State investments in innovation: fixing vs. creating markets

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Structure of talk

1. State: market fixing or market creating/shaping?
2. Why getting this wrong leads to bad policies.
3. Why it matters for inequality (risks and rewards)
4. Why it matters for how we reform finance.

What is the State's role in the economy?

Correcting:

1. Output failure (Keynesians) 
2. Market failure (even 'free marketeers') 
3. System failure (Schumpeterians) 

Creating/shaping:

4. Something more interesting (today's talk)

1) Output failure (Keynes)

"The important thing for Government is not to do things which individuals are doing already, and to do them a little better or a little worse; but to do those things which at present are not done at all." *J.M.Keynes, The End of Laissez Faire, 1926*

$$GDP=C+I+G+(X-M)$$

Private investment (I) is too pro-cyclical, and volatile (driven by animal spirits), so government investment (G) must be counter-cyclical and more stable.

The *opposite* of what is happening today.

2) Market failure

Markets fail to allocate investment, goods & services, due to:

- Externalities
- Public goods
- Information asymmetries
- Non competitive markets
- Principal agent problems

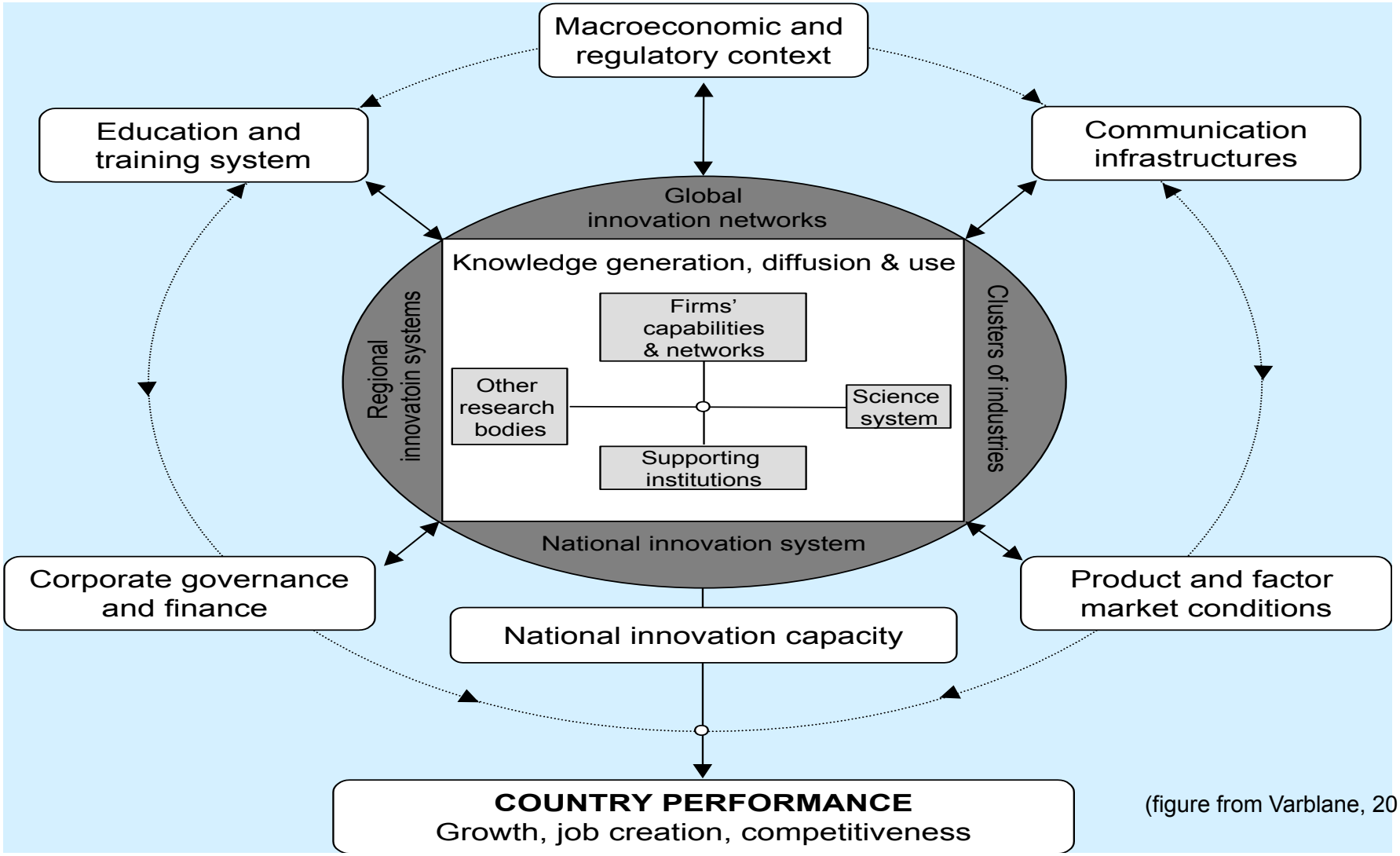
e.g. **basic research** is a public good (positive externality), hard to appropriate, so firms tend to under-invest. (vs. mission oriented)

e.g. pollution is a negative **externality** not incorporated into company costs, making marginal social cost greater than the marginal social benefit.

Market failure policies

- Fund what is not funded: motorways, basic research.
- Change **incentive structures** (e.g. R&D subsidies, environmental taxes, feed-in tariffs).
- **Nudge** private sector in the right direction (e.g. Green Investment Bank).

3) System failure



(figure from Varblane, 2011)

National System of Innovation

system failure policies

e.g. Europe's *Innovation Union*

Strengthening the knowledge base & reducing fragmentation

- Education and skills
- European Research Area
- EU financing instruments

Getting good ideas to market

- Access to finance
- Single innovation market
- Openness and creative potential

Social and territorial cohesion

European Innovation Partnerships

International cooperation

Source: Innovation Union
Flagship Initiative presentation, Oct, 2010

failure failure failure…

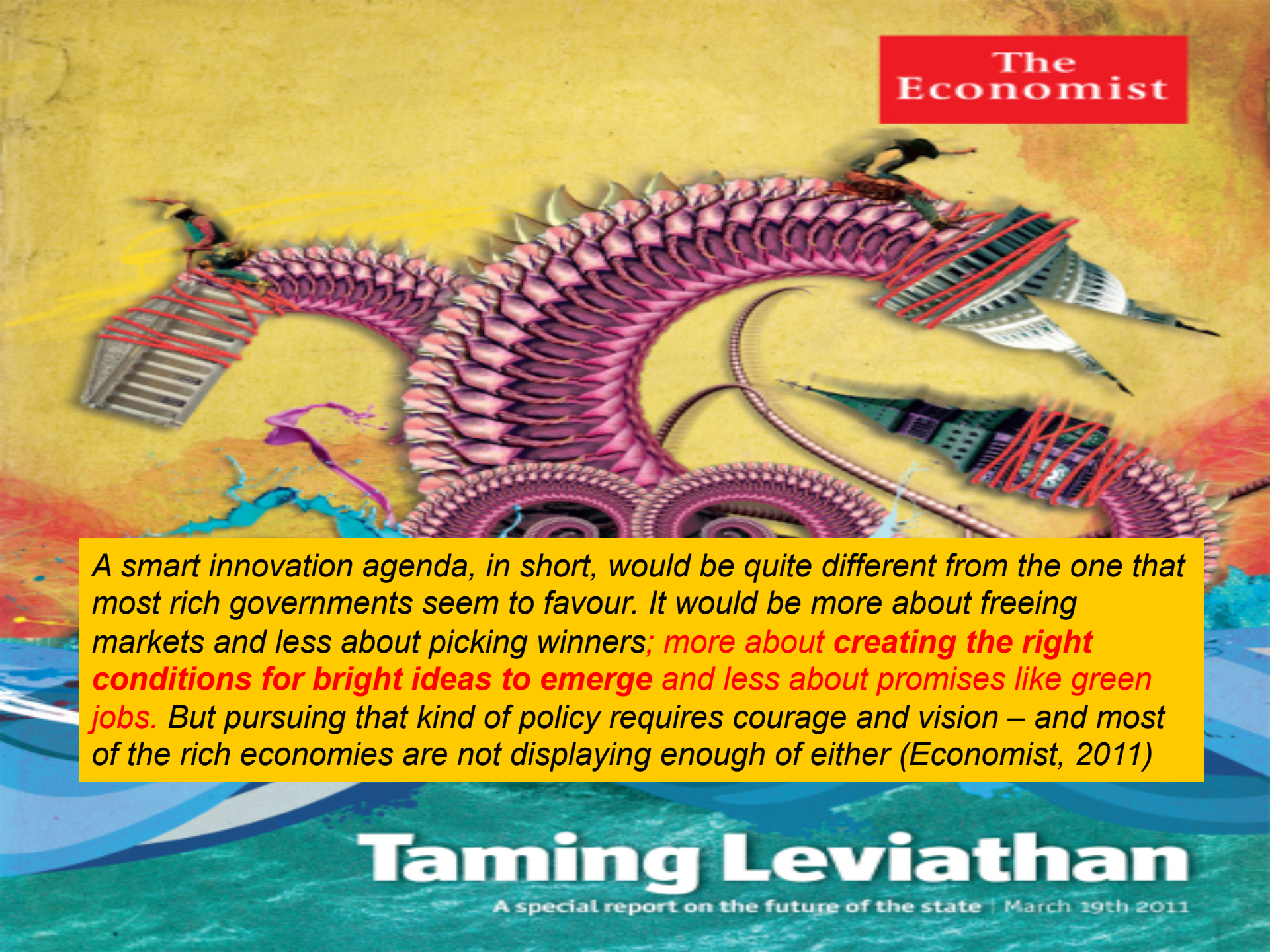
If there are so many failures….why don't we change the diagnosis, rather than constantly just picking up the pieces, and wasting so many precious plasters?

based on false contrast…

Private sector = fast, innovative, dynamic, entrepreneurial...

Public sector = slow, bureaucratic, inertial...or even worse:

'enemies of enterprise' (David Cameron, 2011)



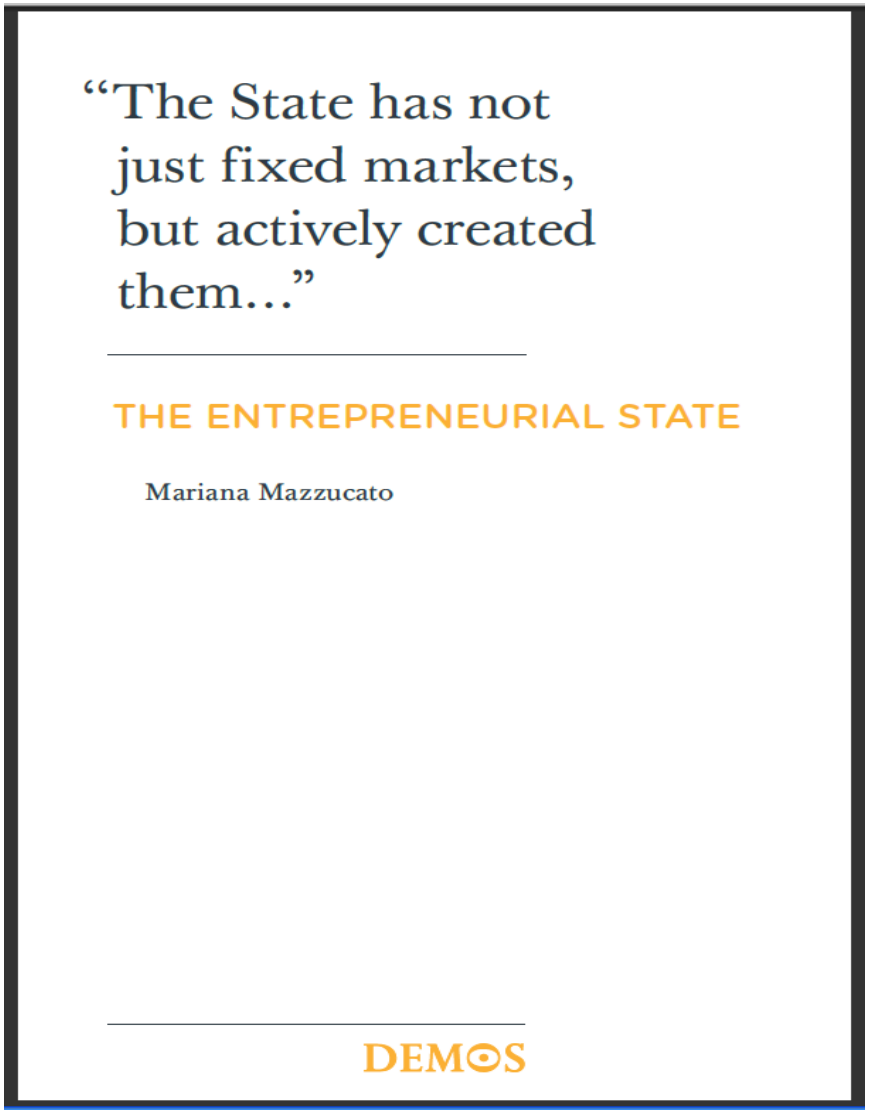
A smart innovation agenda, in short, would be quite different from the one that most rich governments seem to favour. It would be more about freeing markets and less about picking winners; more about ***creating the right conditions for bright ideas to emerge*** *and less about promises like green jobs. But pursuing that kind of policy requires courage and vision – and most of the rich economies are not displaying enough of either (Economist, 2011)*

Governments have always been lousy at picking winners, and they are likely to become more so, as legions of entrepreneurs and tinkerers swap designs online, turn them into products at home and market them globally from a garage. As the revolution rages, governments should stick to the basics: better schools for a skilled workforce, clear rules and a level playing field for enterprises of all kinds. *Leave the rest to the revolutionaries.*

The Third Industrial Revolution, *The Economist,* April 21, 2012

4) The Entrepreneurial State

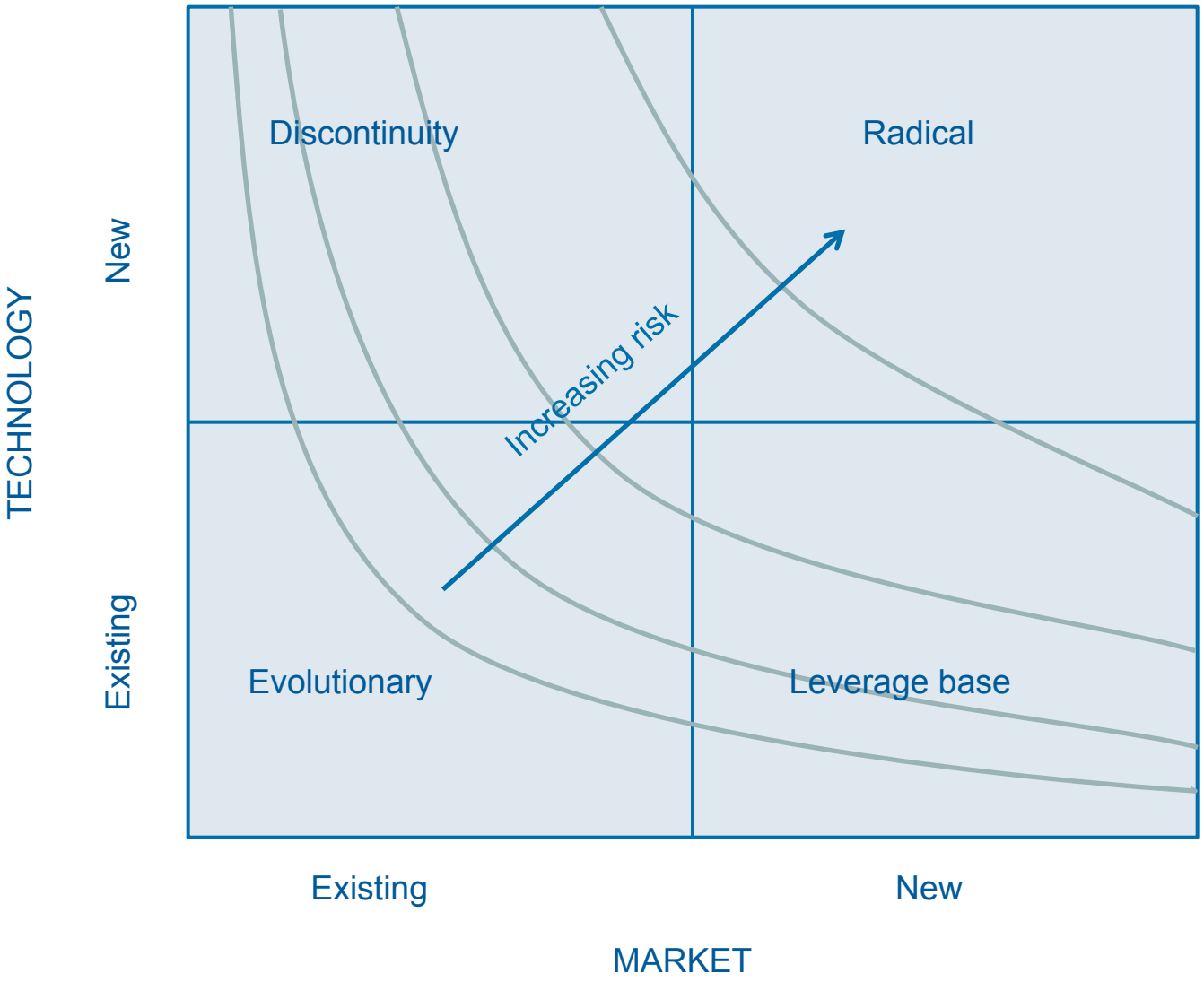
- Government doesn't only 'fix' markets but does what private sector not willing to do.
- Catalyst, and lead investor, sparking the initial reaction in a network. *Creator* not facilitator of knowledge economy.
- Engaging with very high risk, uncertainty, radical change.
- Courageous…but a bit naïve on the returns….



bumpy investment landscape

Point at which investment made	Risk of loss
Seed stage	66.2%
Start-up stage	53.0%
Second stage	33.7%
Third stage	20.1%
Bridge or pre-public stage	20.9%

market and technology risk



…State has funded the most uncertainty

- In **immature phase** of sectoral development (e.g. Nanotech)
- In **seed stage** of firm development (e.g. Google, Apple, Compaq, Intel)
- In early stage of product development (e.g. Block buster drugs)

In each case it was not just basic research, but also envisioning the opportunity space, engaging in the most risky and uncertain early research, and sometimes overseeing the commercialisation process (internet was even commercialised by DARPA).


9:41 AM
7
Phone
Mail
Safari
iPod

iPhone

Microchips powering the iPhone owe their emergence to the U.S. military and space programs, which made up almost the entire early market for the breakthrough technology. In the 1960s, the government bought enough of the initially costly chips to drive down their price 50x in a few short years, enabling numerous new applications.

The early foundation of **cellular communication** lies in radiotelephony capabilities advanced throughout the 20th century with support from the U.S. military.

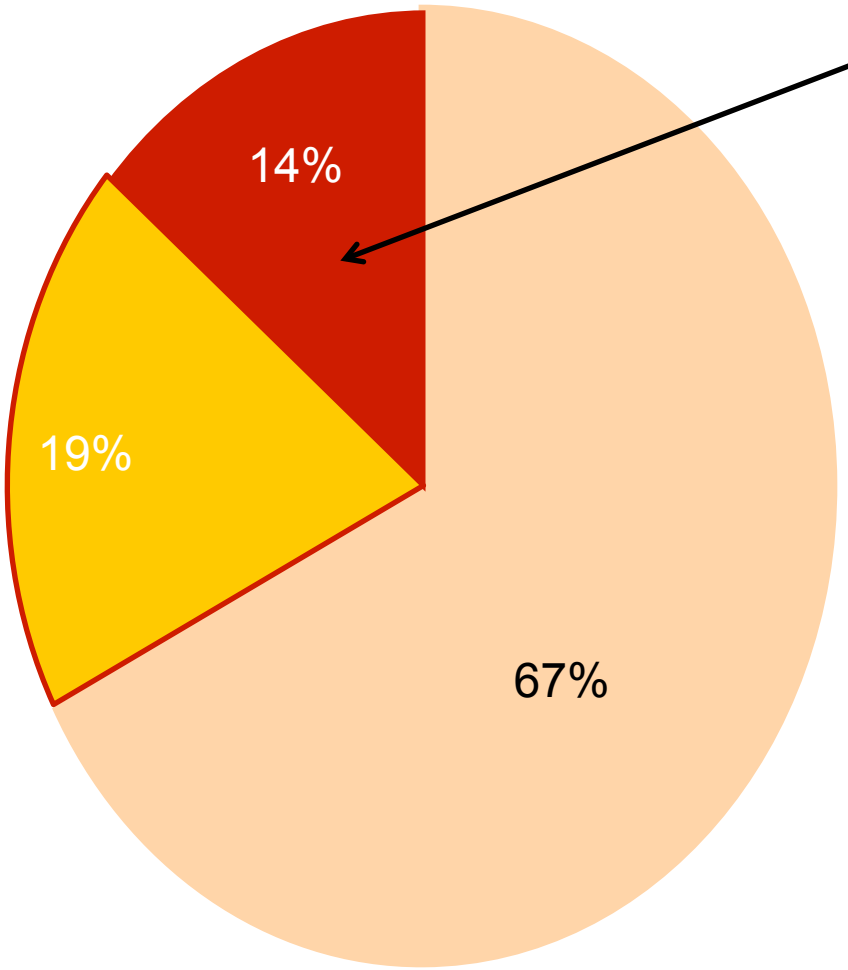
The technologies underpinning the **Internet**, which gives the "smart phone" its smarts, were developed and funded by the Defense Department's Advanced Research Projects Agency in the 1960s and 70s.

GPS was created/deployed in 1980s/90s by the military's NAVSTAR satellite program

The **multi-touch display** that makes using an iPhone so intuitive has the government's fingerprints all over it. The revolutionary interface was first developed by a brilliant pair of University of Delaware researchers supported by NSF and CIA grants Source: **The Breakthrough Institute**, *Where Good Technologies Come From?*, 2011

SIRI, iPhone 5's *personal assistant*, developed initially in DARPA.

new vs. ‘me too’ in pharma (1993-94)



Radical innovation funded almost entirely by public sector labs

Variations of existing drugs

Priority NMEs

Standard NMEs

General Purpose Technologies

Government investments have been key in bringing about GPTs:

- ‘mass production’ system
- aviation technologies
- space technologies
- IT
- internet
- nuclear power
- nanotechnology
- Internet

The green revolution....

Will never take off with a weak state.

Not about nudging ... need to push.

Incremental vs. radical innovation; high risk vs. low risk areas

Lead public investors: China, Korea, Germany, Finland, Denmark, Brazil. And private sector is reacting with their feet…..

technology risk in clean tech

(GIB will nudge, VC will ride the wave, who will kick/push?)

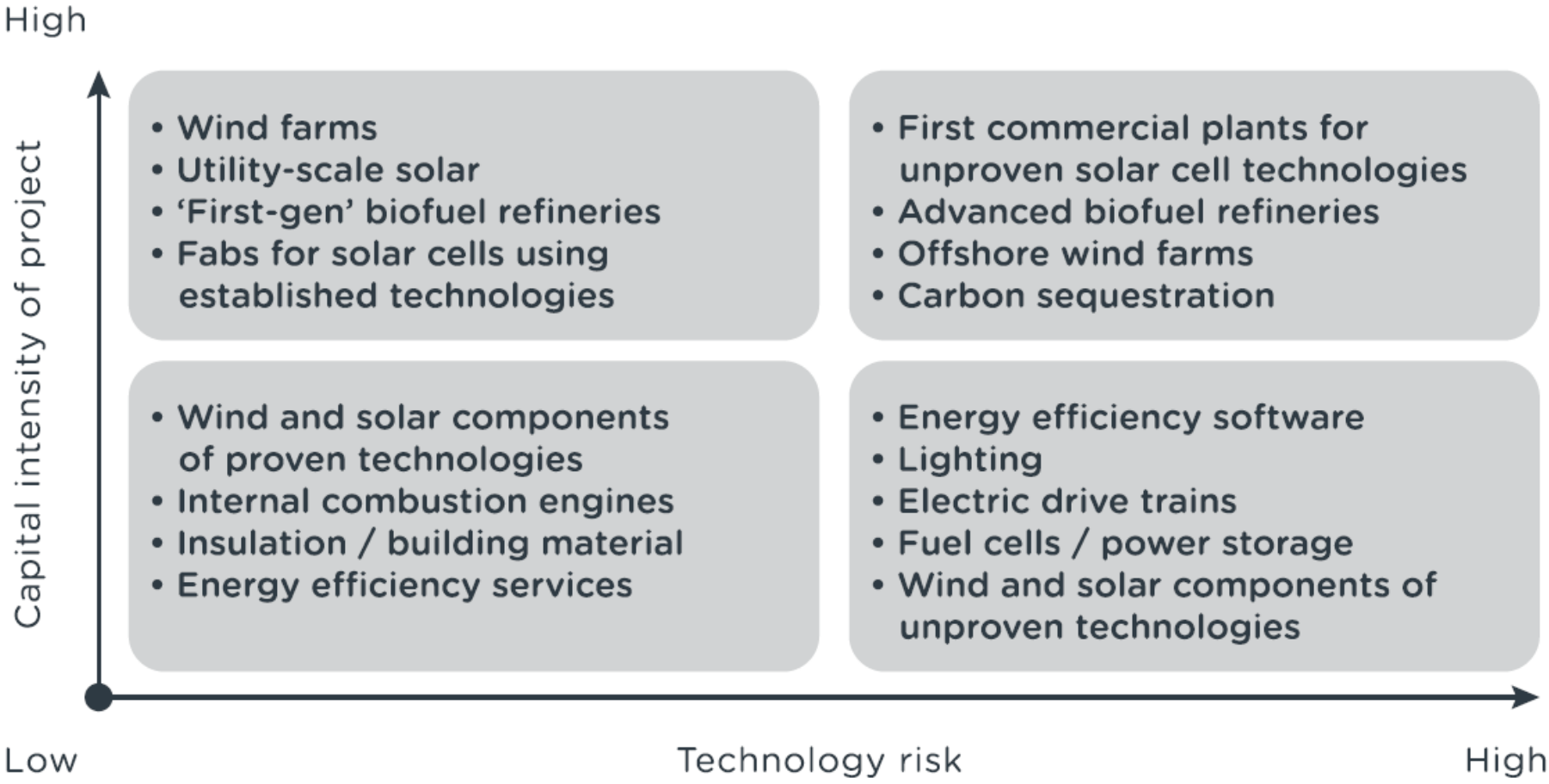


Figure source: Ghosh and Nanda, 2011

Irony: USA = very interventionist

- Myth of US market approach vs. EU State led approach.
- Visible hand of US government present in computer revolution, biotech, nanotech, and green-tech today.
- Active though *decentralised* State agencies (NSF, NNI, SBIR, DARPA..). 'Hidden' industrial policy (Block and Keller, 2011; Mazzucato, 2011)
- SECRET: Willingness to fail, and expertise within Govt. (TSB? not really)

European mistakes

Mistake 1: wrong actors in wrong *places/times*

let's copy Silicon Valley...venture capital!!

Mistake 1: wrong actors in wrong *places/times*

From 1976 VC was applied to biotechnology: Yet it takes at least a decade and $1 billion to develop and commercialize a biopharma drug with high risks of failure; in biopharma there is a prevalence of PLIPOs (productless IPOs): Speculation permits financial interests to gain even when no product is produced. Has the VC model worked in biotech?

> *"During a recent visit to the United States, French President Francois Mitterrand stopped to tour California's Silicon Valley, where he hoped to learn more about the ingenuity and entrepreneurial drive that gave birth to so many companies there.*
>
> *Over lunch, Mitterrand listened as Thomas Perkins, a partner in the venture capital fund that started Genentech Inc., extolled the virtues of the risk-taking investors who finance the entrepreneurs.*
>
> *Perkins was cut off by Stanford University Professor Paul Berg, who won a Nobel Prize for work in genetic engineering. He asked, "Where were you guys in the '50s and '60s when all the funding had to be done in the basic science? Most of the discoveries that have fueled [the industry] were created back then."*

Source: Nell Henderson and Michael Schrage, 1984, "The roots of biotechnology: Government R&D spawns a new industry," Washington Post, December 16, 1984

Mistake 2: obsession with some actors, e.g. SMEs

- Less than 10% of all new firms produce 50% and 75% of all new jobs by new firms. Yet SMEs get £8 billion in direct/indirect support in the UK (more than the police force!).
- Evidence: Storey (1994): 4% of new firms born in any given year accounted for 50% of all the jobs created by the surviving firms within that cohort after ten years. Kirchhoff (1994): 10% of fastest-growing firms contributed to three quarters of new jobs during an eight-year observation period within a cohort of firms started in the US in 1978. Birch et al. (1997): 'gazelles' accounted for more than 70% of the employment growth in the U.S. between 1992 and 1996, while representing only about three per cent of the firm population. NESTA (2009): 6% of UK businesses with the highest growth rates generated half of the new jobs created by existing businesses between 2002 and 2008.
- Need more nuanced approach to uncover the job-generation power of high-growth innovative firms.

Mistake 3: obsession with knowledge transfer, *like pushing on a string*

1. EU problems don't come from poor flow of knowledge from research but from EU firms' smaller stock of knowledge. US govt: 2.6% of GDP on R&D. Germany 2.5%. UK 1.3%.
2. If the US is better at innovation, this isn't because university-industry links are better—they aren't—or US universities produce more spinouts—they don't. It simply reflects more research being done in more institutions, which generates better technical skills in the workforce.
3. And more mission oriented research.
4. US funding is split between research in universities and early-stage technology development in firms. Getting EU universities to do both runs the risk of generating technologies unfit for the market.

5. And what are our competitors doing?

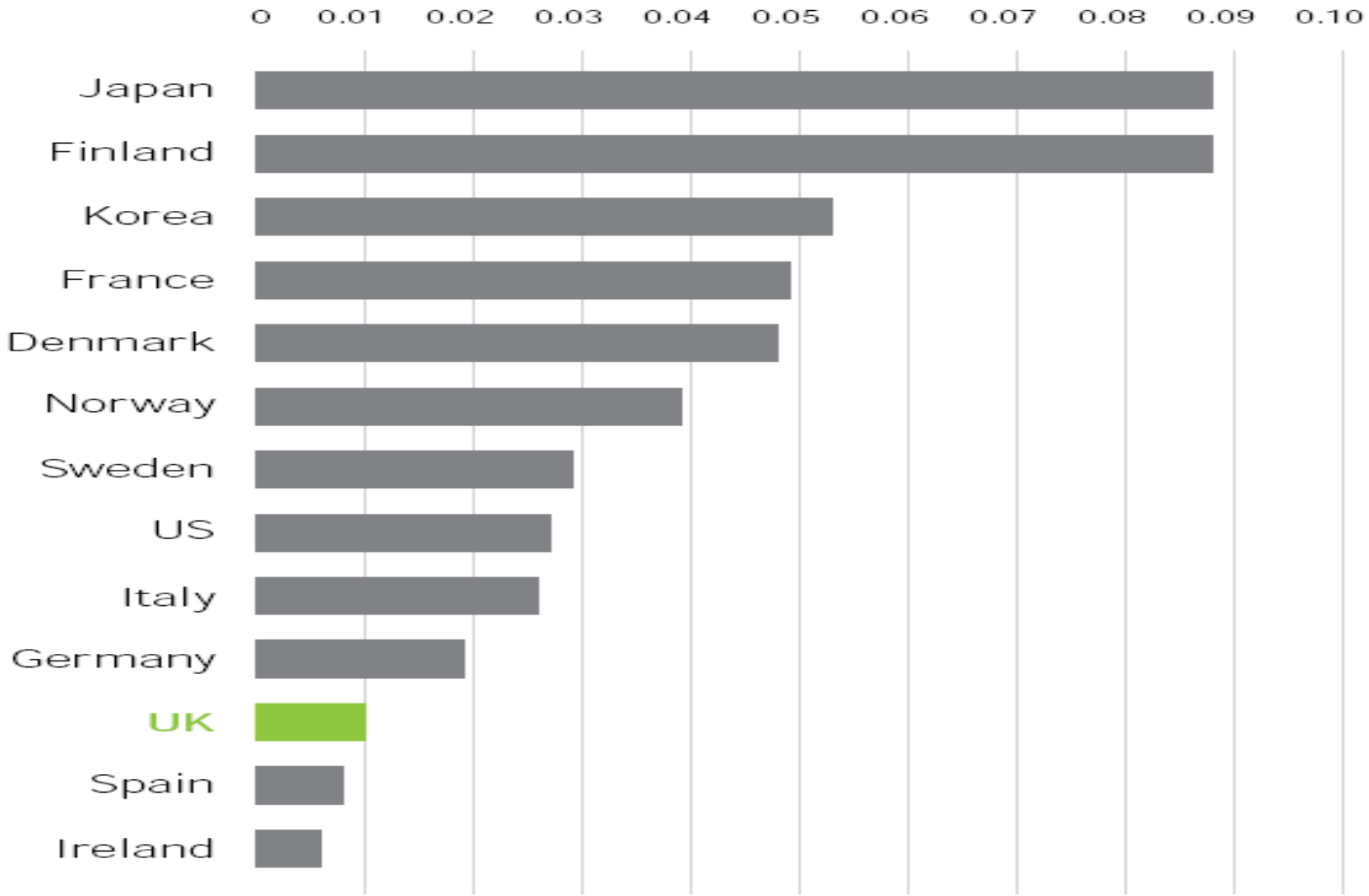
Chinese 5 year plan: 1.5 trillion dollars in 7 new emerging areas, including new engines, new materials, new generation IT, environmentally friendly technologies…

Brazilian State Investment Bank: BNDES, bond for 'death valley', and 20% return on equity.

If green is the next internet, who (besides China) is leading in Green? Germany and Denmark alone?

Does green require a gentle 'nudge' (Green Investment Bank) or a strong push (ARPA-E)?

Government energy R&D spend as % GDP (2007)



(Source: Committee on Climate Change, 2010)

Risks and Rewards

Moving beyond eco-system hype (old wine in new bottles) to a division of innovative labour, and getting something back.

Can ‘tight’ EU budgets afford to invest in risky innovation? How to reconcile investment (in expensive and risky R&D) with ‘golden rule’ of deficit reduction?

A new pharmaceutical that brings in more than $1 billion per year in revenue is a drug marketed by Genzyme. It is a drug for a rare disease that was initially developed by scientists at the National Institutes of Health. The firm set the price for a year's dosage at upward of $350,000. While legislation gives the government the right to sell such government-developed drugs at 'reasonable' prices, policymakers have not exercised this right.

The result is an extreme instance where the costs of developing this drug were socialized, while the profits were privatized. Moreover, some of the taxpayers who financed the development of the drug cannot obtain it for their family members because they cannot afford it. (Vallas et al. 2011).

Nokia vs. Google

When **SITRA**, the Finnish government's public innovation fund, provided the early stage funding for Nokia, it later reaped a significant return on this investment – a fact accepted by the Finnish business community and politicians.

The reason why the US government has not reaped a return from its early stage investments in companies like Google (which benefitted from a state-funded grant for its early algorithm) and other such success stories including Apple, Intel and Compaq (which received public SBIR funding) is due to the lack of understanding in the USA, and many other economies, of state-led growth-inducing investments, which allow conservative forces to portray the state as only a menace in the economy.

Creative thinking on tools to claim back return

- Innovation ‘fund’ that firms pay into
- IPR golden share
- Income contingent loans
- Public VC (reinvested back), e.g. SITRA
- Shares
- National Investment Bank (e.g. Brazil’s BNDES 20% return on equity!)

Lazonick and Mazzucato (2012), Risks and rewards in the innovation-inequality relationship, FINNOV DP 2.11

What a Smart State investment bank can achieve!
(from the ashes of RSB?)

US$ millon	BNDES	IDB	IBRD	CAF	China DB
	Dec 31, 2010	Dec 31, 2010	Jun 30, 2010*	Dec 31, 2010	Dec 31, 2009
Total Assets	329,504	87,217	282,842	18,547	665,168
Shareholders' Equity	39,551	20,960	37,401	5,753	55,471
Net Income	5,950	330	(870)	166	4,673
Loan Disbursements	96,322	10,341	28,854	4,584	92,998
Total Loans	217,006	63,007	120,103	13,873	543,196
Capitalization	12.0%	24.0%	13.2%	30.8%	8.3%
ROA	2.1%	0.4%	-0.3%	1.6%	0.8%
ROE	21.2%	1.6%	-2.3%	3.7%	8.8%
Established	1952	1959	1945	1968	1994

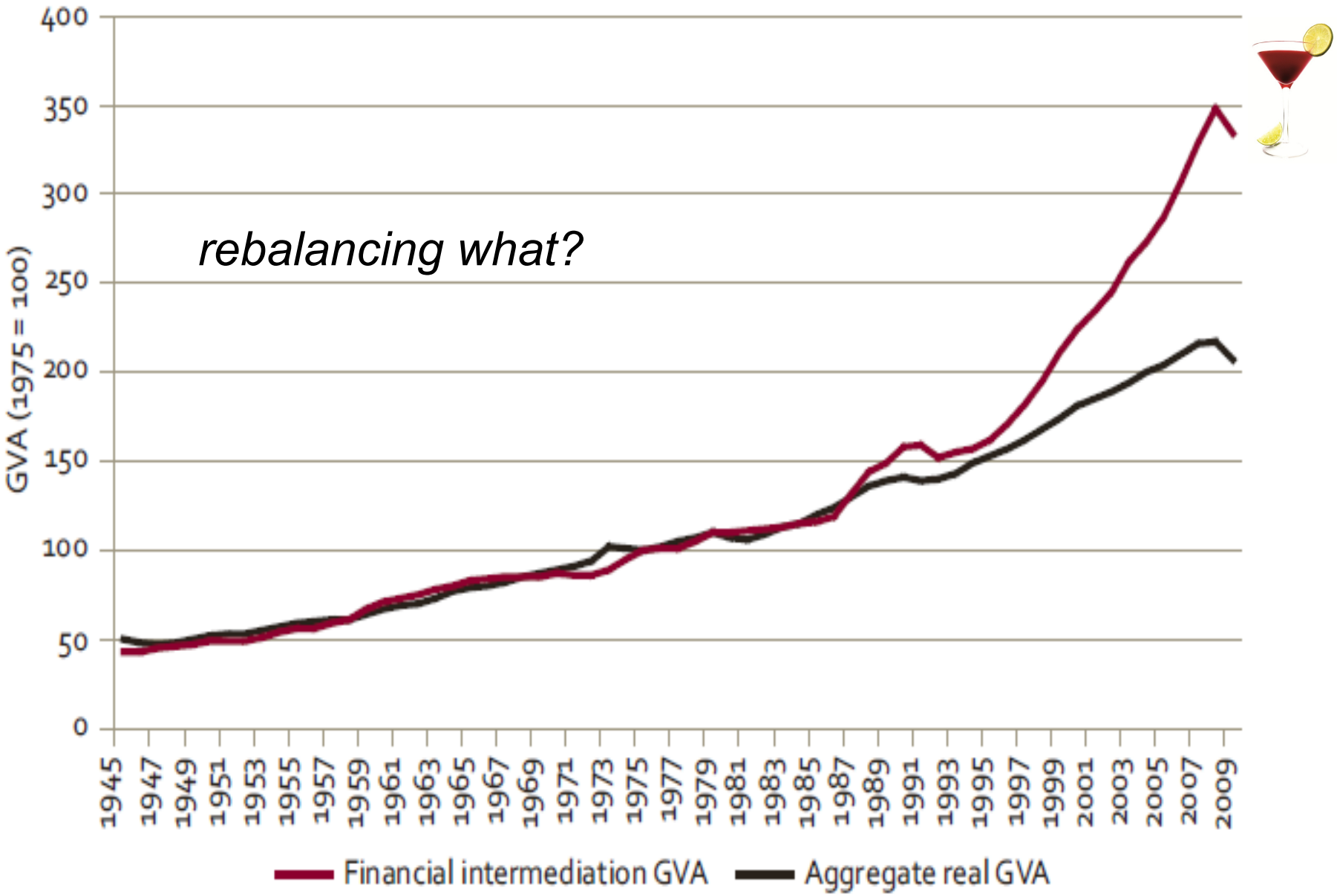
IDB = Inter-American Development Bank

IBRD = The International Bank for Reconstruction and Development (World Bank)
(*) Unlike other institutions, 12-month fiscal year ends June 30th

CAF = Corporación Andina de Fomento
CDB = China Development Bank

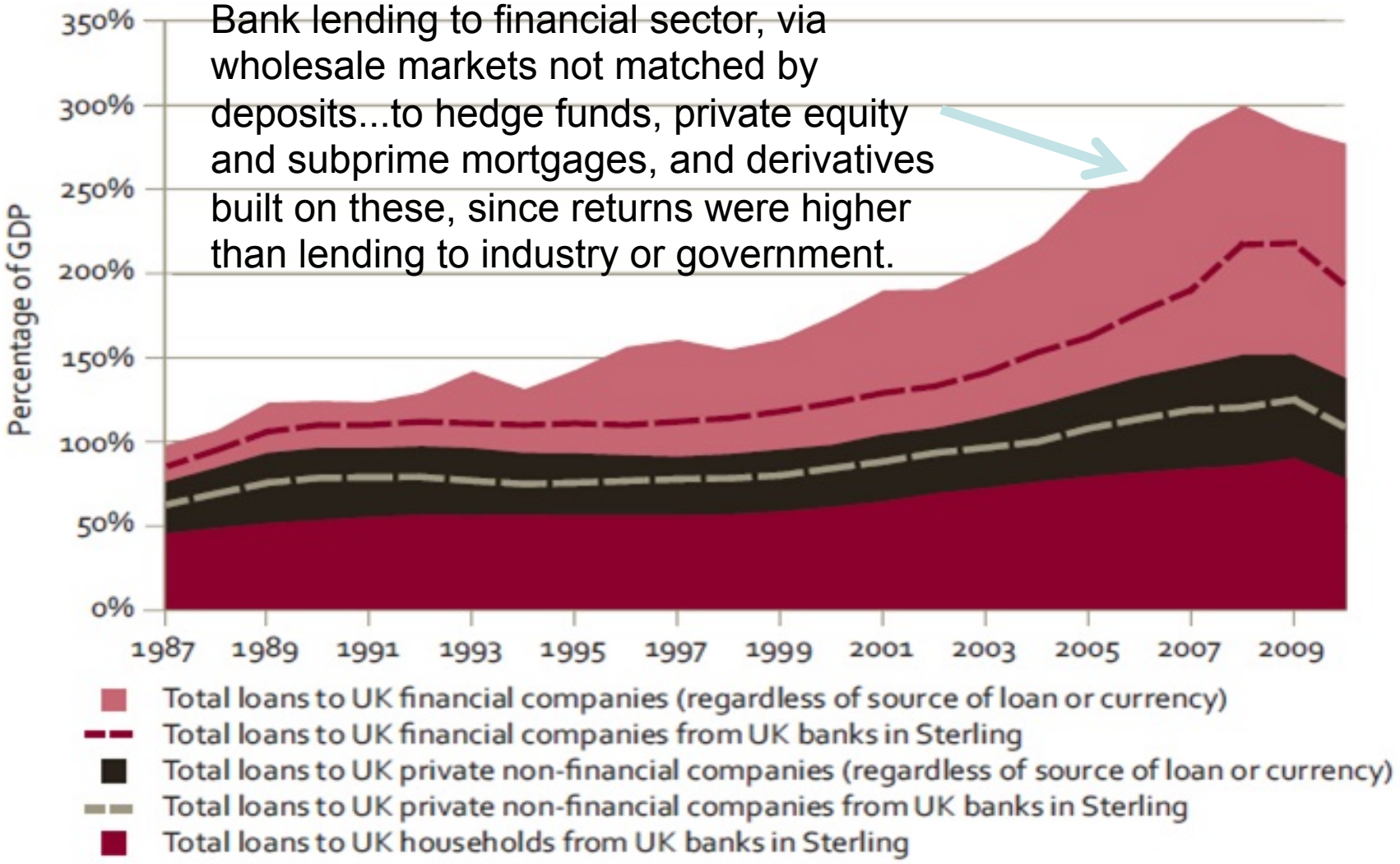
Capitalization = Shareholders' Equity / Total Assets
ROA = Return On average Assets
ROE = Return On average Equity

Financial intermediation and aggregate gross value added compared



Source: Bank of England

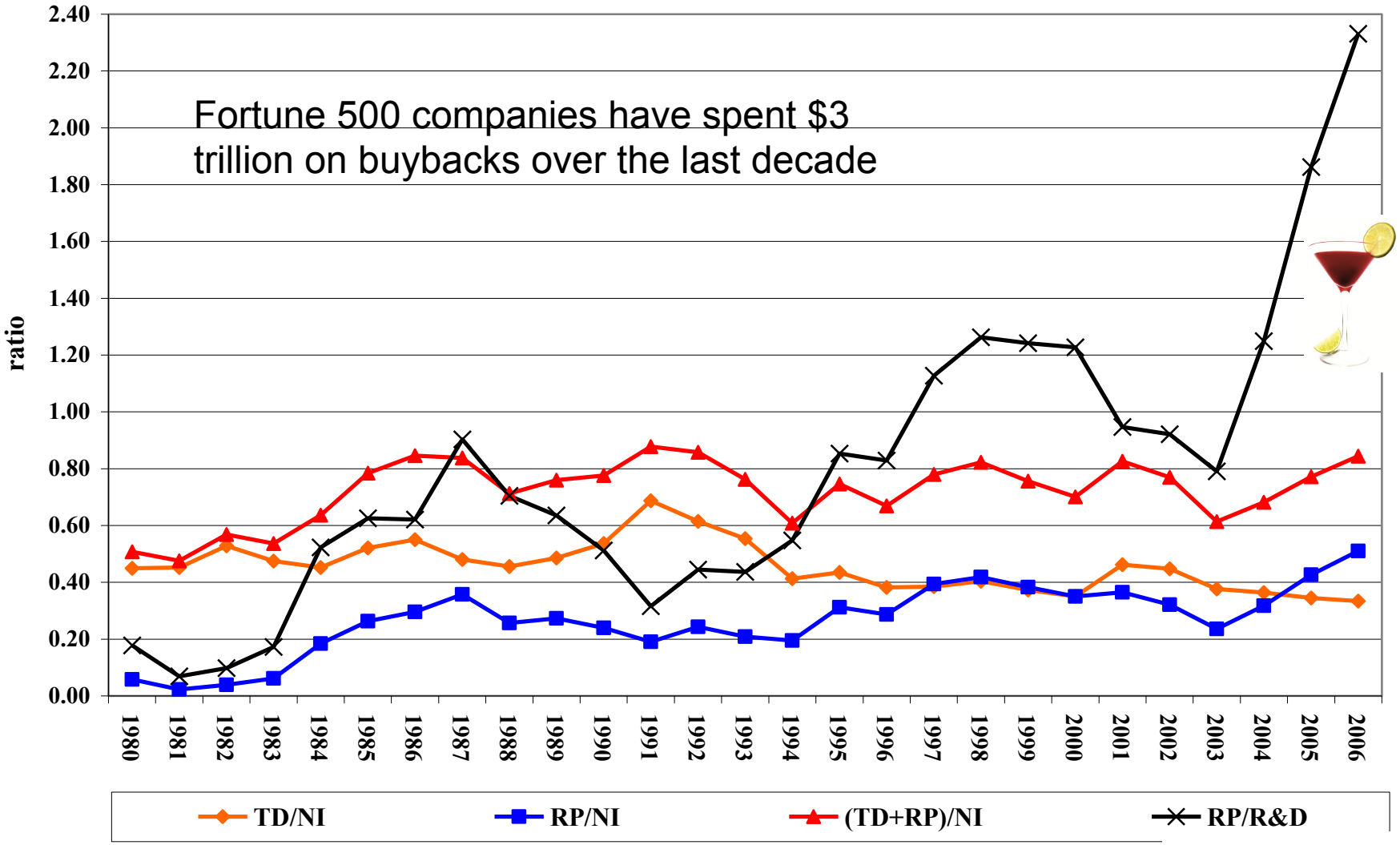
Total loans to different sectors of the economy as % of GDP



Source: Commission analysis, Bank of England, Office for National Statistics Blue Book.

Repurchases, dividends, net income, R&D 1980-2006

(293 corporations in the S&P500 in October 2007 in operation in 1980)



FINNOV WP 5 (Bordeaux)

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The end …..Thank you!