Knowledge-intensive Innovative Entrepreneurship & Innovation Policy

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My talk in this session on ‘Barriers to Innovation’ will

1. Conceptualize KIE: Knowledge-intensive innovative entrepreneurship

2. KIE turning knowledge into innovation
   2.1 Specific characteristics of KIE
   2.2 Compare KIE in creative industries vs KIE firms in manufacturing

3. Derive barriers & implications for Innovation Policy
Co-authors on knowledge-intensive entrepreneurship (KIE)

KIE as a phenomenon and related to innovation policy
Aegis project (see book Malerba et al 2016)
Ethan Gifford
Franco Malerba
Rögnvaldur Saemundsson
Olof Zaring

KIE as entrepreneurs
Jens Laage-Hellman
Daniel Ljungberg
Astrid Heidenmann Lassen
1. Conceptualize KIE

AEGIS EU project, especially (Malerba et al 2016, Routledge)
Malerba & Mc Kelvey (2011, EU)
Malerba & Mc Kelvey (2016, Routledge)
Malerba & Mc Kelvey (in, Niosi (ed) Cambridge University Press)
Malerba & Mc Kelvey (2018, Small Business Economics)
Why do economists care about entrepreneurship?

1. Evidence that entrepreneurship is an important phenomenon that stimulates economic growth & societal well-being

2. Evidence that entrepreneurship drives economic change:
   - Because entrepreneurs can stimulate creative destruction in industry through small firms
   - Also large firms can use entrepreneurial behavior to innovate and continue to compete

3. Evidence that technological and scientific knowledge are necessary, but not sufficient for explain growth
What might be the wrong conclusions of this for innovation policy?

1. Important phenomenon:
   All types of entrepreneurship (as a phenomenon) have equal impact on economic growth & societal well-being

2. Driving economic change:
   Only starting companies matters
   Academic / scientists companies the most important

3. Scientific, design & technology knowledge:
   Knowledge (scientific and technological) easily diffuse
   Universities per se should innovation, or directly transfer
   Only high tech industries matter
Tackle through knowledge-intensive innovative entrepreneurship

KIE encompass a wider scope than existing definitions

Manufacturing / goods

Low tech / Traditional industries

High tech industry / University spin-offs

Services

New tech based firms
Academic entrepreneurship
Gazelles

KIBS (knowledge intensive business services)
Knowledge-intensive innovation entrepreneurship - built from three theoretical foundations

- Schumpeterian Theories
- Evolutionary Economics
- Innovation Systems

KIE
Theoretical Foundation 1: The Schumpeterian entrepreneur & entrepreneurship

An understanding of the Schumpeterian entrepreneur, creating opportunities through action, and disrupting the economy but also enabling economic development

Audretsch, Buenstorf, Feldman, Foster, Garnsey, Loasby, Metcalfe, McKelvey, Shane, Venkataraman
Schumpeterian theories for KIE

- Carrying out new combinations
- Accepting uncertainty – and adapting to change
- Taking risks but also reaping profits
- Acting as a disruptive, dis-equilibrium force, which arises endogenously in the economy
- Driving wider processes of innovation, economic development, which in turn can lead to creative destruction
Theoretical Foundation 2: Evolutionary economics

An evolutionary economics understanding of the distinctive role of knowledge – specifically its creation, diffusion and use – in economic processes and co-evolution

Nelson & Winter, Canter, Dosi, Klepper, Metcalfe, Murmann, Pyka, Witt
Implications of Evolutionary Economics for KIE

- Entrepreneurs as actors in the economic system are developing and generating new knowledge as well as using and transforming existing knowledge.

- Companies are constituted by routines, problem-solving activities and learning in relation to environment.

- Individuals and firms are active within a context of knowledge regimes, involving specific innovative opportunities, which arise from characteristics of knowledge and markets.
Theoretical Foundation 3: Innovation systems

An innovation systems approach – to focus upon the relationships, networks, non-firm actors, and institutions – in analyzing industrial dynamics

Carlsson, Cooke, Edquist, Lundvall, Malerba, Nelson, Rosenberg
Implications of **Innovation Systems** for KIE

- Entrepreneurial learning and problem solving in KIE ventures takes place through internal capabilities, as well as through innovation systems including knowledge networks.

- The innovation system context in terms of actors, sources and institutions focuses our analysis of KIE on their learning, problem solving and innovation.

- Entrepreneurs’ access to information, capabilities and solutions are channeled through innovation systems.
Theoretical definition, KIE ventures are:

New learning organizations that generate new knowledge or use, transform or recombine existing knowledge and are problem solvers through innovation systems and knowledge networks

Malerba & McKelvey 2018, SBE
2. KIE turning knowledge into innovation

2.1 Specific characteristics

2.2 Comparison

Publications underway
Gifford, Ljungberg, McKelvey, (2018)
Lassen, Ljungberg, McKelvey (2018)
Lassen, Ljungberg, McKelvey (2019)
Flow of arguments

Point 2 Analysis of empirical evidence =>

2.1 specific characteristics of KIE

2.2 contrast KIE in cultural industries & L-M-H tech manufacturing industries

Point 3: Innovation policy

⇒ identify possible barriers to innovation in this type of firm

⇒ Derive implications for innovation policy
2.1 Specific characteristics

Based upon an empirical definition for measuring KIE (EU project AEGIS)

*KIE are new firms that are innovative, have a significant knowledge intensity in their activity and exploit innovative opportunities in diverse evolving innovation systems*

Analysis based on 4004 new firms in Europe (survey; Aegis EU project)
Criteria based on KIE knowledge & innovation

• Survey divided into:
  • KIE firms, 2454 firms
  • Non-KIE firms :1550 firms

• Innovative firms (Q 27): innovations for profit
  » whether the company has introduced new or significantly improved goods or services during the past three years

• Knowledge intensity (Q 5): education of founder
  » > or = bachelor degree

• Knowledge intensity (Q 8): skills of founder
  » Technical/engineering, design
Finding 1:
Empirical evidence that KIE ventures exist & distributed across sectors
Found in business services, advertising as well as food & beverages

So: KIE ventures exist across all sectors – manufacturing, services, creative industries, high tech, low tech

KIE ventures found in all European countries - sampled

Ergo, they do not just exist in high-tech sectors and not only in advanced countries or advanced industries
Finding 2:

Empirical evidence that KIE ventures interact more with innovation systems

Found more linkages with universities, with suppliers, with customers, and so on

*KIE firms interact more with other actors in innovation systems than the non-KIE firms*

Ergo, KIE firms seem to rely more upon surrounding innovation system than others (e.g. more networks, more dense relationships) in knowledge relationships
2.2 Comparison of KIE firms in creative industries (CI) vs KIE in low-medium-high tech manufacturing (M)

KIE firms differ from other types of entrepreneurship (in general)

*Can we better understand barriers to innovation within subsectors of KIE?*

Higher in CI = Significantly higher in CI as compared to M

Lower in CI = Significantly lower in CI as compared to M

Lassen, Ljungberg, McKelvey 2019, CIM
<table>
<thead>
<tr>
<th>Based on industry class (Nace Rev. 1.1)</th>
<th>Example key words used</th>
<th>Example of activities excluded</th>
<th># identified firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising</td>
<td>“advertis*”; “public relations”; “communication”; “marketing”; “design”; “graphical”</td>
<td>Sales of goods; real estate agencies;</td>
<td>66</td>
</tr>
<tr>
<td>Architecture</td>
<td>“architect*”; “design”; “drawing”</td>
<td>Engineering activities; Construction activities; Surveyors</td>
<td>130</td>
</tr>
<tr>
<td>Publishing</td>
<td>“publish*”; “book*”; “author”; “print*”; “edit*”; “publication”; “sound”; “audiovisual”; “radio”; “journalist”</td>
<td>Accounting; Sales of IT services etc.; Production of physical media;</td>
<td>275</td>
</tr>
<tr>
<td>Software development</td>
<td>“software develop*”; “software design”; “web design”; “game*”</td>
<td>IT consulting; Computer support; IT and computer hardware sales</td>
<td>112</td>
</tr>
<tr>
<td>Misc.</td>
<td>“photo*”; “artist*”; “graphic design”</td>
<td>Translation; Sales of goods; Trade and import business;</td>
<td>30</td>
</tr>
</tbody>
</table>

| Total                                  | 1 406                   |                               | 601                |
Details of empirics

We analyze differences between firms in manufacturing and creative industries, using a Chi2 test for the categorical variables, and the Mann-Whitney U test for ordinal and continuous variables.

Tables.
Higher in CI = Significantly higher in CI as compared to M
Lower in CI = Significantly lower in CI as compared to M
### KIE in cultural (CI) vs Manufacturing (M) while accessing ideas & input

<table>
<thead>
<tr>
<th>Characteristics of founder</th>
<th>Higher in CI</th>
<th>Lower in CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Founder degrees</td>
<td>- Founder degrees</td>
<td></td>
</tr>
<tr>
<td>- Woman founder</td>
<td>- Woman founder</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors leading to formation of firm</th>
<th>Higher in CI</th>
<th>Lower in CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Technological knowledge</td>
<td>- Technological knowledge</td>
<td></td>
</tr>
<tr>
<td>- Market need opportunities</td>
<td>- Market need opportunities</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sources of funding</th>
<th>Higher in CI</th>
<th>Lower in CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Own savings</td>
<td>- Own savings</td>
<td></td>
</tr>
<tr>
<td>- Venture capital</td>
<td>- Venture capital</td>
<td></td>
</tr>
<tr>
<td>- Bank loans</td>
<td>- Bank loans</td>
<td></td>
</tr>
</tbody>
</table>
## KIE in cultural (CI) vs Manufacturing (M) while managing & developing the firm

<table>
<thead>
<tr>
<th></th>
<th>Higher in CI</th>
<th>Lower in CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human resources</td>
<td>- Employee degrees</td>
<td>- # FTE</td>
</tr>
<tr>
<td>Mechanisms to protect innovations</td>
<td>- Trademarks &amp;/or copyright</td>
<td>- patents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Secrecy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Design complexity</td>
</tr>
<tr>
<td>Internal and external knowledge sources</td>
<td></td>
<td>- Suppliers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- In-house R&amp;D</td>
</tr>
<tr>
<td>Market success factors</td>
<td>- Low costs</td>
<td>- Novel products/services</td>
</tr>
<tr>
<td></td>
<td>- Marketing / promotion</td>
<td>- R&amp;D / univ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Premiumum offers</td>
</tr>
<tr>
<td>Market obstacle factors</td>
<td></td>
<td>Funding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lack technical knowledge</td>
</tr>
</tbody>
</table>
KIE in cultural (CI) vs Manufacturing (M) when evaluating performance

<table>
<thead>
<tr>
<th></th>
<th>Higher in CI</th>
<th>Lower in CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovative performance</td>
<td>- Share of service innovations</td>
<td>- Share of product innovations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Radical / new to world</td>
</tr>
<tr>
<td>Business performance</td>
<td>- Generates losses</td>
<td>- Higher turnover and profit (avg last 3 years)</td>
</tr>
<tr>
<td></td>
<td>- Higher profitability per employee</td>
<td></td>
</tr>
</tbody>
</table>
3. Derive barriers & innovation policy for KIE firms
Identifying possible barriers (B =>) in relation to KIE characteristics (2.1)

- Focus our attention on KIE existing in low-tech & traditional industries as well as services
  
  B => Highly dependent upon educated people

- Proposes that KIE firms embody capabilities, which enable them to link knowledge, innovation and entrepreneurship
  
  B => Without firm capabilities, no innovation
  B => without possibility to test capabilities through entrepreneurship, no development more broadly

- Identifies that relative to other types of entrepreneurial firms: more dependent upon innovation system linkages
  
  B => With weak innovation systems, less KIE
Identifying possible barriers (B =>) in relation to the comparison within KIE firms (2.2)

• KIE in creative industries are even more dependent upon internal knowledge and services, but tend not to grow
  
  B => Highly dependent upon educated people
  B => Innovate in services but not scale up

• KIE in manufacturing industries (all types) are more dependent upon financing, technology, and products
  
  B => Without innovation system linkages, have difficulties to scale up
  B => More likely to do products & radical innovations, but those may require global market
Using KIE to help nuance innovation policy

1. Important phenomenon:
   KIE is likely more important than other types

2. Driving economic change:
   KIE firms are highly dependent upon education/specialists
   KIEs have strong links to specific knowledge networks in innovation systems, including large companies, institutions

3. Scientific, design & technology knowledge:
   Knowledge (scientific, design and technological) diffuse through educated people/knowledge networks
   Universities play key role in knowledge networks (> important than direct to start-ups or innovation)
   All industries can use knowledge to innovate
Much future research needs to be done on how exactly KIE links these 3