The National Innovation Systems and the role of the OECD: two decades later

Luc Soete
UNU-MERIT,
Maastricht University
Outline

- Background of the NIS concept and literature
  - Historical parenthesis: actually more than two decades
  - Definitions and characteristics of NIS
  - Policy attractiveness of NIS

- Future challenges for NIS
  - National limits of NIS
  - From the rate to the direction of NIS?
  - New “open innovation” NIS opportunities?
  - From national to RIS?

- Conclusions
A brief historical parenthesis

- Origin of the National System of Innovation can be identified with Chris Freeman in an unpublished 1982 OECD contribution called *Technological Infrastructure and International Competitiveness* on Japan’s successful technological catching-up and the role of the state in there. Freeman referred in particular to Friedrich List's (1841) contribution.

- "List’s was probably the first economist to argue consistently that industry should be linked to the formal institutions of science and education: “There scarcely exits a manufacturing business which has no relation to physics, mechanics, chemistry, mathematics or to the art of design, etc. No progress, no new discoveries and inventions can be made in these sciences by which a hundred industries and processes could not be improved or altered” (p. 162). List’s book entitled *The National System of Political Economy* might just as well have been called *The National System of Innovation*.”

- For Freeman, the role of the Prussian state in technology catch up in the mid-nineteenth century resembled very much that played by the Japanese state a couple of decennia later (or the Korean state a century later, or China today). At each time the coordinating role of the state was crucial, as was the emphasis on many features of the national system of innovation which are at the heart of contemporary studies.
Definitions

- The **systems of innovation** approach spells out the importance of the ‘systemic’ interactions between the various components of inventions, research, technical change, learning and innovation;

- The **national** systems of innovation brings to the forefront the central role of the state as coordinating agent. Its particular attractiveness to national/international policy makers lays in the explicit recognition of the need for complementary policies, drawing attention to weaknesses in the system, while highlighting the national setting of most of those institutions.

- The concept of ‘national innovation systems’ was further developed in the 1980s by Lundvall (1985, 1992), Nelson (1993), Metcalfe (1995) and Edquist (1997) with each time slightly different accents.

- Lundvall provided the most explicit definition of NIS: “the elements and relationships which interact in the production, diffusion and of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state” (Lundvall, 1992, p. 12). While at OECD he shifted the emphasis away from the sector dimension, towards the broader national institutional framework within which firms and other organisations operate.
Characteristic features of NIS

The NIS approach has provided a number of particularly useful insights, which can be summarised in five points.

1. **Particular role of the sources of Innovation**
   - Especially the Lundvall approach to NSI – which stressed the role of non-R&D-based innovation – was useful in broadening the discussion on innovation beyond R&D.

2. **Institutions (and organisations)**
   - Institutions are central as they provide structure to as well as insights in the way in which actors (including organisations) behave within the system.

3. **Interactive Learning**
   - The innovation system is a “system constituted by elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge” (Lundvall 1992, p.2).

4. **Interaction**
   - A common feature of innovation systems is the fact that firms rarely if ever innovate alone. As Nelson (1993, p.10) noted: “to orient R&D fruitfully, one needs detailed knowledge of its strengths and weaknesses and areas where improvements would yield big payoffs and this type of knowledge tends to reside with those who use the technology, generally firms and their customers and suppliers. In addition, over time firms in an industry tend to develop capabilities … largely based on practice.”

5. **Social capital**
   - Not only formal institutions matter for innovation. Social capital stimulates also innovation.
The NIS policy attractiveness

The policy attractiveness, also to OECD and TIP of the NIS concept was that it provided a broader foundation for policy as compared to traditional market failure-based policy arguments. In a NIS view, markets do not play the overarching role of generating an optimal state. Instead, non-market-based institutions are an important ingredient in the ‘macro’ innovation outcome. This broader policy outlook has two major consequences for the foundations of actual policy measures.

1. The first is that there is now also a broader justification of the use of policy instruments as compared to market failure-based policies. For example, R&D subsidies are linked in the market failure-based approach to a lack of incentives at the private level (firms). The subsidy instrument has the aim to lower private costs, thus bringing investment up to the level where social costs equal social benefits. In the systems approach, subsidies serve a more general purpose that includes influencing the nature of the knowledge base in firms, and to increase absorption capacity. Similarly, policies aimed at stimulating cooperation, for example between university and industry, would be motivated in the market failure-based approach by internalising externalities, while in a systems approach, such policies can be aimed at influencing the distribution of knowledge, to achieve coordination (not provided by markets), or to increase the cognitive capacity of firms.

2. The second implication is that the government or policymaking body is part of the system itself with its own aims and goals being endogenous. Therefore, policymakers have to function within the system itself, and this restricts them. As a (mere) actor in the system, policymakers are unable to design the system in a top-down way. In the market failure-based approach, this would be featured as ‘policy failure’, i.e., the impossibility to achieve a first-best welfare solution by solving market failures. From the systems point of view, policies are necessarily adaptive and incremental. They are specific to the system in which they are set, and would be ineffective in other settings.
2. Challenges for the NIS approach

- The concept of national systems of innovation is under erosion from several sides.
  - First, the ‘national’ perspective on an innovation system approach appears under pressure given the globalisation trends and the limits of national policy making in an area which is increasingly borderless. Might NIS policies have tended to miss emerging international trends, assuming that national weaknesses could only be addressed within the boundaries of national environments?
  - Second, too much focus on the “rate” of technical change or innovation rather than the “direction”? How to design policies influencing the direction of innovation?
  - Third, there is the emergence of various new sorts of knowledge ‘service’ activities, allowing for innovation without the need for particular leaps in science and technology, something that sometimes has been referred to as ‘innovation without research’. While in many ways not new, innovation is less linked to the typical manufacturing forward and backward linkages, but ‘fuelled’, so to say, by the Internet and broadband, by more open flows of information raising of course many information-search problems as it is now confronted with impediments to accessing the existing stock of information that are created by intellectual property right laws.
  - Fourth, and as the corollary of the first point, NIS might well be of increasing relevance at the regional/local level today than at the national level. Importance of the notion of so-called regional/local knowledge ecology.
a. National limits of NIS: not an EIS

- In Europe, where the policy impact of the NIS literature was greatest, the NIS literature has barely contributed to the debates surrounding the creation of European research and innovation institutions such as the European Research Area, the European Research Council or the European institute on Innovation and Technology. As a result, the European policy debate has been characterised by continuous debates about the ‘rationale’ for European research and innovation policies next to individual member states’ national systems of innovation policies.

- Failure of the Barcelona 3% target: at best it has led to beggar-thy-neighborhood” R&D tax credit policies in Europe… The EU has now a gap not just with the US but also with China in private R&D expenditures.

- Proposal for a new 3% knowledge investment target: with clear policy advantages over the Barcelona 3% target. Focuses on what governments are directly responsible for: whether in terms of funding or setting funding rules such as in the case of tuition fees with respect to higher education. Target thus offers credibility. All EU countries are being challenged to either find own public resources to increase such knowledge investments, alternatively to call upon private resources to invest in individual’s future human capital.
R&D tax credit effects on R&D personnel costs
Industry-financed GERD as % of GDP (2000-2007): flat, a new gap!
A new 3% target proposal
b. From the rate to the direction of NIS

The notion of “Societal Challenges” applies to major social problems that cannot be solved in a reasonable time and/or with acceptable social conditions, without a strong coordinated input requiring both technological and non-technological innovation, and at times, advances in scientific understanding. In a way the central issue is at the opposite end of the previous one…

Can resources, not just research but also procurement and other investments, be shifted across European stakeholders to more productive “societal use” to influence not only the rate but also the direction of technical change and innovation?

Societal Challenges are not grand rather they raise grand policy challenges: how to achieve compatibility between top-down initiatives and more market-driven resource allocation logic that allows for multiple decentralized experiments.

What has the NIS literature to contribute to these societal policy debates? On the one hand promising going beyond the rather sterile “timing” debates between Stern and the Copenhagen Consensus group on climate change. On the other hand irrelevant: see recent publications from Aghion and Veugelers, 2009, David et al. 2009 with no references to NIS.

Other innovation areas much more relevant: BOP, biomimicry, etc.
The global research challenge:

Ecological Footprint (Global Hectares per Person)

- Africa
- Asia-Pacific
- Europe
- Latin America
- Middle East and Central Asia
- North America

Global average available biocapacity per person with no area set aside for wild species.

Threshold for high human development.

Sustainable Development Quadrant

Human Development Index (HDI)
c. New “open innovation” NIS opportunities?

- At organizational level, the financial crisis has/will lead to a further increase in the off-shoring and outsourcing of private R&D: a more rapid relocation of certain parts of R&D, in particular Development activities, to cheaper locations.

- Also an increase in “national outsourcing” of private R&D from large firms to smaller firms that offer an increased specialization and of the incumbents’ large private R&D labs increasingly playing a new local role as more systemic parts of the innovation infrastructure.

- Open innovation creates new opportunities for young innovative SMEs. Due to their flexibility and ability to operate in new areas of business that are uncertain but potentially highly promising, such firms appear important for pursuing radical innovations and constitute an important avenue of specialization and knowledge growth.

- Again the NIS approach appears to offer a particularly promising framework in this area. But as Europe illustrates, the prevailing institutional conditions in the European partly fragmented markets raise formidable barriers which limit the overall success of this process. Up to now, the NIS approach, with its national focus provides little insights into how these bottlenecks can be overcome and what e.g. the challenges are with respect to competition policy.
d. From national to RIS?

- At the geographical level, the crisis is likely to increase the gap between front runners in knowledge investments and ultimately innovation, and those lagging behind, by exacerbating the different existing capacities of countries and regions to respond.
- What does this imply for regional policies? There seems to be a need for the design of smart specialization policy mixes capable of capturing the capabilities of entrepreneurial entities within regions.
- Various notions close to the NIS literature of knowledge triangles, regional knowledge ecology appear of particular relevance here.
- NIS might well witness a new, second life: highlighting the various systemic virtuous or vicious interactions between local knowledge components. Might this become the future of NIS OECD TIP studies?
- See e.g. Catalonia OECD study.
  - Strong need for smart policy making.
  - Particular value of policy peer reviews.
  - Role of private entrepreneurs in local innovation process
  - Ways to respond to global/local societal challenges
Conclusions

- Notion of innovation systems points to a crucial role of history in contemporary economic performance, and the roots it has in innovation performance.
- The innovation systems literature has led to some very significant insights. Each one of those opens up links with literatures and approaches that are not so common in (mainstream) economics. In other words, the innovation systems literature is one that is rather multidisciplinary.
- NIS offer national policy maker a tool for analysing innovation processes and influencing them, without the strong restriction of innovation policy to market failures that characterises the mainstream approach. This offers opportunities, but also hosts threats. The opportunities are related to the broader set of processes that are embodied in the innovation systems approach, and which enable more channels for influencing innovation performance. The threats are related to a potential misjudgement by policymakers of how innovation systems actually work.
- Future of the NIS approach will depend on how its proponents are able to develop the approach further. Three avenues appear particularly promising:
  - Systemic approaches to societal challenges and the competition policies issues these raise;
  - The institutional challenges open innovation processes raise; and
  - The potential relevance of “smart” regional innovation system policies.