Spatial Agglomeration, Global Value Chains and Productivity. Micro-Evidence from Italy and Spain

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1. Motivation of the Paper

Global economic integration has increased the complexity and geographic dispersion of production processes.

As a consequence:

- changing local-based production dynamics, due to firms’ increasing involvement into (global) production networks:
  - traditional “neighbouring” business partners partly replaced by new “global” actors;
  - production systems observe increasing heterogeneity among local firms, which is driven by their different positioning along Global Value Chains (GVC).

Do spatial agglomeration forces still matter for firms’ performance?

Is there any differential effect related to GVC positioning which drives the relationship between agglomeration externalities and firms’ performance?
2. Theoretical Framework

- Large empirical consensus that location in a spatially-bounded, highly agglomerated production system benefits firms through tangible and intangible externalities, mainly related to:
  
  ✓ labour market pooling;

  ✓ input sharing;

  ✓ knowledge spillovers.

- These positive externalities help firms to lower production costs, and so to improve their performance (Puga and Duranton, 2004).
2. Theoretical Framework

- Traditional theoretical and empirical literature on spatial agglomeration assumes homogenous firms:

  - firms within a spatially agglomerated production system are treated as identical unit:
    - all firms benefit in the same way from and contribute with the same intensity to the production of local externalities.

- However, recent Economic Geography contributions underline the hypothesis of firm heterogeneity:

  - the co-existence of firms that differ in size, productivity and technology is a feature common to many agglomerated areas (Wang, 2015):

  - firms with different characteristics differ in their capability to absorb local externalities, which alters the impact of agglomeration on performance - e.g. productivity (Cainelli and Ganau, 2017).
2. Theoretical Framework

- The process of global economic integration has deeply altered the configuration of production processes, in terms of both complexity and geographic articulation:
  - fragmentation of production, by which production stages are allocated to different firms in different countries (Amador and di Mauro, 2015);
  - re-configuration of “traditional” production dynamics within local systems;
  - movements of firms along the GVC.

- Firms operating at different stages of the GVC are likely to interact differently with the local production environment:
  - suppliers VS final firms.
2. Theoretical Framework

- Suppliers VS final firms:

  ✓ suppliers:
  
  o firms selling to other firms (e.g. sub-contracting);
  
  o exploit “local” advantages related to spatial proximity (e.g. face-to-face interactions, knowledge transfer, reduced transport costs);
  
  o agglomeration-related advantages are internalised and translated into higher efficiency;

  ✓ final firms:
  
  o producers that serve end markets;
  
  o thus, less dependent on local inter-firm (production-side) externalities.
3. Research Hypothesis

➢ Since firms operating at different stages of the GVC (suppliers VS final firms) are likely to interact differently with the local production environment …

… they are also likely to benefit differently from agglomeration externalities:

✓ we can hypothesise that suppliers’ performance still benefits from spatial agglomeration “directly”,

✓ while the effect on the performance of final firms is only “indirect”, i.e. related to efficiency gains in suppliers’ performance.
4. Contribution of the Paper

- We analyse whether agglomeration externalities influence firms’ labour productivity:
  - in the manufacturing industry;
  - by comparing two southern European countries, i.e. Italy and Spain:
    - both their economies are more strongly manufacturing-based;
    - both are highly involved in GVCs (OECD, 2012);
    - both are characterised by the presence of industrial districts and highly agglomerated production systems (Cainelli 2008; Boix, 2009);
  - we explicitly account for firm-level heterogeneity in GVC positioning as a mediator factor which may alter the agglomeration-productivity relationship.
5. Data

- Firm-level data drawn from the EFIGE (Bruegel) dataset:
  - survey data collected in 2010 for about 15,000 manufacturing firms in AT, DE, ES, FR, HU, IT, UK;
    - source of information on firm-level GVC positioning;
  - integrated with balance sheet data from Amandeus (Bureau Van Dijk) database;

- Focus on active firms operating in Italy and Spain:
  - data on incorporation year, value added and employment available in EFIGE were combined with updated data directly drawn from Amadeus through BVD ID number:
    - fill data gaps, where possible, and double-check data consistency;
    - retrieve information on location at geographic NUTS-3 level;
    - unbalanced panel of 4,025 firms observed over the 2010-2014 period.

- Labour productivity equation:

\[
\log(LP_{ipct}) = \alpha + \beta \log(Agglomeration_{pct}) + \sum_{k=1}^{K} (\gamma_k X^k_{ipct}) + \delta_i + \zeta_t + \varepsilon_{ipct}
\]

- \(LP_{ipct}\) is labour productivity (deflated value added over employment) of firm \(i\) in province \(p\), country \(c\) at time \(t\);

- \(Agglomeration_{pct}\) is a density measure capturing the spatial concentration of local units (LU) operating in manufacturing and KIBS sectors (e.g. Ciccone, 2002):

\[
Agglomeration_{pct} = \frac{\sum_{g=1}^{G} LU_{gpct}}{Surface_{pc}}
\]

- \(X^k\) captures log-transformed variables for firm size (employment) and age.
7. Identifying GVC Positioning

- Position along GVCs determined using information on sales of produced-to-order goods:
  
  - best proxy available in EFIGE to capture high-targeted, vertical market relationships between clients and suppliers;
  
  - e.g. Veugelers et al. (2013), Accetturo and Giunta (2016), Agostino et al. (2016);
  
  - average percentage of sales accounted for by produced-to-order goods, and main customer of these goods:
    
    - supplier, if produced-to-order sales go exclusively to other firms:
      - 87% of Italian firms in the sample, 69% of Spanish firms the sample;
    
    - final firm, if produced-to-order sales go to end markets.
8. Estimation Approach

- Two-way Fixed Effect (FE) estimation:
  - labour productivity equation is estimated on the whole sample, and on sub-samples of final firms VS suppliers.

- IV approach to deal with endogeneity of the agglomeration variable (e.g. Graham et al., 2010):
  - reverse causality, if provinces endowed with high-performing firms tend to present higher agglomeration patterns;
  - spatial sorting, if the most efficient firms locate in – or re-locate towards – more agglomerated areas.
9. Identification Strategy

- Identification of spatial agglomeration effects through a shift-share approach à la Bartik (1991):

  ✔ we exploit geographic (sub-national) variability in Great Recession’s effects in Italy and Spain:

    o provinces with a pre-crisis industrial structure more exposed to international markets could have experienced a more severe recession:
      - deeper process of local industrial re-configurations during the crisis, with consequent effects on the local agglomeration structure;

    o in the absence of province-specific shocks, each province would have experienced a change in its industrial structure over the crisis period proportional to its initial (pre-crisis) condition.
9. Identification Strategy

We consider two-digit sector shares of local units at province level at time T=2007, and sector-specific national changes over the periods t-T, with t=2010,…,2014, to instrument our agglomeration variable:

$$IV_{pct} = \sum_{g=1}^{G} \left\{ \left( \frac{LU_{gpcT}}{\sum_{g=1}^{G} LU_{gpcT}} \right) \times \left[ \log(LU_{g(-p)ct}) - \log(LU_{g(-p)cT}) \right] \right\}$$

Exogeneity of the IV is strengthened by:

- excluding the province-specific contribution to the national changes (Faggio and Overman, 2014);
- using lagged shares (de Blasio et al., 2016), i.e. defining the nationwide shocks with respect to pre-crisis conditions to avoid imposition of time constraints on the processes of industrial re-configuration.
10. Baseline Results: Whole Sample

<table>
<thead>
<tr>
<th>Estimation Method</th>
<th>Country</th>
<th>Italy and Spain</th>
<th>FE</th>
<th>Italy</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>log(Agglomeration\text{pet})</td>
<td>0.638***</td>
<td>1.010***</td>
<td>0.432*</td>
<td>0.706***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.165)</td>
<td>(0.215)</td>
<td>(0.258)</td>
<td>(0.256)</td>
<td></td>
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<tr>
<td>Control Variables</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Year Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tr>
<tr>
<td>Number of Observations</td>
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<td>18,757</td>
<td>10,182</td>
<td>8,575</td>
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<tr>
<td>Number of Firms</td>
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<td>4,025</td>
<td>2,235</td>
<td>1,790</td>
<td></td>
</tr>
<tr>
<td>Model F Stat. [p-value]</td>
<td>11.12 [0.000]</td>
<td>43.14 [0.000]</td>
<td>39.58 [0.000]</td>
<td>27.89 [0.000]</td>
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</tr>
</tbody>
</table>

Notes: * p<0.1; ** p<0.5; *** p<0.01. Standard errors are clustered at the geographic NUTS-3 level and they are reported in parentheses.
## 10. Accounting for Heterogeneity in GVC Position

<table>
<thead>
<tr>
<th>Estimation Method</th>
<th>FE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Italy and Spain</td>
</tr>
<tr>
<td>GVC Position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final Firms (1)</td>
</tr>
<tr>
<td></td>
<td>Suppliers (2)</td>
</tr>
<tr>
<td><strong>log(Agglomeration\textsubscript{pct})</strong></td>
<td>0.662** (0.316)</td>
</tr>
<tr>
<td>Control Variables</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Year Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>4,004</td>
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<tr>
<td>Number of Firms</td>
<td>851</td>
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<tr>
<td>Model F Stat. [p-value]</td>
<td>23.98 [0.000]</td>
</tr>
</tbody>
</table>

Notes: * p<0.1; ** p<0.5; *** p<0.01. Standard errors are clustered at the geographic NUTS-3 level and they are reported in parentheses.
## 10. Accounting for Heterogeneity in GVC Position

<table>
<thead>
<tr>
<th>Estimation Method</th>
<th>FE-TSLS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country</strong></td>
<td>Italy and Spain</td>
</tr>
<tr>
<td><strong>GVC Position</strong></td>
<td>Final Firms</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>log(Agglomeration(_{pct}))</td>
<td>1.445</td>
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<td></td>
<td>(1.627)</td>
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<td><strong>Control Variables</strong></td>
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<tr>
<td><strong>Firm Fixed Effects</strong></td>
<td>Yes</td>
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<td><strong>Year Fixed Effects</strong></td>
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<tr>
<td><strong>Number of Observations</strong></td>
<td>4,004</td>
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<tr>
<td><strong>Number of Firms</strong></td>
<td>851</td>
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<tr>
<td><strong>Model F Stat. [p-value]</strong></td>
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<td><strong>1st Stage F Stat. [p-value]</strong></td>
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</table>

Notes: * p<0.1; ** p<0.5; *** p<0.01. Standard errors are clustered at the geographic NUTS-3 level and they are reported in parentheses.
11. Concluding Remarks

- We investigate how agglomeration effects influence firms’ labour productivity in Italy and Spain by considering firms’ heterogeneity in GVC positioning as a factor.

- Agglomeration seems to benefit the productivity of supplier firms only:

  - firm heterogeneity matters, as firms within agglomerated areas differ in their capability to absorb local externalities;

  - this is an important result in the era of production globalisation:
    - a lack of positive agglomeration externalities – in tandem with relatively small operational size – could increase the probability of suppliers’ exiting the market, as they are the relatively “weak” type of firms within GVCs;

  - the effect of agglomeration on final firms is most likely only indirect:
    - stemming from vertical relationships between suppliers and final firms:
      - the most efficient local suppliers may transfer part of their agglomeration benefits to final firms.
Thanks!

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r.ganau1@lse.ac.uk

https://sites.google.com/site/rganau/
## Structure of the sample

<table>
<thead>
<tr>
<th></th>
<th>Italy</th>
<th>Spain</th>
<th>Italy and Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. v.</td>
<td>%</td>
<td>a. v.</td>
</tr>
<tr>
<td>EFIGE Dataset</td>
<td>2,983</td>
<td>51.73%</td>
<td>2,783</td>
</tr>
<tr>
<td>Sample</td>
<td>2,235</td>
<td>55.53%</td>
<td>1,790</td>
</tr>
</tbody>
</table>

Notes: Percentage values are defined on row totals.
## Sample distribution by GVC position

<table>
<thead>
<tr>
<th>GVC Position</th>
<th>Italy</th>
<th>Spain</th>
<th>Italy and Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. v.</td>
<td>%</td>
<td>a. v.</td>
</tr>
<tr>
<td>Final Firms</td>
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<td>13.29%</td>
<td>554</td>
</tr>
<tr>
<td>Suppliers</td>
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<td>86.71%</td>
<td>1,236</td>
</tr>
<tr>
<td>Whole Sample</td>
<td>2,235</td>
<td>100.00%</td>
<td>1,790</td>
</tr>
</tbody>
</table>

Notes: Percentage values are defined on column totals.