

Science and Innovation Policy for New Zealand

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Disclaimers

- I've only been here for three months
- General need for humility in this area



Overview

- ‘Science of Science Policy’
- Policy goals
- Policy levers
- The known, the speculative, and the unknowable
- Policy research priorities



Science of Science Policy

“The Science of Science Policy (SoSP) is an emerging interdisciplinary and international field of research and community of practice that seeks to develop theoretical and empirical models of the scientific enterprise. The development of a strong science of science policy can enable policymakers and researchers to use an evidence-based platform to assess the impacts of the Nation’s scientific and engineering enterprise, to improve their understanding of its dynamics, and to evaluate potential future outcomes.”

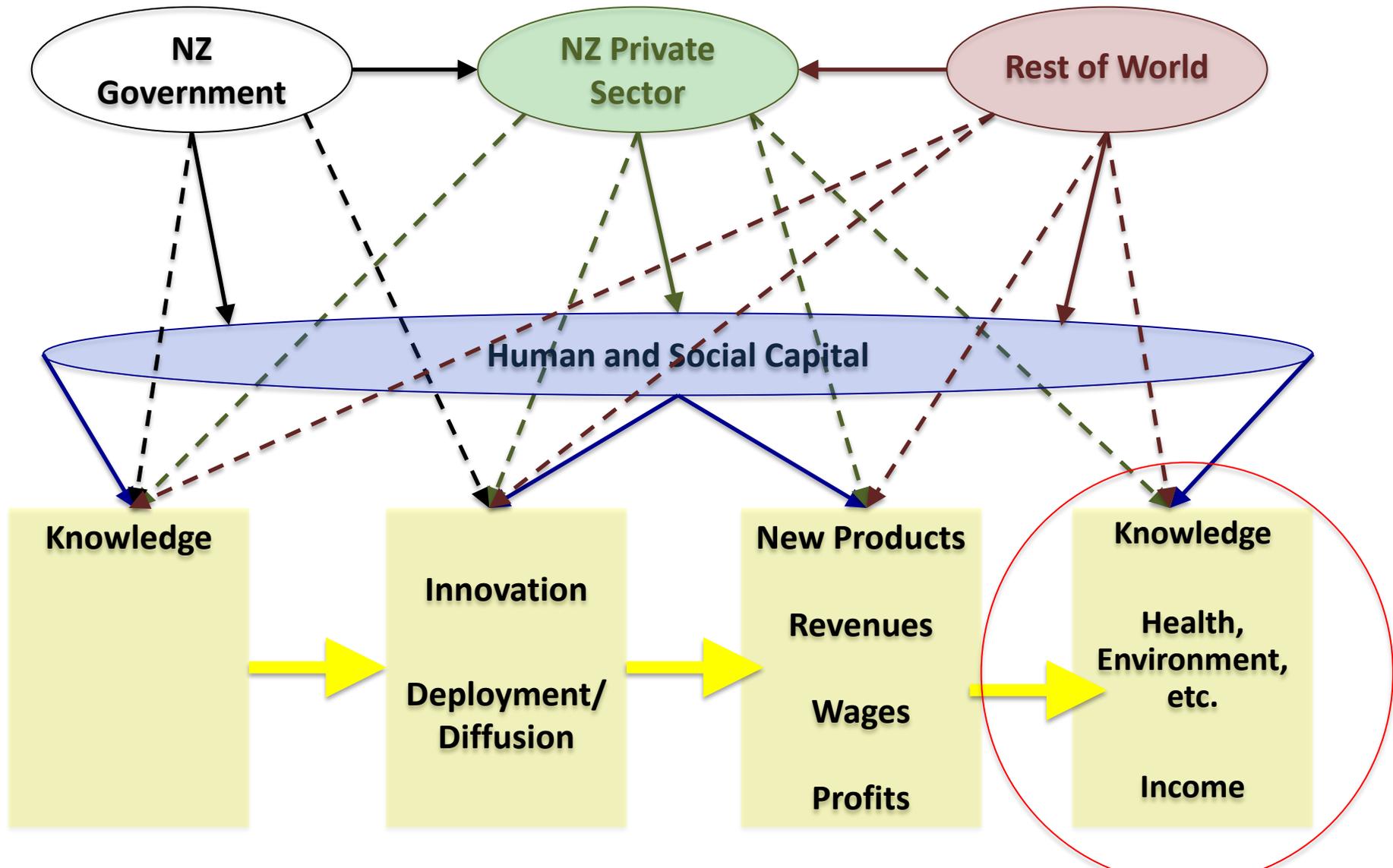
U.S. Office of Science and Technology Policy, Executive Office of the President, <http://www.scienceofsciencepolicy.net/page/about-sosp>

Science of Science Policy (SoSP) (or Science of Science and Innovation Policy, SciSIP)

- Collection of data and development of metrics and proxies
- Modeling of research and innovation processes, particularly interactions between researchers and socio-economic system
- Performance evaluation of specific policies and policy instruments



Schematic Model



The Known: Need for Public Policy in Support of Technology Creation and Diffusion

- Creation, transmission and utilization of knowledge and technology are rife with “market failures.”
 - The **Social Rates of Return** to investments in research, innovation and technology deployment exceed the private returns
 - Private incentives to invest in this area are inadequate
- Spillovers mean that NZ can benefit from investments in the rest of the world (ROW)
- But distance still matters (internet notwithstanding)



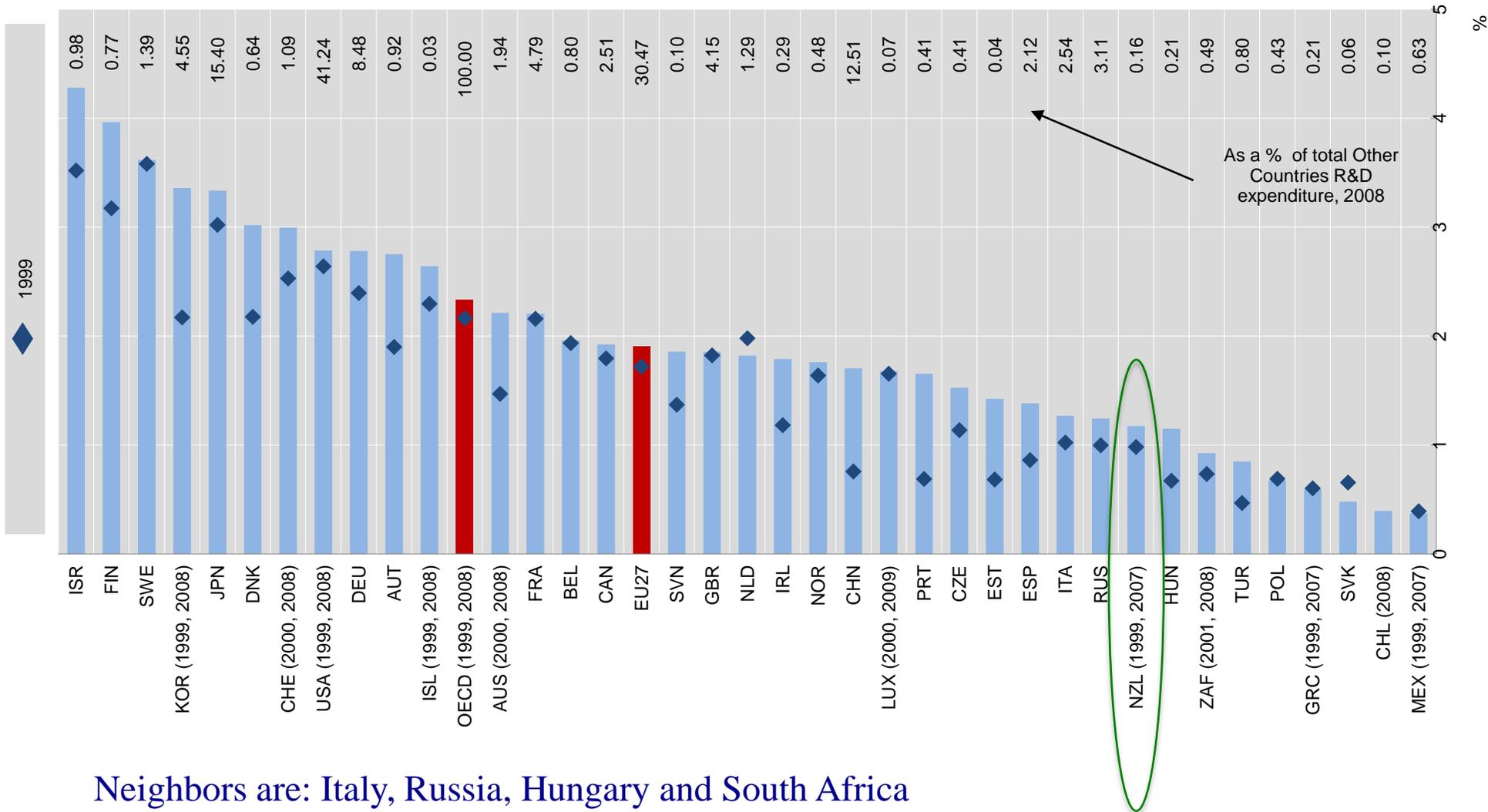


The Known: Investment Rates in Knowledge Creation and Innovation are Low in NZ

- Public and private investment in research in New Zealand are low compared to other advanced economies.
 - Total R&D spending relative to economic activity



Total NZ Research Expenditure as PCT of GDP, 1999 and 2007 Compared to Other Countries



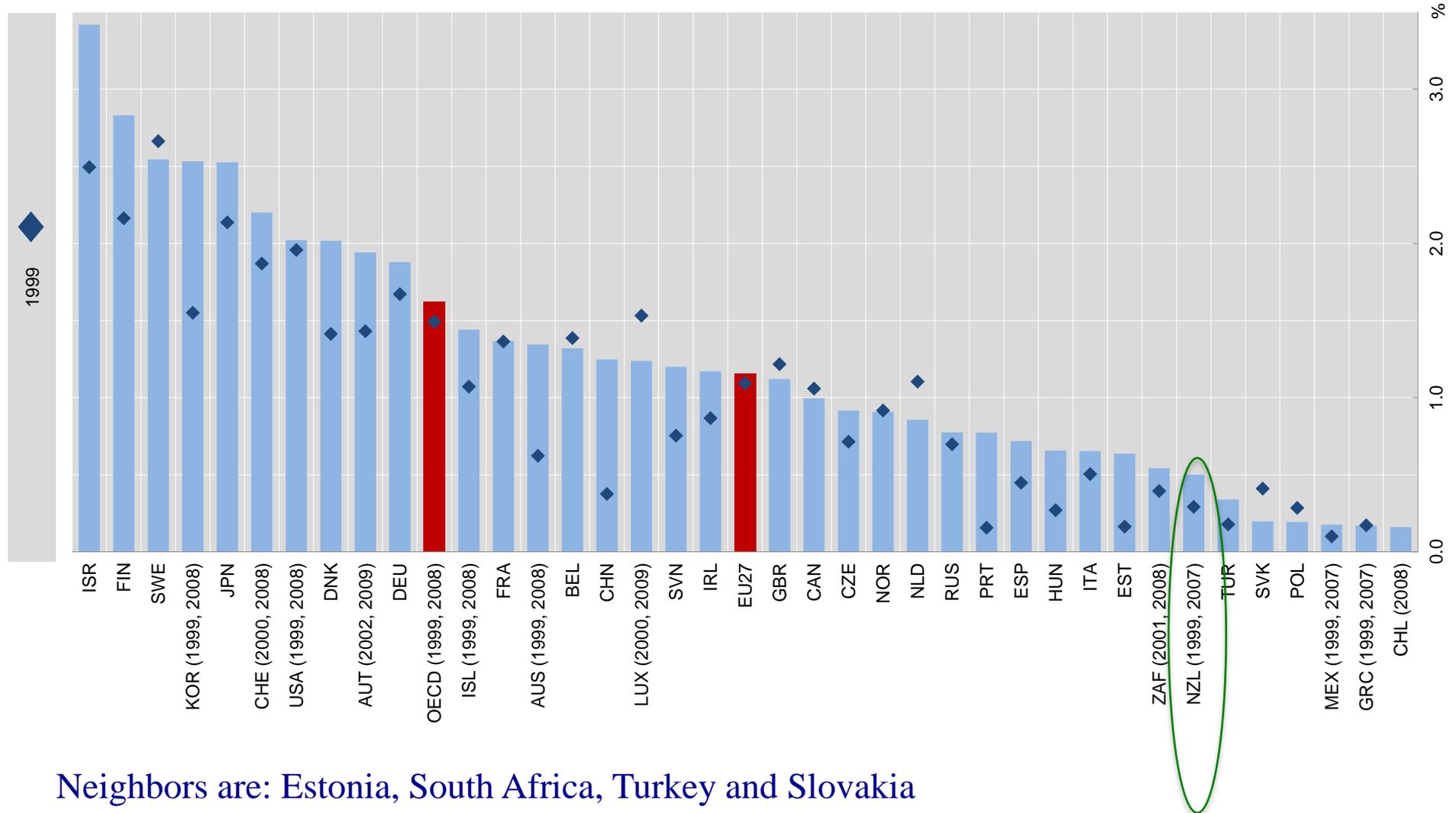
Neighbors are: Italy, Russia, Hungary and South Africa

The Known: Investment Rates in Knowledge Creation and Innovation are Low in NZ

- Public and private investment in research in New Zealand are low compared to other advanced economies.
 - Total
 - Private Business R&D (“BERD”)
 - Patents



NZ Business Research Expenditure as PCT of GDP, 1999 and 2009 Compared to Other Countries

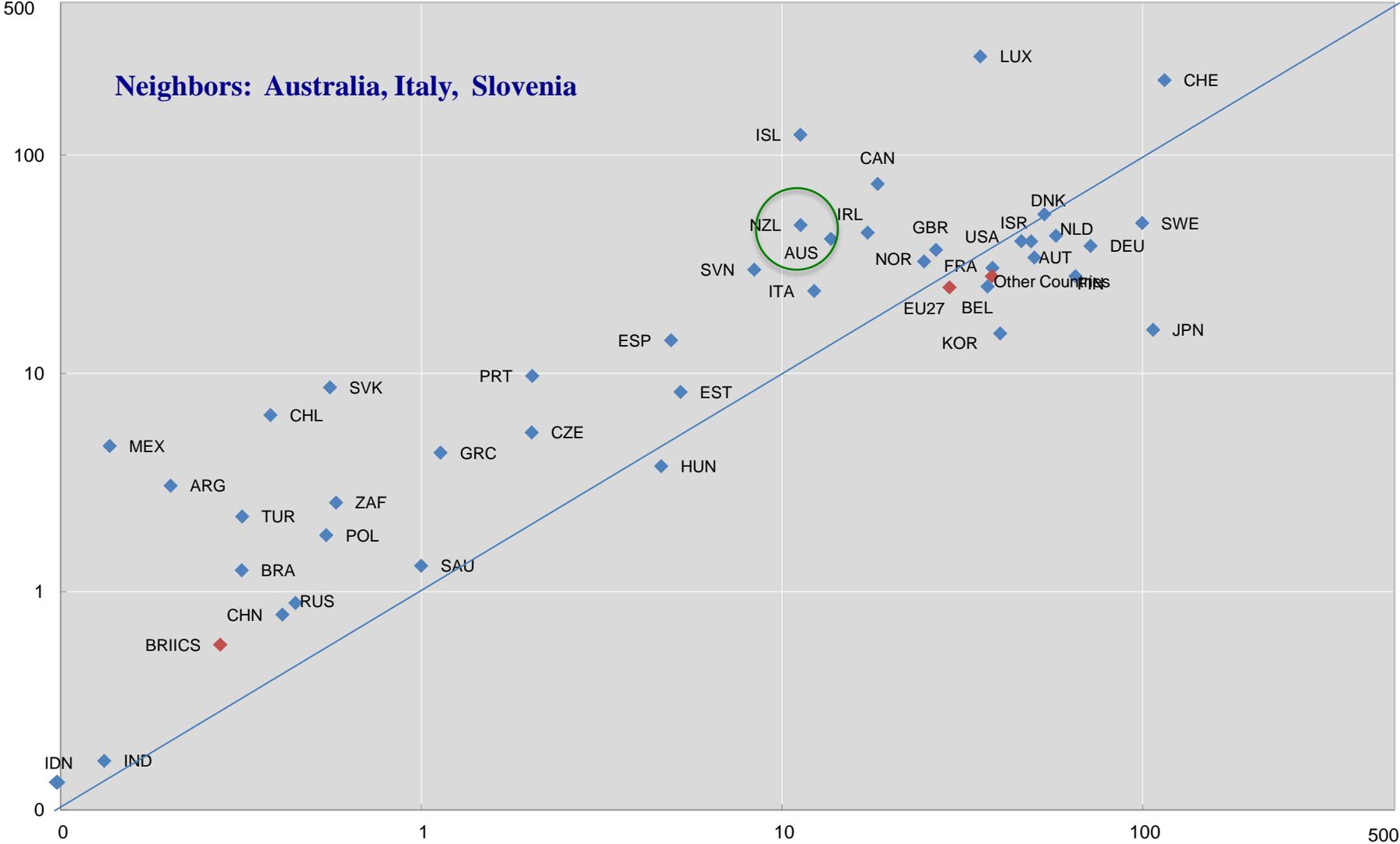


Neighbors are: Estonia, South Africa, Turkey and Slovakia



Patents and Trademarks Per Capita, 2007-09 Compared to Other Countries

Trademarks/Capita



Axes in logarithmic scale

Important Patents/Capita

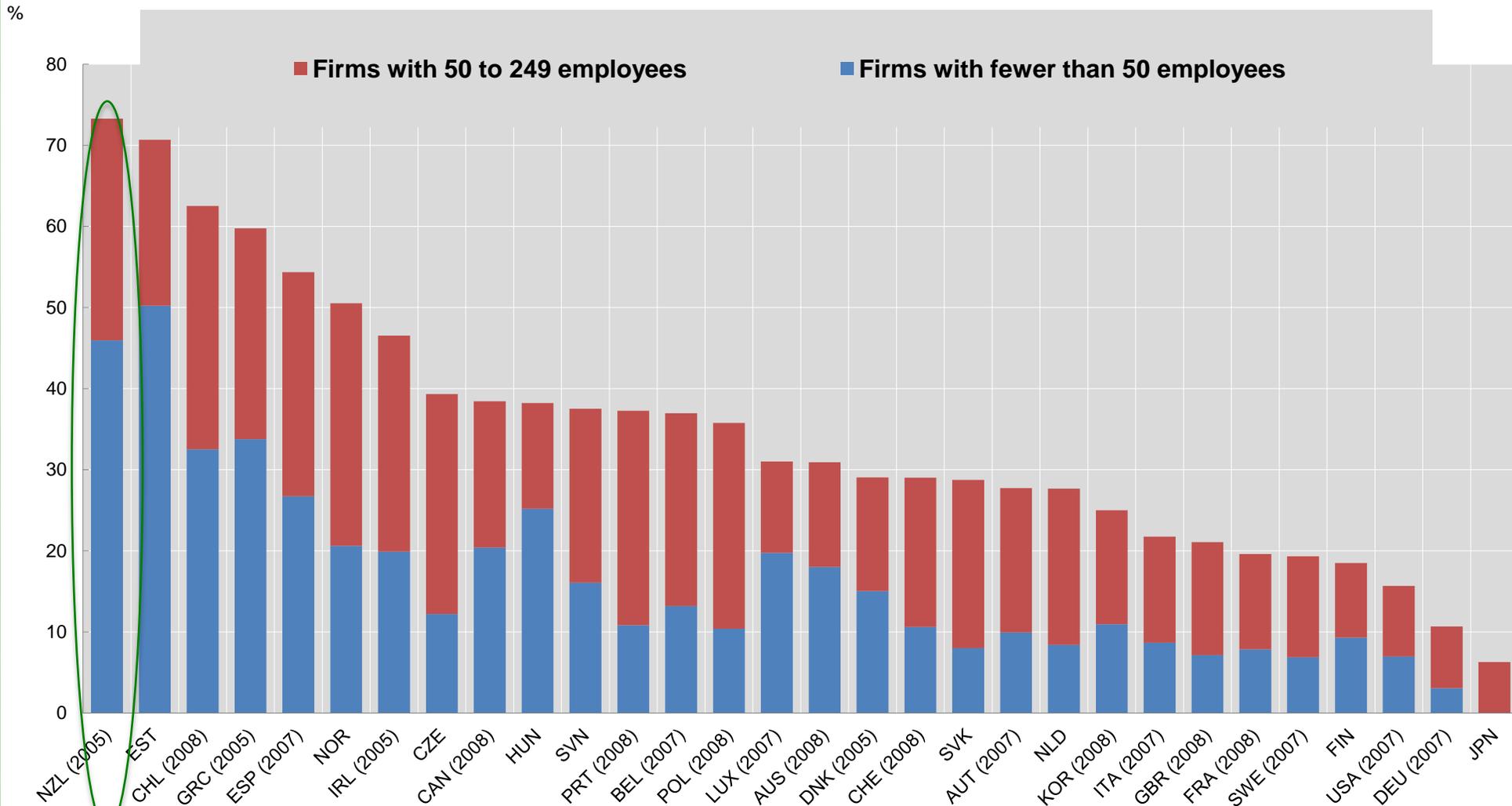


The Known: Low Private R&D Spending is Largely Explained by Industry Structure and Firm Size

- Agriculture, Fishing, Forestry and Tourism are low-R&D intensity sectors that comprise a significantly larger share of the NZ economy than of that of other countries.
- R&D intensity tends to rise with firm size, and NZ has an unusually large proportion of small firms



NZ Business Research Expenditure Share of Small Firms Compared to Other Countries



Neighbors are: Estonia, Chile, Greece

The Known: Low R&D Spending is Largely Explained by Industry Structure and Firm Size

- Agriculture, Fishing, Forestry and Tourism are low-R&D intensity sectors that comprise a significantly larger share of the NZ economy than of that of other countries.
- R&D intensity tends to rise with firm size, and NZ has an unusually large proportion of small firms
- Key question: do what extent is business R&D low because the returns are low, and to what extent is it low because there are barriers to firms' undertaking high-return investments.



Speculation/Observations I: Knowledge Creation

- Always think about our investments in context of ROW
- Given our size, we have more to gain by fostering research cooperation than research competition.
- Even where we invest in “knowledge for knowledge’s sake,” think about spillovers
- Significant adjustment costs in the system make policy instability and rapid ramp-up or refocusing costly



Speculation/Observations II: Building Human Capital

- Training and human capital accumulation should be an explicit focus of all science and innovation investment programs
- Immigration policy
- Attraction/retention of stars as an element in design of funding mechanisms
 - Another argument for reducing grants competition?
 - An argument for funding “frontier” research?



Speculation/Observations III: Business Research and Innovation

- Low business R&D is a symptom, not a cause
- Valuable innovations are more likely to arise from the sectors in which we are strong than from emergence of entirely new sectors
- Valuable innovations are more likely to emerge from firms focused on export markets
- Large firms are a missing component of the NZ innovation system. We are more likely to have an impact by inducing multinationals to invest here than by trying to grow our own.
- As with public research, fostering research cooperation seems to make sense given our size



Speculation/Observations IV: Innovation-enabling Environment

- As net technology importers, we do not benefit from strong intellectual property protection, except as an international bargaining chip.
- Innovation requires a set of attitudes:
 - Taking risks is how you succeed (and success is a good thing...)
 - Failure is not as good as success, but it is a learning opportunity
 - The marketing destination is always The World, not NZ
 - Related to but distinct from “Science and Society” issue raised by the National Science Challenges Panel
- Innovation is built on networks and relationships--Cooperation, again



Speculation/Observations V: Innovation in Innovation Policy

- Innovation policy should model the culture of innovation
 - Experiment--and measure the outcomes
 - Fail, and adjust appropriately
- Failure is hard for bureaucracies. Need to distinguish:
 - Failure of elements of a portfolio (expected)
 - Failure due to incompetence
 - Poor performance of one policy instrument relative to another
- **Note: Experimentation is NOT the same as instability!**



Topics for SciSIP Research in New Zealand

- Given the relatively low private investment in R&D, what attributes distinguish those firms that do invest from those that don't?
- What are the opportunities for greater cooperation in research, in the private and the public sectors?
- What are the barriers that deter multinational location in NZ?
- What is the relative effectiveness of different modes or mechanisms of public research support?
- What are the most important factors affecting migration of skilled workers in and out of NZ?



The Unknowable

- The marginal rate of return on investments of specific types
- Which specific scientific or technical areas could be or will be the source of the greatest innovation benefits
- How to increase NZ innovation significantly in the short run



Parting shots

- Research on the science/innovation system can make public policy more effective
- *Always* make decisions thinking about the ROW
- Building and maintaining world-class human capital is critical
- Try to figure out where/when/why BERD is low due to barriers to otherwise high-return investments
- Policy effect on environment for entrepreneurship and cooperation at least as important as amount of money
- Policy should be systematic and evaluative

