Professor Göran Roos

ADELAIDE thinkers IN RESIDENCE

Manufacturing into the future

UniSA | THE HAWKE CENTRE

www.thinkers.sa.gov.au

Government of South Australia

Address to Parliamentary staff
Wednesday 28 September, 2011

- How is manufacturing changing globally

- What actions does SA need to take in order to ensure a strong manufacturing future?

- What responsibilities fall on Federal, State and firm levels respectively?

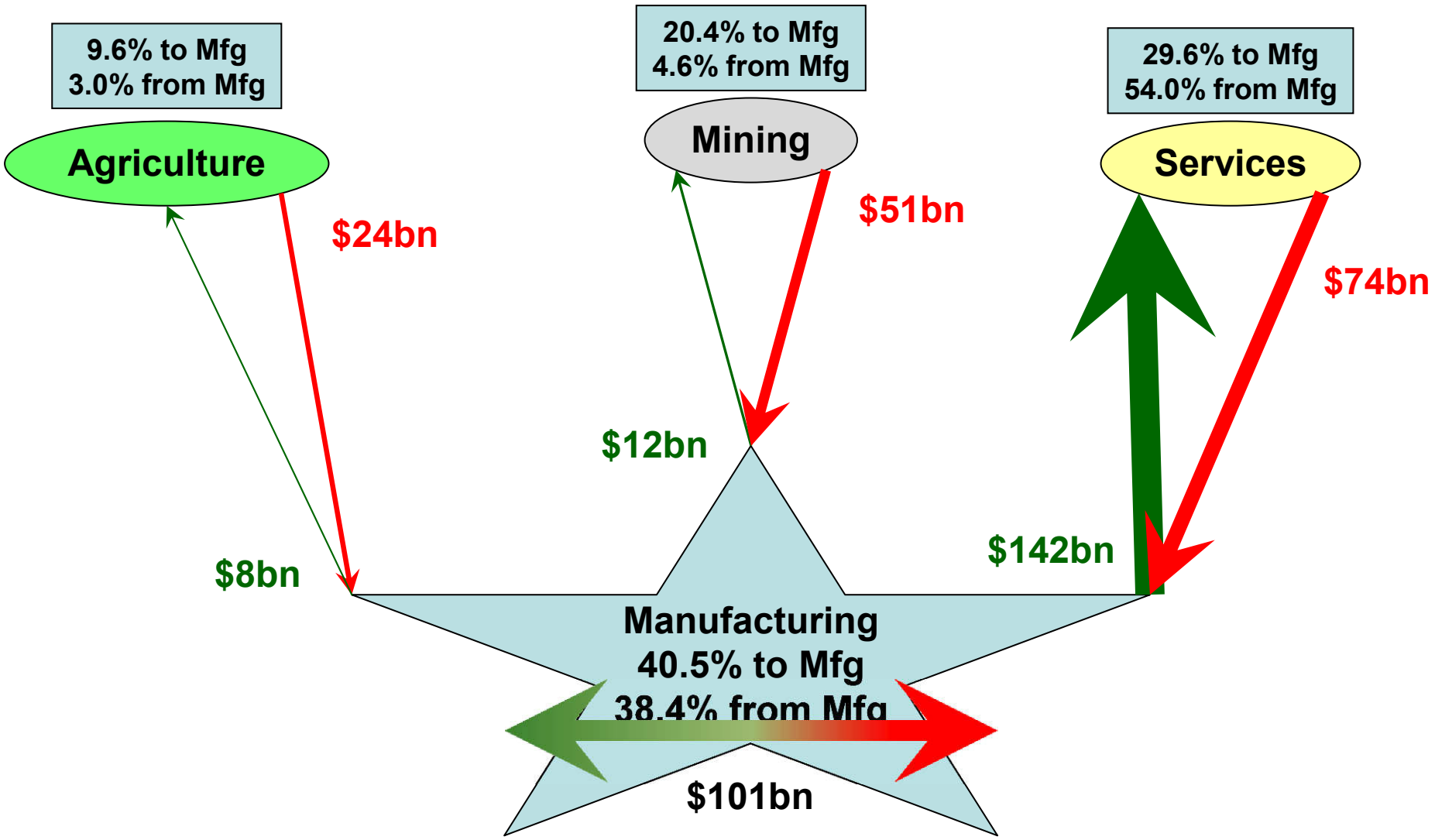
The Big Picture

http://www.celestiamotherlode.net/catalog/images/screenshots/various/earth_Real_color_Earth_surface_1__Shadmith.jpg

The Importance of Manufacturing

- It is the biggest spender of applied research and innovation with spillover effects into the rest of the economy
- It is the key driver of productivity improvement with spillover effects into the rest of the economy
- It makes up the biggest share of world trade and hence is critical for export earnings that pays for the cost of importing things
- It is the largest driver of high value services so is critical for the high end of the service economy but these services demand specialized skills and create few jobs, so their contribution to aggregate employment is bound to remain limited.
- Each job in manufacturing generates on average between 2 and 5 jobs in the rest of the economy

Manufacturing is Embedded in the Australian Economy



Source: ABS Cat. No. 5209.0.55.001, Final release 2006–07 tables

Manufacturing Matters to South Australia

Manufacturing employment by state, May 2011

	Manufacturing % share of total state/territory employment	Number Employed
Victoria	11%	310,000
South Australia	10%	82,000
Tasmania	9%	21,000
New South Wales	8%	286,000
Queensland	8%	179,000
Western Australia	8%	93,000
Northern Territory	3%	3,000
Australian Capital Territory	1%	3,000

Source: ABS Cat. No. 6291.0.55.003, May 2011 (original, detailed quarterly)

"Manufacturing may ultimately be central to the vigor of a nation's democracy"

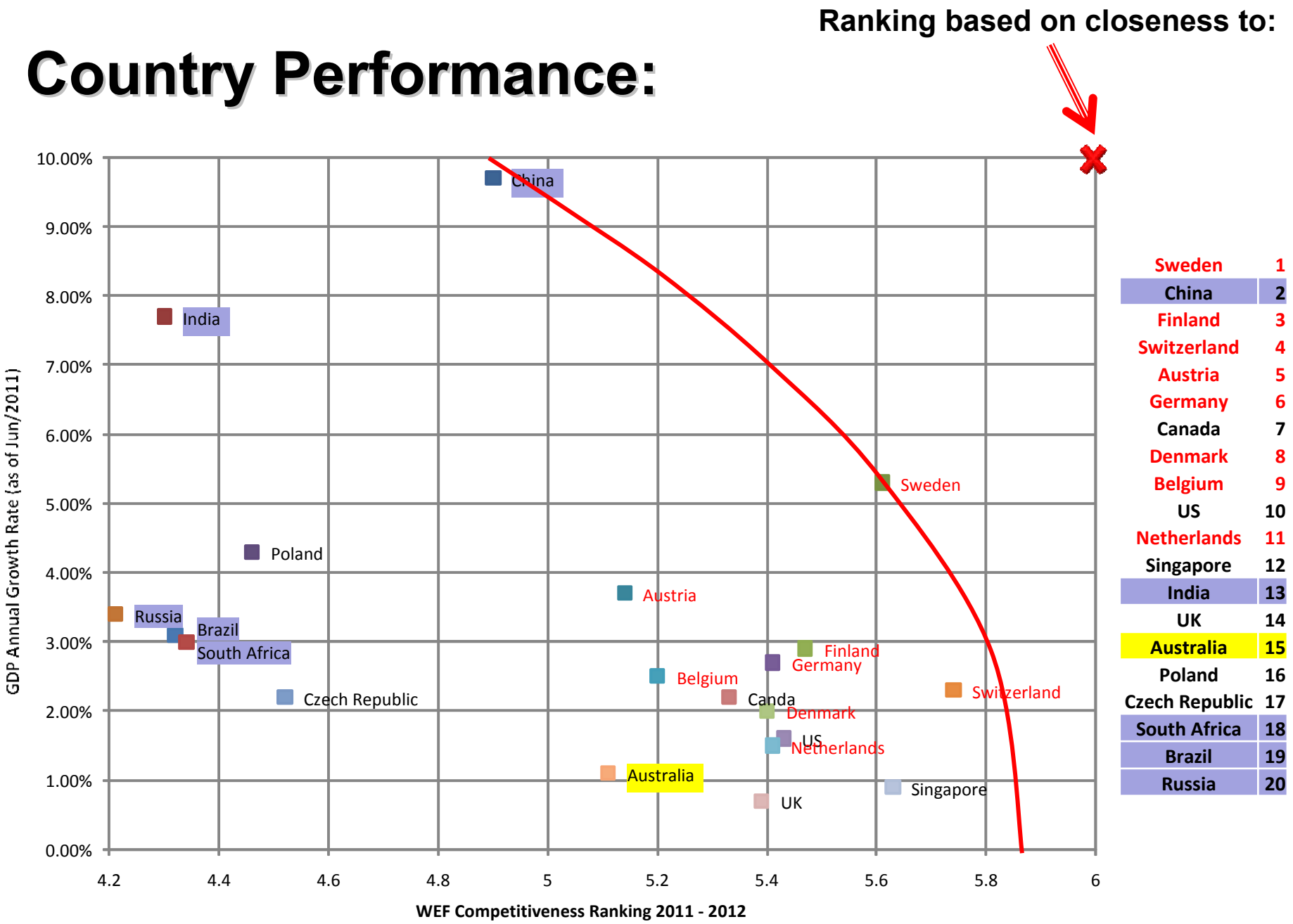
Dani Rodrik
Professor of International Political Economy
Harvard University

Without a vibrant manufacturing base, societies tend to divide between rich and poor – those who have access to steady, well-paying jobs, and those whose jobs are less secure and lives more precarious.

The importance of manufacturing has been realised by all advanced economies, if not before, then after, the global financial crisis

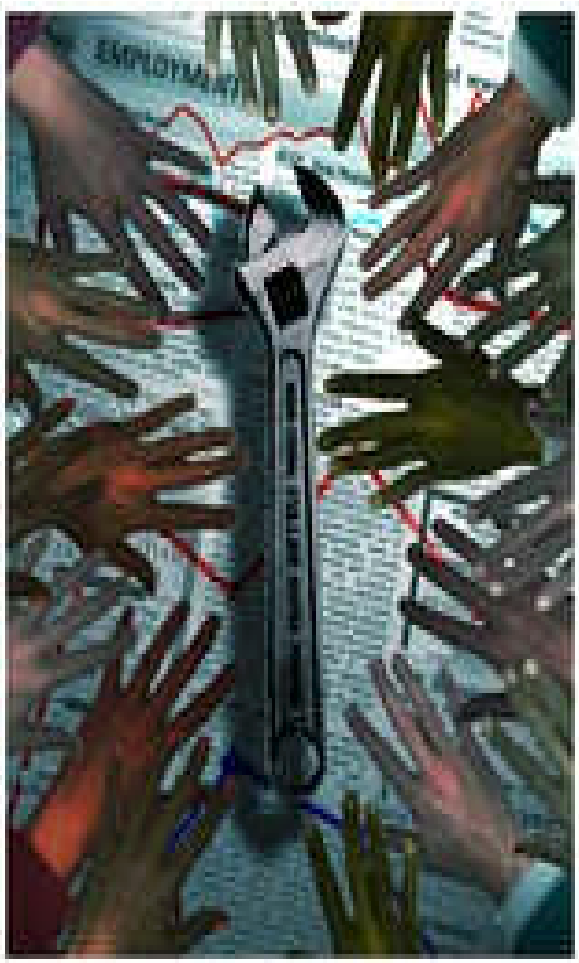
- There has been several call to arms and actions in both Europe and the US but once lost it is incredibly difficult to rebuild manufacturing
- The countries that have recovered best from the global financial crisis are all based around high value added export oriented manufacturing. The European manufacturing belt countries are all expected to grow substantially faster than Australia in 2011.
- Chinese growth is all around export oriented manufacturing (of which only 15% is being exported)

Country Performance:



A Warning Example: The Seriousness of the US situation

- **The shift to global manufacturing and a lasting lack of concern for the health of the U.S. manufacturing sector has led to the loss of 5 million manufacturing jobs in the US since 2000.**
- **Since 1990, manufacturing's share of employment has fallen by nearly five percentage points. This would not necessarily have been a bad thing if labour productivity (and earnings) were not substantially higher in manufacturing than in the rest of the economy – 75% higher, in fact.**
- **At the high end of the service industries that have absorbed the labour released from manufacturing we have finance, insurance, and business services. Taken together they have productivity levels that are similar to manufacturing. These industries have created some new jobs, but not many – and that was before the financial crisis erupted in 2008.**
- **The bulk of new employment has come in "personal and social services," which is where the economy's least productive jobs are found. This migration of jobs down the productivity ladder has shaved 0.3 percentage points off US productivity growth every year since.**
- **Close to half of all manufactured products sold in the United States today are imported; the country exports only a quarter of that volume (of which a large share of input is imported), which has led to a huge, persistent, and growing trade deficit that has reached 11 % of GDP. This deficit is almost entirely attributable to the trade imbalance in manufactured goods.**



Source: Dani Rodrik, The Manufacturing Imperative , Project Syndicate, 2011, www.project-syndicate.org

A healthy manufacturing sector is a must for any advanced economy with ambitions to maintain economic and social wellbeing

Manufacturing is Frequently Misunderstood

The Changing Shape of Manufacturing

+

The Outdated Lens of Public Statistics

+

Decision Makers and Opinion Makers with Insufficient Knowledge around Technology, Business and Behavioural Economics

=

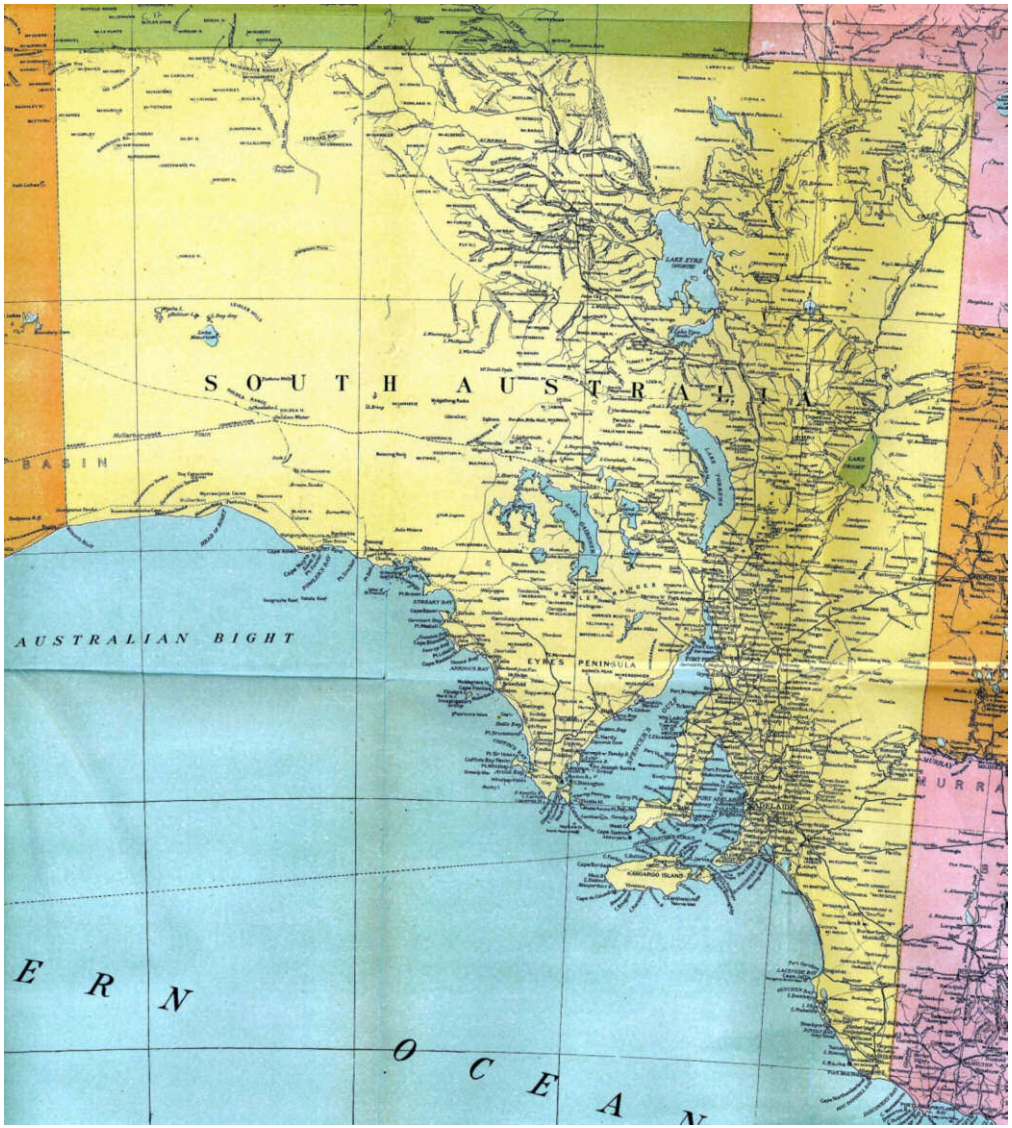
Erroneous Conclusions

(e.g. *manufacturing is dying, we can live without manufacturing, the future is in services, the resource sector will be our future*)

Moving to Solutions Selling

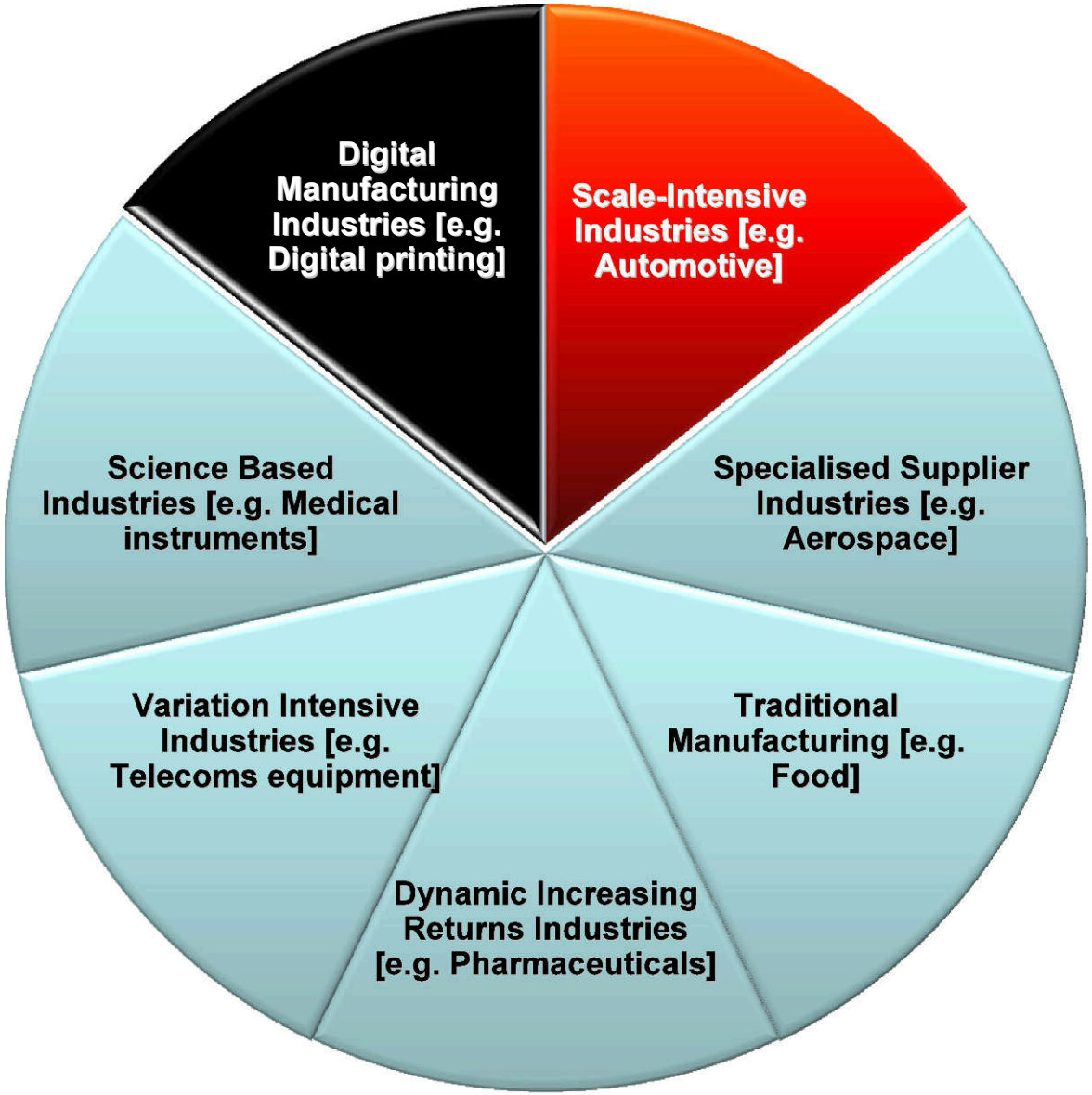
Manufacturing
is in decline in some but not in all OECD countries

The Intermediate Perspective

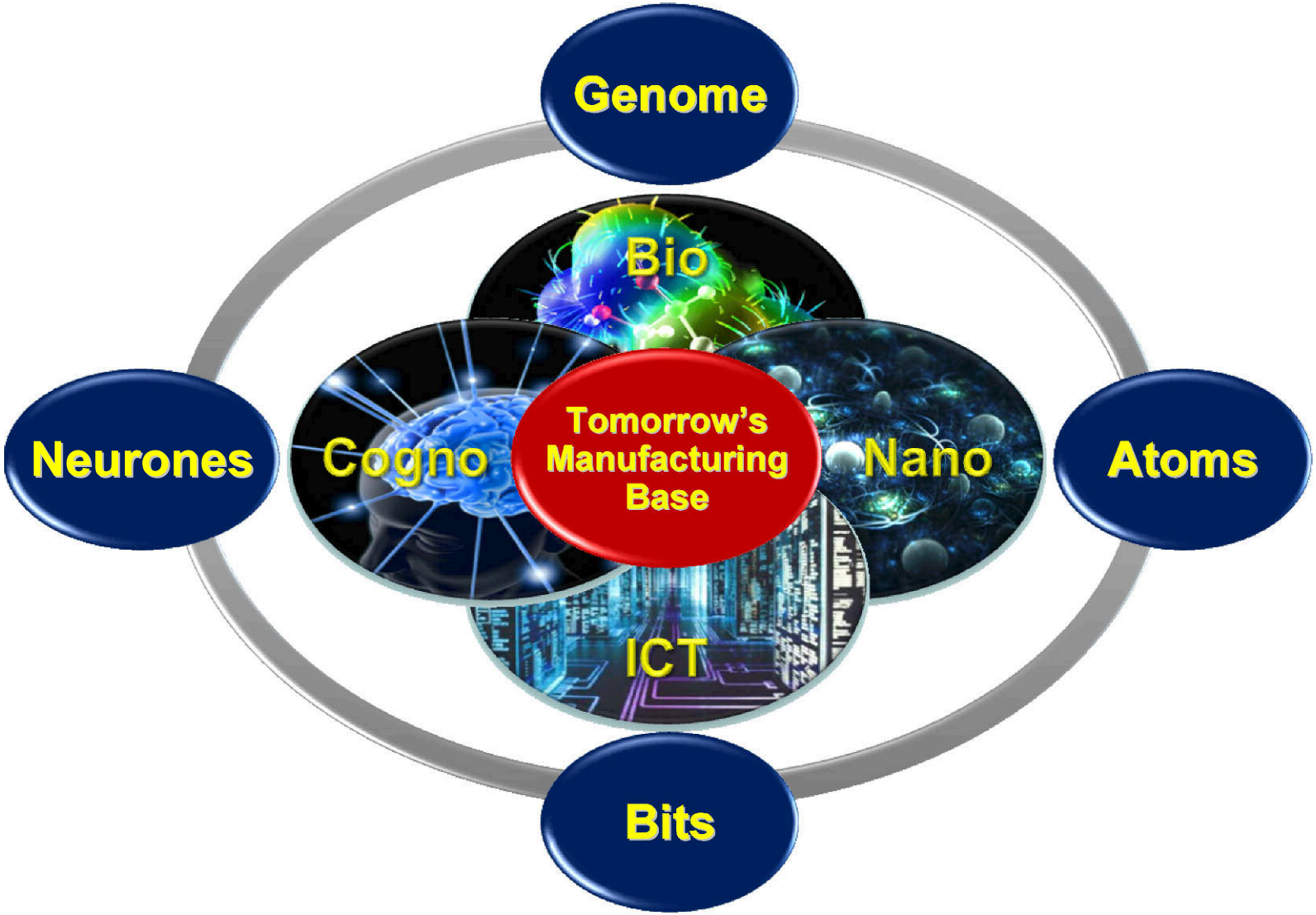


http://www.britishempire.co.uk/images3/southaustralia1916map.jpg

There are many different types of manufacturing business



All Impacted by Converging Technologies



Generating New Business Opportunities

Huge opportunities for SA in high value added export oriented value chains originating in inputs with comparative advantage:

- **Wheat**
- **Wool**
- **Grapes**
- **Wood**
- **Minerals**
- **Biomass**
- **Etc.**

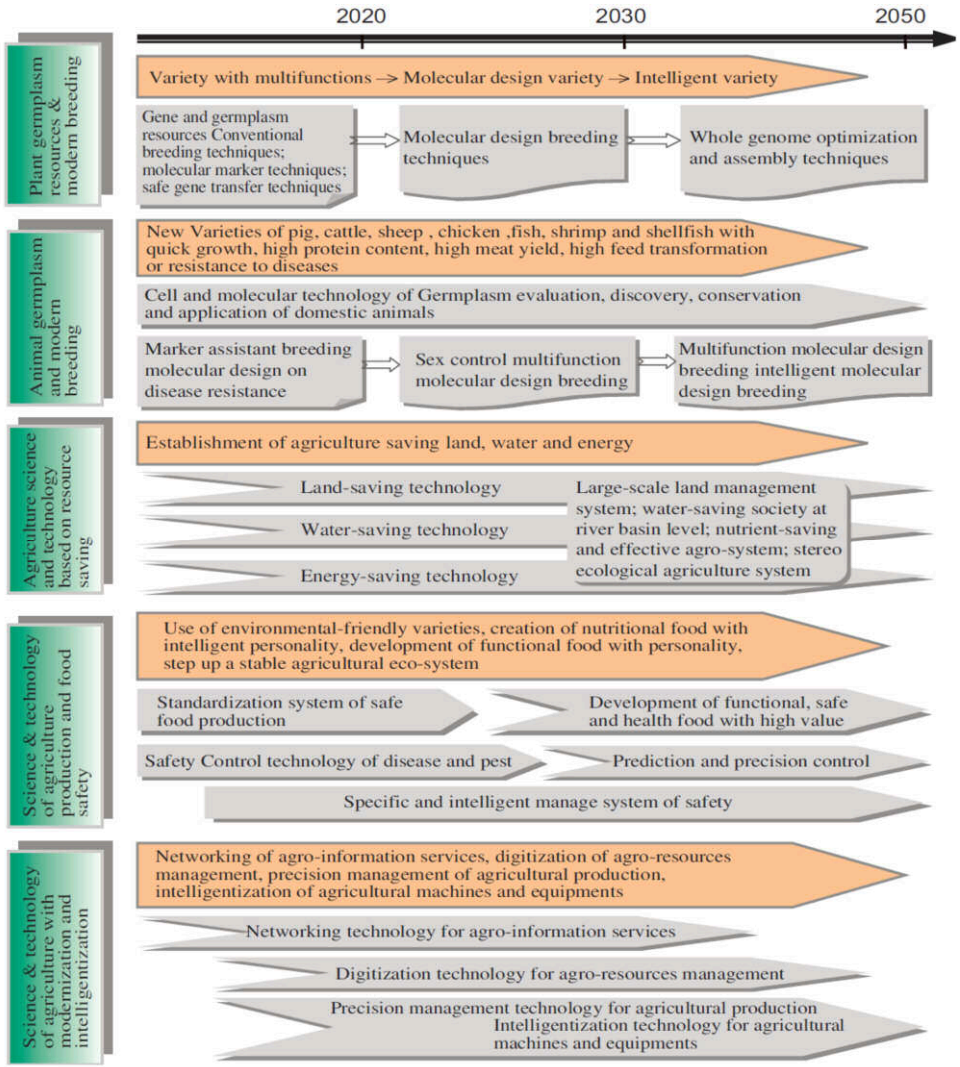
Others are working hard: European Manufacturing Focus for the Future

- The Eco-Factory: cleaner and more resource-efficient production in manufacturing
- Cooperative machines and open-architecture control systems
- Smart Factories:
  - Integrated process automation and optimisation for sustainable manufacturing
  - applications based on context-aware ICT and scalable networks of sensors
  - robotics-enabled production processes
  - laser applications
  - plug-and-produce components for adaptive control
- Supply chain approaches for small series industrial production
- Towards zero-defect manufacturing
- Manufacturing chains for nano-phased components and coatings
- Intelligent, scalable manufacturing platforms and equipment for components with micro and nano-scale functional features
- New human-robot cooperation in advanced factory environments
- Sustainable maintenance of production equipment
- Innovative re-use of equipment and integrated factory lay-out design
- Production using environment-neutral materials [Tonsley Park]
- Manufacturing of engineered metallic and composite materials

Source; Industrial Technologies conference: integrating nano, materials and production, *Brussels, 7-9 September 2010*

Chinese Manufacturing Industry Focus for the Future

Category		By around 2020	By around 2030	By around 2050
Advanced manufacturing	Manufacturing level	Dependence ratio of manufacturing technology on foreign countries <30%	Dependence ratio of manufacturing technology on foreign countries <20%	Dependence ratio of manufacturing technology on foreign countries <5%
	Equipment manufacturing	High dependence of key and important equipment on import will basically be changed.	Research, development and production of key and important equipment will basically satisfy the domestic needs.	China will have the world top-class ability to design and manufacture key and important equipment.
	Manufacturing intelligentization	Automated manufacturing with ubiquitous sensing will be extensively used to raise the productivity at 10% more.	The intelligent control and management system with man-machine harmony will be established.	Production system with intelligent machine and autonomous control will be implemented.



Yongxiang Lu, Editor-in-Chief, 2010, Science & Technology in China: A Roadmap to 2050, Strategic General Report of the Chinese Academy of Sciences, Chinese Academy of Sciences, Science Press Beijing

What about the threat of offshoring?

- **The majority of our revenues come from abroad, yet we continue to innovate and manufacture many products in Switzerland due to the outstanding base of engineering and technical talent here.**

  President of the Schindler Group

- **As long as the total cost of Labour does not exceed 15% of our cost base the disadvantages of offshoring outweighs the advantages**

  R&D Director, Scania

Source: Interviews with top executives and experts of 25 leading Swiss manufacturing companies, business organizations, think tanks, and research institutes; joint study of the Swiss-American Chamber of Commerce and Booz & Company
Interview with Scania by G. Roos

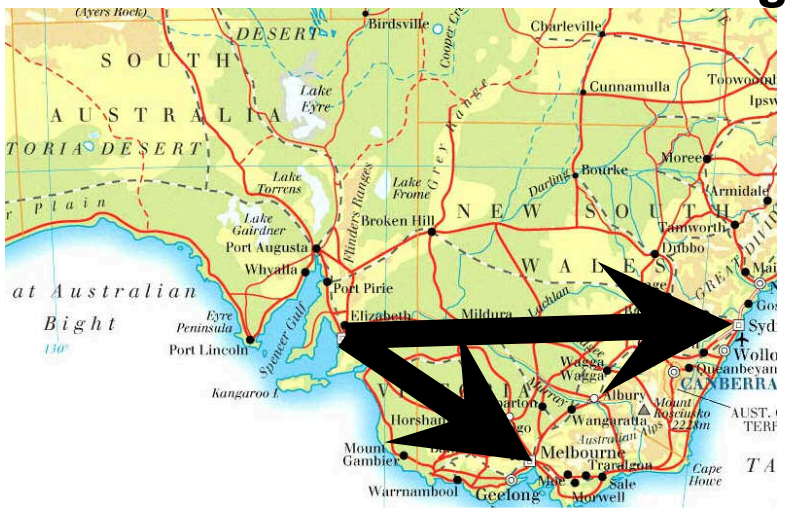
Manufacturing is changing to become very different from what it has been

The problem of being a small economy and generating appropriate response

- A small economy does not have the opportunity of a large economy to spontaneously generate the optimal or somewhat optimal response to change and left to its own devices the small economy as a whole will decline unless there is outside intervention from e.g. government.
  - In simple terms it could be expressed that the need for government intervention in the form of industrial policy is larger the smaller the economy
  - or in neo-classical economic terminology: The smaller the economy the more pervasive market failure is as an attribute of the economy as a whole.

The problem of being a small economy and retaining firms

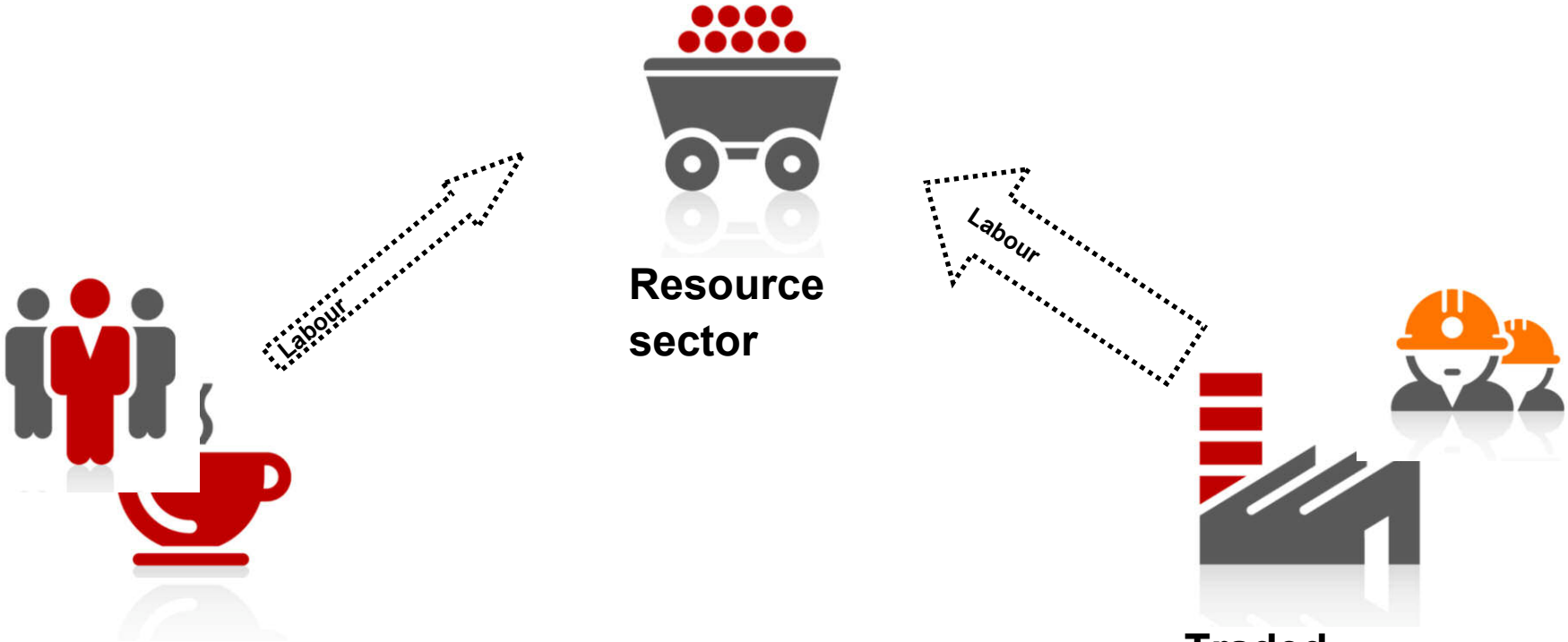
- **Since both access to new knowledge and access to lead customers are substantially higher in a large economy than a small one it is likely that a firm, over time, will move from a smaller economy to a larger one.**
  - **This relocation decision is also impacted by the ownership structure of the firm. If the firm is owned by one individual with a high preference for a given location, this may well nullify the rational choice, whereas if the decision making power rest in a group of diverse individuals with no location preference it is more likely that the rational choice is made.**
- **This means that the need for proactive government intervention in the form of industry, innovation and research policy is very high in order to ensure a strong diversified local manufacturing.**



The role of government in a small economy is by necessity and justifiably more interventionist

Dutch Disease

The National Economy



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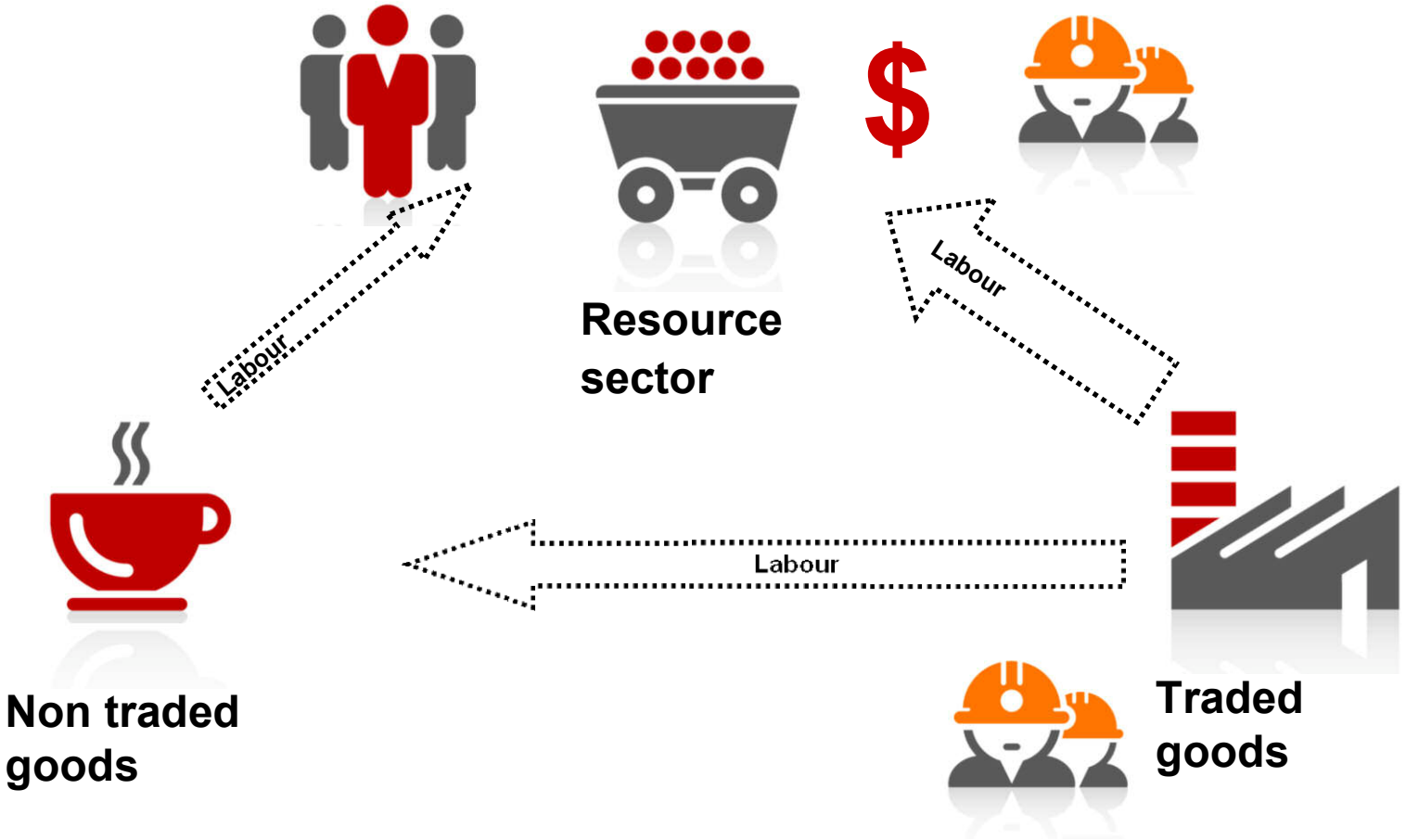
Dutch Disease

The National Economy



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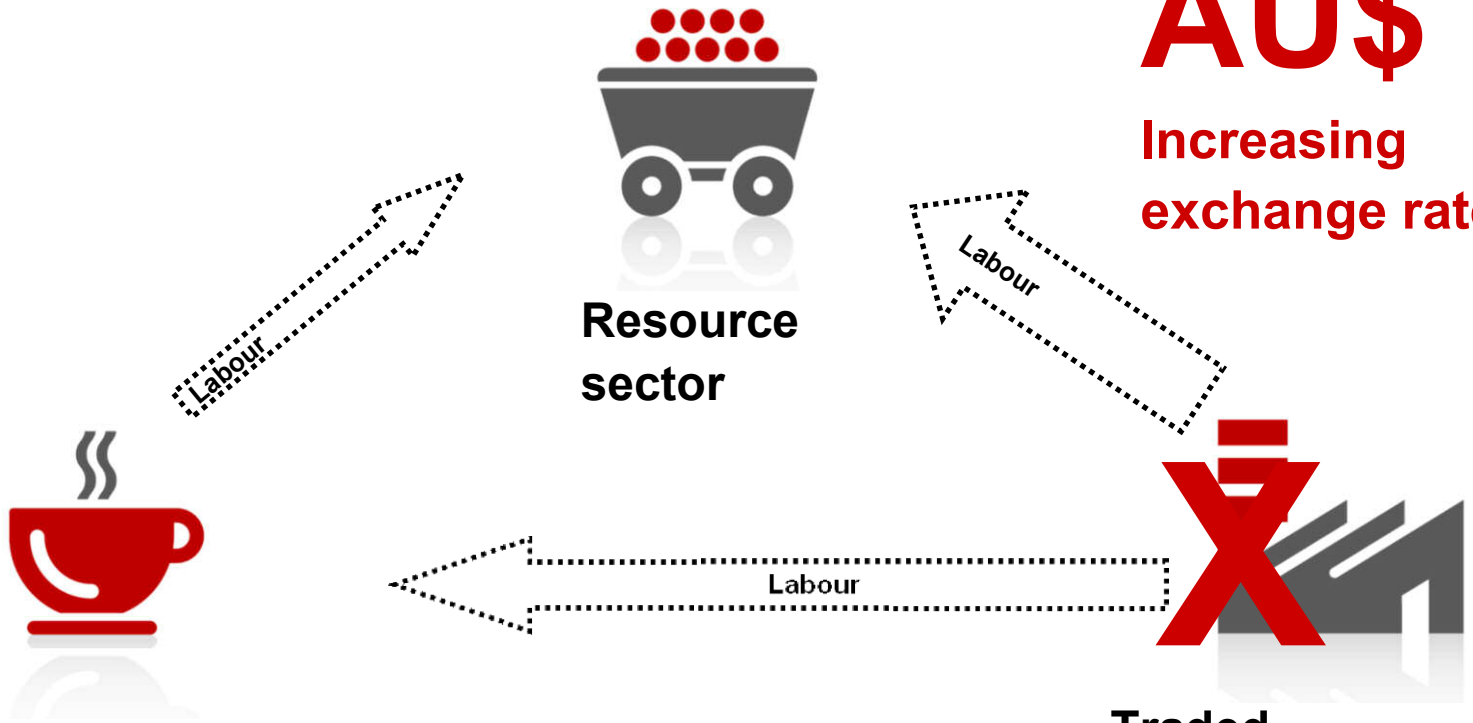
Dutch Disease

The National Economy

AU$

Increasing exchange rate



Resource sector

Non traded goods – prices increase

Traded goods – price increases not possible

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Allowing this shift away from manufacturing to happen will be detrimental to the long term wellbeing of the nation since:

- It takes longer and is much more complex and complicated [and hence costly] to re-build a competitive manufacturing industry than it is to allow it to die.
- A case can be made that the cost of regaining a lost competitive manufacturing sector can be higher than the net gains from the resource boom.
- This is due to the relatively lower speed of technology growth in the booming resource sector [15:1] and the non-traded goods sector as compared to the traded goods sector. [3:1].

The role of government in ensuring the future of the manufacturing sector in an emerging Dutch disease reality is critical

So far we have shown that

- A healthy manufacturing sector is a must for any advanced economy with ambitions to maintain economic wellbeing and social cohesion
- Manufacturing is not in decline in the OECD world in spite of what the statistics shows
- Manufacturing is changing to become very different from what it has been which is one reason for the statistical error
- The role of government in a small economy is by necessity and justifiably more interventionist
- The role of government in ensuring the future of the manufacturing sector in an emerging Dutch disease reality is critical

Key Recommendation

Develop and Implement an active integrated Industry, Innovation & Research Policy enabling a high value added, diversified export oriented manufacturing industry in South Australia

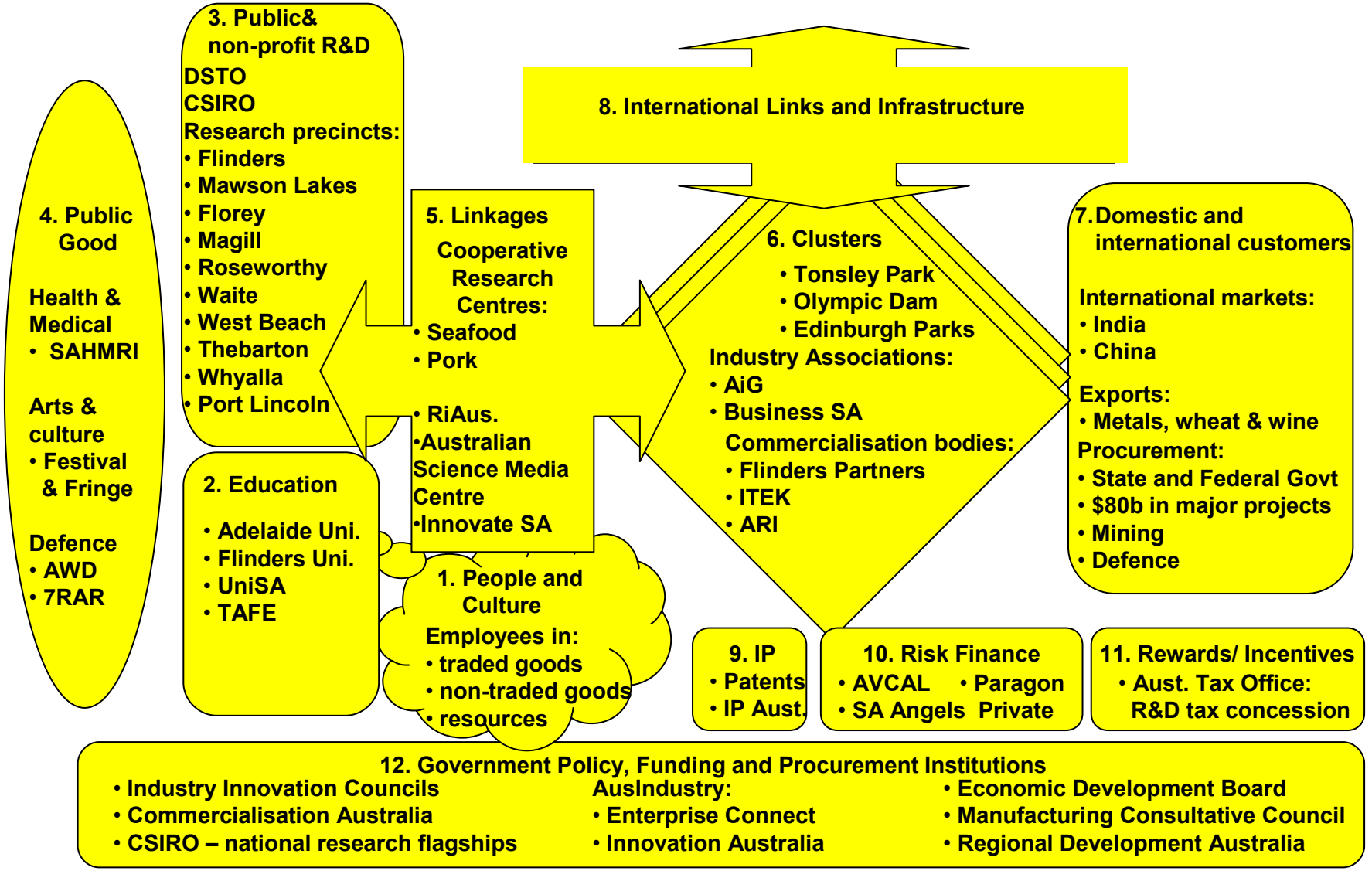
The work on this manufacturing strategy has begun

An Active Industry, Innovation and Research Policy is needed to Secure South Australia's Short- and Long Term Future

This Policy Needs to be:

- **Fact Based using**
  - Data
  - Foresight
  - Understanding, Insight and Competence
- **Developed in a Structured Way, Ensuring Dialogue, Anchoring and Continuity**
  - Industry, Innovation & Research Council
- **Implemented With Clear Objectives and Responsibilities**
  - A Better Performing Innovation System
  - Clarifying the Role of Cabinet, DTED and its delivery agencies: Macro, Meso & Micro
- **Using a Balanced Portfolio of Supply and Demand Side Tools**
  - Put in Place a beneficial Industry Engagement Policy
  - Initiate Cluster Policies
  - Implement a South Australian version of the SBIR program

A key necessity for a successful policy for industrially based economic growth is a well functioning innovation system

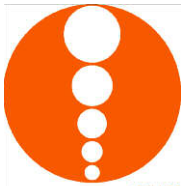


Examples only

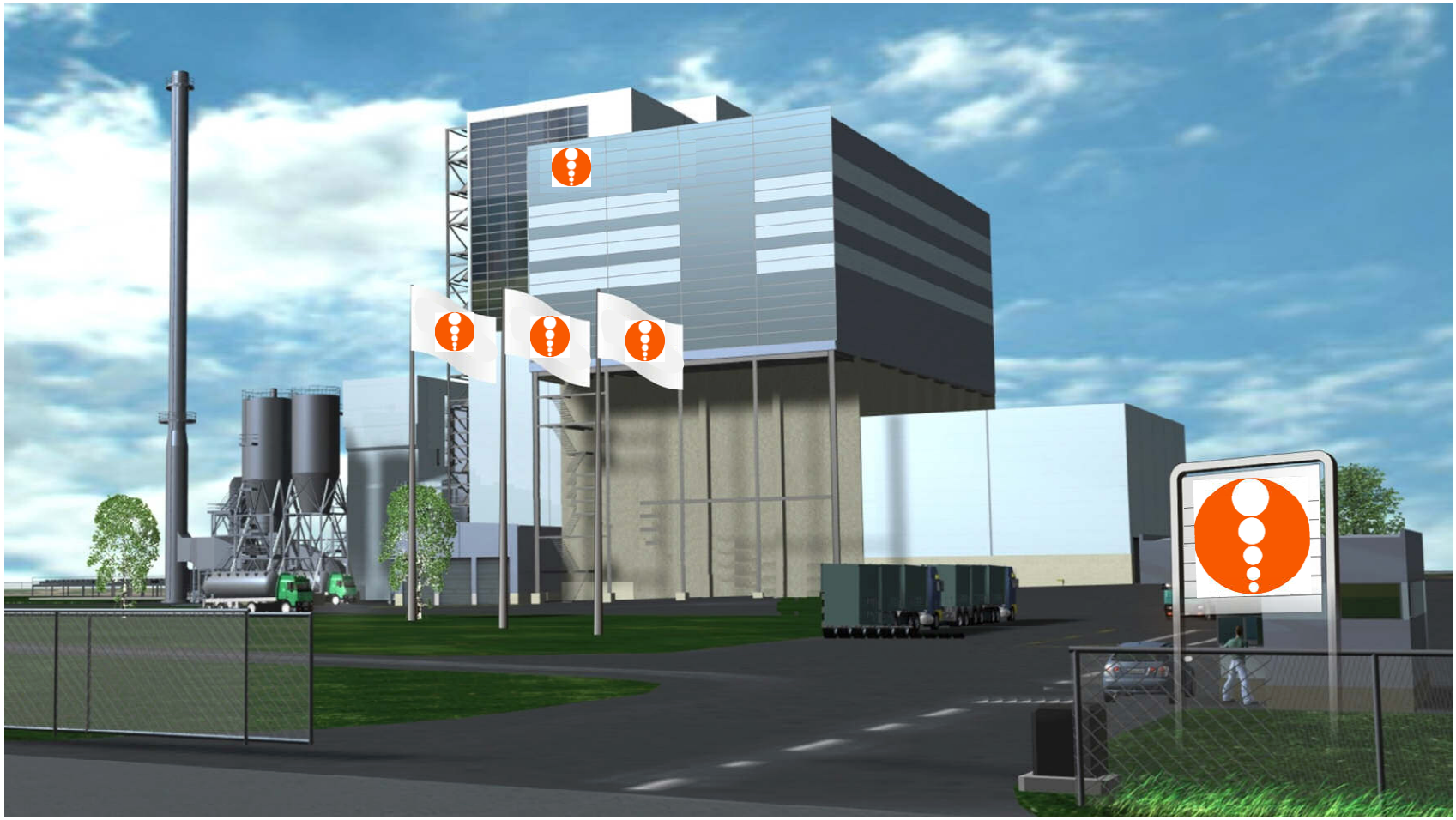
Courtesy of Rebecca Murrie

Key actions are

- **Identify Lead Customers (frequently Public Sector entities e.g. Hospitals, SA Water etc.)**
- **Target the SA location of Lead Customers in key cluster domains [get them here!]**
- **Target the SA location of leading international Research & Technology Organisations in key cluster domains [get them here!]**
- **Influence and facilitate the interaction between SA universities & research institutes and firms in key cluster domains**



The Detailed Picture



http://www.fortum.lt/uploads/images/klaipeda/elektrines%20maketas%201.jpg

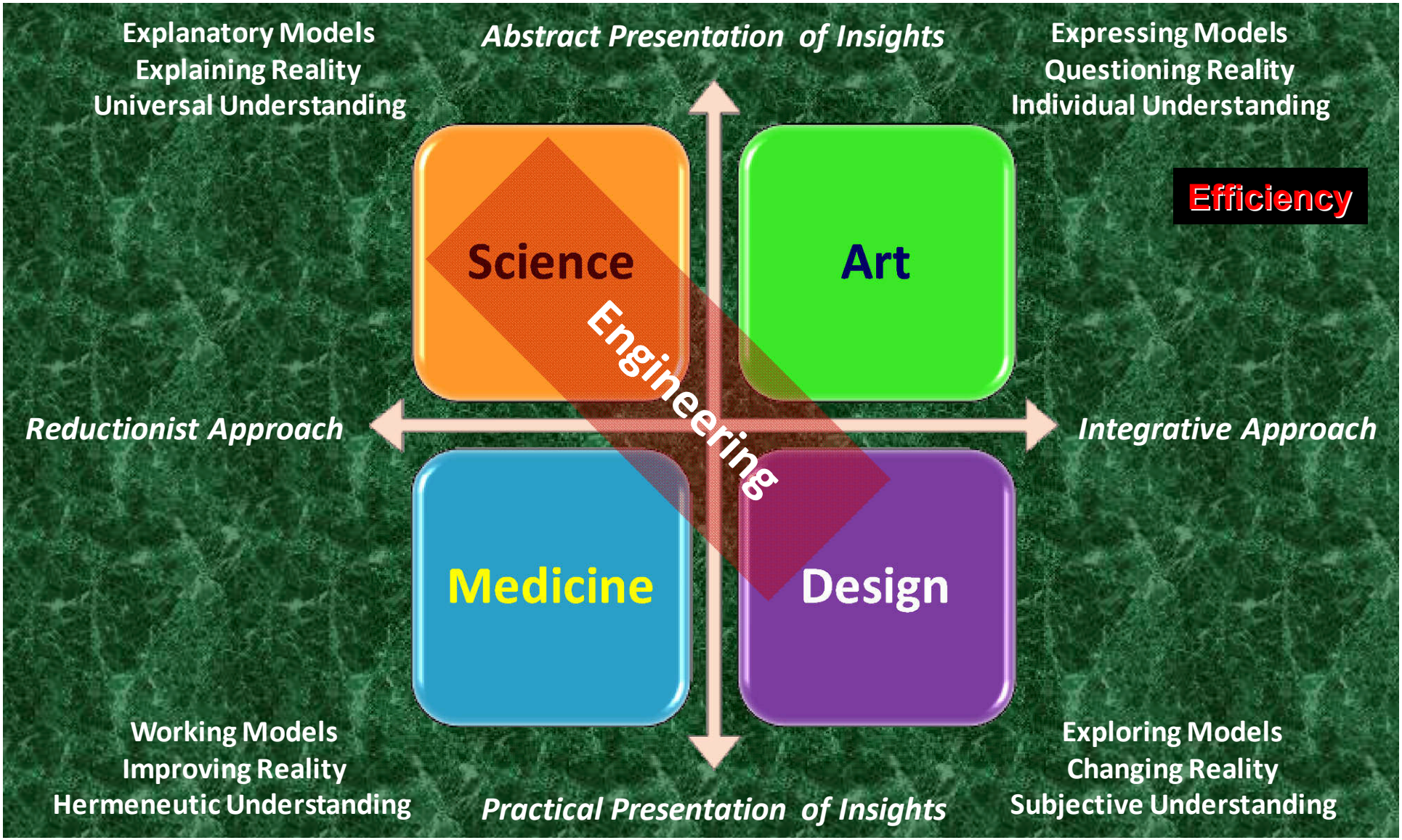

On the firm level there is a need
to encourage better innovation
& management competence

Aim for High Value Add, Low Volume, Niche Product-Service-System Offerings

- Understand the distinction between services and solutions
- Innovate to generate high Value Add
- Innovate to Appropriate the Value Add Generated
- Work Collaboratively and Globally
- Develop/Acquire and Leverage Superior Management Capability, Intangible Resources and Tangible Assets
- Develop Low Resource Footprint Closed-Loop Production Systems in Industrial Symbiosis Clusters
- Ensure organisational flexibility to rapidly adapt to changing market needs – including changing technologies and inputs used.
- Develop the BRICS as export markets

Based on: Future Manufacturing Industry Innovation Council,
Discussion paper: Trends in manufacturing to 2020, Draft, 19 Sep 2011

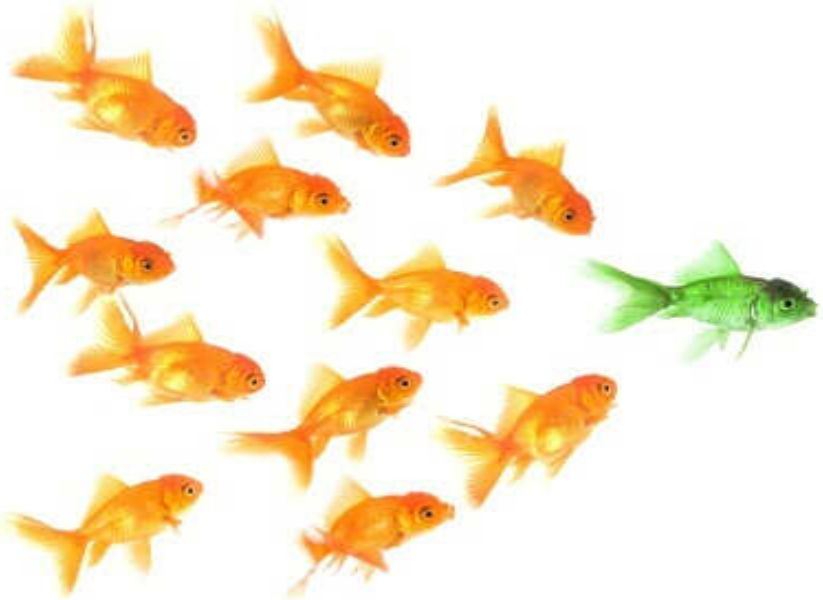
Routes to added value



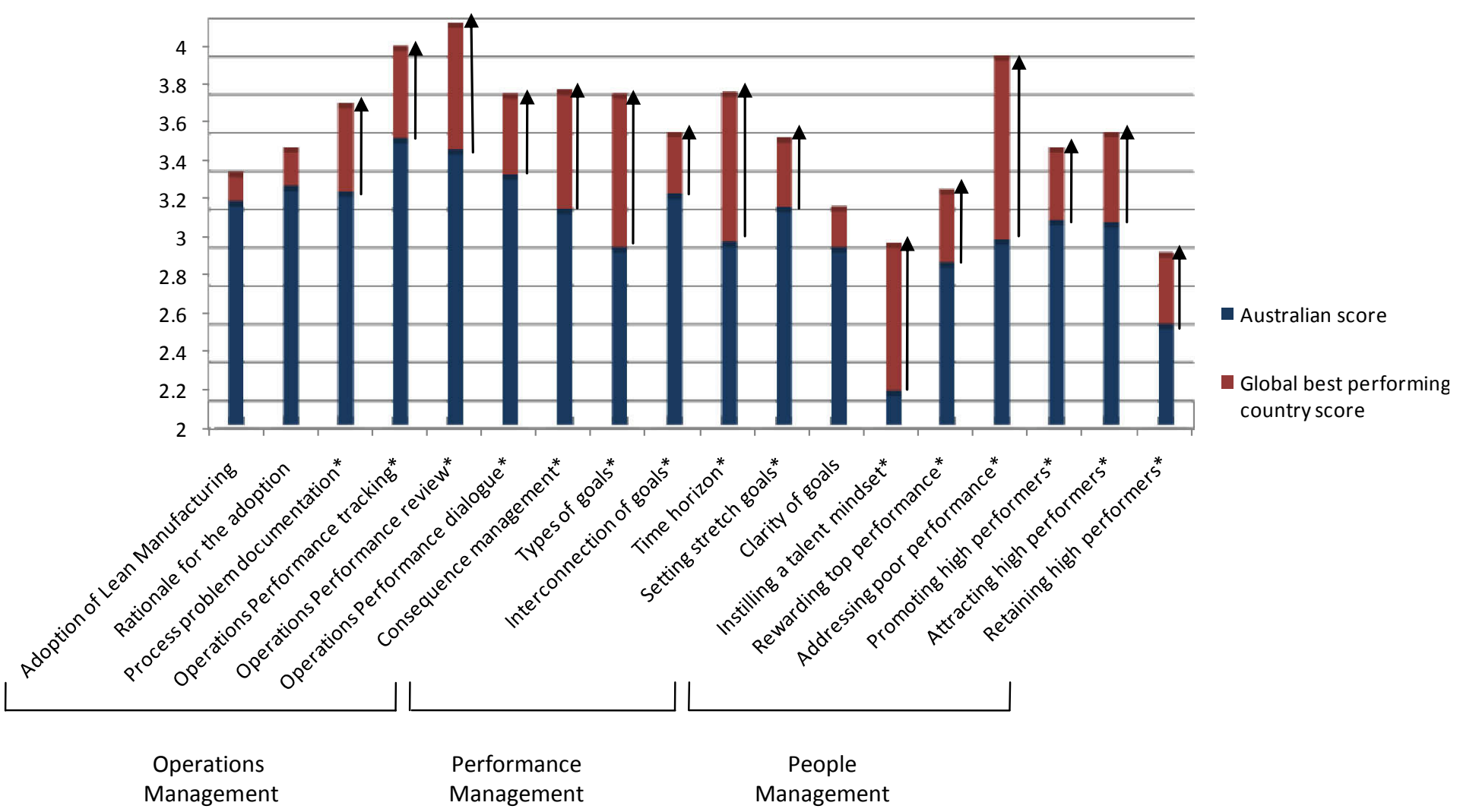
Routes to higher value appropriation

- **Effectiveness**

- **Business Model Innovation**



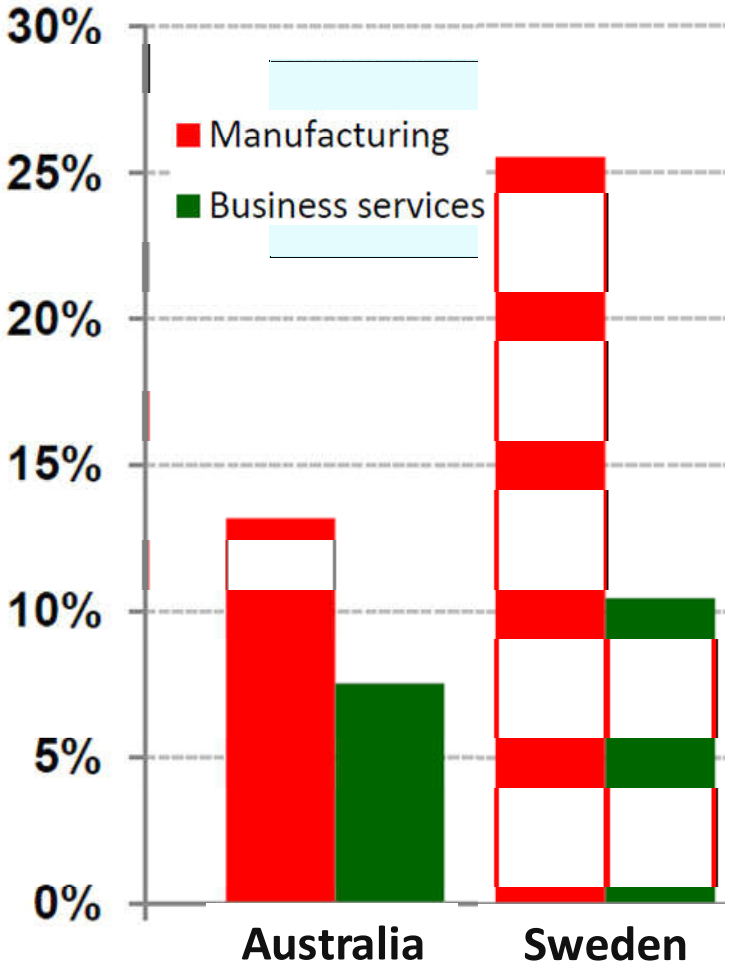
Encourage the narrowing of Australian management performance gaps



Extracted from slide No. 17 in Green, R., 2011, Future of manufacturing – management, innovation and productivity, Presentation, Australian Chambers Business Congress Gold Coast Convention Centre, June 1-3 2011

On the firm level there is a need to encourage more investment in intangibles

Intangible investments in manufacturing and business services



Intangible Investments = Investments in:

- **R&D**
- **ICT**
- **Organisational Structures**
- **Design**
- **Brand Equity**
- **Education and Training**

Edquist, H., 2011, Intangible investment and the Swedish manufacturing and service sector paradox – what can Europe learn?, Research Institute of Industrial Economics, Stockholm, Sweden

Example of what can come out of collaboration between a firm and a university:

SMR has in co-operation with the University of South Australia developed a plastic mirror solution by pioneering an innovative plastic coating system and process for plastic surfaces. Plastic mirrors are much lighter than conventional glass mirrors and present many advantages.

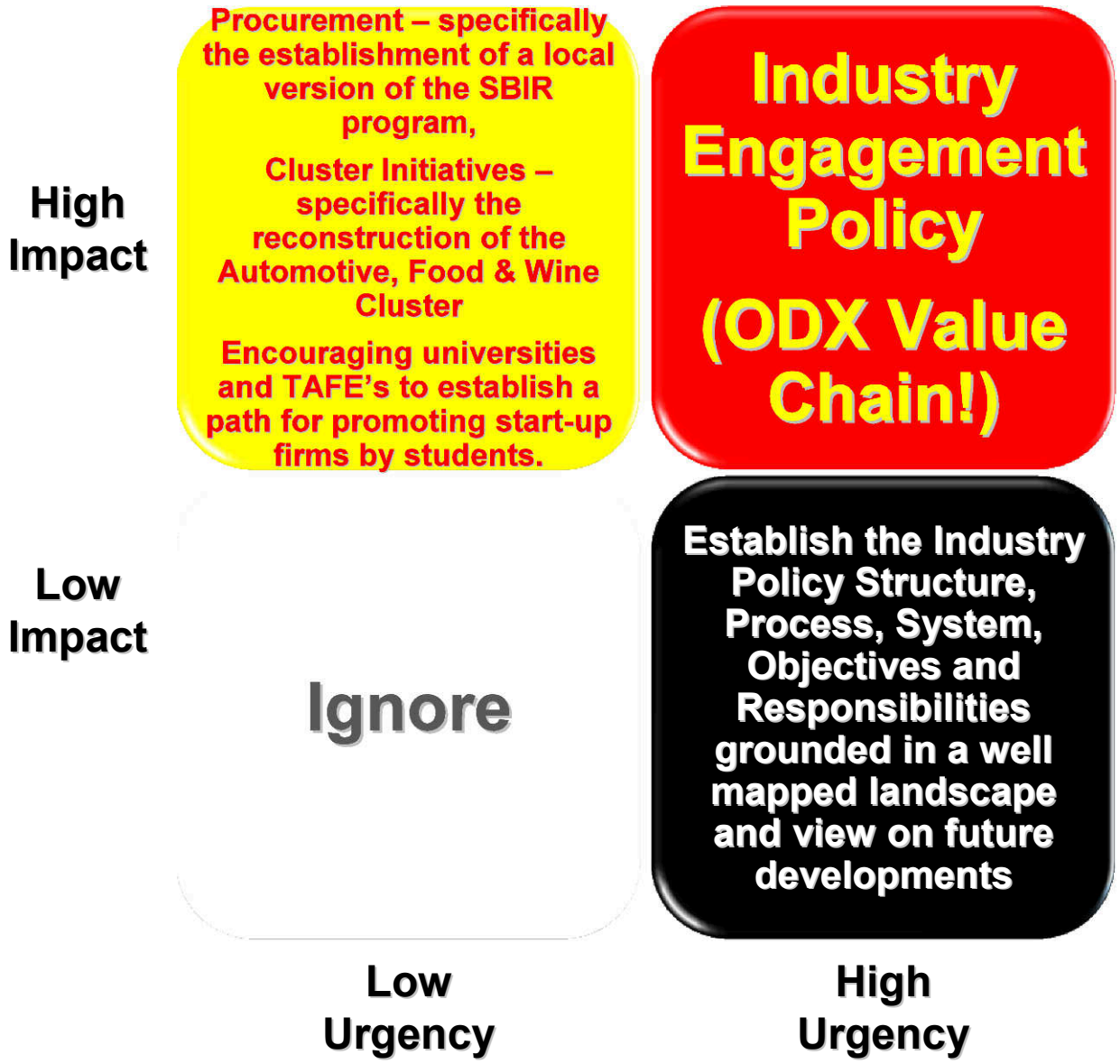
- No optical interference under any lighting conditions
- Environmental and functional durability, including accelerated UV weathering to meet the most stringent automotive requirements
- Achieving performance equivalent to first surface chrome glass, acceptable abrasion resistance and coating adhesion through automotive specifications

plasticglass

Samvardhana Motherson Reflectec

Principle Recipe for Firm Success

All in all there are about 50 recommendations of which the following are critical



I have a great belief
in the future of South Australia
but
the good outcomes
will not happen by themselves

DOING NOTHING IS NOT AN OPTION

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