III. “Like Some, Like All, Like None”
A Comparison of Five National Innovation Ecosystems, With Emphasis on Markets & Demand

Prof. Amnon Frenkel, Prof. Shlomo, Dr. Eran Lack
Towards Innovation Ecosystem Theory

An innovation ecosystem similarly reflects the relationships among: firms, government bodies, universities, researchers, consumers, owners of capital and workers.

An innovation ecosystem generates increased innovative output in two ways:

• Through an increase in the quantity of inputs (capital and labor) in the system, and

• Through an improvement in the efficiency with which existing inputs are used to generate innovation.
Towards Innovation Ecosystem Theory

An initial first step toward focused effective pro-innovation policies is to model each nation’s innovation ecosystem, to fully understand its components and their interaction.

The theory of demand-driven innovation raise the dilemma in the context of pro-innovation policy: where a key issue is:

*How can basic research driven by the curiosity of individual researchers be leveraged to build innovations that meet real human needs and wants (demand-side innovation), without restricting it so much that the energy driving such research (curiosity, freedom, initiative) is diminished or destroyed?*
‘Valley of death’ (termed by Jackson, NSF)

‘Valley of death’ – the gap between basic research funded largely by government and commercial development funded by industry.

- Type I errors - technologies that should develop - instead unjustly ‘die’, owing to lack of funds, and

- Type II errors - technologies that should rightly ‘die’ - in fact are heavily funded.

Success in navigating through the Valley of Death relates to how supply-side and demand-side innovation are integrated
National Innovation Ecosystems

The analysis enables us to:

• Show visually and clearly the key elements of demand-side innovation drivers

• To indicate how these demand-side aspects of innovation interact with supply-side elements

• Focus on identifying ‘gaps’ -- crucial market needs that have not been fully met, such that innovative technologies can be leveraged to match supply with demand and create business opportunities.

• Identify supply-driven processes reflecting innovation driven by supply (incentives, funding, etc.), through which resources are directed toward specific markets and products, “pushed” by supply factors rather than “pulled” by demand factors.
`Visual Map’ of the Nations’ Innovation Ecosystem

Legend

- Group of processes (factor analysis)
  - Supply side
  - Demand Driven
  - Cluster of Anchors

Israel
- P1. Private & Public Sector Initiatives
  - A1. ‘Out of the box’ thinking
  - A2. Entrepreneurship Cluster
  - A3. Culture of Empowerment
  - A4. Scientific & Educational Infrastructure
  - A5. Competitive structure
  - A6. Cultural Diversity
  - A7. Economic Institutions
  - P3. Public-Private Cooperation
  - P4. National Research Funds
  - P6. Govt Programs

Germany
- P1. Market-Driven Forces
  - A1. Technology Capabilities
  - A2. Availability of Human Capital
  - A3. Pro-innovation Culture
  - A4. Market Structure
  - A6. External Effect
  - P2. Cluster Strategies
  - P3. Standardization

France
- P1. Standards & Regulations
  - A1. Public Policy, Intervention & Regulation
  - A2. Corporate Policy
  - A3. Education, Mobilization
  - A4. Demand Side Policies
  - P2. Public procurement
  - P3. Lead markets & Consumer policies
  - P4. Labeling & awareness raising Ind

Spain
- P1. Local and Regional incentives
  - A1. Technological & Entrepreneurial Infrastructure
  - A2. Human capital and Leadership
  - A3. Pro-innovation Culture and attitude
  - P2. Joint Public-Private Initiatives
  - P3. Targeted Public Programs
  - P4. Develop. of Human Capital
  - P5. Public Funding of Private Entities

Poland
- P1. Increased awareness of innovation
  - A1. Entrepreneurship
  - A2. Human capital structure
  - A3. Financial and regional systems
  - P2. Gov. encourage Innovation Implement
  - P3. Government programs
  - P5. Private sector attractiveness
  - P4. Encourage technological independence
A Comparison of Five National Innovation Ecosystems

The first layer refers to the list of **key anchors** identified in each of the participant countries based on four key innovation dimensions:

- **Culture** (shared values)
- **Context** (scientific and technological infrastructure, structure of the economy)
- **Markets** (demand, preferences)
- **Institutions** (system of laws & regulations, written & unwritten ‘rules of the game’)
### Comparison of Innovation “Anchors”: Israel, Germany, France, Spain and Poland

<table>
<thead>
<tr>
<th>Key Innovation Dimensions</th>
<th>Country</th>
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<td>Israel</td>
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<td>A2. Entrepreneurship Culture</td>
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<td>A6. Cultural Diversity</td>
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## A. “Like All....”

### Comparison of Innovation “Processes”: Israel, Germany, France, Spain and Poland

<table>
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<tr>
<th>Supply/Demand side of Innovation</th>
<th>Israel</th>
<th>Germany</th>
<th>France</th>
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<td>P2. Cluster Strategies</td>
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A. “Like All....”

Lessons:

• It is the individual energy of entrepreneurs and innovators that drives the innovative ecosystem, which in turn flows from the culture and history of their nation.

• The ‘valley of death’, where basic research crosses the ‘desert’ of resource scarcity toward commercial exploitation, exists in all five countries under study.

• It is market forces that ‘pull’ innovative ideas through this barren territory toward full implementation and global scale-up.

• The five innovation ecosystems indicate that this ‘demand pull’ force can fruitfully be strengthened in each of the five nations under study, in particular in Spain but also in France.
There are aspects of the innovation ecosystems that exist in some, though not all, of the five countries.

- All five systems are complex, though the French, Polish and Spanish ecosystems appear rather simpler than those of Israel and Germany.
- Poland’s ecosystem is simple because it is in its early stages.
- France’s is simple, perhaps because it is dominated by the role of the public sector.
- Spain features ‘local and regional initiatives’.
- Israel’s culture of “empowerment” and “out-of-the-box” thinking is vital.
- Germany features “cluster strategies”.

B. “Like Some....”
B. “Like Some....” The third layer

• We identify and isolate the most important linkages for each of the five countries.

• For each of the four key dimensions, we listed the main processes that were most strongly linked to anchors comprising the four dimensions.

• In this manner, it can be seen:

  □ Which dimensions of the innovation ecosystems contribute most to fostering innovation-supporting processes

  □ Which processes are ‘innovation accelerators’, and

  □ What are the major differences across countries.
## A. “Like Some....”

Comparison of Key Innovation Dimensions that strongly encourage factor processes: Israel, Germany, France, Spain and Poland

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<tr>
<th>Key Innovation Dimensions</th>
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<td>P5. Government Investments in Human Capital</td>
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<td>Institutions (System of laws &amp; regulation)</td>
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<td>P4. Key Skills Development</td>
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<td>P5. Private Sector Attractiveness</td>
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B. “Like Some....”

lessons:

• There is a strong contribution by the culture dimension to innovation processes, in particular in Spain and in Israel;

• Culture seems to be less important in France and in Germany;

• Poland in particular appears to need to create and strengthen an innovation culture, as it is a transition economy;

• In all five countries the infrastructure dimension supports processes that contribute to innovation driven by the public sector and the private sector alike. This is true in particular of Israel, Germany and Poland;

• France and Spain notably appear to lack processes driven by this dimension.
C. “...and Like None....”

Each innovation ecosystem has unique features found only in that country:

**Israel**

- Its innovation ecosystem is quite well developed relying greatly on the Israeli culture of entrepreneurship supported largely by the public sector.

- A variety of institutions exist that leverage defense-related R&D into civilian innovation.

- The Office of the Chief Scientist (OCS), within the Ministry of Industry, plays a key role in R&D by leveraging a large budget to support technology-intensive projects.
C. “...and Like None....”

Germany

- Significant demand-driven key processes drive German innovation system
- Technological capabilities and the existence of economies of scale (in the market structure cluster) seem to have a profound impact on processes that foster innovation.
- Important industrial ‘clusters’ that comprise agglomerations of complementary capabilities act and are actively supported by tax and subsidy policies
- Germany’s vocational training schools provide valuable skills that support its mittelstand SME’s that produce precision machinery
- A unique chain of R&D labs, such as the Fraunhofer Institutes, that provide fast and efficient technology transfer.
Spain

• This country has a number of local and regional incentives for innovation worthy of further study.

• Key processes that drive Spanish innovation are mostly supply-driven. This finding accentuates the importance of strengthening targeted demand-driven policies in Spain.
C. “...and Like None....”

Poland

• Is in the process of creating an innovation system, and an innovation culture.

• The lack of a free market economy until the early 1990's, has placed Poland in an inferior starting point with regard to supply-side initiatives, as these were primarily targeted at the private market and aimed at spurring economic growth.

• Part of its innovation processes include a focus on self-reliance
C. “...and Like None....”

France

• France does have a singular educational system that has made French engineering and French engineers among the best in the world.

• Yet these universities do not play a prominent role in the French innovation ecosystem.

• We speculate that this is perhaps an extreme case of the “valley of death” the enormous gap between the production of basic research in science and technology, and the successful rapid and profitable commercial exploitation of such research.
C. “…and Like None….”

There is great untapped potential here, for best-practice benchmarking – a process in which countries adapt and import ideas that have been successful in other countries in strengthening innovation.
Summary

• A country requires strategic direction and vision, that provide a clear answer to the questions:

  o What does our country do better than other countries, in which products and industries?

  o Can we excel, so that we can produce and export, in order to generate jobs, income, wealth, exports and dynamic sustained growth, even in the face of weak global markets?

• Such strategic planning is normally regarded as “top down”, driven by the country’s political and business leadership.
Summary and Conclusions

• Our analysis of national innovation ecosystems has revealed, the crucial importance of combining ‘top down’ strategic innovation policies with ‘bottom up’ policies driven by the infrastructure of existing capabilities.

• These capabilities find expression in the innovation ‘anchors’, in our analysis, which differ widely across countries in their impact on the evolution of innovation ecosystems and their ability to implement national strategic goals.

• These anchors, and the dimensions to which they belong, comprise the foundation on which nations can build their strategic innovation policies.
Conclusions

• Each nation, therefore, must design its own unique, specific national innovation policy, according to the strengths and weaknesses identified in its innovation ecosystem.

• And at the same time, through the process of best-practice benchmarking, it is useful for nations to explore these special innovation drivers, and to find ways to adapt them to their own innovation systems.
**WP2 – Time-Table: The Neat Steps**

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<thead>
<tr>
<th>Year</th>
<th>Months</th>
<th>Task 2.1.</th>
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<td>Preparation of methodology for mapping the national innovation ecosystem</td>
<td>Construction of a prototype procedure</td>
<td>Collection and integration of individual country innovation information about innovation ecosystem policies</td>
<td>Preparation of a comprehensive review of innovation ecosystem policies</td>
<td>Preparing a critical integrative review of the literature on demand-side and supply-side innovation</td>
<td>Presenting the final results in a workshop</td>
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Deliverables

D2.1 - **Mapping the Nations’ Innovation Ecosystems:**

Provide detailed report on each country’s innovation ecosystems and a comparative analysis report [month 12]

D2.2 - **Detailed Taxonomy of Innovation Policies:**

Detailed taxonomy of innovation policies, organized as a kind of decision tree, with an early split coming between "demand-side" and "supply-side“[month 18]

D2.3 - **Workshop Summary:**

Volume presenting the results of the workshop at which participants provide input and feedback on the bibliography, literature review, taxonomy, and policy survey [month 18]
Task 5.5: Preparing critical integrative review of the literature on demand side and supply side innovation

The review will be based on 130 relevant items that already were collected in the following areas:

- Multi-sector activities based on knowledge and innovation diffusion
- Long term government strategic plans for fostering innovation
- Operational government intervention through legislation
- Indirect government policy to support innovation
- Market-driven forces that foster entrepreneurship
- Additional sources for Demand Driven Innovation
- Innovation and Culture
THANK YOU

Legend

Group of processes (factor analysis) factor analysis

Supply side

Demand Driven

Cluster of Anchors
WP5 Evolution of demand and dynamics of knowledge base in knowledge intensive sectors and regions

leading partner: Utrecht University (URU)

Ron Boschma

other participants:

University of Sophia Antipolis (France)
The Samuel Neaman Institute (Israel)

Nice, 4 november 2011
WP5 Evolution of demand and dynamics of knowledge base in knowledge intensive sectors and regions

- **main objectives:**

1. to investigate the dynamics of knowledge bases in knowledge-intensive industries (related variety, coherence)

2. to analyze the evolution of the industry mix of regions over time (rise and fall of industries)

3. to determine the extent to which new industries are technologically related to existing industries at regional level

- start month: 13 - end month: 36
WP5 Evolution of demand and dynamics of knowledge base in knowledge intensive sectors and regions

three tasks

- **task 5.1** Technological variety and coherence of knowledge structure in knowledge-intensive sectors (UNS)

- **task 5.2**: Evolution of industry mix and relatedness among industries in regions (URU)

- **task 5.3** Policy implications (URU, UNS, SNI)
Task 5.1 Technological variety and coherence of knowledge structure in knowledge-intensive sectors (UNS)

Background:

1. interaction between evolution of knowledge and demand pull

2. outcome of a recombination process: stems from search activities locally conducted in technological and geographical space

3. in previous work, we identified 3 properties of the knowledge base of a sector
   • coherence: the extent to which the pieces of knowledge that agents within the sector combine to create new knowledge are complementary to one another
   • similarity: the extent to which the pieces of knowledge used in the sector are close to one another in technology space
   • variety: the technological differentiation within the knowledge base, with respect to possible combinations of pieces of knowledge in the sector, from the creation of a radically new type to the more incremental recombination of already existing types of knowledge
Task 5.1 Technological variety and coherence of knowledge structure in knowledge-intensive sectors (UNS)

objectives

1. map the dynamics of knowledge bases of 3 different knowledge-intensive sectors using measures of the properties of knowledge base

2. compare the dynamics of knowledge bases of 3 different knowledge-intensive sectors, i.e. biotechnology, telecommunications and electronics

3. analyse how the dynamics of the knowledge bases have an impact on the industrial dynamics of the knowledge-intensive sectors
Task 5.1 Technological variety and coherence of knowledge structure in knowledge-intensive sectors (UNS)

Data

- Espacenet data base, European Patent Office
- USPTO patent dataset
- relatedness indicator: co-occurrence analysis of technology classes in the same patent document
- all data will be georeferenced as to allow for the analysis of the dynamics in geographical space
Task 5.2: Evolution of industry mix and relatedness among industries in regions (URU)

**Background:**

1. variety as key driver of regional growth: the more variety, the more knowledge spillovers, the better

2. however, some degree of cognitive proximity between sectors is needed to enable effective learning between sectors

3. so what matters for regional growth: sectors that are technologically related in a region: induces knowledge spillovers

4. related variety major driver of urban and regional growth

5. countries tend to expand and diversify into sectors that are closely related to their existing industrial structure

6. regional branching: new industries grow out of technologically related industries, in which new firms recombine and exploit the knowledge and skills taken from local related industries
Task 5.2: Evolution of industry mix and relatedness among industries in regions (URU)

objectives

1. evolution of related variety at the regional level
2. its impact on long-term regional employment growth
3. entry and exit of industries in regions: depending in the degree of technological relatedness with existing industries in a region?
4. growth and decline of industries in regions: depending on the degree of technological relatedness with existing industries in a region?

this will also provide critical insights for the analysis carried out under Workpackage 6: especially mechanisms that connect related sectors, like labor mobility
Task 5.2: Evolution of industry mix and relatedness among industries in regions (URU)

Data

• industry data (4-6 digit) by region from 1970s - now: Germany (200 regions), Sweden (70 regions) and Italy (784 regions)

• several measures of technological relatedness between industries will be applied: skill relatedness, based on the intensity of labor flows across industries
Task 5.3 Policy implications (URU, UNS, SNI)