EUROPEAN MANUFACTURING SURVEY
EMS

RIMPlus Final Workshop | Brussels | December, 17th, 2014
Christian Lerch | Fraunhofer ISI
Content

1. EMS – A European research network
2. EMS – firm-level data of European manufacturing industry
3. Core content of EMS
4. EMS as an information basis for policy-making
5. Application of EMS data in research projects and scientific publications
European Manufacturing Survey (EMS) – a European research network

- Network of European research institutions and universities in currently 15 European countries and 3 BRIC countries
- Performing research on current technological and organisational modernization trends in the European manufacturing industry
  - providing an excellent and relevant database on aspects of manufacturing firms being not surveyed so far
  - highly recognized by the scientific community
  - joint acquisition of research projects

- Collaboration build on trust and mutual commitment, not on formal contracts
  - each partner with intrinsic motivation and interest in research on manufacturing industry
  - organised by the EMS consortium with annually EMS meetings, informally distributed responsibilities and a shared communication platform
EMS – strategic partnerships with BRIC countries

- **Strategic partnerships** with important players in rapidly growing markets
  - associated status

- **Exploration and development of new fields of research**
  - lack of quantitative empirical data on firm-level until now
  - lack of high quality data on modernization patterns in manufacturing industries and firms

- **Basis for cooperation**
  - European Manufacturing Survey and its established research network
  - first pilot studies were conducted by leading business research institutions (Russia, PR China)
  - first joint projects since 2008
EMS – a growing and living network

EMS partner network

<table>
<thead>
<tr>
<th>Year</th>
<th>Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Germany, Switzerland</td>
</tr>
<tr>
<td>2003</td>
<td>Germany, Switzerland, Austria, Croatia, France, Italy, Slovenia, United Kingdom, Turkey</td>
</tr>
<tr>
<td>2006</td>
<td>Germany, Switzerland, Austria, Croatia, France, Italy, Slovenia, United Kingdom, Turkey, Spain, The Netherlands, Greece</td>
</tr>
<tr>
<td>2009</td>
<td>Germany, Switzerland, Austria, Croatia, France, Italy, Slovenia, United Kingdom, Turkey, Spain, The Netherlands, Denmark, Finland, PR China, Russia</td>
</tr>
<tr>
<td>2012</td>
<td>Germany, Switzerland, Austria, Croatia, France, Italy, Slovenia, United Kingdom, Turkey, Spain, The Netherlands, Denmark, Finland, PR China, Russia, Portugal, Sweden, Brazil</td>
</tr>
</tbody>
</table>

Partner from previous round
New partner in new country
Changed partner
Content

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EMS - firm-level data of European manufacturing industry

- EMS - a unique firm-level survey
  - highly specialised to the target group of European manufacturing firms and industries
  - focusing on value creating processes of producing goods and services & innovation activities in manufacturing firms

- Nationally organised and simultaneously conducted in each partner country
  - excellent and relevant database for national as well as cross-country studies

- Based on commonly agreed and fostered framework
  - on the methodological approach (survey method, population, sampling)
  - on the focus of the survey (content, core, national)
  - on the time perspective (repeated surveys, long term engagement)
## EMS – From the beginning …

### … focus on European manufacturing

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Fraunhofer ISI starts monitoring the core manufacturing industries by regularly conducting the survey <em>Modernization of Production</em>.</td>
</tr>
<tr>
<td>1999</td>
<td>Collaboration with Georgia Tech’s Enterprise Innovation Institute which used parts of the ISI survey in the Georgia Manufacturing Survey.</td>
</tr>
<tr>
<td>2001</td>
<td>Switzerland joined the survey by using an identical questionnaire – birth of the <em>European Manufacturing Survey</em>.</td>
</tr>
<tr>
<td>since 2001</td>
<td>In each wave, new partners join the initiative commonly labelled as <em>European Manufacturing Survey</em> – a registered trademark.</td>
</tr>
<tr>
<td>2006</td>
<td>Enlargement of the survey population to cover all manufacturing industries.</td>
</tr>
<tr>
<td>since 2009</td>
<td>Ongoing integration of BRIC countries as associated partners.</td>
</tr>
<tr>
<td>2012</td>
<td>EMS already addresses 76% of firms within the European manufacturing sector with at least 20 employees.</td>
</tr>
<tr>
<td>20XX</td>
<td>EMS covers 90% of the total number of EU manufacturing firms if PL, RO, HU could be added.</td>
</tr>
</tbody>
</table>

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**Next round:**

*2015*
EMS – main features

- Main features of EMS
  - target group: establishments and production sites of manufacturing firms with at least 20 employees or more
  - representative sampling (full survey, random sampling, stratified random sampling)
  - core questionnaire developed by joint efforts of all EMS partners + nationally specific questions added by each partner / group of partners
  - valid measures by focusing on facts and figures rather than subjective estimations
  - data harmonization processes applied to each national EMS dataset to secure for international comparability (consistency checks, testing of new constructs)
  - new partners included by a mentoring system

- All partners remain owners of their national data
  - agreement on procedures for sharing data for scientific or commercial purposes
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The contents of EMS – systemic approach to modernization in manufacturing firms

Input
Firm characteristics
Throughput/value generating processes
Output/Outcome

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Core content of EMS 2012 – the input dimension

- Value of totally purchased parts, (raw) materials, operating supplies, services
- Share of nationally and internationally received input
- Degree of manufacturing capacity utilisation
- Depreciation of machinery and equipment
- Internal and external R&D activities and R&D expenditure
- Use and scope of temporary work / agency workers
- Collaboration with external partners in the fields of R&D, purchasing, production, sales and distribution, service
- Most important internal and external sources of innovation knowledge
- Qualification level of employees
- Distribution of employees across functional areas within the firm (R&D, configuration and design, manufacturing and assembly, customer service, others)
- ...
Core content of EMS 2012 – the throughput dimension

- Use / used planned / first year of introduction / intensity of use of advanced manufacturing technologies in:
  - robotics and automation
  - processing and production technologies
  - digital factory/IT cross-linkage
  - energy and resource efficiency

- Use / used planned / first year of introduction / intensity of use of organisational concepts in the fields:
  - production organisation
  - work organisation
  - standardization and audits
  - human resource management

- Offshoring and backshoring of industrial production and R&D

- Motives for offshoring and relocation of industrial production and R&D

- Importance of product, process, and product-related service innovation for modernization of production

- Portfolio of product-related services and business model innovation

- ....
Core content of EMS 2012 – the output/outcome dimension

- **Sales of product-related services**
- Development and total sales of new products / market novelties
- Share of products offered for more than 10 years
- Average **manufacturing lead time** of the main product
- **Short-time volume flexibility** (increase & decrease)
- Share of orders delivered in time
- Share of products or semi-finished products that have to be **scrapped or reworked**
- **Labour productivity / total factor productivity / service productivity**
- Annual turnover / development of turnover
- Development in employment
- Return on sales
- Payroll costs
- **Energy consumption of production**
- ...

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## Core content of EMS 2012 – firm characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
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<tbody>
<tr>
<td>Main product / industry affiliation</td>
</tr>
<tr>
<td>Establishment part of a multi-side company</td>
</tr>
<tr>
<td><strong>Position in value chain</strong></td>
</tr>
<tr>
<td>Most important competitive factor</td>
</tr>
<tr>
<td>Level of energy consumption</td>
</tr>
<tr>
<td>Type of product development (customisation, standard programme with variants, standard programme, no product development)</td>
</tr>
<tr>
<td><strong>Type of manufacturing (made to order, assembly to order, made to stock)</strong></td>
</tr>
<tr>
<td>Average manufactured batch or lot size</td>
</tr>
<tr>
<td><strong>Product complexity of the main product</strong></td>
</tr>
<tr>
<td>Vertical range of manufacturing</td>
</tr>
<tr>
<td>Number of employees / trend in employment</td>
</tr>
<tr>
<td>Year of establishment</td>
</tr>
<tr>
<td>Existence of a works council</td>
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<tr>
<td>...</td>
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EMS as a tool for evidence-based policy making (1)

- EMS is not bound to specific (ideologic) perspectives
  - no pre-selection of “innovative” firms, no ex-ante causal assumptions
  - EMS is purely fact-centred survey, highly specialised to the target group of manufacturing firms

- EMS opens the “black box” of firm-internal processes of industrial value creation
  - improve understanding of firms’ actual behavior, rationalities and intra-structure

- EMS tackles innovation beyond R&D
  - including other types of knowledge and resource generation
  - non-technical forms of innovation (organisation, service, business models)

- EMS as a tool to reduce complexity
  - identification of new patterns of innovation among firms, networks, and industries
  - e.g. innovation patterns of non-R&D-performing firms (Som 2012)
EMS as a tool for evidence-based policy making (2)

- **EMS as a basis to adjust and enhance the design of STI policy**
  - to technologies’ specific position in the life cycle and the specific channels/bottlenecks of knowledge transfer activities
  - to address specific barriers on the firm level (e.g. for technology adoption)
  - to firms’ specific needs according to their functional role in the industrial value chain (e.g. differentiated picture of “SMEs”)

- **EMS as a tool for policy evaluation**
  - analysis of structural determinants of participation in policy funding schemes
  - impact analysis

- **EMS allows for tailor-made, highly customer-specific analysis**
  - variables can be flexibly combined and integrated with each other
  - complex analyses with high number of control variables
  - possibilities for matching with secondary databases (e.g. patents)
  - cross-country / cross-region comparisons and industry benchmarking
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Selected research projects using EMS data on behalf of EU

- **EU_FTE_robo** – Socio-economic impact of industrial robots (DG Research and Innovation, 2014)

- **INNO-GRIPS** – Innovation Drivers and Barriers in Support of Better Policies, DG ENTR, 2010/2012
  ➔ Organisational and Marketing Innovation – Promises and Pitfalls (Study No. 6)

- **Innova** – Sectoral Innovation Watch, DG ENTR, 2008-2011

- **Global Value Chains**, European Competitiveness Report 2012, DG ENTR

- **Service Output of Manufacturing Firms**, ECR 2011, DG ENTR

- **Foreign Corporate R&D and Innovation in the EU**, ECR 2010, DG ENTR

- **SME Robot™** - The European Robot Initiative for Strengthening the Competitiveness of SMEs in Manufacturing, 2005/2009

- **PORCH** - Patterns of Organisational Change in European Industry, 2004/2006
Selected scientific journal papers using EMS data

- **International Journal of Technology Management, 2011**
  *Relevance and innovation of production-related services in manufacturing industry*

- **R&D Management Conference, 2011**
  *Eco-Innovation in European Manufacturing Industries*

- **Journal of Service Management, 2010**
  *The relevance of service in European manufacturing industries*

- **Int. Journal Product Development, 2010**
  *Internal and external R&D collaboration as drivers of the product innovativeness of the German mechanical engineering industry*

- **Research Policy, 2009**
  *Innovation paths and the innovation performance of low-technology firms*

- **Journal of Purchasing and Supply Management, 2009**
  *Drivers and antecedents of manufacturing offshoring and backshoring - a German perspective*

- **Technovation, 2008**
  *Organizational innovation: The challenge of measuring non-technical innovation in large-scale surveys*
Contact

Thanks for your attention!

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