



Meeting the Imperative for Growth within Fiscal Constraints;

How Sustainability Transitions and Innovation Policy Can Deliver
the Public Goods (Necessary for the Economic Recovery)

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Relevance to the Conference Theme

- “Reconstruction and Recovery: Rethinking Inclusive Industrialisation in Response to COVID-19”
- Main Proposition: Public-funded research, development and innovation (RD&I) is critical to the recovery

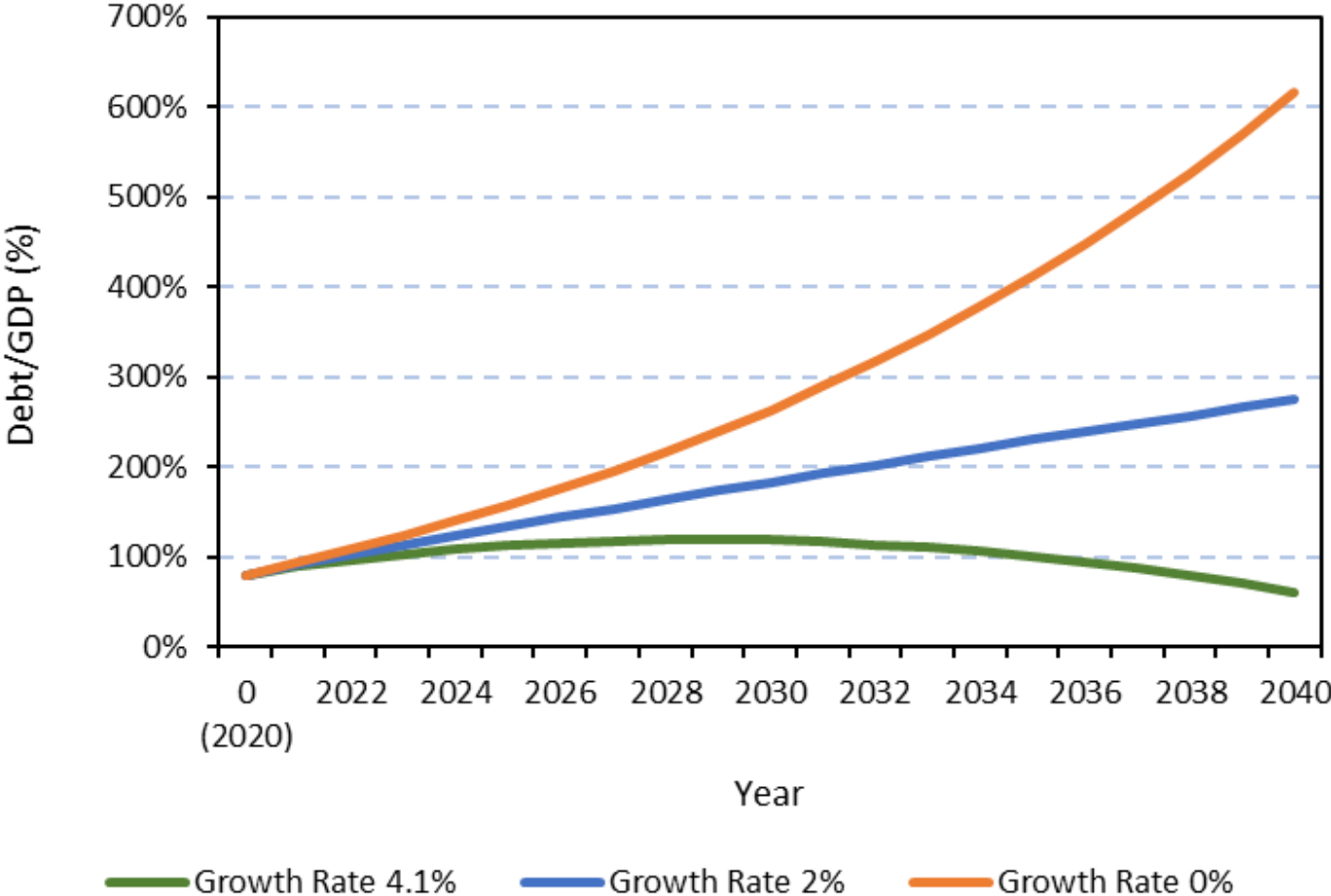
Main Questions of the Presentation

- Why do we need the upturn?
- Can we afford to spend money which we “don’t have” during the recession/downturn?
- How can we “engineer the upturn”?
 - Why is R&D counter-cyclical?
- On what should we spend the money?
 - Areas of focus for public-funded R&D

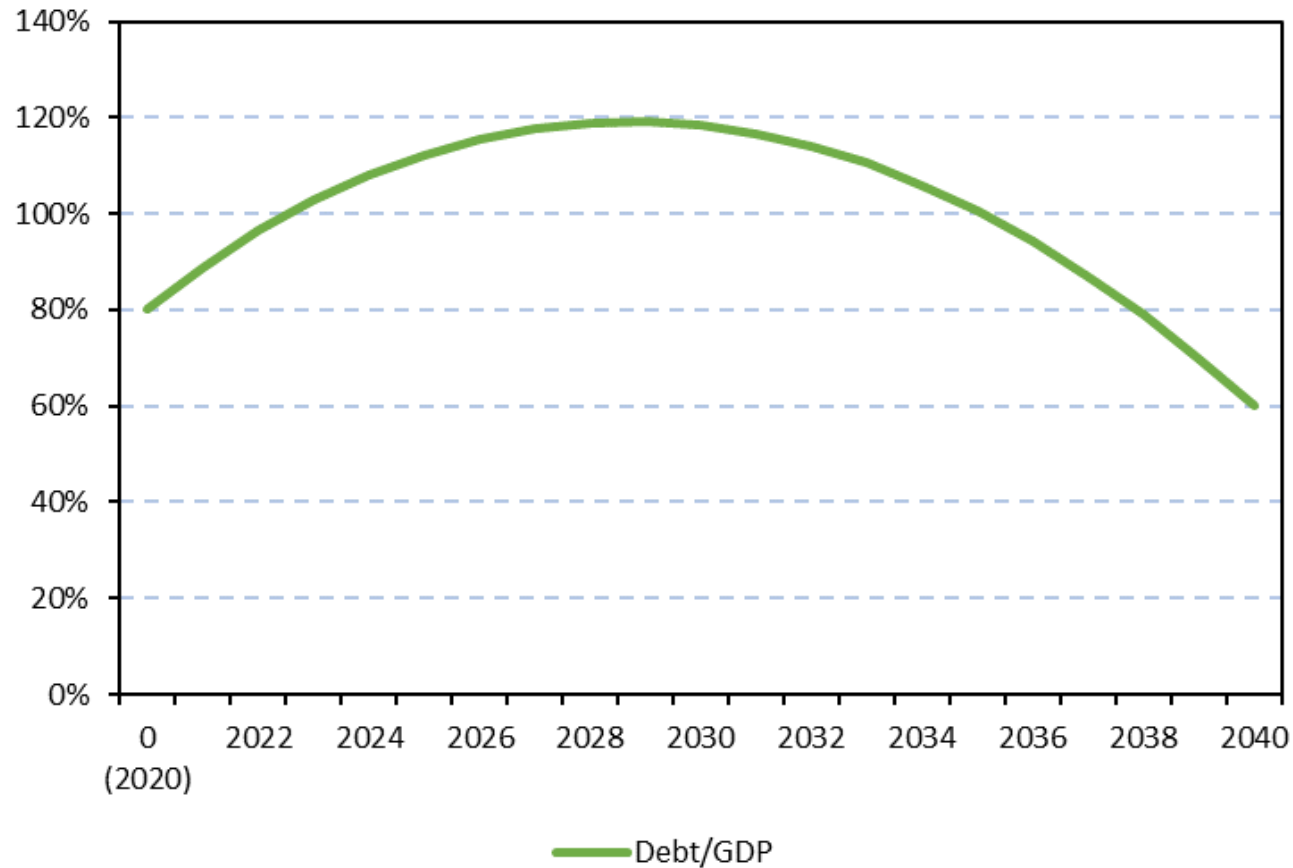
A Simple Excel Model of Public Finance

Year	0 (2020)	2021	2022	2023	2024
<i>GDP</i>					
Real GDP	4,920	5,121	5,331	5,549	5,776
<i>Government Expenditure</i>					
Real Expenditure without Debt Payments	1,750	1,750	1,750	1,750	1,750
Real Expenditure including Debt Payments	2,000	2,020	2,061	2,101	2,139
<i>Government Revenue</i>					
Real Revenue	1,363	1,419	1,477	1,537	1,600
<i>Repayments</i>					
Total Debt	3,950	4,551	5,135	5,699	6,239
Debt Repayment Real	-250.0	-270	-311	-351	-389
Deficit (Real)	637	601	584	564	539
Debt/GDP	80%	89%	96%	103%	108%

National Debt and GDP

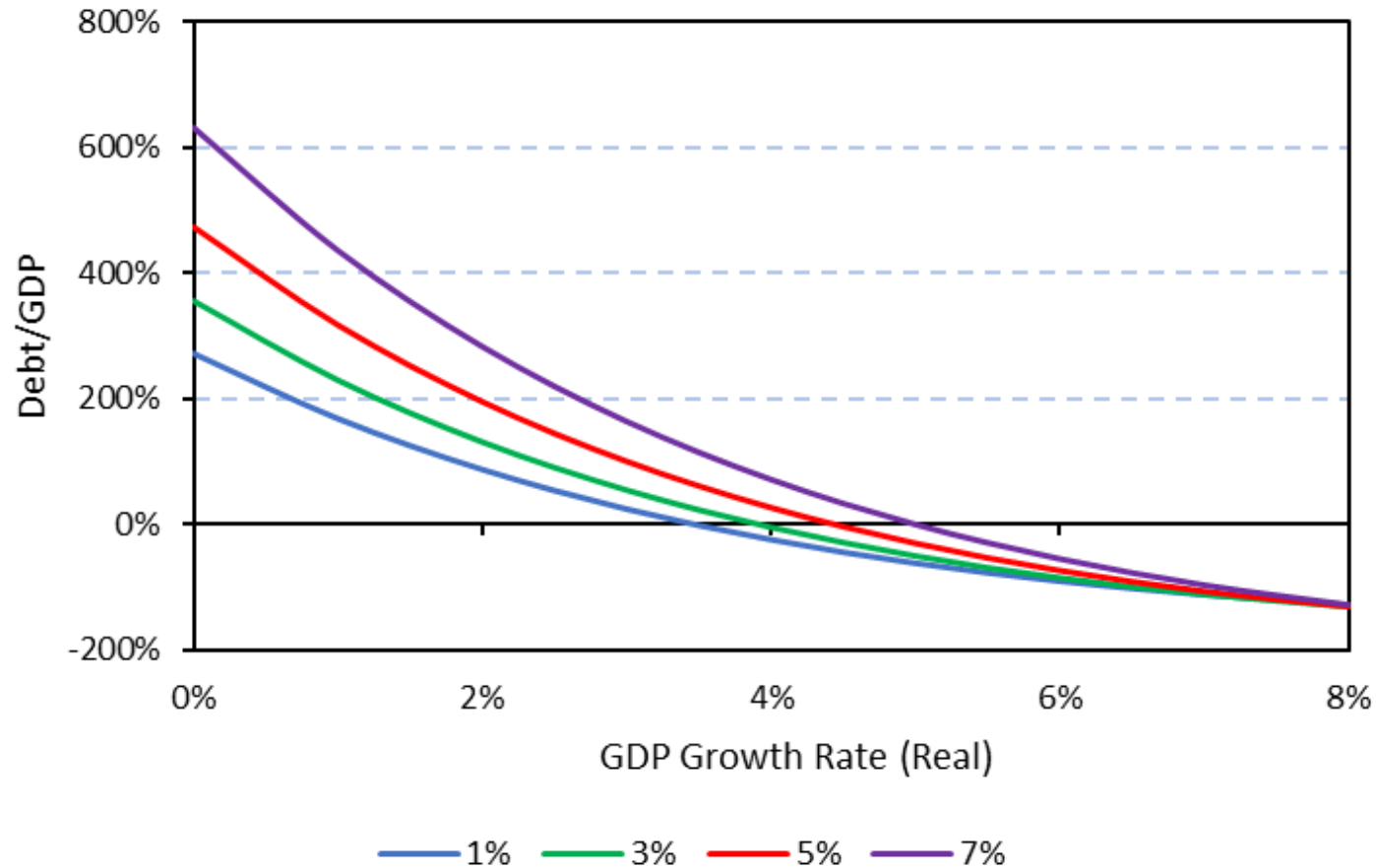


How Fast Must the Economy Grow to Return the Debt Level to 60% of GDP by 2040?



What is the Impact of Interest Rates?

National Debt at 2040



Why Do We Need an Upturn?

- To fund national debt ...
- “There are only two ways to escape a debt trap in South Africa. Increasing growth so that tax revenues rise sufficiently to compensate for increased spending or decreasing spending to balance the equation. The latter poses the greatest political and social risk, whereas the first could lift us out of our current economic quagmire.”

Wood, S. 2021. *Experts agree that 3% is South Africa's magic number on the economic growth front* [Online]. Johannesburg: Daily Maverick. Available: <https://www.dailymaverick.co.za/article/2021-01-27-experts-agree-that-3-is-south-africas-magic-number-on-the-economic-growth-front/>

What is a Fiscal Constraint;

Can We Afford to Spend Money We Don't Earn?

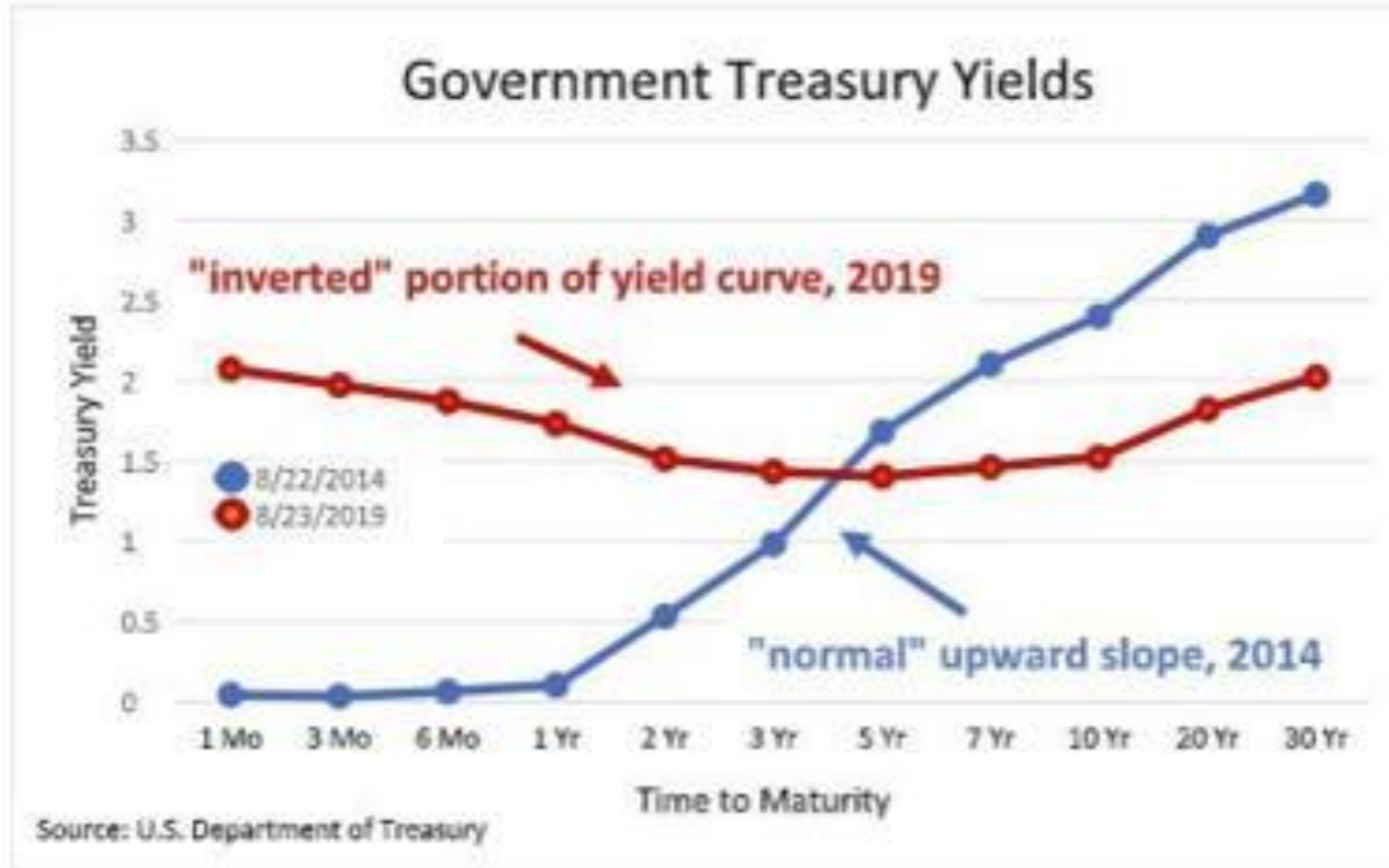
- **Stephanie Kelton and Modern Monetary Theory**
 - governments use tax to create goods for its needs (force citizens into productive labour)
 - the deficit is immaterial; national budgets are not like household budgets
 - inflation targeting is the only important target for money supply

Kelton, S. 2020. The deficit myth: modern monetary theory and the birth of the people's economy, London: Hachette.

Fiscal and Monetary Policy

- Fiscal policy = fiscal discipline (expenditure < revenue)
- Monetary policy = control over interest rates to manage inflation
- Does R&D fall outside this policy framework?
 - Yes 1: much like inverted yield curves, private R&D decreases in times of low confidence in the future. Public R&D expenditure can be seen in the same terms as quantitative easing!
 - Yes 2: Nokia case study
 - Yes 3: COVID-related public funding

Inverted Yield Curves

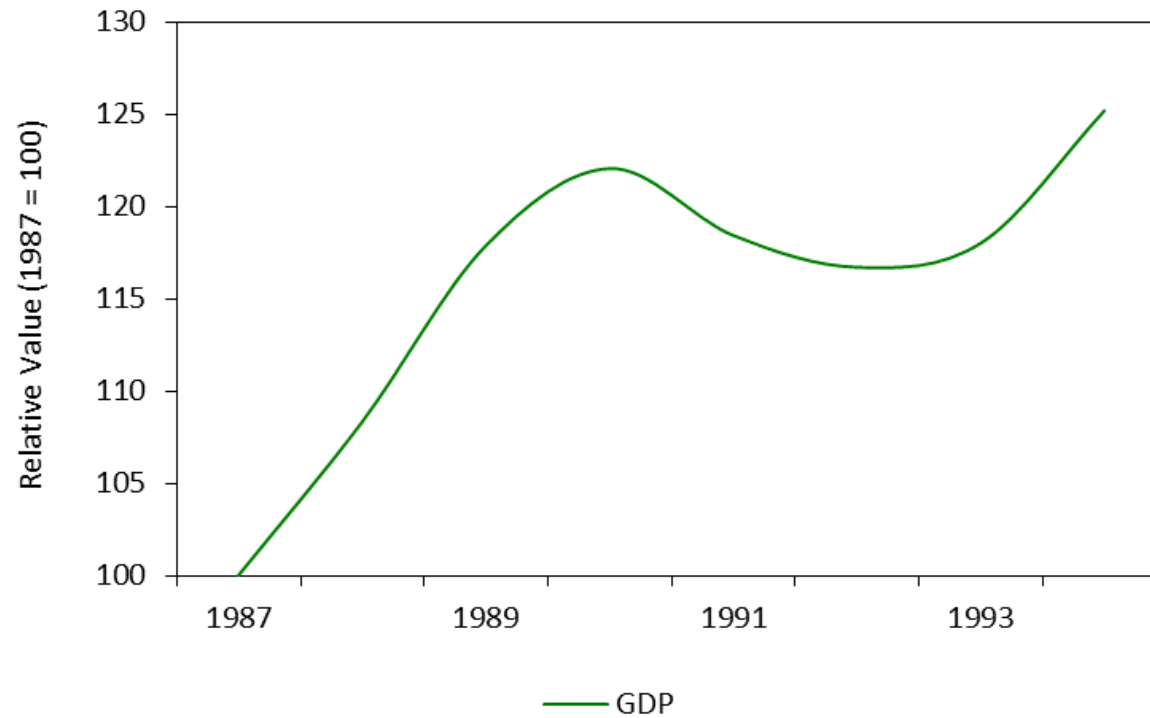


Spread between 2-year and 10-year yields

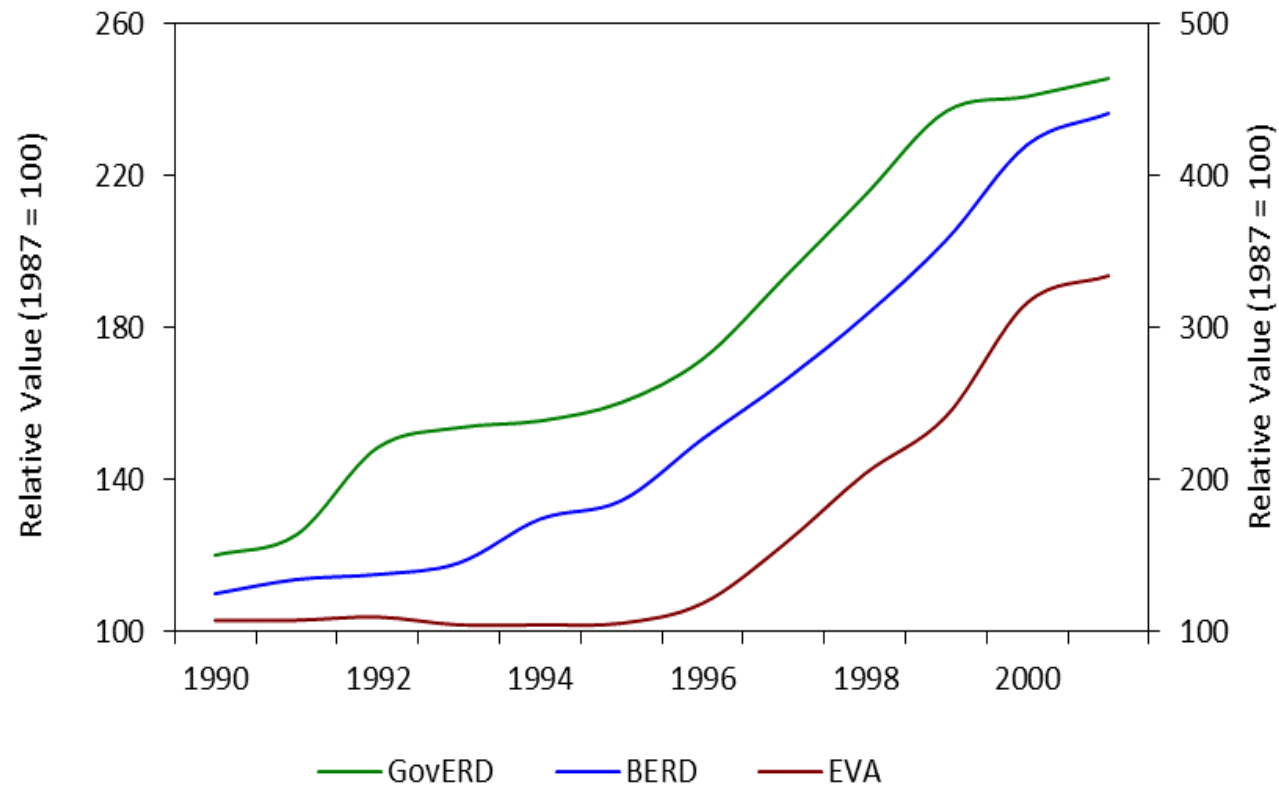


Finland and the Nokia Case Study

Finland GDP in the early 1990s



Intramural R&D (GovERD) and Economic Growth



Walwyn, D. 2007. Finland and the mobile phone industry: A case study investment from government-funded research and of the return on development. *Technovation*, 27(6-7), pp 335-341.

3 Learning Points

- Increase in public sector performance of R&D (GovERD) took place at a time when the GDP and government revenues were declining i.e., the increases were counter-cyclical relative to the economy.
- Initial GovERD investment preceded a similar growth in private sector R&D (BERD) which preceded the growth in the sectoral value add (referred to as electrical goods value-added or EVA) and the country's GDP.
- Directed investment or mission-oriented innovation policy.

Public-Funded R&D and COVID Vaccines

UK Funding of COVID Treatments/Diagnosis

- The Oxford/AstraZeneca vaccine; pre-clinical and early clinical studies supported by publicly-funded research
- World's largest clinical trial into Covid-19 treatments, the RECOVERY trial, which established dexamethasone as one of the world's first effective treatments – estimated to have saved a million lives worldwide
- The UK's genomic sequencing capability tracking mutations of the virus in real time
- Publicly-funded epidemiology and statistical modelling has been at the heart of framing the policy choices

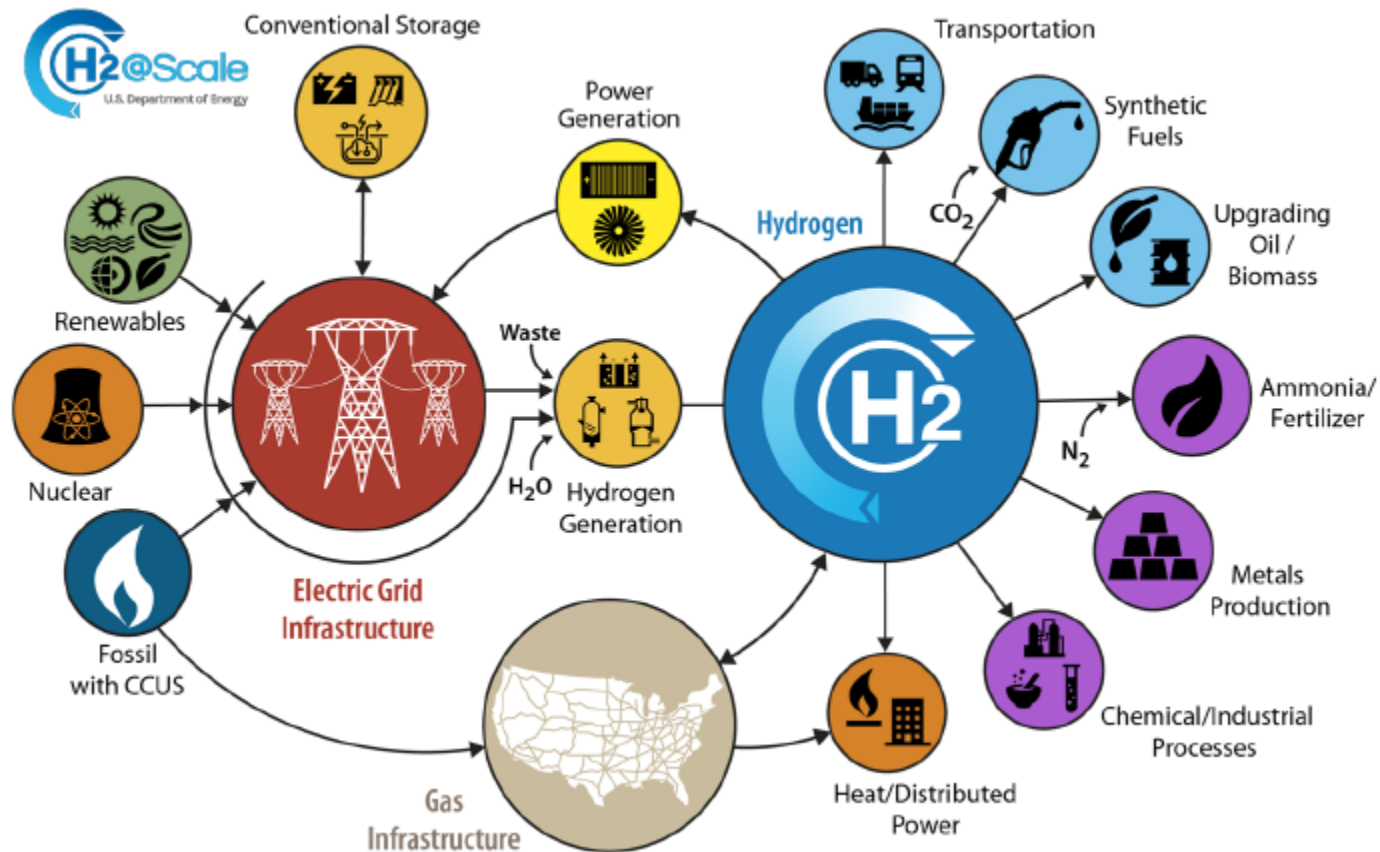
To What Areas Should Public-Funded R&D Be
Directed?

Key Priorities

- Green Economy
 - Hydrogen
 - Energy storage
 - Photovoltaics and wind
- Public Health
 - Vaccines
 - Active pharmaceutical ingredients
- Communications
 - photonics

Hydrogen Economy in USA

- Dr Satyapal, US Dept of Energy, July 2021



- 10 MMT of H₂/yr produced today with scenarios for 2-5X growth.
- +10 MMT H₂ would ~ double today's solar or wind deployment
- Industry study shows potential for \$140B in revenue, 700K jobs by 2030. 16% GHG reduction. Analysis underway (export, etc.)