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2013 Smart Services CRC Participants and Showcase Forum Meeting

Innovation reflections – 5 years on from the Review of the National Innovation System

4 December 2013

Mary O'Kane, NSW Chief Scientist and Engineer

5 years on from Review of the National Innovation System (Cutler)

Rationale: We are a wealthy country – 10th highest average income per capita – and yet worrying factors associated with innovation including:

- -ve productivity growth
- declining rate of public investment in education
- declining rates of educational attainment
- public investment in R&D declining
- patent numbers
- poor entrepreneurship & associated firm-based R&D compared to OECD peers

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Factors that seem to ensure successful innovation

Review NIS Review emphasised:

- Human capital [The Number 1 issue!]
- A good R&D system
- Thinking of business, universities, government etc. as components in *our* innovation *system*
- Stocks and flows
- The bulk of innovation is non-technical
- Customer-driven innovation
- Locus of the firm

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- Need for absorptive capacity in firms
- Importance of intermediaries
- Open innovation systems
- The importance of access to information
- Collaboration
- Importance of public-sector & community-sector innovation
- Smart regulation
- Need for good metrics and data
- Challenge systems e.g. DARPA
- Entrepreneurship & associated firm-based R&D

AUSTRALIA HAS A PROUD HISTORY OF INNOVATION!

DID YOU KNOW AUSTRALIANS INVENTED:

- THE HILLS HOIST
- THE VICTA LAWNMOWER
- THE COMBINE HARVESTER
- PENICILLIN
- SEX
- THE SPANISH DOUGHNUT
- ANTS

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So what's the situation like 5 years on?

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Productivity growth - Australia

- Australia currently experiencing productivity growth decline
- Overall growth 1% per annum from 1998/99 to 2003/04
- Negative growth -0.6% per annum from 2003/04 to 2010/11 [but note capital issues]

Source: ABS 5260.0.55.002 Experimental Estimates of Industry Multifactor Productivity, Australia: Detailed Productivity

Source: ABS Australian System of National Accounts, 2010-11 (cat.no.5204.0)

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Australia's rankings (GCI and GII)

Year	GCI Rank (WEF)	GII Rank (INSEAD)
2004-5	14	
2005-6	10	
2006-7	16	
2007-8	19	17 (2007)
2008-9	18	22 (2008-9)
2009-10	15	18 (2009-10)
2010-11	16	
2011-12	20	21 (2011)
2012-13	20	23 (2012)
2013-14	21	19 (2013)

Innovations generally in last few years

- Open data
- Big data
- Apps
- Sophisticated computing & new media
- High-returning new business models (e.g. Facebook)
- Microbusiness – free to charging; clip services
- Online shopping
- Automation e.g. in mines, ports
- Increasingly spatial (disrupted industry)
- Energy innovation

Energy Innovation

Unconventional gas in North America & consequential energy security & export

Germany drops nuclear & invests massively in renewables

Japan has a tsunami

Australia has White Papers

Gazelles – the small percentage of start-ups that scale up very, very quickly

… are important for job growth.

Most grow to an eventual size of 20-99 employees. Some become Twitter or Google.

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Innovation education for kids…

an Obama initiative

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Specific manifestations of entrepreneurial giftedness include (from Shavinina, 2011)

- Constantly generate ideas on how to make money
- Love to generate and implement real-life projects with at least a minimal financial reward
- Love doing real business plans with predicted financial outcomes
- Work passionately and hard on executing their plans
- Wish to do ‘real’ things that bring money and try to do whatever possible to cut unnecessary steps

General manifestations of entrepreneurial giftedness include:

- perseverance to succeed
- optimism and ‘change the world’ attitude
- early exposure to challenges
- competitiveness, excellence and perfection
- neglect of academic subjects & a rule-breaking attitude
- developing their own creative methods
- ability to implement ideas
- having a unique point of view
- practical intuition
- courage

Teacher Brendan Bailey, of Thornbury in Melbourne, says he would welcome a permanent job and the chance to apply for a loan

Teach troublemakers to be moneymakers

JUSTINE FERRARI

AN overly rigid education system dence of thoughts and attitudes and rule-breaking behaviour that cast them as the bad students.

"We need to value the misfits, school system had to allow students to fail, so they could learn from making mistakes and develop resilience, key factors in Wyndham public lecture, named after a former NSW director-general of education responsible for broadening the curriculum in

The Australian 14/5/12

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Some reflections on the innovation indices

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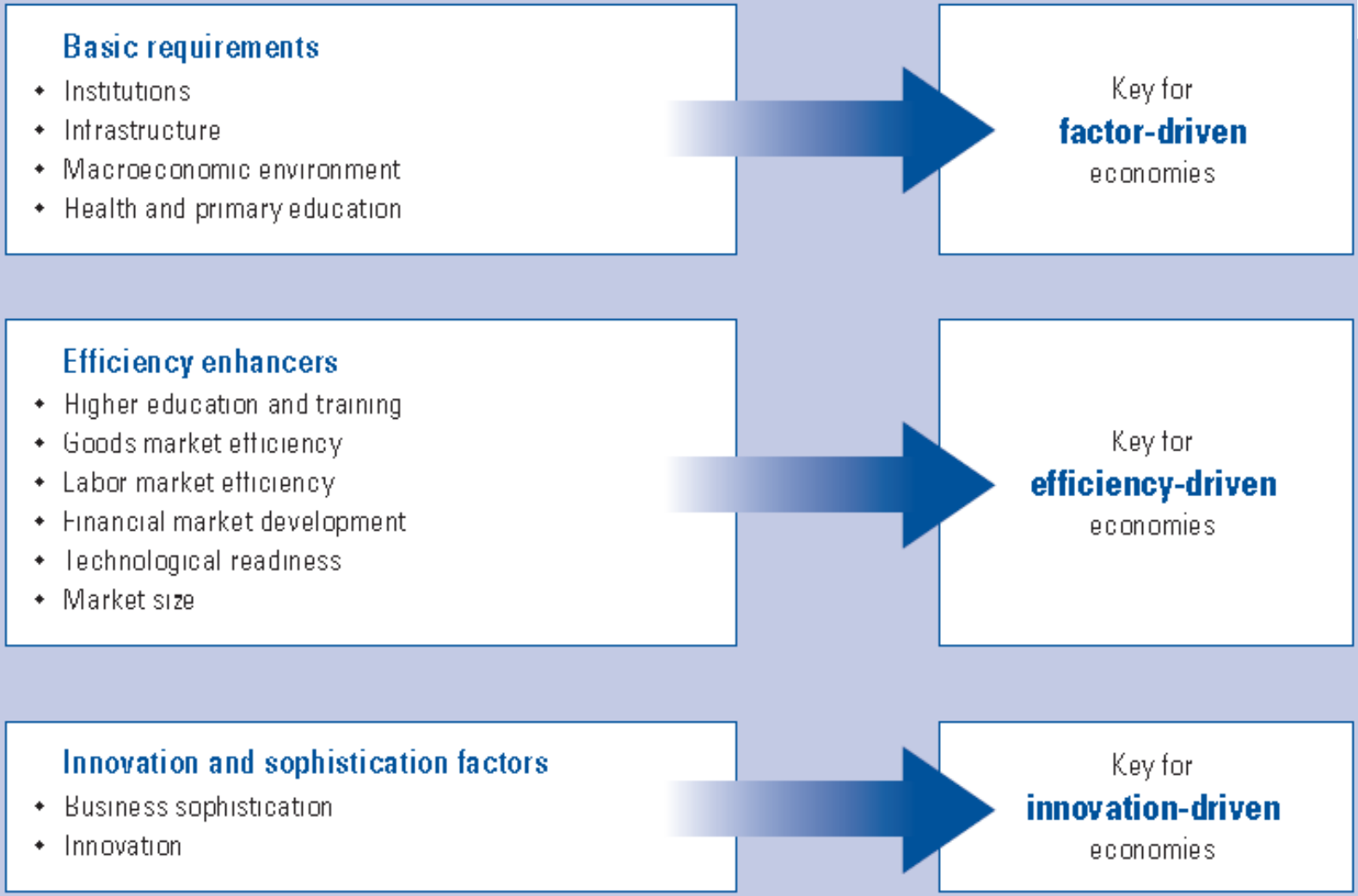
Global Competitiveness Index (GCI)



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Global Innovation Index (GII)

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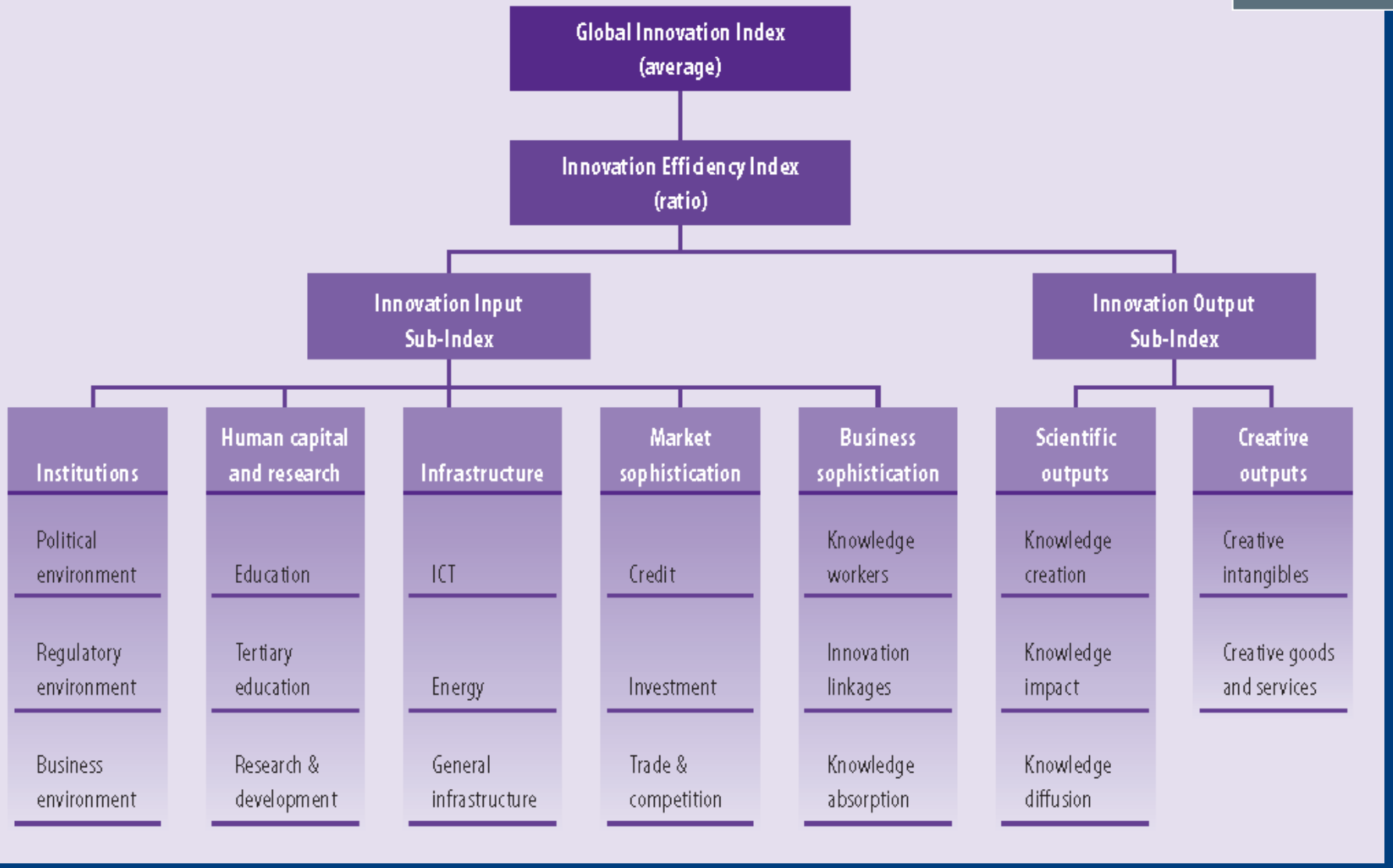
The Business School for the World®



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Global Competitiveness Index (GCI)

Country	2013/14	2012/13	2011/12	2010/11
Switzerland	1	1	1	1
Singapore	2	2	2	3
Sweden	6	4	3	4
Finland	3	3	4	7
USA	5	7	5	4
Germany	4	6	6	5
UK	10	8	10	12
Canada	14	14	12	10
↓	↓	↓	↓	↓
Australia	21	20	20	16
China	29	29	26	27

Global Innovation Index (GII)

Country	2013	2012	2011
Switzerland	1	1	1
Sweden	2	2	2
Singapore	8	3	3
Finland	6	4	5
USA	5	10	7
Canada	11	12	8
Germany	15	15	12
UK	3	5	10
↓	↓	↓	↓
Australia	19	23	21
China	35	34	29

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Education Indicators (2013/14)

Quality of maths and science education

- How would you assess the quality of maths and science education in your country's schools?

Country	Rank (GCI)
Singapore	1
Finland	2
Switzerland	5
Canada	17
Germany	21
Australia	37
Sweden	41
China	48
USA	49
UK	50

Quality of education system

- How well does the educational system in your country meet the needs of a competitive economy?

Country	Rank (GCI)
Switzerland	1
Finland	2
Singapore	3
Canada	10
Germany	14
Sweden	17
Australia	23
USA	25
UK	26
China	54

Tertiary education enrolment rate

- Gross tertiary education enrolment rate

Country	Rank (GCI)
Finland	2
USA	3
Australia	11
Sweden	18
Singapore	20
UK	36
Canada	38
Switzerland	45
China	83
Germany	-

Education

- Education expenditure
- Public expenditure per student
- School life expectancy
- PISA scales reading, maths and science
- Pupil teacher ratio (secondary)

Country	Rank (GII)
Sweden	10
China	20
USA	27
Canada	29
Germany	31
Finland	34
UK	36
Australia	47
Switzerland	56
Singapore	61

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Scientists and Engineers Indicator

Graduates in Science and Engineering

- Tertiary graduates in science (% of total tertiary graduates) 2010

Country	Rank (GII)
Finland	9
Germany	19
Sweden	21
UK	35
Switzerland	50
Australia (2009)	65
USA	77
Canada	-
China	-
Singapore	-

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University/industry collaboration indicators (2013/14)

University/industry research collaboration (GII)

Country	Rank (GII)
Switzerland	1
UK	2
USA	3
Finland	4
Singapore	5
Sweden	7
Germany	11
Australia	12
Canada	14
China	33

University-industry collaboration in R&D (GCI)

Country	Rank (GCI)
Switzerland	1
Finland	2
USA	2
Singapore	4
UK	5
Germany	9
Sweden	10
Australia	15
Canada	18
China	33

Innovation Indicators

Capacity for Innovation

- In your country, how do companies obtain technology? by conducting formal research and pioneering their own from products – or from licensing and imitation

Country	Rank (GCI)
Switzerland	1
Finland	2
Germany	3
USA	5
Sweden	7
UK	8
Singapore	18
Australia	23
Canada	27
China	30

Knowledge Creation

- Domestic resident patents
- Patent applications through Patent Cooperation Treaty
- Utility model applications filed at the national office
- Science and technical articles

Country	Rank (GII)
Switzerland	1
Sweden	2
China	3
Germany	6
USA	7
UK	8
Finland	10
Canada	16
Australia	28
Singapore	30

Knowledge Impact

- Growth rate GDP per worker
- New businesses per 1000 population
- Computer software spending

Country	Rank (GII)
China	2
Singapore	6
Switzerland	10
USA	11
UK	12
Sweden	23
Germany	24
Canada	25
Finland	32
Australia	66

Knowledge diffusion

- Royalty and license fees
- High tech exports
- Computer and communication service exports
- Foreign direct investment net outflows

Country	Rank (GII)
Switzerland	5
Finland	6
Sweden	9
Singapore	14
USA	15
UK	18
Germany	20
China	21
Canada	24
Australia	63

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Global Competitiveness Index (GCI)

Country	Basic Requirements	Efficiency Enhancers	Innovation and sophistication factors
Switzerland	3	5	1
Singapore	1	2	13
Sweden	8	7	5
Finland	7	9	2
USA	36	1	6
Germany	9	8	4
UK	24	4	10
Canada	15	6	25
Australia	17	13	26
China	31	31	34

Global Innovation Index (GII)

Country	Input	Output
Singapore	1	18
USA	3	12
UK	4	4
Sweden	5	3
Finland	6	8
Switzerland	7	1
Canada	9	13
Australia	11	32
Germany	20	10
China	46	25

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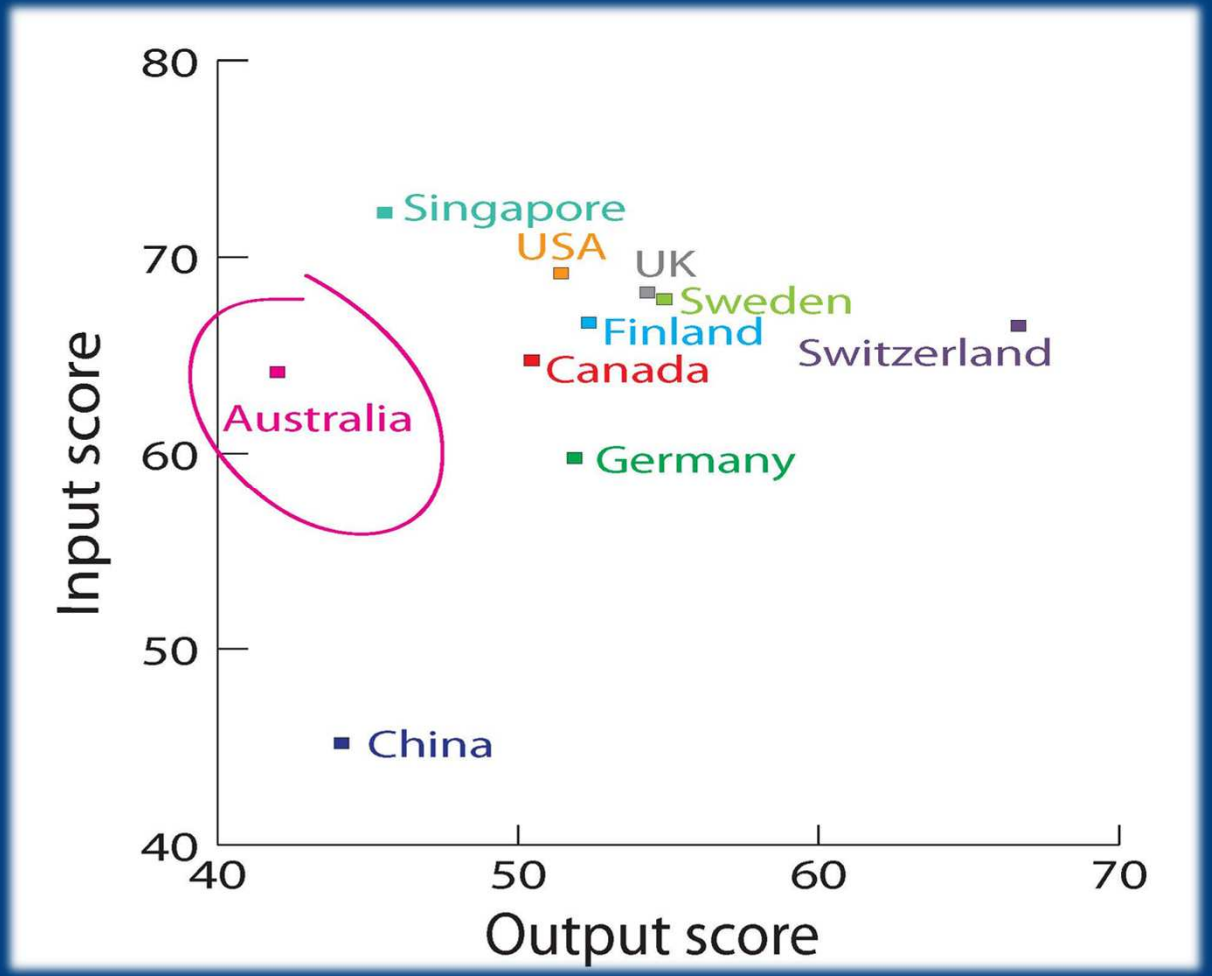
Global Innovation Index (GII)

Country	Input	Output
Switzerland	7	1
Sweden	5	3
Singapore	1	18
Finland	6	8
USA	3	12
Canada	9	13
Germany	20	10
UK	4	4
Australia	11	32
China	46	25



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Some reflections on the innovation indices

Australia is fairly strong on innovation inputs

…and weak on leveraging that into innovation outputs.

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So what might we do?

It's easy to suggest things but hard to get traction & results.

But we could …

- Encourage/value our entrepreneurs & their values
- Encourage gazelles – align incentives e.g. tax, regulations, …
- Remove innovation blockers
- Capitalise on Australia's unique features e.g. energy, minerals, big coastline, new infrastructure …

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