Enabling Policy and Research in Europe: The CompNet Dataset

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Chairperson CompNet

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With input from Marco Matani
Roadmap

- Micro-based policy and academic analysis: Motivation
- The CompNet Dataset
  - Overview
  - Confidentiality Guarantees
- The 2023 CompNet Firm Productivity Report
- Research application: Concentration and productivity
- CompNet going forward
Thanks a lot to the Malta National Statistical Office for hosting us today

After having pioneered CompNet, Malta has recently rejoined our 9th Vintage

What we will be presenting can be very useful for:

• Malta productivity analysis
• Cross-country comparison
Micro-based data analysis: Motivation

Traditional economic analysis

Focus on countries and sectors

It does NOT consider Heterogeneity of firm productivity

Improve policy analysis
Productivity analysis is key for welfare

Firm performance distribution is very disperse and asymmetric

There are a lot of firms with low productivity and only a few in the "right-tail" that are very productive (the "happy few").

In the case of France the curve shifted to the right direction

Higher productivity for more firms and thus higher AVERAGE aggregate productivity
Micro-based data analysis: Motivation

- Aggregate indicators alone, when interpreted as if generated by a **representative firm**, give **partial messages**...
- ...and may generate wrong **policy recommendations**
- For instance impacts of a macro shock or policy will depend on the shape of the **actual underlying distribution**
- CompNet allows **cross-country comparisons** along these dimensions leveraging on **official balance-sheet information** of European firms...
- ...while **preserving confidentiality**
- **QUALITY** is key (cannot say the same for private providers such as Orbis)
Let's take the case of Unit Labour costs (ULC)

ULC = tot labor cost / productivity

➔ When ULC ↑ Competitiveness ↓

GERMANY

• Overall rising ULC....loss of competitiveness
• Flat productivity of both least and most productive firms
• Rising wages of top productive firms
• Rising wages of bottom productive firms...even more marked ...and totally out of whack with their productivity

POLAND

• Broadly constant ULC
• Rising productivity of top firms as well as...
• .....of least productive ones
• Stagnant wages of top productive firms
• Rising wages of least productive firms
Micro-based data analysis: Motivation

- **MALTA**
  - Overall rising ULC = competitiveness loss
  - Stagnant productivity of top productive firms
  - Stagnant wages of top productive firms
  - Somewhat rising productivity of least productive firms
  - ...but with their wages rising much faster
The CompNet Dataset

• Unbalanced panel of productivity and competitiveness indicators
• **Started in 2012** from research departments of the ECB/Eurosyste, hosted at IWH since 2017
• Our data providers are national statistical institutes, national central banks and governmental research institutions
• They run our codes on the best existing national datasets (business registers and tax returns, with 2-3 years lag)
• We provide cross-country harmonization
• No need to undertake new and costly data collection efforts
• 9th Vintage: out in July 2023 for **22 European countries, 1999-2020/21**

<table>
<thead>
<tr>
<th>Countries</th>
<th>Aggregation levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland.</td>
<td>Country, Macro-Sector, Macro-Sector-Size-Class, 2-digits NACE Industry, NUTS Region</td>
</tr>
<tr>
<td><strong>New:</strong> Latvia, Lithuania, Malta, UK</td>
<td><strong>New:</strong> Technology Class and Age</td>
</tr>
</tbody>
</table>
## The CompNet Dataset – 9th Vintage

### Productivity
- Labour productivity
- VA and revenue TFP; various estimation techniques
- ULC
- Firm size
- Capital Intensity
- Marginal revenue productivity of inputs
- Static and dynamic allocative efficiency
- Energy cost

### Financial
- Investment ratio
- RoA
- Cash holdings
- Leverage
- Financing gap
- Collateral
- Equity to Debt
- Cash flow
- Interest coverage ratio
- Trade Credit/Debt
- Debt burden
- Credit constraint index
- Share of “distressed” firms

### Trade
- % permanent exp.
- % sporadic exp.
- Export intensity
- Characteristics of top exporters
- Productivity premium of exporters
- Characteristics of firms that export AND import
- Exports by destination

### Competition
- Price-cost margins
- Mark Ups – various estimation techniques
- Herfindahl index
- Concentration of sales in top 10 firms of a sector

### Labour
- % firms that change employment between t and t+3 (t+1)
- Share of high-growth firms
- Job creation and job destruction rates
- Wage premium (proxy for human capital)
- Firm entry and exit

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**Previously we had added**
- Zombie firms
- Regional dimension within countries
- Intangibles proxies
The CompNet Dataset – Joint Distributions

Example type of question:
Are low productive firms in a country-sector characterized by higher credit constraints?
CompNet – The Mechanics

- Aggregated (e.g. sectoral) Raw Output
- Data preparation tools
- Confidentiality Guarantees
- Data Collection Code
- Metadata
- Final Dataset
- Micro Firm-level Information

CompNet – The Competitiveness Research Network

www.comp-net.org
The CompNet code includes a specific routine that checks the eventual output cells to guarantee that no individual firm can be identified.

The specific routine bases on two different thresholds:

- **Minimum Number of Observations**: If a cell is based on a limited amount of underlying micro-observations, the cell will be dropped;
- **Statistical Dominance**: The largest permissible size share a single observation can attain for a given cell. If it is overcome, the cell will be dropped.

The data providers freely set both thresholds *a priori* to satisfy their country or institution-specific requirements. The thresholds apply to each single cell.

The comparability of all cells (e.g., sectors) eventually published is not affected.

For Malta, 8.23% of the cells are missing at the country level* and 33.75% at the macro-sector level* mainly due to confidentiality (but other variables, like investments, are simply not available).

* Unconditional 20e weighted dataset
▪ Q&A
The 2023 CompNet Firm Productivity Report

EU-TSI Weblink

- **Coordinators**: Marco Matani and Marcelo Piemonte Ribeiro (both CompNet)
- **Contributors**: Daniele Aglio, Sara Azzarito, Eric Bartelsman (Tinbergen Institute), Urska Cede (IMAD, Slovenia), Ralph De Haas (EBRD), Leonardo Indraccolo, Neelarika Kakunuri, Anmol Kaur Grewal, Laura Lehtonen, Laura Lufray, Eva Pereira (GEE, Portugal), Jan Sebo (UVSR, Slovakia), Vincent Sterk (UCL), Neeltje van Horen (BOE), Alessandro Zona Mattioli (all CompNet if not otherwise specified)
How did COVID-19 impact post-COVID firm-level productivity?

- COVID-19 crisis was followed by a decline in within-industry total factor productivity (TFP) growth in the short term in Europe.
- Amidst unprecedented cross-country variation.
- The performance of Malta was close to the European average.
The **Phillips curve** is used in macroeconomics to summarize the empirical relationship between “slack” in the economy and changes in the prices or wages, conditional on expected inflation.

- When the capacity un-utilized (e.g., un-employment) drops, inflation tends to rise.
- Vice versa, higher inflation is associated with lower unemployment.

Over the years, this relation tended to weaken, possibly because Governments were trying to **use it** to promote growth via less attention to inflation.
Since the time the PC was conceived (mid-70) the curve tended to ‘flatten’

Still the debate reopens periodically:

- Can the Phillips curve still be used and how amid its apparent irreversible secular flattening?
Ch. 1 - Phillips curve for heterogeneous firms

- We take a **firm-level perspective** to the topic using **CompNet data**
- We link the macroeconomic concepts behind the Phillips curve with the outcomes of production and pricing decisions made by **heterogeneous firms** (industry aggregated by their productivity quintile)
- The main idea is that the **distribution of firms in productivity quintile MATTERS for the inflationary impact of the same demand shock**

❖ If demand for the output of an industry rises, and this **demand is disproportionately supplied by the most productivity (lowest costs) firms**, industry **prices may rise less** than if the demand is met by least productive firms, *ceteris paribus*
We test this hypothesis by estimating:

\[ \text{Real wages growth} = \alpha + \beta \text{OutGap}_{ct} + \beta_1 \text{RealWagesGrowth}_{cidt-1} + \beta_2 \text{Inflation}_t - 1 + \delta_{cid} + \delta_t + \epsilon_{cidt} \]

- **TWO main results:**

1) The (traditional) Phillips curve (i.e., the output gap parameter) is different to zero and therefore still holds (The higher the output of firms with respect to their potential output, the higher the inflationary pressure through an increase in real wages)...

⇒ PC is NOT FLAT
2) There is strong difference in the Phillips curve parameters, as measured at the different productivity classes

- The Phillips curve is flatter for the most productive firms.
- This is flattening across the productivity distribution

- Therefore, in a country-sector it matters which composition of firms prevails to understand the relationship between the economic slack and inflation.
- The more demand shock is met by increase in production by the most productive firms, the least inflationary pressure will be observed
Across Europe we observe a Flattening Phillips curve on average by productivity class.

- This is driven by Den, Fin, Ger, Hun, Net, Por, Rom, Swe, and Swi...
- ...while for other countries (Be, Cro, Cze, Fra, Ita, Lit, Pol, Slk, Slo, and Spa) this is not the case.
- For Malta, no evidence of significant flattening (though few sectors are covered):
Ch.2 - EU firms in the global economy: A competitiveness assessment

- Competitiveness is key; we look at 3 aspects:
  1) Export drop during COVID-19
  2) Role of EU Global Value Chains (GVCs) for productivity transmission
  3) CompNet-based Index

1) Were export drops driven by firm characteristics?
  - We disentangle heterogeneity in export performance by size classes, destination, and margin
    - intensive, i.e., same firms exporting more or less
    - extensive, i.e., change in the number of firms
Starting with the overall result, the drop in total export in 2019 and 2020 resulted from the extensive and intensive margin alike.

However, for small exporters (20-49 employees) and for those exporting outside the EU the drop was due to the EXTENSIVE margin only, i.e., there has been a cut in number of firms exporting (only red histogram).
Ch.2 - EU firms in the global economy: A competitiveness assessment

❖ Focus on Malta

➢ Overall stronger dip in 2020, almost completely at the extensive margin

➢ Like in the EU, small exporters in Malta were more prone to exit export markets in 2020 but with a much stronger drop (20% vs 3%)
2) We find evidence that the GVCs set in motion a two-stages productivity diffusion within and between European countries

- **1st Stage**: From GVC to national frontier (most productive) firms
- **2nd Stage**: From national frontier to national mid-productive and laggard (least productive) firms

- We see strong TFP transmission at both stages
Strong contribution of productivity gap ➔ Balassa-Samuelson "catching-up effect"

The TFP contribution of EU GVC counterparts (dashed blue) becomes strongly negative during crises
3) **Firm-level characteristics** play a crucial role in shaping competitive dynamics

- **Policymakers** need to identify those **critical aspects of firm activity** and tackle problems
  - We constructed a micro-aggregated **Enterprise Competitiveness Indicator (ECI)**
  - 5 Dimensions, standardization to a 0-1 scale ("min-max" procedure)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measured Firm characteristics</th>
<th>Variables in the Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Return</td>
<td>Profit orientation</td>
<td>Return on assets (ROA); Estimated markup; Value added on Revenues; Operating profits on revenue</td>
</tr>
<tr>
<td>2. Production Costs</td>
<td>Coverage of production costs</td>
<td>Price cost margin; Revenue coverage of capital costs; Revenue coverage of labor costs; Revenue coverage of intermediate costs</td>
</tr>
<tr>
<td>3. Productivity</td>
<td>Efficiency of production factors</td>
<td>Labor productivity; Capital productivity; Capital Intensity</td>
</tr>
<tr>
<td>4. Risk</td>
<td>Financial risks</td>
<td>Collateral on total assets; Debt/Total assets; Cash flow/Total assets</td>
</tr>
<tr>
<td>5. Quality Orientation</td>
<td>Ability to develop future competitive advantages</td>
<td>Intangible fixed assets on Revenues; Wage premium; Estimated returns to scale</td>
</tr>
</tbody>
</table>
What are the firm-level characteristics driving **external competitiveness**?

- Our ECI explains countries' export market shares **better than Real Effective Exchange Rates (REERs)**
- The most significant dimensions are **Productivity, Risk (financial soundness), and Quality Orientation**

> Enhancing these aspects, rather than import controls, will elevate the EU’s competitive advantages

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ECI, REERs and Export Market Shares, European Countries, 2012-2020

<table>
<thead>
<tr>
<th></th>
<th>(1) Goods and Services</th>
<th>(2) Goods</th>
<th>(3) Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECI</strong></td>
<td>0.3263***</td>
<td>0.3216***</td>
<td>0.3429***</td>
</tr>
<tr>
<td></td>
<td>(0.0428)</td>
<td>(0.0448)</td>
<td>(0.0400)</td>
</tr>
<tr>
<td><strong>REER</strong></td>
<td>0.0699*</td>
<td>0.0686</td>
<td>0.0761**</td>
</tr>
<tr>
<td></td>
<td>(0.0397)</td>
<td>(0.0416)</td>
<td>(0.0371)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>-14.5172***</td>
<td>-14.2904***</td>
<td>-15.4998***</td>
</tr>
<tr>
<td></td>
<td>(4.1744)</td>
<td>(4.3745)</td>
<td>(3.8990)</td>
</tr>
<tr>
<td><strong>Year FE</strong></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>176</td>
<td>176</td>
<td>176</td>
</tr>
<tr>
<td><strong>Adjusted R-squared</strong></td>
<td>0.2355</td>
<td>0.2107</td>
<td>0.2874</td>
</tr>
</tbody>
</table>
In the 2023 State of the Union Address, President von der Leyen put competitiveness at the top of the EU agenda.

Mario Draghi was tasked with preparing a report on the future of European competitiveness.

CompNet is all set to provide support...

...and is already contributing to the debate.

VoxEU Column: "Talking about competitiveness in Europe: Productivity not protection"
We study firms’ ability to adjust employment:
1) Over the business cycle
2) Across countries

Why?
a) How firms react matters for aggregate productivity
b) Different countries have different labor adjustment costs (bureaucratic, legal, administrative and institutional costs)

What do we find?
1) Aggregate productivity improves during recessionary periods because less productive firms exit the markets
2) Firms fire and hire less in countries with more rigid labor market institutions
Ch. 3 - Resource reallocation over the business cycle: A cross-country comparison

The Indicators

1. Job Reallocation Rate: \( JRR_{at} = \sum_{i \in a} \left( \frac{X_{iat}}{X_{at}} \right) |g_{iat}| = JCR_{at} + JDR_{at} \)

   a) Job Creation Rate:

   \( JCR_{at} = \sum_{i \in a} \left( \frac{X_{iat}}{X_{at}} \right) g_{iat} \)  iff  \( g_i >= 0 \)

   b) Job Destruction Rate:

   \( JDR_{at} = \sum_{i \in a} \left( \frac{X_{iat}}{X_{at}} \right) |g_{iat}| \)  iff  \( g_i < 0 \)

\[ g_i = \frac{(E_i - E_{i-1})}{X_i} \]
\[ X_i = 0.5 \cdot (E_i + E_{i-1}) \]
How are resources (capital and labor) reallocated during expansionary and recessionary periods?

JDR and JCR over the business cycle by European countries across sectors, 2008-2020

➢ Job destruction and creation rates (strongly related to reallocation) are resp. higher in recessions and expansionary periods.
How does firm responsiveness (job creation and destruction rates) relate to country-specific institutional features?

Countries where it is more difficult to fire workers also have lower JDRs;

Similar but weaker association between JCRs and the index of ease of hiring (labor market rigidity from the OECD)
Service sector was driving the job creation, until the drop in 2020
service sector was highly volatile in job destruction with a peak in 2020
Q&A
European firm concentration and aggregate productivity

(joint with Tommaso Bighelli, Marc Melitz and Matthias Mertens)

In Journal of European Economic Association (January 2023)
Motivation and results
Motivation: Concentration and market power are increasing in the US

Covarrubias et al. (2020)

De Loecker et al. (2020)
Research questions

How has firm concentration changed in Europe?

Is firm concentration in Europe an outcome of a more efficient market environment (winner-takes-all), or a reflection of higher firm market power and less competition?
Summary results

• European Concentration is increasing after 2009;
• Changes in productivity and changes in concentration are positively associated, but not with Market Power;
• Rise in concentration is driven by reallocation of market share towards concentrated sectors and countries
• Germany explains the largest share of European Concentration
1. Derives a European concentration index from 15 independently derived micro-aggregated country datasets;

2. Tests the association between concentration, productivity and market-power using European data at 2-digits industry level
Concentration in Europe
Define two countries, A and B, which compose the world population of firms. Define $r^A$ the total revenue of country A and $r^B$ the total revenue of country B.

$$
\sum_{i=1}^{T} r_i = r^A + r^B = \sum_{i=1}^{T-k} r_i + \sum_{T-k+1}^{T} r_i
$$

$$
HHI^A = \sum_{i=1}^{T-k} \left( \frac{r_i}{r^A} \right)^2
$$

$$
HHI^B = \sum_{T-k+1}^{T} \left( \frac{r_i}{r^B} \right)^2
$$

$$
HHI = \sum_{i=1}^{N} s_i^2 \quad \left[ \frac{1}{N}, N \right]
$$
Concentration derives from national concentration and size of the country.
Market concentration in Europe is mostly related to Germany.
Empirical analysis
• Industry 2-digits data, panel of 15 countries, 2000-2017, 20e firms

• \[ HHI_{n,s,t} = \alpha + \beta_1 \text{Productivity}_{n,s,t} + \beta_2 \log PMP_{n,s,t} + \log X_{n,s,t} + r_{n,s,t} \]

• \( X \) is a vector of controls: Median Firm size, Capital/labor ratio, year FE, country-industry FE

• SE clustered at industry level
## Results

<table>
<thead>
<tr>
<th></th>
<th>HHI (1)</th>
<th>HHI (2)</th>
<th>HHI (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregates Productivity</td>
<td>0.026*** (0.006)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within-firm productivity</td>
<td>-0.008  (0.007)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-firm productivity</td>
<td></td>
<td>0.069*** (0.020)</td>
<td></td>
</tr>
<tr>
<td>K/L</td>
<td>-0.003  (0.002)</td>
<td>-0.001  (0.001)</td>
<td>-0.002  (0.002)</td>
</tr>
<tr>
<td>log Avg. Firm size</td>
<td>4.493** (1.718)</td>
<td>4.183  (1.697)</td>
<td>4.332*** (1.567)</td>
</tr>
<tr>
<td>log PMP</td>
<td>0.768  (1.496)</td>
<td>3.394  (2.097)</td>
<td>-0.123  (1.327)</td>
</tr>
<tr>
<td>Observations</td>
<td>6,364</td>
<td>6,364</td>
<td>6,364</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.799</td>
<td>0.793</td>
<td>0.812</td>
</tr>
<tr>
<td># of Clusters</td>
<td>47</td>
<td>47</td>
<td>47</td>
</tr>
</tbody>
</table>

SE clustered at industry level in parentheses

*** p<0.01, ** p<0.05, * p<0.1
Conclusion

• European Concentration is increasing over the last 10 years;
• This increasing trend is related to productivity and allocative efficiency, NOT to market power
• It is the results of *reallocation* of market shares towards more concentrated sectors and countries;
Q&A
CompNet going forward
The MDI – Setup

1. Special research & publication
   - Researcher
   - Obtains the output
   - Remote access
   - Remote execution
   - Output is obtained by CompNet/MDI Network

2. Standard moments and indicators & publication
   - Code to build the infrastructure
   - Metadata preparation
   - Metadata and tools
   - Research project and code

CompNet/MDI Network

Statistical institute

Code

Researcher

Code to build the infrastructure

Metadata preparation

Metadata and tools

Research project and code

The Competitiveness Research Network

www.comp-net.org
Homogenized set of datasets (sourced from National Statistical Institutes):

- For each dataset, *same list of indicators* with *Firm-level* data
- **Time coverage:** 2007-2017, 2000-2020 for some countries
- **Additional Datasets** are about to be added (Prodcom, Energy Consumption Survey, ...)
- Much more granular than the traditional CompNet dataset
The MDI – Current status

- **Step 1:**
  - **LV, SK:** negotiations with statistical office
  - **AT:** contract negotiations

- **Step 2:**
  - **DE:** construction of dataset, contract to be signed
  - **PT:** construction of dataset & testing of the codes

- **Step 3:**
  - **SI:** harmonization of data and indicators
  - **FR, NL:** MDI is established

➡️ MDI soon operational for 7 Countries

➡️ Start preparing your codes....
The Research agenda

- Emphasis on operationalising the MDI
- Convert CompNet projects into the MDI whenever possible to enhance granularity
- **4 meta directions:**
  - Trade and Competitiveness: Productivity transmission within GVCs and drivers of EU firms' comparative advantages
  - Phillips Curve and Monetary Policy: Micro-founded Phillips Curve and the effects of firm heterogeneity on inflation
  - Energy: Firms' heterogeneity in reacting to energy shocks and the relevance of firm characteristics for optimal policy designing
  - Firm Dynamics: Firms' heterogeneity in responsiveness to the business cycle and the relation between firm dynamism and reallocation-driven productivity growth
• Looking forward to having Malta ALSO in the MDI

• ....and to collaborate to Maltese institutions and researchers on concrete project applications for policy and academic output
Conclusions

- CompNet is thriving on
  - Data generation (CompNet and MDI)
- ... Research output
  - CompNet flagship Report
  - Diverse publications
- Going forward
  - Keeping up with the research and policy debate
    - Focus on Competitiveness
    - Concentration, mark up, firm dynamism ....
Thanks very much for your attention and hospitality
Important Links

- TSI Website
- The 2023 CompNet Firm Productivity Report
- VoxEU Column on Competitiveness