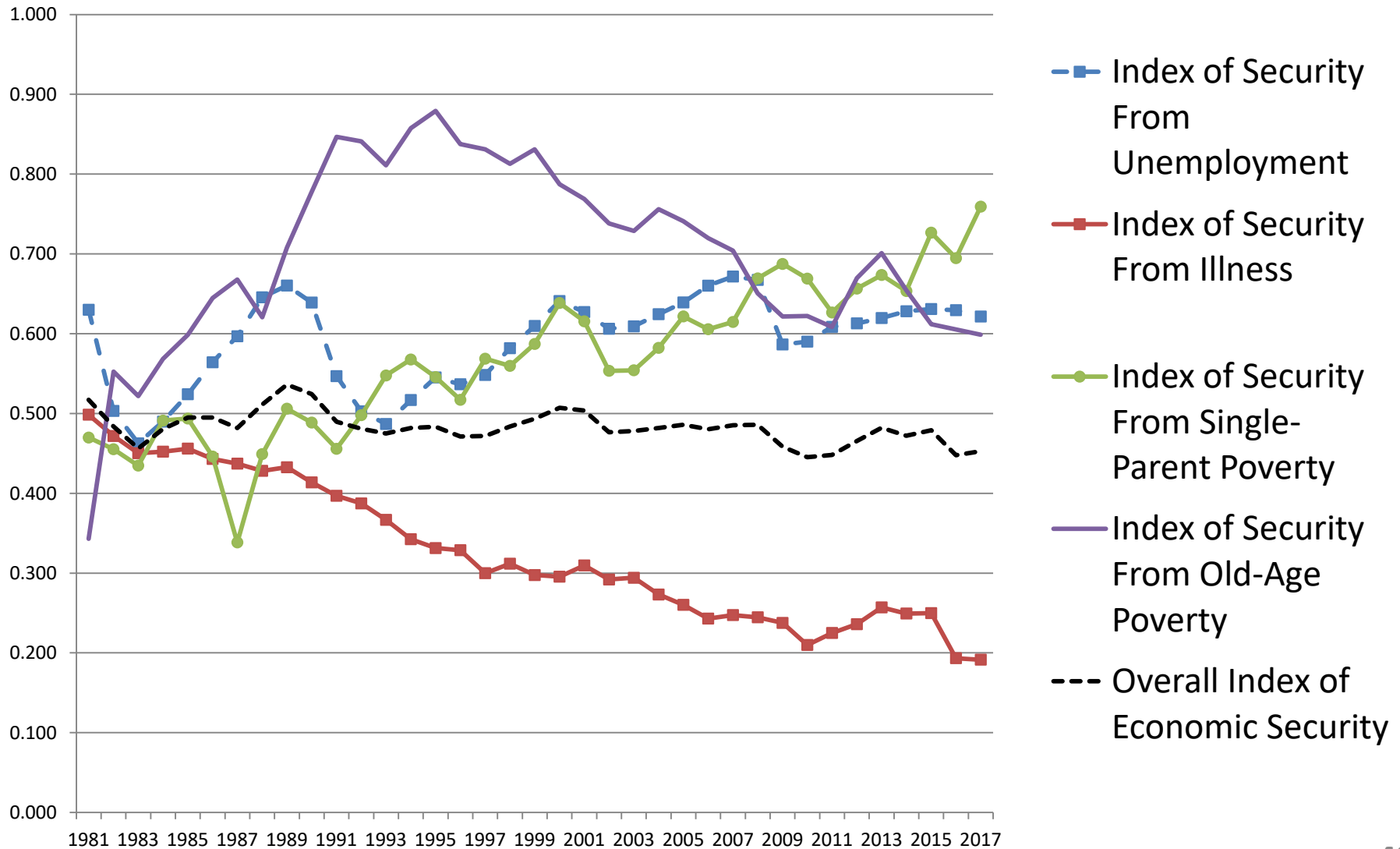
- Note: Public & Private Risk Mitigation least available for citizens of poor nations – i.e. Most of humanity: Poorer and More Insecure lives

Security spending as % of GDP in OECD (+ regulation & other costs to decrease insecurity)

Osberg, L. (2015) "How Should One Measure Economic Insecurity?", OECD Statistics Working Papers, 2015/01, <http://dx.doi.org/10.1787/5js4t78q9lq7-en>

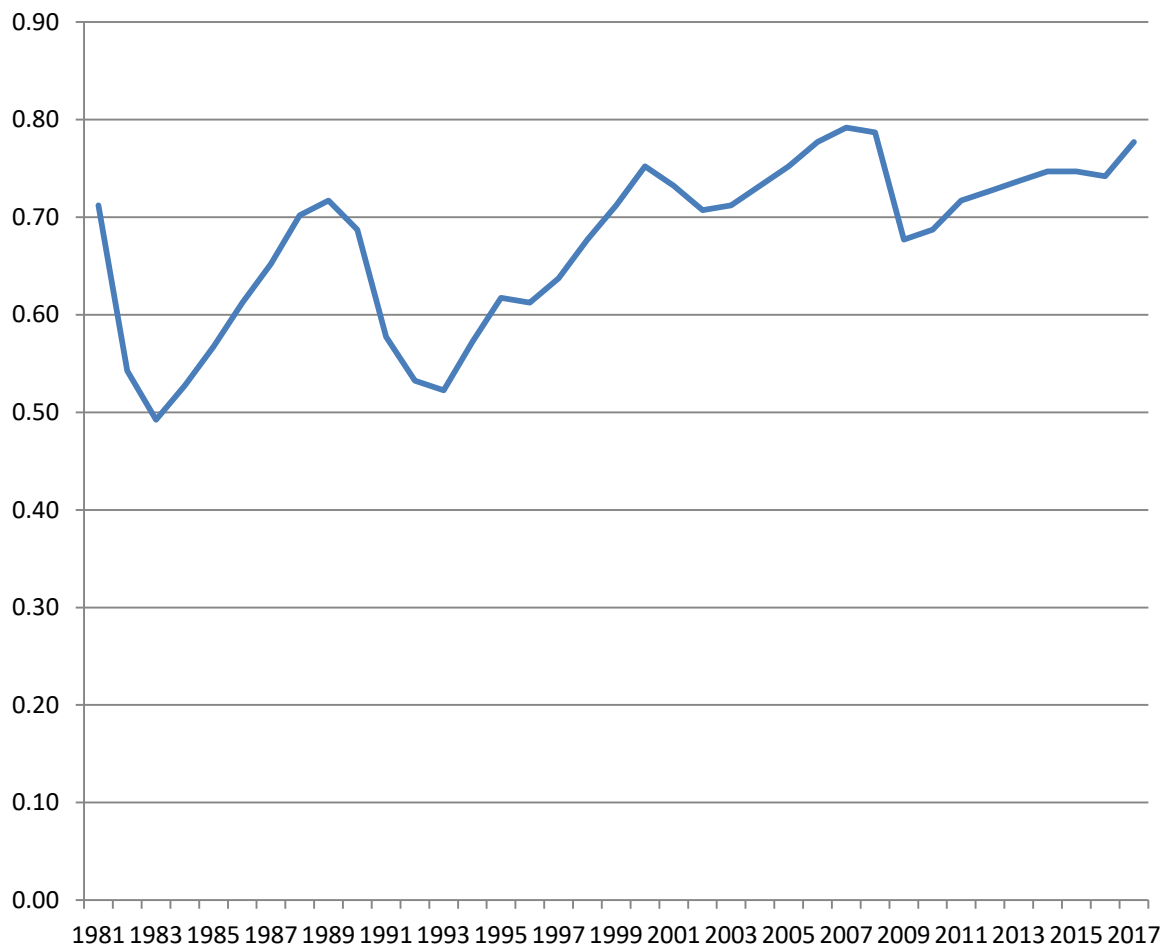


Index of Economic Security & Components, 1981 – 2017: Offsetting Trends => Very Slightly Negative



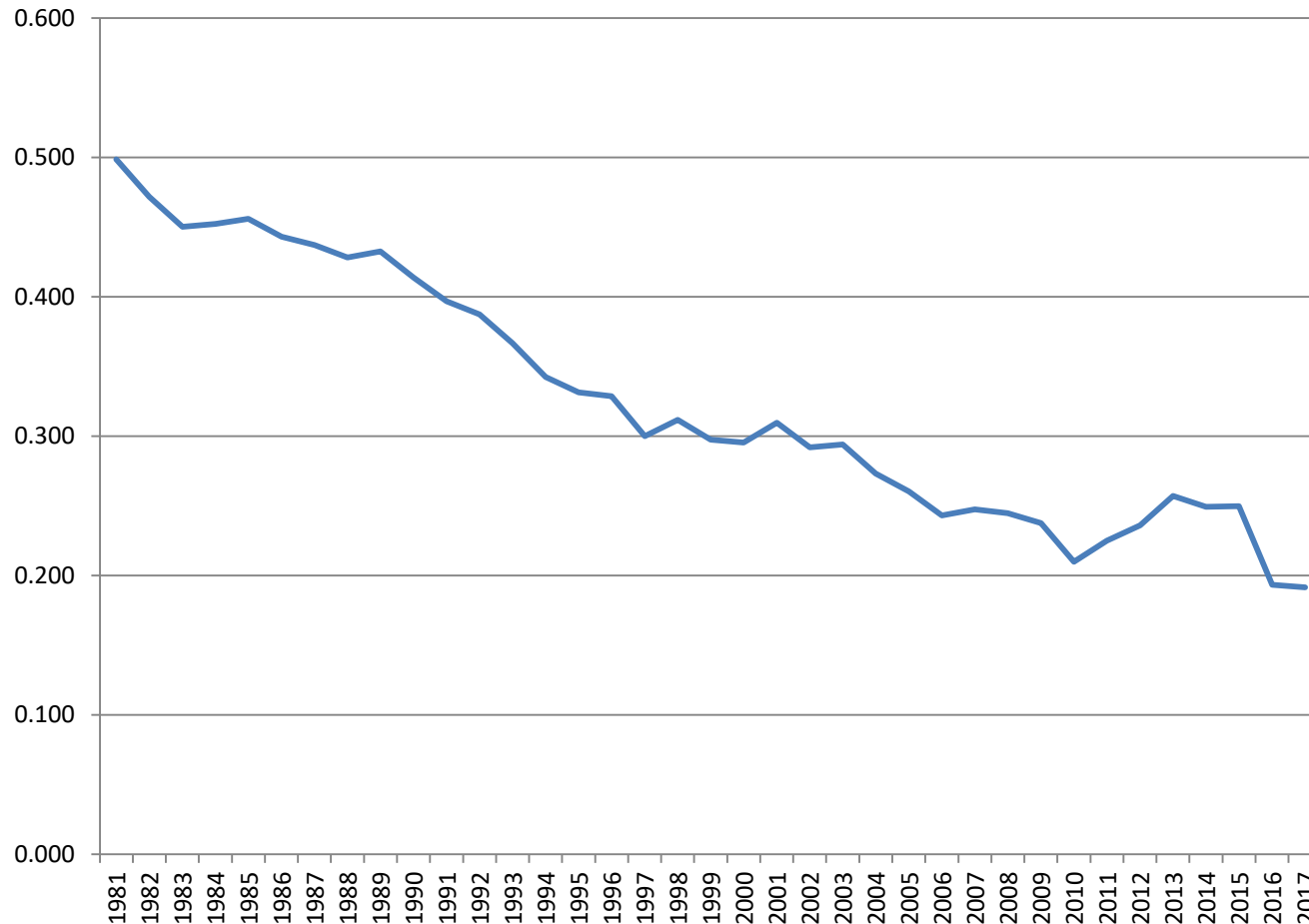
Index of Security From Unemployment, 1981 – 2017

$$= 0.2 * (\text{cost unemp} = \text{Prob}(\text{Ben}) * \text{Ben}/W) + 0.8 * \text{Prob}(\text{Unemp})$$



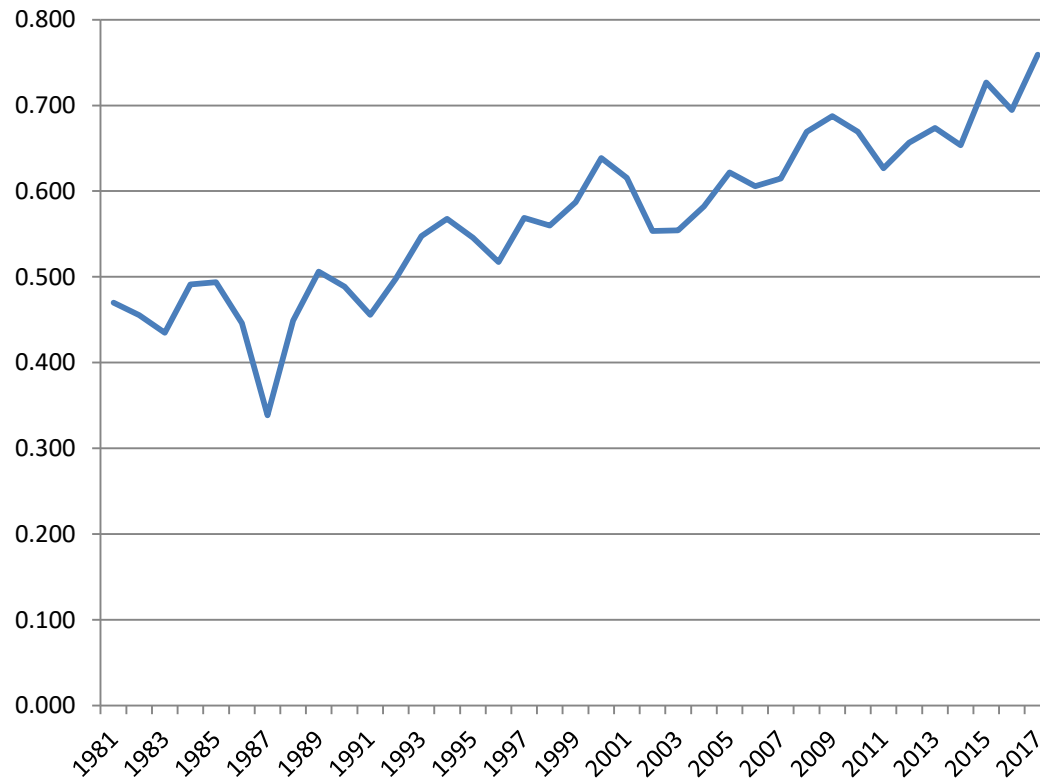
Index of Security From Out of Pocket Medical, 1981 – 2017

Cost of Pharmaceuticals Increasingly Important



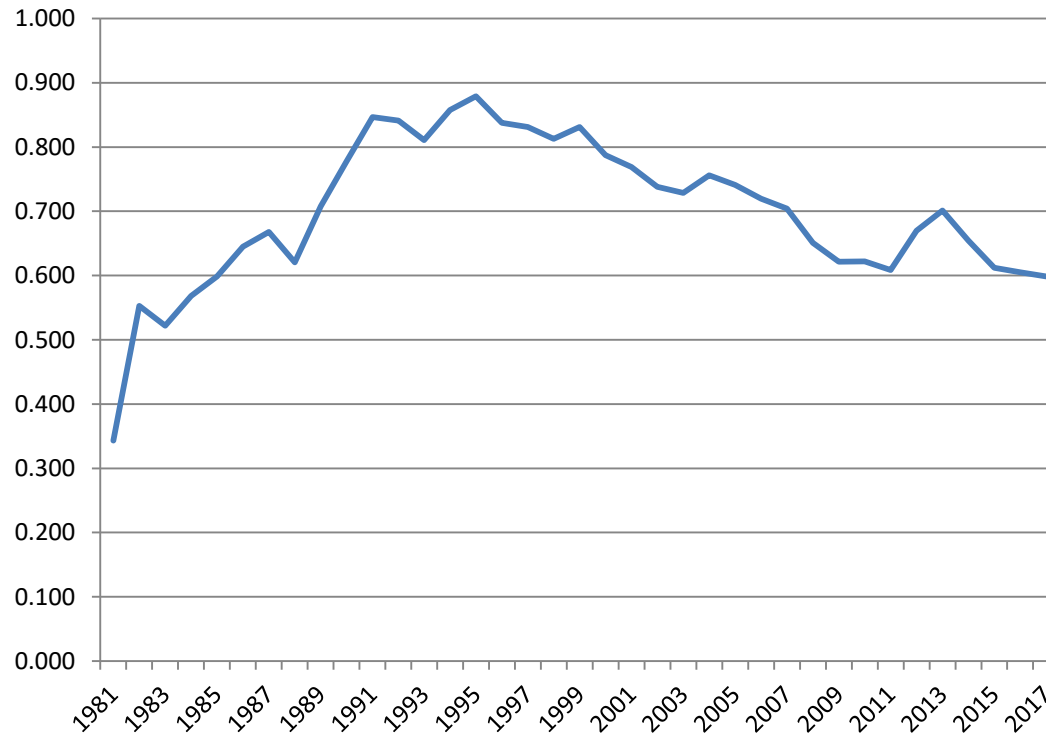
Index of Security From Single-Parent Poverty, 1981 – 2017

Positive Trend



Index of Security From Old-Age Poverty, 1981 – 2017

Strong gains to 1995 + slow decline since then



Source: IEWB Database

Conclusion

Range of Value weightings is clear, but central tendency = roughly equal weights

	Consume	Wealth	Distribute	Secure
Mean	0.26	0.21	0.26	0.27
Median	0.25	0.2	0.2	0.25
Max	0.5	0.4	0.8	0.6
Min	0.02	0.1	0.1	0.03

- Small Nfld sample
 - N = 21

Uncertain Facts & Differing Values

- Sensitivity of Compound Annual Growth Rates of IEWB to Alternative Weightings and Carbon Costings: 1981 – 2017

	\$51.25 in 2016	\$125 in 2016 (Baseline)	\$250 in 2016
Equal Weighting =.25C+.25W+.25E+.25S	0.61	0.49	0.19
Consumptionist Weighting =.7C+.1W+.1E+.1S	1.83	1.83	1.70
Consumption Weighted More Heavily Than Wealth =.4C+.1W+.25E+.25S	0.88	0.84	0.72
Anti-Egalitarian Weighting =.33C+.33W+.0E+.33S	1.01	0.85	0.42
Equality & Security =.2C+.1W+.4E+.3S	0.29	0.24	0.13

Uncertain Facts & Differing Values

- Compound Annual Growth Rates of IEWB sensitivity to Alternative Weightings and Carbon Costings: 1981- 2000

	\$51.25 in 2016	\$125 in 2016 (Baseline)	\$250 in 2016
Equal Weighting =.25C+.25W+.25E+.25S	0.60	0.46	0.10
Consumptionist Weighting =.7C+.1W+.1E+.1S	2.30	2.24	2.06
Consumption Weighted More Heavily Than Wealth =.4C+.1W+.25E+.25S	0.93	0.88	0.73
Anti-Egalitarian Weighting =.33C+.33W+.0E+.33S	1.28	1.08	0.56
Equality & Security =.2C+.1W+.4E+.3S	0.14	0.09	-0.04

Uncertain Facts & Differing Values

– Sensitivity of Compound Annual Growth Rates of IEWB to Alternative Weightings and Carbon Costings: 2000 - 2008

	\$51.25 in 2016	\$125 in 2016 (Baseline)	\$250 in 2016
Equal Weighting =.25C+.25W+.25E+.25S	1.43	1.39	1.21
Consumptionist Weighting =.7C+.1W+.1E+.1S	2.93	2.92	2.87
Consumption Weighted More Heavily Than Wealth =.4C+.1W+.25E+.25S	1.74	1.73	1.66
Anti-Egalitarian Weighting =.33C+.33W+.0E+.33S	1.87	1.83	1.61
Equality & Security =.2C+.1W+.4E+.3S	0.92	0.90	0.83

Uncertain Facts & Differing Values

- Sensitivity of Compound Annual Growth Rates of IEWB to Alternative Weightings and Carbon Costings: 2008 - 2017

	\$51.25 in 2016	\$125 in 2016 (Baseline)	\$250 in 2016
Equal Weighting $=.25C+.25W+.25E+.25S$	-0.10	-0.22	-0.52
Consumptionist Weighting $=.7C+.1W+.1E+.1S$	1.41	1.38	1.31
Consumption Weighted More Heavily Than Wealth $=.4C+.1W+.25E+.25S$	0.82	0.79	0.71
Anti-Egalitarian Weighting $=.33C+.33W+.0E+.33S$	0.70	0.59	0.26
Equality and Security Weighting $=.2C+.1W+.4E+.3S$	0.45	0.41	0.32

Conclusions:

- Growth rate of IEWB < Growth GDP per capita
 - Slower growth of IEWB has been driven by Stagnant/Adverse changes in Equality & Security Domains (good news items outnumbered)
- IEWB wealth Domain - Accounting for GHG stock makes a significant negative difference
 - GHG is Stock Pollutant: Increasing Impact over time
 - Huge uncertainty in Marginal Carbon Cost, large enough to affect aggregate wealth trends
- 2008-2017 slowing of growth (sometime to negative) is clear in all cost & value scenarios