

# Bringing it all back home?

‘Industrie 4.0’, global value chains, and the backshoring of production activities to Western Europe

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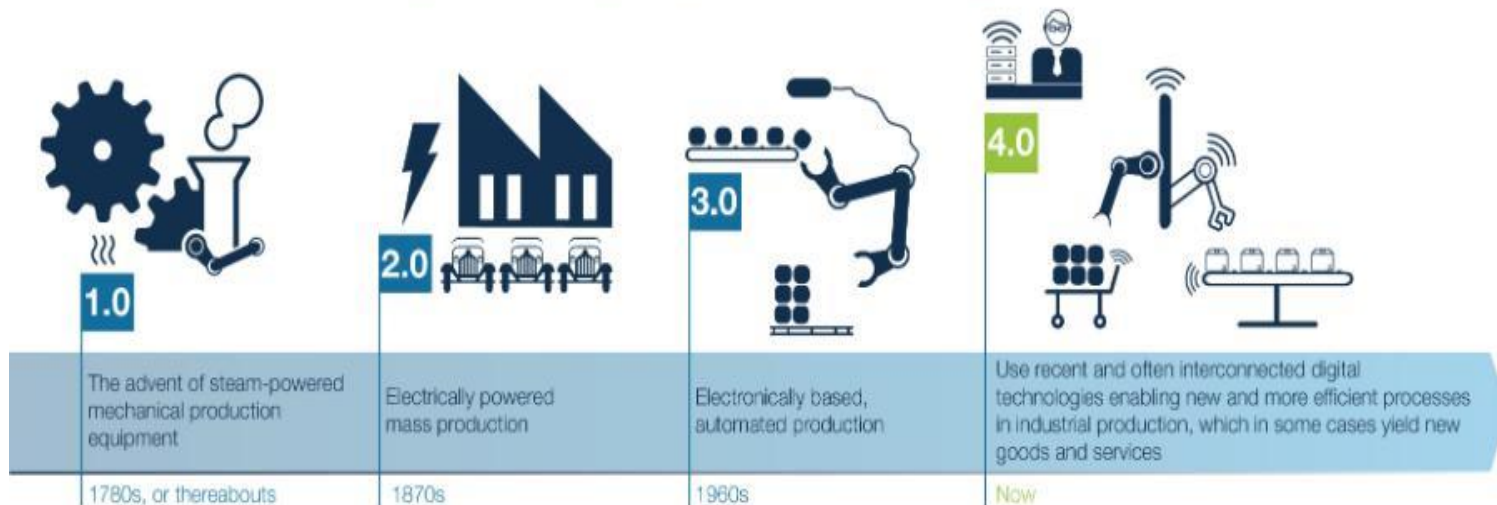
## An example

- A small Austrian multinational firm, a producer of metal parts
- Smoothing and polishing large metal parts is a time-consuming (100 – 150 h), dirty work which requires experienced staff
- The firm did polishing in Hungary, but **moved this production step back to Austria** because they managed to teach it to a robot
  - This robot is faster (20 h, works 24/7, and gives the firm more flexibility because transport between Hungary and Austria is not needed anymore
- Automation will allow to take new orders that were not possible before because of the lack of flexibility and transport time between Austria and Hungary
- Is this a sign of a general trend that **IA.0 fosters re-concentration?**

## Industrie 4.0

- Digital manufacturing technologies (also known as **Industrie 4.0** or I4.0) includes networked production, cyber-physical systems, 3D printing, advanced robotics, automated decision making, Big Data ..
- They are seen by many as the most important driver for future productivity growth (OECD 2017, UNCTAD 2017).

### INDUSTRIAL REVOLUTIONS AND "INDUSTRY 4.0"



# Backshoring

- Backshoring in the context of this paper is moving manufacturing activities back to the country of its parent company
  - Includes backshoring from own subsidiaries **and** from suppliers
  - However, it does not include nearshoring, for example the relocation from China to Hungary
  
- There is not theory of backshoring
  - However, we can adapt theories of the multinational enterprise to understand backshoring
  - Backshoring can be explained by the **erosion** of locational advantages over time, or by **misjudgements** of firm advantages
  - For example, changes in ownership, location and internalization advantages in the Dunning tradition

## Hypothesis

From the literature on the benefits of I4.0, we assume a **positive association** between I4.0 investments and backshoring

- Similar arguments have been brought forward in JIBS (Laplume et al. 2016), special session EIBA 2016, Vienna, de Backer and Flaig (2017).

Two mechanisms

- I4.0 production technologies can lead to **productivity increases**
  - It may neutralize the factor cost advantages of offshoring locations and make labour arbitrage less appealing.
- I4.0 technologies can improve **quality** and **flexibility** of production
  - this may be an incentive for firms to locate production close to their European customers to regain some of the flexibility lost in fine-sliced global production networks.

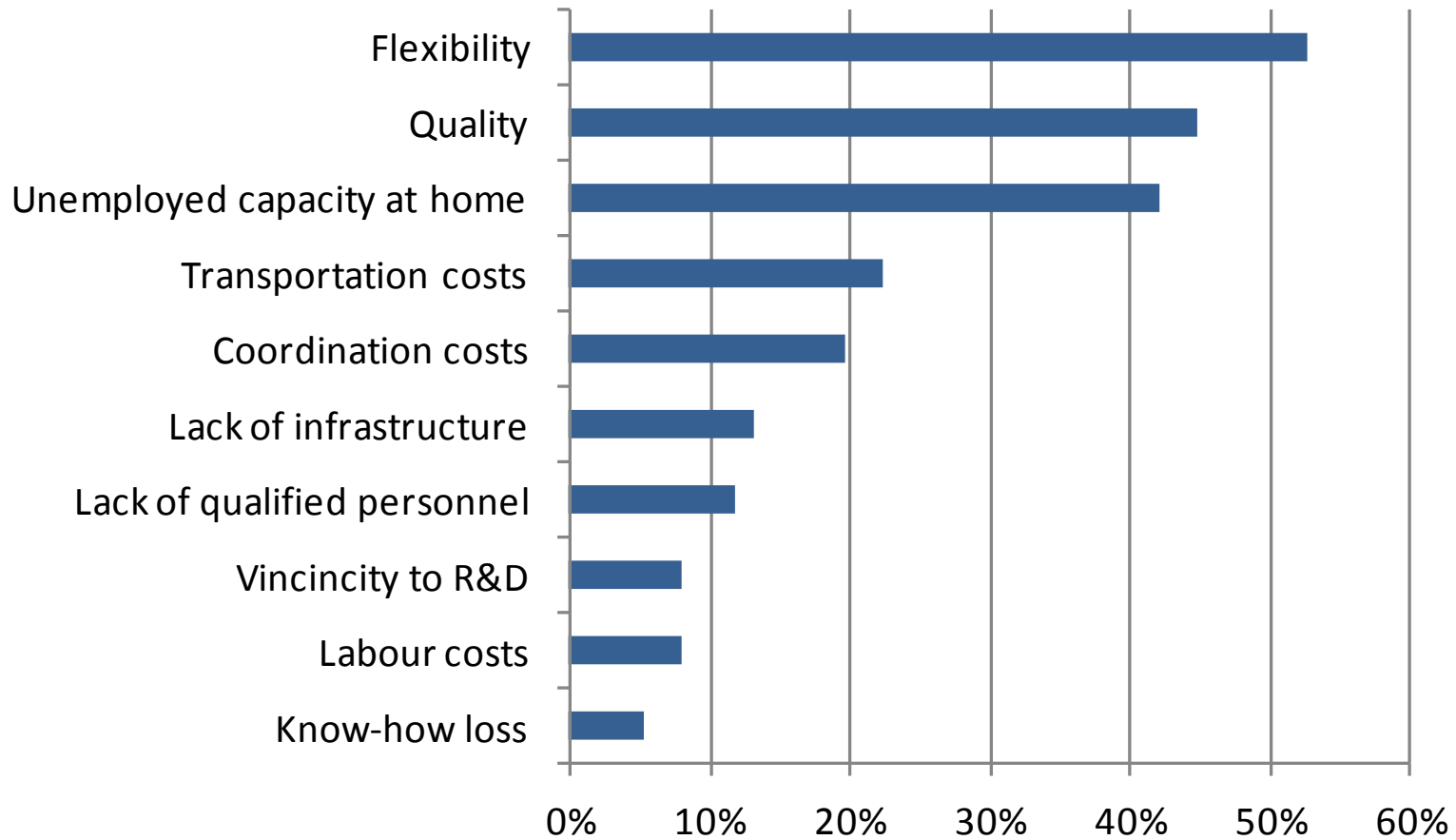
## European Manufacturing Survey

- EMS is a firm-level survey that investigates product, process, service and organisational innovation in European manufacturing.
  
- The EMS includes detailed information
  - on the degree of utilization of a number of production technologies, including Industrie 4.0 technologies
  - offshoring and backshoring
  - innovation input including R&D expenditure,
  - innovation output such as the introduction of new products,
  - a number of control variables such as firm size, exports, the position of the firm in the value chain, or characteristics of the main product and of the production process.
  
- We use EMS data for 2,000 manufacturing companies from Austria, Germany and Switzerland, reference year is 2014

## I4.0-readiness index

- We create an index that represents the degree of investment in these technologies
  - 0 = no investment in these technologies
  - 1 = at least one technology out of the three groups
  - 2 = at least two technologies out of the three groups
  - 3 = at at least three technologies out of the three groups
  - 4 = at least two technologies from the group of cyber-physical systems
  - 5 = at least three technologies from the group of cyber-physical systems
  
- Just like backshoring, I-readyness is:
  - Rising with firm size
  - is more frequent in technology-intensive, R&D intensive sectors
  - Differences between Austria, Germany and Switzerland are small

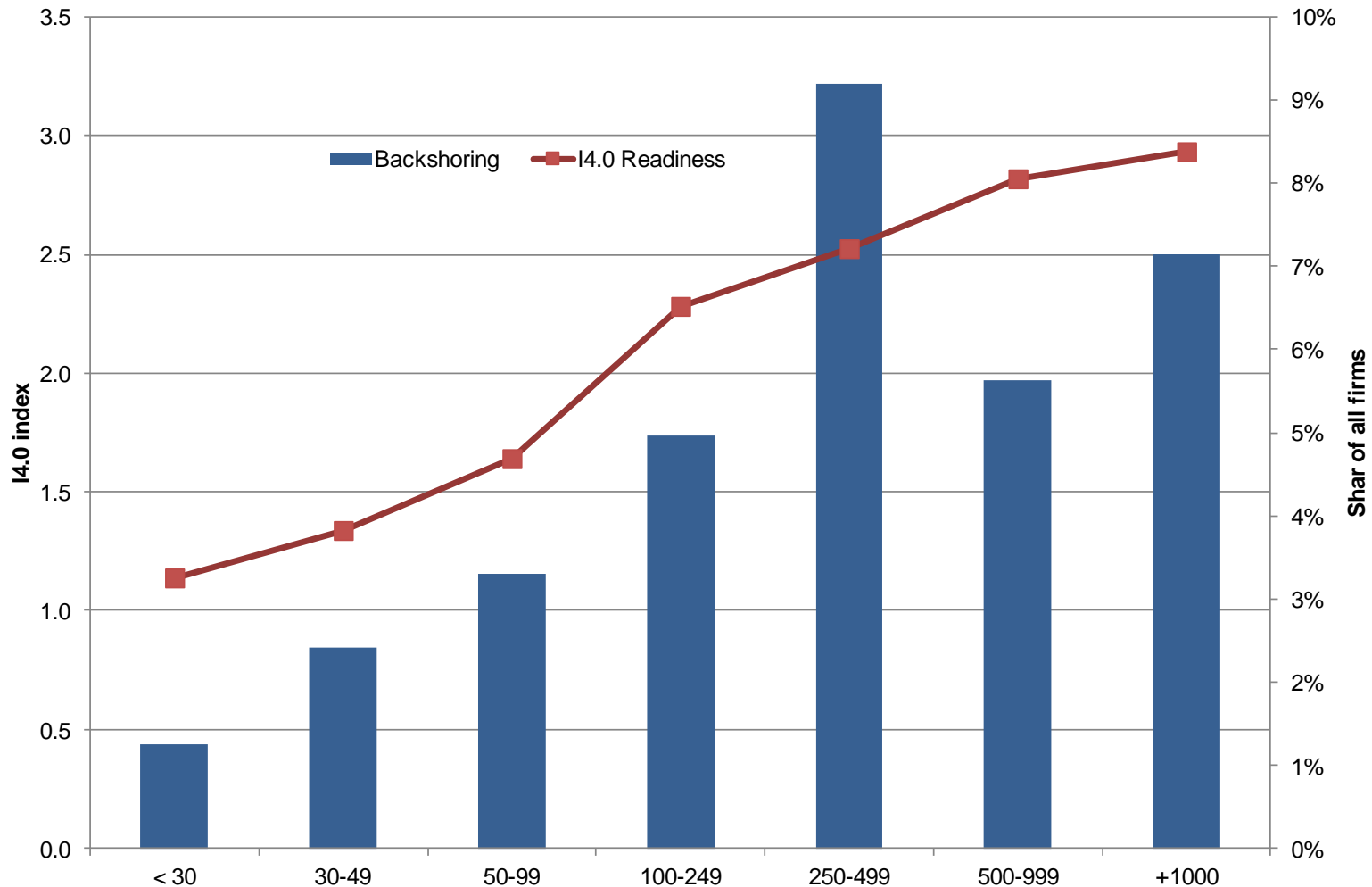
# Motives for backshoring



N= 76 Source: European Manufacturing Survey 2015



# I4.0 and backshoring in different size classes



N= 76. Source: European Manufacturing Survey 2015

# Results of the probit regression

	(1)	(2)	(3)	(4)	(5)
lemp	0.006 (0.057)	0.031 (0.057)	0.017 (0.058)	0.058 (0.054)	-0.172** (0.083)
iready	0.121*** (0.042)	0.109*** (0.042)	0.107** (0.042)		0.129** (0.065)
exp	0.004* (0.002)	0.005** (0.002)	0.004** (0.002)	0.004** (0.002)	0.000 (0.004)
aproduct	0.626*** (0.130)	0.604*** (0.129)	0.579*** (0.132)	0.579*** (0.132)	
reg_fp	0.259 (0.264)		0.253 (0.265)	0.267 (0.262)	0.455 (0.379)
reg_cs	0.778*** (0.265)		0.808*** (0.267)	0.768*** (0.268)	0.976** (0.407)
reg_sb	0.342* (0.185)		0.355* (0.188)	0.359* (0.187)	0.569* (0.319)
reg_pe	0.129 (0.159)		0.150 (0.163)	0.143 (0.164)	0.176 (0.288)
supp	-0.430*** (0.138)	-0.421*** (0.137)	-0.471*** (0.141)	-0.439*** (0.139)	-0.543*** (0.205)
batch		0.173 (0.149)	0.152 (0.154)	0.162 (0.154)	
complex		-0.046 (0.127)	-0.079 (0.130)	-0.089 (0.130)	
3dprint				0.163 (0.136)	
Constant	-2.538*** (0.280)	-2.580*** (0.274)	-2.662*** (0.305)	-2.675*** (0.300)	-0.815* (0.476)
Pseudo R2	0.1391	0.1239	0.1403	0.1324	0.0785
Observations	1,875	1,843	1,843	1,843	376

## Conclusions

- Descriptive statistics as well as regression results indicate a **positive** association between backshoring and Industrie 4.0.
  - I4.0 technologies and backshoring both improve flexibility in the firm, and may complement each other
- Backshoring is still a rare event, but with growing diffusion of Industrie 4.0 technologies, we expect that backshoring will increase
  - The results are good news for policy; policy debates are dominated by fears of job losses to I4.0 technologies
  - However, we should not expect huge increases in manufacturing jobs; new jobs due to backshoring will be rather high-skilled; **it is unlikely that the old low-skilled jobs will ever return.**

That's it, thanks a lot for your attention

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## Obviously, there are some limitations

- Offshoring is not only cost-driven, but also market-seeking;
- increases in flexibility do not lead to offshoring if customers are located far away from the home country (this is why suppliers are sig negative)
- We are only at the beginning of digitalization in production

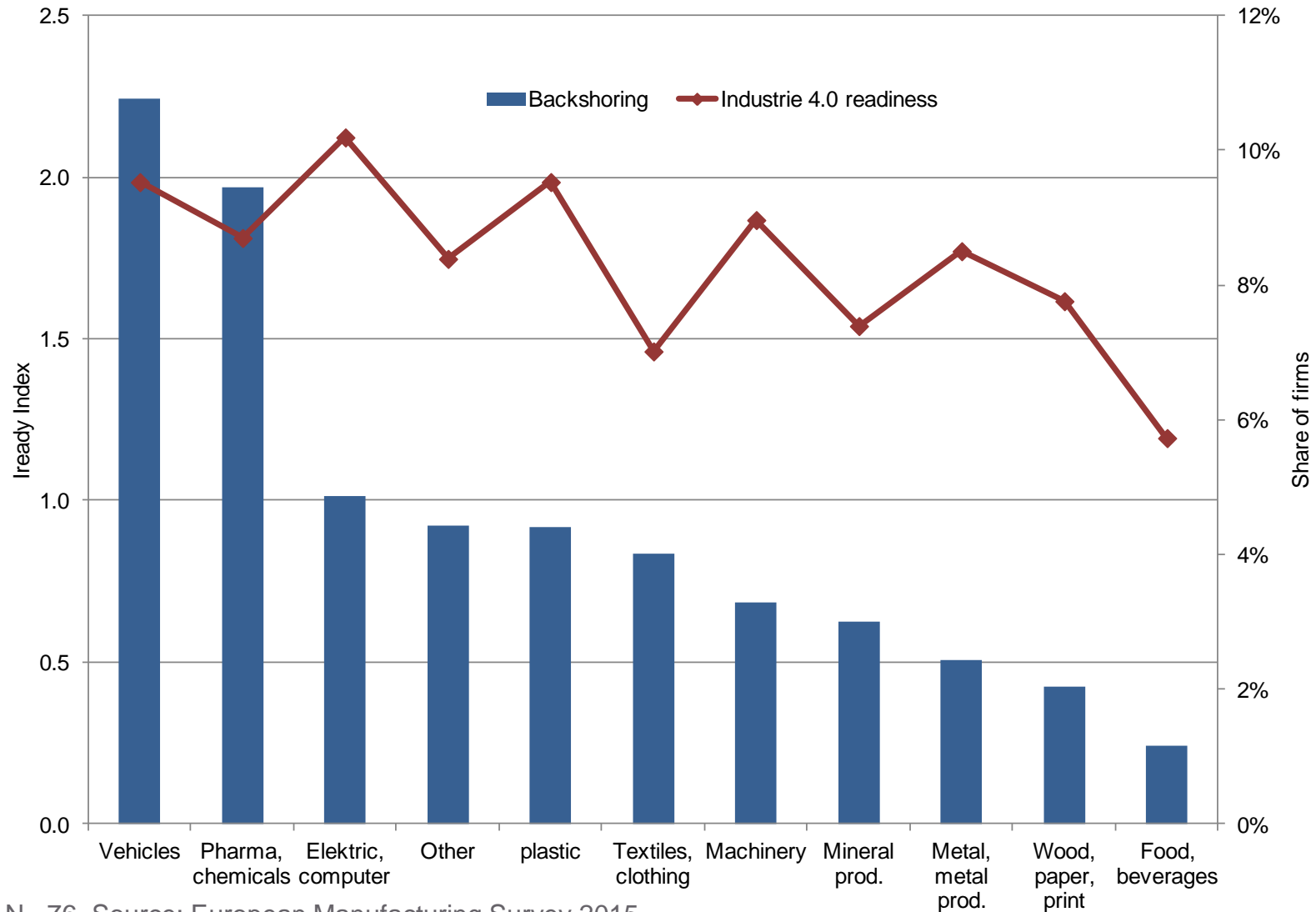
# Digital production technologies in the EMS

- Digital Management Systems
  - Product-Lifecycle-Management-Systems (PLM) or Product/Process Data Management
  - Software for production planning and scheduling
- Wireless Human-Machine-Communication
  - Mobile/wireless devices for programming and operation of equipment and machinery
  - Digital solutions for providing drawings, work schedules or work instructions directly on the shop floor
- Cyber-Physical System (CPS)-like Processes
  - Near real-time production control system
  - Supply chain management
  - Systems for automation and management of internal logistics

## Backshoring

- „Hat Ihr Betrieb seit 2013 Teile der Produktion an ausländische Standorte oder andere ausländische Unternehmen ausgelagert bzw. von dort **rückverlagert?**“
  
- So backshoring is moving manufacturing activities back to the country of its parent company
  - Includes backshoring from own subsidiaries from suppliers
  - However, it does not include nearshoring, for example the relocation from China to Hungary

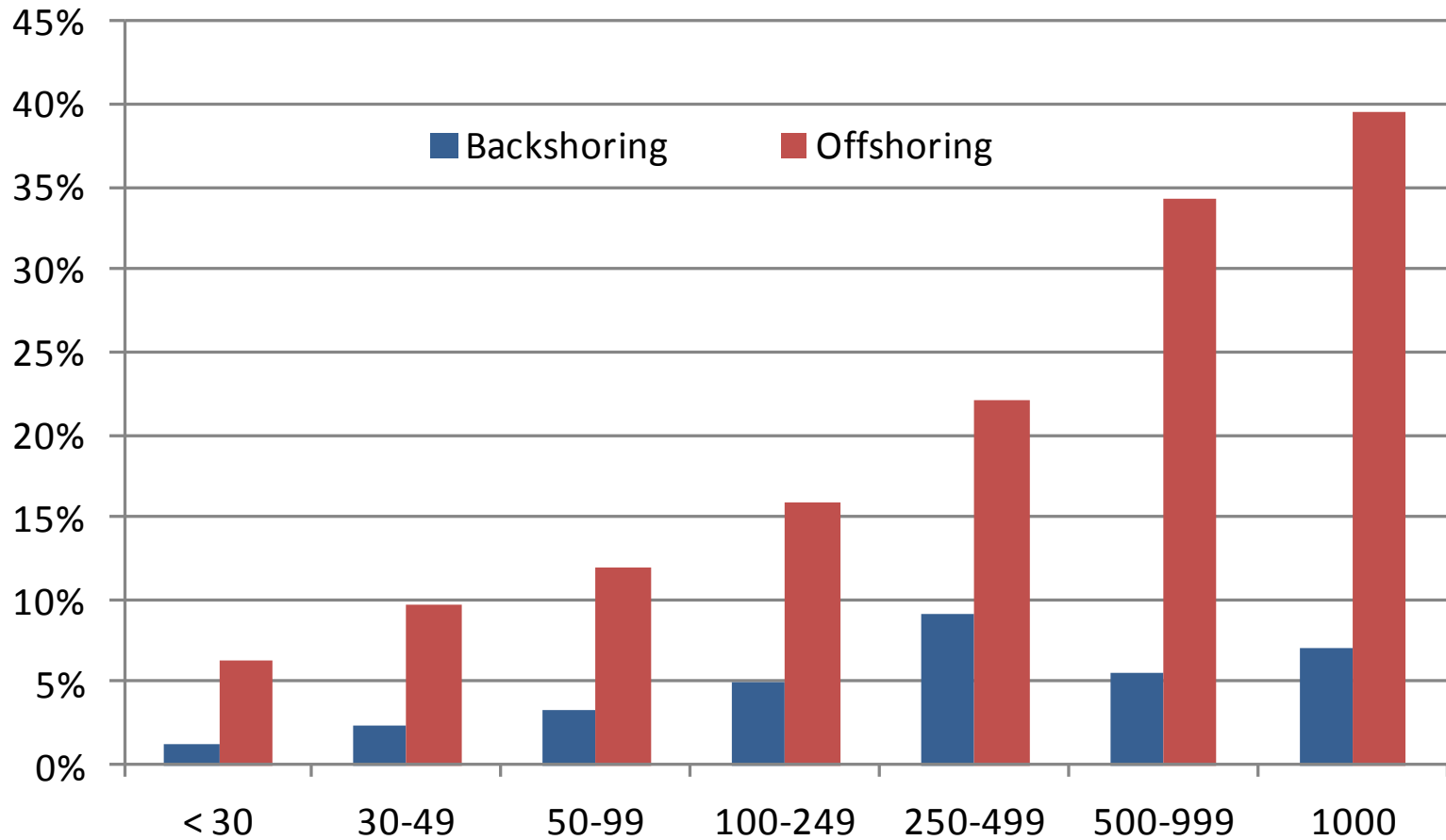
# 14.0 and backshoring in sectors



N= 76. Source: European Manufacturing Survey 2015



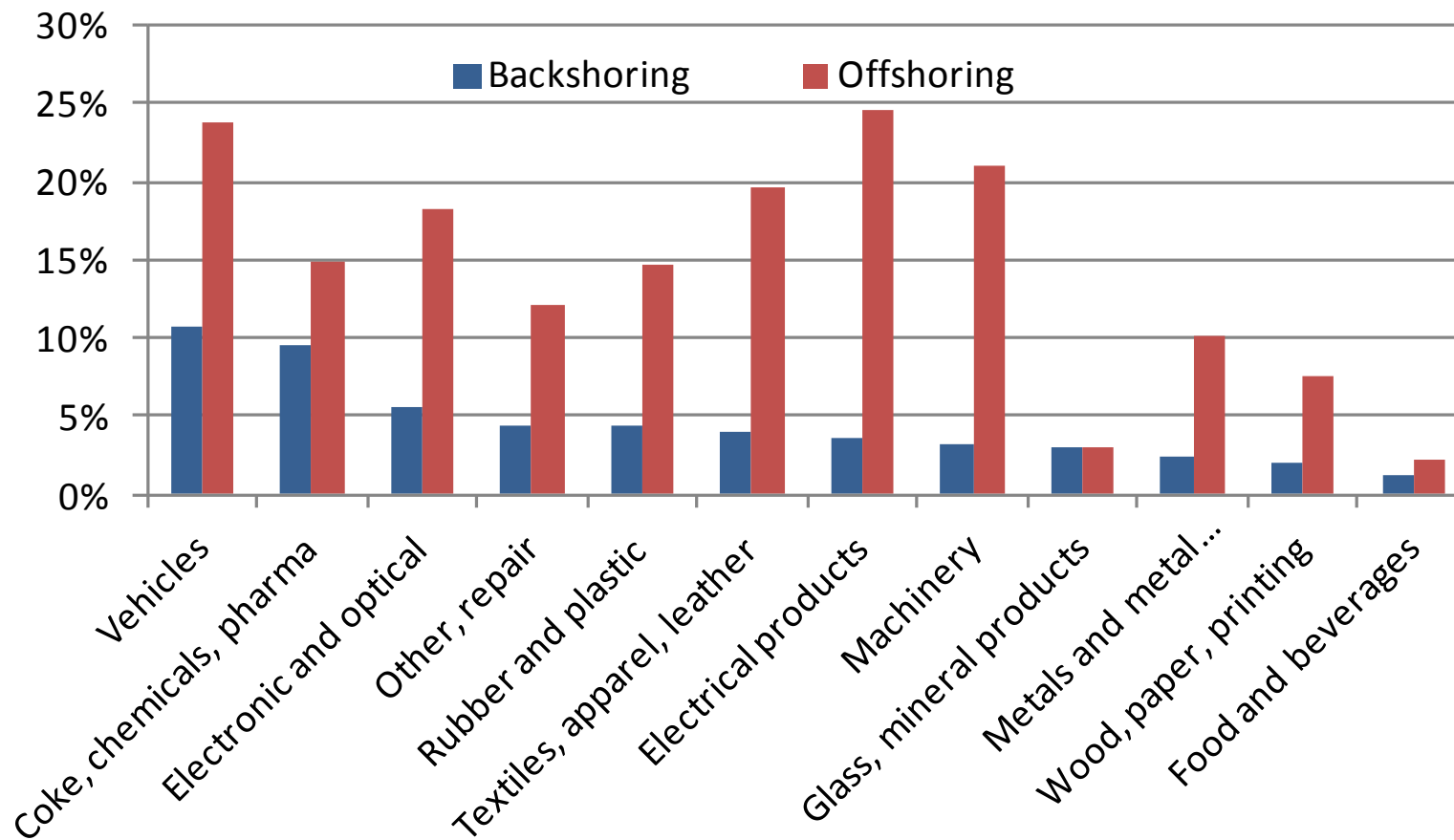
# Distribution of backshoring across size classes



Source: European Manufacturing Survey 2015

N= 2,035

# Distribution of backshoring across sectors



Source: European Manufacturing Survey 2015

N= 2,035