High-growth, innovative enterprises in Europe: How many are there?

Dániel Vértesy

INNOVA Measure Workshop: “Innovation, high-growth and internationalization of R&D”, Brussels, 28 Nov 2017
Motivations

Interesting for multiple policy domains:

• **Post-crisis job creation**: A small group of high-growth innovative enterprises (HGIEs) generate a large share of new jobs

• **Structural change** towards innovative sectors (close EU <> US gap in technology intensity)

Yet, a growing high-growth enterprises [in EMPL terms] may simply indicate increase in labor-intensive (rather than knowledge-intensive) activities

Despite the interest, we still don’t know about the share of HGIEs in the European economy (data challenge: both innovation & growth)
1. What is the share of HGIEs in Europe?

2. Identifying HGIEs:
   - HGIEs grow fast... but how fast growth makes them HG Es?
   - HGIEs innovate... but what kind of innovations makes them HGIEs?
   ⇒ Understand the relationship between normative definitions and alternative definitions based on empirical observations?

3. How does high-growth and innovation performance of sectors and countries relate to one another at the country and sectoral level? (Do the two co-occur?)
Methods we followed

1. Discuss the **theoretical considerations** for measuring high-growth and innovativeness of firms

2. Construct a **Growth and Innovativeness Matrix** to measure the share of HGIEs using 20-country CIS2012 microdata and analyze the difference between the various HGI measures

3. Reduce the number of dimensions to analyze how **sectors** and **countries** perform in terms of high-growth and innovation?
Measuring high-growth: theoretical considerations

• Evidence of **uncertainty**:  
  • Eurostat <> OECD EIP disagree in growth thresholds (10% vs. 20%)

• Definition is crucial – results are sensitive to... :  
  • indicator (turnover- or employment-based?)  
  • Measure (absolute or relative? Or, combined? /Birch Ind/)  
  • Period considered (growth spurts vs. sustained growth?)  
  • The process of growth (organic vs M&A)  
  • Threshold for high-growth (absolute (above X%) or relative (Top N% of distribution))  
  (Delmar, 1997; Delmar et al, 2003; Coad et al, 2014)

• => We should apply many alternative definitions to ensure more valid results
Measuring innovativeness: theoretical considerations

- CIS-based measurement: richer data on inputs and outputs
  - Oslo Manual (OECD, 2005); [4th ed. update in progress]
  - Quantitative data from innovation survey responses are of various quality (Mairesse and Mohnen, 2010);
- (Other proxies: i.e. patents, new designs, R&D, etc.)

- Alongside cross-country & cross sectoral differences, companies’ innovative profile differs in terms of...
  - Innovation types (product, process, organizational, marketing)
  - Degree of novelty (new to world or new to firm /diffusion/)
    - Importance of new products in turnover
  - Whether and where they perform R&D (in-house or external); and R&D intensity (overall, by sector, country, etc.)

Our “core” measures

Our “contextual” measures
The Data:
distribution of firms by country and size

20 countries weighted sample
{ IT, DE, ES, FR }: ~80%

All firms
~450,000
[92,960]

Small
(76%)

Large
(4%)

Medium
(20%)

Limitations:
• Cannot measure persistency of high-growth or use other measures of growth performance;
• For many sectors, data was collected on a voluntary basis

Total Employment

<table>
<thead>
<tr>
<th>Employment Range</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 300</td>
<td>0</td>
</tr>
<tr>
<td>300 - 600</td>
<td>3</td>
</tr>
<tr>
<td>600 - 1,200</td>
<td>6</td>
</tr>
<tr>
<td>1,200 - 2,200</td>
<td>2</td>
</tr>
<tr>
<td>2,200 - 3,600</td>
<td>3</td>
</tr>
<tr>
<td>3,600 - 9,400</td>
<td>5</td>
</tr>
<tr>
<td>9,400 - 96,380</td>
<td>9</td>
</tr>
</tbody>
</table>
Absolute and relative growth thresholds: What is the difference?

- Top 10% of distribution
- Top 25% of distribution

Employment change, 2012/2010

Δ Empl. 10% [Eurostat]
Δ Empl. 20% [OECD]

- med
- P90
- P95
- p75
- ESTAT (10%)
- OECD (20%)
The share of HGIEs among European firms

The HGIE matrix results

<table>
<thead>
<tr>
<th>Inn1</th>
<th>Inn2</th>
<th>Inn50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hg1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hg2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hg30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0.1 – 31% of European firms are HGIEs (depending on the definition)
0.1 – 10% of firms are HGIEs in the 90% of cases
Reading the matrix

<table>
<thead>
<tr>
<th>inn1</th>
<th>inn2</th>
<th>inn3</th>
<th>inn4</th>
<th>inn5</th>
<th>inn6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prod.</td>
<td>Proc.</td>
<td>Pd/Pc</td>
<td>Org/Mkt</td>
<td>Any</td>
<td></td>
</tr>
</tbody>
</table>

hg1
7% 5% 4% 1% 0% 12%

g2
8% 6% 5% 1% 0% 13%

hg3
10% 7% 6% 2% 0% 9%

hg4
11% 8% 7% 2% 0% 7%

hg5
4% 6% 5% 2% 0% 3%

hg6
14% 11% 10% 3% 0% 6%

hg7
3% 3% 4% 2% 0% 1%

hg8
1% 1% 1% 0% 0% 2%

hg9
7% 8% 10% 4% 0% 17%

hg10
1% 1% 1% 0% 0% 1%

hg11
18% 17% 16% 9% 7% 25%

hg12
20% 19% 17% 9% 7% 25%

hg13
24% 23% 21% 9% 9% 31%

hg14
24% 23% 21% 9% 9% 31%

hg15
1% 1% 1% 0% 0% 1%

hg16
3% 3% 4% 2% 0% 1%

hg17
1% 1% 2% 1% 0% 2%

hg18
2% 2% 3% 1% 0% 3%

hg19
3% 3% 4% 2% 0% 1%

hg20
2% 2% 2% 1% 0% 2%

hg21
3% 3% 3% 1% 0% 3%

hg22
4% 4% 6% 2% 0% 8%

Top Empl

HGiINNj

Top Sales EMPL SALES Birch

Empl. 10% [Eurostat]

Sales 20% [OECD]
The co-occurrence of high-growth & innovativeness across countries, sectors

Aim: reduce dimensions
- 30 x 50 HGIE indicators: too many to handle
  ⇒ 2 pillars of high-growth
  ⇒ 1 core innovation pillar

- Around core variables (ESTAT-based definition + relative threshold; all types of innovation); statistically coherent
- Address uncertainty in the establishment of thresholds
- Leave contextual variables apart

Outcome: 3 pillars
1. “HG_P1”: Employment growth: absolute threshold
2. “HG_P2”: Various growth measures: top N% of distribution
3. “INN_P1”: Core innovation types
Both “absolute” and “relative” HG pillars negatively correlated with the innovation core pillar at the country level.

Countries strongest in Innovation relatively weaker in high-growth

- Less innovative firms grow fast in RO, BG, LV, LT or NO
- [ES: not fully comparable due to larger number of sectors]
At the sectoral level: **no association** between HG & INN

- Yet: positive correlation observed at 1-digit sectoral level [heterogeneity within 1-d sectors]

### NACE 2-digit

<table>
<thead>
<tr>
<th></th>
<th>inn_p1</th>
<th>hg_p1</th>
<th>hg_p2</th>
</tr>
</thead>
<tbody>
<tr>
<td>inn_p1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hg_p1</td>
<td>0.183</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>hg_p2</td>
<td>-0.012</td>
<td>0.774 ***</td>
<td>1</td>
</tr>
</tbody>
</table>

### NACE 1-digit

<table>
<thead>
<tr>
<th></th>
<th>inn_p1</th>
<th>hg_p1</th>
<th>hg_p2</th>
</tr>
</thead>
<tbody>
<tr>
<td>inn_p1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hg_p1</td>
<td>0.406 *</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>hg_p2</td>
<td>0.257</td>
<td>0.819 ***</td>
<td>1</td>
</tr>
</tbody>
</table>
Core innovation activities:

- **KIABI:**
  - positive, moderate correlation;
  - more innovative sectors show both high & low [65] HG performance

- **Non-KIABI:**
  - no association between HG & INN

Knowledge-intensive sectors do not seem to underperform other (more labour-intensive) sectors

**Graphs by KIABI**

- non-knowledge-intensive, core
- knowledge-intensive, core
Conclusion

Novelty of study: quantify the share of HGIEs in Europe using CIS2012 data
• between 0.1 and 10% in case of 90% of HGIE def. combinations
• Results most sensitive to growth measure and threshold & degree of novelty of innovations.
• A useful method to characterize innovative profiles of high-growth enterprises

Observed difference between country-level and sector-level relationship between HG & I
• Very high heterogeneity within country / sector aggregations
• Chasing 2 targets at the same time: danger of trade-off between high-growth & innovativeness [especially in catching-up countries]
• Horizontal HGIE policy may be problematic
Thank you!

Welcome to email us at: daniel.ertesy@ec.europa.eu
Country and sectoral performance gaps largely related to firm size structure