

# Investing in R&D and innovation in developing countries for addressing societal challenges

José Guimón

Department of Development Economics

Universidad Autónoma de Madrid, Spain

[jose.guimon@uam.es](mailto:jose.guimon@uam.es)

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# Presentation outline

- Introduction
- Why is R&D investment important in developing countries?
- And why should the public sector intervene?
- Social innovation as a priority for low-income countries
  - Dimensions of social innovation
  - ‘Grand challenge’ thinking
  - ‘Small challenge’ thinking
- Conclusions

# Sussex Manifesto, 1969

- An advisory note to the UN, very influential in framing thinking about development and technological change
- Geographical concentration of inventive inputs in high income economies means that **technological progress is biased** towards needs of rich consumers, generating large scale and capital intensive technologies which are **not appropriate** for low income countries
- Underinvestment in R&D in low income countries is exacerbated by the “**external brain-drain**” of talent to high income countries
- There is also an “**internal brain-drain**”: domestic S&T systems, (largely publicly-funded) modelled on advanced country standards, with little impact on local economic needs

## R&D in developing countries has increased substantially since 1970

	1970	1990	2002	2009
% of global R&D expenditure (\$PPP)	2	10.2	17.5	27.1
R&D expenditure (% of GDP)	n.a.	0.7	0.8	1.1

Source: Kaplinsky 2011, Table 2, for 1970 and 1990. UNESCO (UIS), 2014, for 2002 and 2009.

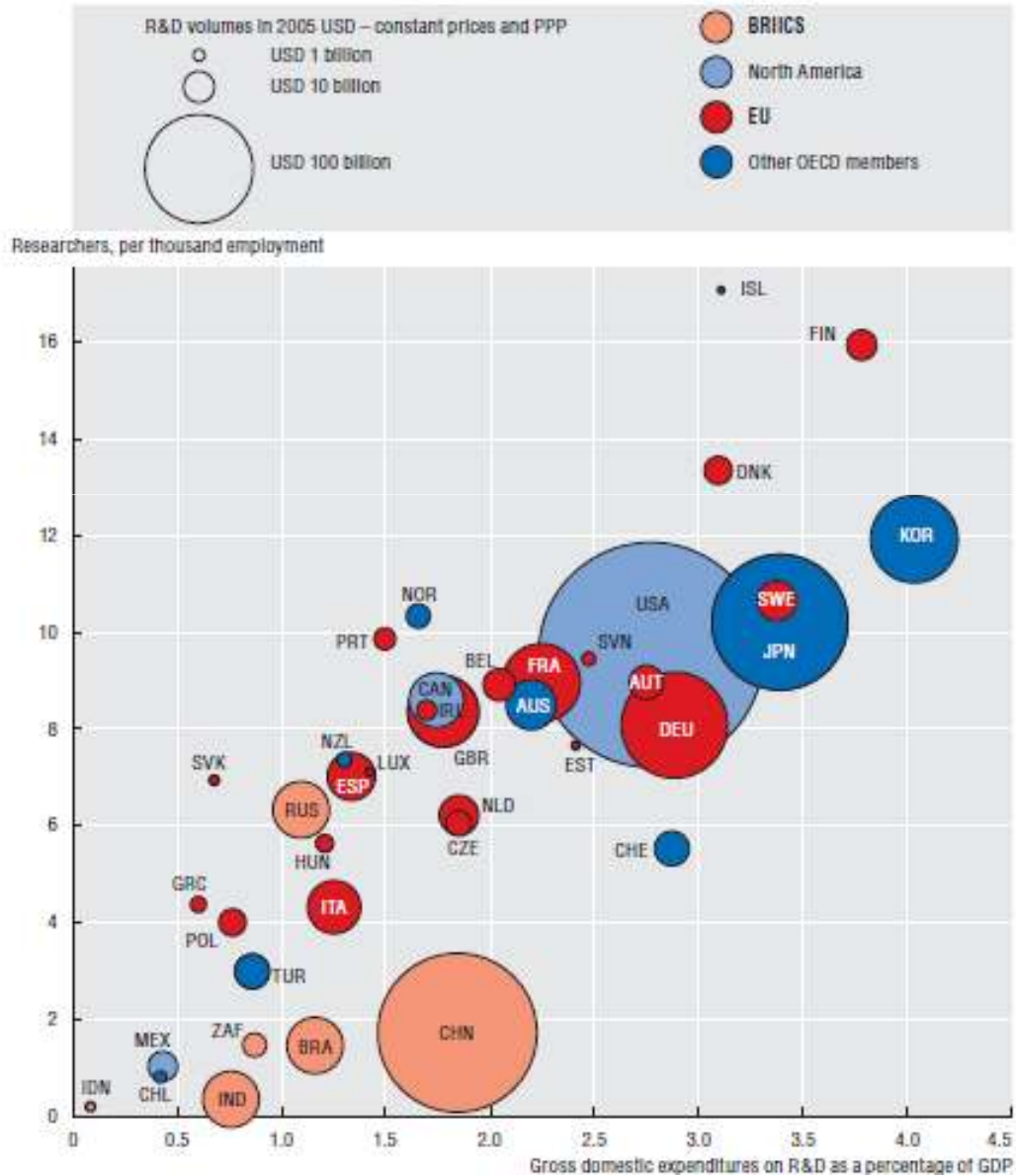
## But it remains very low compared to developed countries

<i>R&amp;D expenditure per capita in USD (current, ppp)</i>	2002	2007	2009
World	126	173	187
Developed countries	543	723.1	757
Developing countries (excl. least developed countries)	31	58	72
Least developed countries	1.8	2.3	2.6

Source: UNESCO, UIS 2014

# And much of the increase is explained by BRICs

44. R&D in OECD and key partner countries, 2011



Source:OECD, 2013

# Why is R&D investment important in developing countries?

- R&D can contribute to the development of domestic industry and agriculture (**competitiveness and productivity agenda**)
- R&D can contribute to addressing societal challenges like water and energy supply, health, etc. (**social agenda**)
- Catching-up based merely on acquisition of foreign technology is sub-optimal (Bell and Albu, 1999)
- The two faces of R&D - not only generation of new knowledge, but also **absorptive capacity** (Cohen and Levinthal, 1990)
- The interrelationship between R&D investment, high level **education**, and the creation and retention of a **scientific community**
- R&D is key to foster **diversification** of the economy towards higher value added activities, and this **structural change** is key to economic prosperity (Hausman and Hidalgo, 2011)

# And why should governments intervene?

- To compensate low levels of private investment in R&D
- To address societal challenges

## **Evolving rationales for innovation policy:**

- *Market failures* (Arrow, 1962)
- *Systemic failures* (Smith, 2000)
- *Public value failures* (Bozeman and Sarewitz, 2011)

***Key challenge:*** *Need for a compelling rationale (supported by ongoing evaluations) to be able to advocate for the continuation and expansion of R&D investments given competing development agendas, other more acute social needs, and severe financing constraints.*



# Dimensions of social innovation

- Social innovation as innovative responses to unmet social demands
  - Targets needs of segments of society that are more vulnerable, less able to be involved in the market economy, and poorly served by public services.
  - Related to **inclusive innovation** and **pro-poor innovation**
- Social innovation as innovative responses to societal challenges
  - Innovation to bear on challenges facing society as a whole, often on a global scale
  - Connected to **grand challenges** and **sustainability** agenda
- Social innovation as innovation to achieve systemic transformation of society
  - Innovation to contribute to the re-shaping of society itself, including policies, organizational structures, institutions and processes, delivery systems and services, methods and ways of working, etc.
  - Social innovation outputs contribute to the reform of society in the direction of a more widely participative arena

# 'Grand challenge' thinking

- Grand challenges as an increasingly popular feature of science policy around the world
  - Identification of grand challenges for priority setting, leading to mission-oriented research programs in areas like climate change, transport, energy, ageing populations...
- Addressing these complex, open-ended research areas require reconfiguration of science systems and policies
  - “Designing research policy for grand challenges requires a long-term perspective and a broader notion of innovation than is usual” (Kuhlmann and Rip 2014)
  - “The agenda-setting, coordination and conduct of science, and the ways in which scientific knowledge is diffused and used, are critical” (Keenan et al. 2013)
- In developing countries, grand challenges are associated with MDG agenda
  - Charities such as Gates Foundation (with its focus on health in poor countries) play a critical role, but local governments remain crucial

# Enhancing international collaboration

- Grand challenges to be addressed at global level reflecting:
  1. The scale of the objectives addressed
  2. The international nature of science itself
- Shift from technology transfer mentality to collaborative and inclusive approach
  - Low-income countries not mere recipients of technology but partners for social innovation, providing inputs on context-specific opportunities and constraints
  - Empower low-income countries to participate in innovation to address grand challenges both at the development and at the diffusion stage
- Global production and circulation of knowledge entails delicate balance between cooperation and competition (in priority-setting, human capital, patents, etc.)



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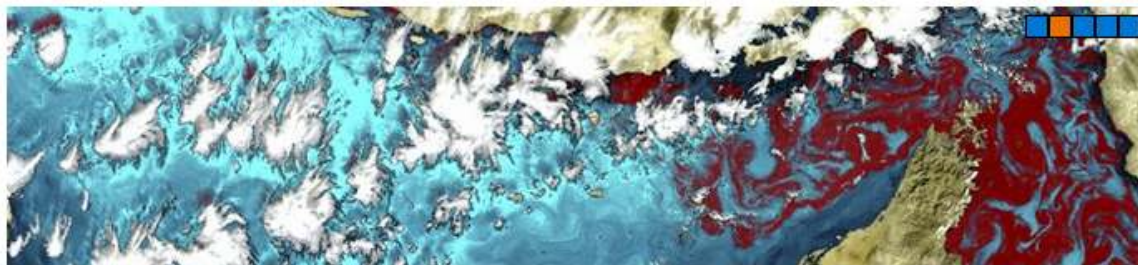
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# 'Small challenge' thinking

- **Appropriate technology:** “Small is beautiful” (Schumacher)
  - Incremental innovation to adjust existing technologies to specific user contexts (e.g. lack of electricity)
  - Frugal innovation to reach the bottom of the pyramid
- **Grassroots innovation** (innovation by the poor)
  - To empower lower income communities
  - To transform informal business activity into formal activity
- **Demand-oriented policies** to finance small scale research projects that address local needs below the radar of current markets
  - Example: “Quien se le mide?” Program (Antioquia, Colombia, 2013-present)

## Some examples

- **ICT** (for banking, health, education,...)
- **Renewable** energies
- Fighting **malnutrition**
- Access to drinking **water**

## Drivers of success

- **Adapting** existing technologies to low income contexts
- **Leapfrogging** to newest technologies
- End **super-functionality**, reduce costs
- **Institutional change** to accompany technological change



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Source: World Bank Institute, 2012

# Questions rather than conclusions

- How can developing countries better align their R&D efforts towards societal needs?
- How to combine “grand challenge” with “small challenge” initiatives in social innovation?
- What lessons can be learnt from recent experiences in international R&D cooperation to address societal challenges?
- What new power relations are emerging in global production and circulation of knowledge as a result of the focus on global societal challenges?

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