Multinationals and regional development: evidence from across the globe

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Multinationals hit the headlines ... when they come ...

To ‘central’ cities: PARIS
Or ‘peripheral’ cities: NAPLES
Multinationals hit the headlines ... when they leave...

Multinationals hit the headlines ... when they just say they will leave ...
Global FDI flows jumped 36% in 2015 to an estimated US$1.7 trillion, their highest level since the global economic and financial crisis of 2008-2009.

Source: UNCTAD - Global Investment Trend Monitor 2016
FDI Projects in the city-regions of the world (inward, cumulative CAPEX)

2004-2014 (in million USD)

FDIMarkets data – Own elaboration

Surprisingly little is known about Multinationals’...

Where and how do they have an impact on local innovation and employment?

How do they interact with domestic firms?

How can regions leverage Multinationals for innovation and recovery?

Research Questions
- Where do multinationals go? And Why?
- What activities are (de)localised where and how?
- How location drivers vary across MNEs? Are EMNEs different?

Disciplines
- International Business Studies
- International Economics
- Economic Geography
Innovation agents and their networks

• The geography of innovation is shaped by the evolving location of innovation agents and their performance.
• Innovation agents are nodes of complex social, cognitive, organisational or institutional networks of varying spatial densities;
• The attention has moved from ‘regional (black) boxes’ towards:
  – Integrated frameworks for regional analysis and diagnosis:
    • Impact of local and non-local knowledge flows is assessed in relation to local institutional conditions and political economy factors
  – Micro-level analysis of the spatial behaviour and impacts of key innovation actors: mobility of individuals (e.g. inventors) and (multinational) firms (and their combination).

Spatial behaviour and impacts of multinational firms (1)

The joint analysis of location and impacts makes it necessary to:

1. **Bridge** firm-level characteristics, investment-level characteristics and features of the host economies at the national and city-region level (spatial, economic and socio-institutional features of the host economies)

2. **Conceptualise** internationalisation in terms of:
   1. **Spatial extent**: extra-local, international and global
   2. **Nature**: capital, skills and knowledge are bundled in the intra- and inter-firm connections that form GPNs/GVCs. The actual combination of their constituent elements and their sophistication/complexity depend on the function (or value chain stage) pursued by the agents ‘connected’ by each flow
   3. **Direction**: regional economies simultaneously exposed to inflows and outflows (bi-directionality). ‘Host’ and ‘home’ country/regions overlap
Spatial behaviour and impacts of multinational firms (2)

- Embed into economic geography and urban and regional economics concepts and insights from international economics, strategy and management, Global Value Chain analysis and international business studies.
- Combine rigorous quantitative methods with complex data problems at a ‘global’ scale (external validity).
- Assess the rationale and impact of existing policies for the attraction and retention of FDI.

Long-run research agenda ...

- (Selected) published work:

  LOCATION
  - How do multinationals organise their value chains in space? What is the role of national vs. regional factors? Do regional innovation factors matter for the location of FDI? [Crescenzi, Rabellotti and Pietrobelli, 2014]
  - Do multinationals from Emerging Economies follow different spatial strategies vs. advanced economies multinationals? [Crescenzi, Rabellotti and Pietrobelli, 2016]
  - How does the location behavior of MNEs is shaped by the economic institutions of the host countries? How do MNE preferences changes across sectors and functions? [Ascani, Crescenzi and Immarino, 2016]

  IMPACT
  - What is the innovation impact of Multinationals on domestic firms active in their same sector? [Crescenzi, Gagliardi and Iammarino, 2015]
  - How do openness and connectivity interact with regional economic development trajectories? How has the crisis changed this link? [Crescenzi and Iammarino, 2017]
THE SPATIAL BEHAVIOUR OF MNES

with Vito Amendolagine (Univ. of Pavia) and Roberta Rabelloitti (Univ. of Pavia)

MNE ESTABLISHMENT MODE, FIRM HETEROGENEITY AND LOCAL INSTITUTIONAL CONDITIONS
Establishment mode choice

- Multinational Enterprises (MNEs) can engage in foreign direct investment (FDI) via:
  - Cross-border acquisitions i.e. entering foreign markets by acquiring an existing local company;
  - Greenfield FDI i.e. entering foreign markets by establishing a new local firm.

- Different modes of establishment might foster different reactions in the host countries and regions but there is no consensus in the literature on:
  - Determinants of the establishment mode choice
  - Differential impacts on the performance of the (new establishment
  - Impacts on the host economy.

- Sub-national level evidence on all these aspects is missing.

Research Questions

- Our paper aims to start filling these gaps by addressing the following research questions:
  - Are MNE characteristics influencing establishment mode choice? How?
    - Are more productive (or more innovative firms) systematically favouring one establishment mode over the other?
  - How are investing enterprises and ‘host’ economies matched via different establishment modes?
  - Do national AND regional characteristics of the host economy matter for this matching?
    - Do investments in more ‘advanced’ countries/regions favour one establishment mode over the other?
    - Does local institutional quality influence the matching process?
What drives FDI entry mode?

- Existing literature mostly focused on macro-drivers, such as market size and market competition intensity (Mattoo, et al., 2004; Eicher and Kang, 2005; Muller, 2007);
- Nocke and Yeaple (2007, 2008) develop a theoretical model that explains how “the two modes of FDI differ significantly in both the characteristics of the firm that engage in these modes as well as in the characteristics of the host countries in which firms invest”;
- We follow Nocke and Yeaple (2008) in looking at the entry mode choice as a positive assertive matching process between subsidiaries and headquarters;
- However in our framework not only macro-level wages and productivity differences drive investment decisions but also REGIONAL strategic assets and institutional conditions;
- Firm-level characteristics interact with national and regional characteristics and institutional conditions shaping establishment mode choices.

Empirical model

- Following Nocke and Yeaple (2008), we estimate the following logit model:
  \[
  \Pr(y_{ijkl} = 1 | x_{ijkl}) = \frac{\exp(x_{ijkl}\beta)}{1 + \exp(x_{ijkl}\beta)},
  \]
  - \( y_{ijkl} \) is the dependent variable that takes value:
    - 1 if parent firm \( i \) in the industry \( j \) acquires a foreign company in industry \( k \) within country \( l \),
    - 0 if the same company opts for a greenfield FDI.
  - \( x_{ijkl} \) is a set of observable characteristics of firm \( i \), sector \( j \) in which firm \( i \) is active, industry \( k \) of the foreign investment and the destination country/region \( l \).
  - The time indicator \( t \) is omitted. Two periods before and after the crisis are defined.
The variables

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td></td>
</tr>
<tr>
<td>ACQ</td>
<td>Indicator =1 for acquisitions, 0 otherwise</td>
</tr>
<tr>
<td><strong>Investing Company Firm-level Variables</strong></td>
<td></td>
</tr>
<tr>
<td>EFFICIENCY (1)</td>
<td>Total Sales (log)</td>
</tr>
<tr>
<td>EFFICIENCY (2)</td>
<td>Sales/Employee (log)</td>
</tr>
<tr>
<td>SIZE</td>
<td>Employees (log)</td>
</tr>
<tr>
<td>DIVERSIFICATION ACROSS</td>
<td></td>
</tr>
<tr>
<td>INDUSTRIE</td>
<td>Number of SIC sectors in which the firm is active</td>
</tr>
<tr>
<td>INNOVATION</td>
<td>R&amp;D expenditure/Sales (log)</td>
</tr>
<tr>
<td>EXPERIENCE</td>
<td>Indicator for previous experience in the country of destination</td>
</tr>
<tr>
<td>INTERNATIONALISATION</td>
<td>N. of countries with affiliates of the company (log)</td>
</tr>
<tr>
<td>FOREIGN SALES RATIO</td>
<td>Foreign sales/Total Sales (log)</td>
</tr>
<tr>
<td><strong>Host Economy Variables</strong></td>
<td></td>
</tr>
<tr>
<td>REAL GDP</td>
<td>Real GDP per capita (log)</td>
</tr>
<tr>
<td>POPULATION</td>
<td>Country population (log)</td>
</tr>
<tr>
<td>OPENNESS</td>
<td>(Exports plus imports)/GDP</td>
</tr>
<tr>
<td>REGULATORY_Q</td>
<td>WB index for regulatory quality (log)</td>
</tr>
<tr>
<td>GOV_EFF</td>
<td>WB index for government effectiveness (log)</td>
</tr>
<tr>
<td>CONTROL_CORRUPTION</td>
<td>WB index for control of corruption (log)</td>
</tr>
</tbody>
</table>

Data

- The dataset innovatively combines firm-level information on MNEs and their foreign investments with country/regional level data.
- Investing companies are taken from the *Forbes Global 2000 list* (for the year 2015):  
  - it selects the world major publicly listed companies through a composite index built over four metrics (i.e. sales, profits, assets, market value);  
  - out of 2,000 companies, 1,116 have at least one investment in the EU-28 in the time-period 2003-2014;  
  - overall, their investments represent around 42 % and 41 % of the total value of, respectively, greenfield and M&A deals directed to the EU-28 in 2014 (UNCTAD 2016).
- Firm-level data on investing companies are from *Worldscope Database*.
- For each investing company we identify all foreign investments in the EU-28 over the 2003-2014 period:  
  - M&A from *Zephyr* (Bureau van Dijk);  
  - Greenfield FDI from *FDI Market* (Financial Times Group);  
  - For each investment we identify entry mode, year, sector, country, region and financial value.
- Economic and institutional indicators are associated to each destination country/region (*Eurostat*, Summers’ and Heston’s *Penn World Table*, World bank’s *Worldwide Governance Indicators*).
- Distinction between periods before and after the crisis (2008).
### Preliminary Results

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Sign and Significance</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>ACQ</td>
<td>Indicator = 1 for acquisitions, 0 otherwise</td>
</tr>
</tbody>
</table>

| **Investing Company Firm-level Variables** |                       |
| EFFICIENCY (1)                     |                       |
| EFFICIENCY (2)                     | - ***                 |
| SIZE                              |                       |
| DIVERSIFICATION ACROSS INDUSTRIES |                       |
| INNOVATION                        |                       |
| EXPERIENCE                        | + ***                 |
| INTERNATIONALISATION              |                       |
| FOREIGN SALES RATIO               |                       |

| **(Selected) REGIONAL Host Economy Variables** |                       |
| REGIONAL GDP                        | + **                  |
| REGIONAL POPULATION                 | + ***                 |
| QUALITY OF GOVERNMENT               | + ***                 |
| REGIONAL QOG                        | + ***                 |

| **INTERACTION TERMS**              |                       |
| QOG*EFFICIENCY                     | - ***                 |
| QOG*INNOVATION                     | Not sig.             |
Preliminary Results (Summary)

• Are different types of firms involved in different establishment modes?
  – More efficient companies are more likely to undertake greenfield investments;
  – Technological factors do not seem to influence directly entry mode choice.

• Do national AND regional characteristics of the host economy matter for this choice?
  – National factors matter (e.g. more ‘open’ economies are more likely to host greenfield investments)
  – But regional characteristics matter on top of national features

• Does local institutional quality influence entry mode choice?
  – Both national and regional QoG matter and increase the probability of foreign acquisitions;
  – However they also help the ‘selection’ of greenfield investments by the most efficient MNEs

THE LOCAL IMPACTS OF MNES
with Arnaud Dyevre (LSE) and Frank Neffke (Harvard)

INTERNATIONALISATION AND THE SPREAD OF INNOVATION ACROSS CITIES: EVIDENCE FROM ACROSS THE GLOBE

Patenting around the world
More unequally distributed than income

Note: US States are excluded
Overview of patenting around the world

Lorenz curves

Note: US States are excluded

Overview of patenting around the world

Unequally distributed
Overview of patenting around the world

*Unequally distributed*

**Quintiles of patent count 1975-2012**

<table>
<thead>
<tr>
<th>Quintiles of patent count 1975-1990</th>
<th>1 (0-3)</th>
<th>2 (4-6)</th>
<th>3 (7-23)</th>
<th>4 (24-438)</th>
<th>5 (439-440k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (0 patent)</td>
<td>59.3%</td>
<td>27.1%</td>
<td>11.9%</td>
<td>1.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2 (1-3)</td>
<td>19.5%</td>
<td>45.8%</td>
<td>27.0%</td>
<td>7.5%</td>
<td>0.2%</td>
</tr>
<tr>
<td>3 (4-5)</td>
<td>16.9%</td>
<td>34.8%</td>
<td>23.4%</td>
<td>23.9%</td>
<td>1.1%</td>
</tr>
<tr>
<td>4 (6-73)</td>
<td>1.3%</td>
<td>4.9%</td>
<td>19.0%</td>
<td>58.2%</td>
<td>16.7%</td>
</tr>
<tr>
<td>5 (75-100k)</td>
<td>0.0%</td>
<td>0.3%</td>
<td>1.0%</td>
<td>15.7%</td>
<td>83.0%</td>
</tr>
</tbody>
</table>

Very stable over time
How do places become innovative?

Case-studies


- Foreign interventions fosters innovation and economic growth
- **Bangalore, India**: Infosys founded in 1981, quickly followed by leading US tech companies including HP (1989) and Texas Instruments (1985). From a virtually absent IT in base, the region now accounts for a third of India’s IT exports.
- **Hyderabad, India**: In 1999 National Semiconductor rejects plan for MP3. Indian inventors establish firm in India→ In late 2000s, firm employs engineers coding the operating system of the Apple iPod

Example from patent data

*Hewlett-Packard in Bangalore*
Example from patent data

*Hewlett-Packard in Bangalore*

![Graph showing total patents in Karnataka in Computer Hardware and Softwares](image)

What is the role of FDI in propelling local innovation?

The importance of foreign activities in triggering a local virtuous circle of innovation remains an open question:

- Evidence on pre-selected case studies
  - E.g. Saxenian (2006)
- Quantitative Empirical evidence is non-causal and remains inconclusive
  - E.g. Breschi, Lissoni & Tarasconi (2014)
- Key aspect of globalisation: steady increase in global flows of foreign investment, scientists and engineers and global collaboration networks
  - Freeman (2010), Docquier & Rapoport (2012), Crescenzi & al. (2016)
Research Questions & Approach

By looking at patenting across the globe between 1975 and 2012 we address the following questions:

• What is the impact of FDI on the innovative performance of the host regions/technology fields?
• How does this impact (if any) vary across contexts?
• How investing firms characteristics shape impacts?

Data

Patents and region-level observables

• **US Patent and Trademark Office:** 3.6 million distinct inventors, 6.0 million patents
  – From 1975 to 2012
  – Inventor names and owners of the patents are disambiguated via Discriminative Hierarchical Coreference (Wick, Kobren & McCallum, 2013)
  – Geo-coordinates of inventors’ cities of residence
  – Patents in 6 technological categories (Chemicals, Computers & Communications, Drugs & Medical, Electrical & Electronic, Mechanical, and Others) (Hall et al., 2001)

• **Regional observables:**
  – 1528 regions, from 83 countries
  – from 1960 to 2010 (discontinuous and varying with regions)
  – GDP, population, average years of education, geology, reliance on oil and gas (country and region)
Identifying innovation-enhancing FDI

- **First foreign patent**: When first firm from OECD (1985) files the first patent application in a foreign region with a local resident:
  - E.g. German firm patenting in Tyrol with an Austrian resident

- **Home country of firm**: given address of the company at which most of its patents are filed (cross-checked using ORBIS)

- **Timeline**:

```
FDIs
Patent data
```

Treatment: Where to?

- Foreign firms patenting for the first time (by region)
Identification strategy

*Propensity score matching*

- **Propensity score matching: on region×technology cells:**
  - Using GDP/cap in country, GDP of region, average years of education in region (all in logs) and 3-year average growth rate in the country at the time of intervention
  - Keeping 3 nearest neighbours
- **Matching restrictions:**
  - Exact match on year
  - Exact match on technology
  - Exact match on World Bank macro regions (East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia, Sub-Saharan Africa)
  - Control cells cannot have received foreign firms before
  - Two regions from the same country cannot be matched (avoid geo spillovers)

Balance

- Good balance on observables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment</th>
<th>Control</th>
<th>Example in 1985</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>1.07 million</td>
<td>0.93 million</td>
<td>Sevilla (Spain)</td>
</tr>
<tr>
<td>GDP (region)</td>
<td>15.8 bn $</td>
<td>13.3 bn $</td>
<td>Auvergne (France)</td>
</tr>
<tr>
<td>GDP per capita (country)</td>
<td>15,500 $</td>
<td>15,200 $</td>
<td>Israel</td>
</tr>
<tr>
<td>Years of education</td>
<td>8.2</td>
<td>8.1</td>
<td>Pest (Hungary)</td>
</tr>
<tr>
<td>Average growth rate (country)</td>
<td>2.57%</td>
<td>2.59%</td>
<td>Italy</td>
</tr>
</tbody>
</table>
Difference-in-Differences

*Patents by all firms*

- **All regions**

- **Asia**

- *caliper is .0002, 118 inclusions*

- *caliper is .0002, 117 inclusions*
Difference-in-Differences

*Patents by all firms*

(Chart showing differences in patents by all firms between China and India over time.)

(Chart showing differences in patents by all firms in Europe over time.)

caption is: 0.002, 54 observations
What makes foreign firms more impactful?
Some smoking guns

- Continent-specific factors?
- Technology-specific factors?
- Level of development of the host region?
- Most innovative foreign investors?

What can explain the impact?
Most innovative firms vs. medium sized firms
What can explain the increase?

*Most innovative firms vs. medium sized firms*

What makes foreign firms more impactful?

*Regression for heterogeneous effects*

Regression framework: Inspired by labour economics (Jacobson, Lalonde & Sullivan, 1993)

Taking difference between average of patent count before t-2 and after t+2, regress difference on treatment ($T_{rct}$) interacted with a variable of interest ($D_{rct}$), and on vectors of region-specific variables ($X_{rc}$), country dummies ($X_c$) and dummies for years of treatment ($y_{rct}$):

$$(Pat_{Average\ post\ treatment} - Pat_{Average\ pre\ treatment})_{rct} = \alpha_0 + \beta_1 T_{rct} \times D_{rct} + \beta_2 T_{rct} + \beta_3 D_{rct} + \beta_4 X_{rc} + \beta_5 X_c + y_{rct} + \epsilon_{rct}$$
What makes foreign firms more impactful?

### Differences in key transmission channels

- **Differences in labour mobility:**
  - 3.34% of repeat inventors move from foreign firms to local firms in regions ‘treated’ by the bottom 80% investors, against 2.40% in the regions treated by the top 1% (significant at the 1% level).
  - 2.13% of repeat inventors in bottom 80% moving from local firms to any foreign firm and 1.81% in the top 1% (significant 1%) moving from local to foreign.
  - If we consider only the inventors filing a patent in the region before and after the treatment, the figures are 7.95% for the bottom and 4.45% for the top (significant at the 1% level).
  - Descriptive evidence confirmed by formal regressions on probability of mobility

- **Differences in citations from local firms towards the investing company and vice-versa**
  - Ongoing analysis ...
Summary of Results

1. Foreign firms investing abroad increase the innovation capacity of their host regions
2. Heterogeneous impacts:
   • Local benefits possible under specific macro-continental conditions (Asia and Europe)
   • Drugs, Electronics and Computers most likely to benefit from foreign intervention
3. Medium-sized firms have a greater impact than top innovators
   • Ongoing exploration of differences in micro-level transmission channels
     • Labour mobility and circulation of inventors;
     • Localised knowledge spillovers (patent citations).
4. Relevant implications for FDI policies.

Further on-going work on impacts

• Further empirical work on both low-impact and high-impact areas with detailed territorial AND investment data:
  – “Innovation in Russia: The territorial dimension” - with Alexander Jaax (LSE)
  – MNEs and the Geography of Innovation in Latin America: evidence from Brazil, Mexico and Colombia – with Alexander Jaax (LSE)
    • Impact differentiated by establishment mode
  – Inward FDI and Regional Performance in Europe – with Roberto Ganau (LSE & Univ of Padova)
• Additional work looks at transmission channels with reference to mobility - with Arnaud Dyevre (LSE) and Frank Neffke (Harvard)
SOME GENERAL CONCLUSIONS

Conclusions

• Exciting (often inter-disciplinary) field of research;
• Constantly improving data availability at the sub-national and firm level for both advanced and emerging economies makes new insights easier to achieve;
• MNE preferences and strategies are highly differentiated in terms of sectors, GVC stages, innovation intensity, establishment choices that result in complex sub-national geographies of internationalisation;
• Internationalisation and global connectivity are key to regional innovation and development but not necessarily in the forms and via the channels presented by the existing literature
• Towards more cautious regional development policies?
This research to be further developed in new large project at the LSE

MASSIVE
MultinAtionals, inStitutionS and InnoVation in Europe

Funded by the European Research Council for the next five years
For more info: r.crescenzi@lse.ac.uk
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