

Digital servitization in manufacturing firms

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Background

- Manufacturing firms have different options to commercialize their knowledge and competencies:
 - Product and process innovation
 - Technology licencing
 - Spin-offs and corporate venture capital

- Product-related services (Baines et al. 2009; Kowalkowski et al. 2017; Raddats et al. 2019)
 - complement or substitute the physical products of the firm

The benefits of servitization

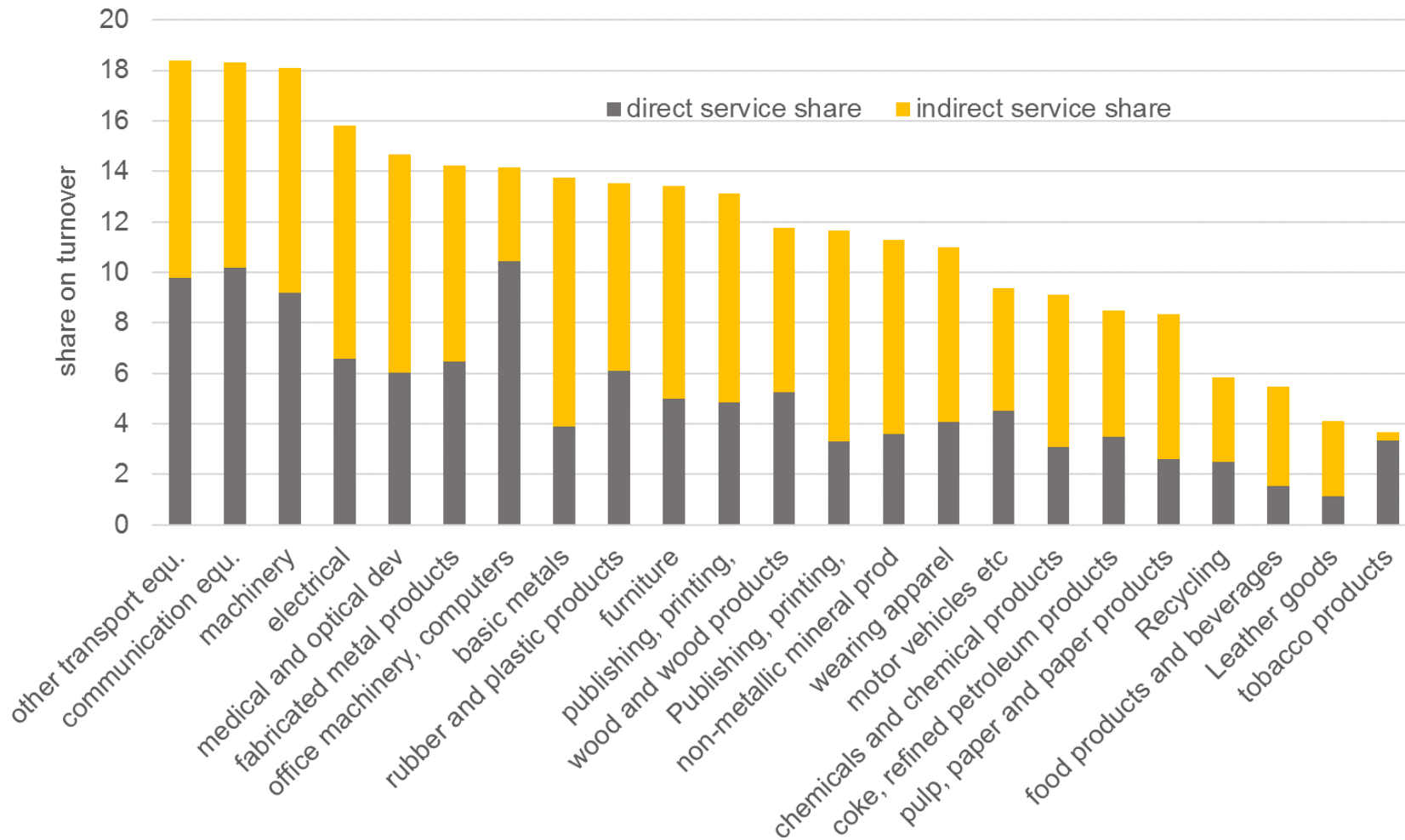
Firms can derive three benefits from servitization (Mathieu 2001):

- *Financial benefits*,
 - in particular new income sources and more stable revenue

- *Marketing benefits*,
 - in particular a more intense relationship with clients
 - interaction with customers as a source of information for the firm

- *strategic benefits*
 - product differentiation and stronger customer loyalty

Service turnover in different manufacturing sectors, 2009



Why is servitization so difficult?

- Customers are not willing to pay for services (Eggert et al., 2014; Neely, 2008; Witell and Löfgren, 2013)
 - Change from services as an add-on to a source of revenue difficult
 - Services are sold as product-service bundles (operator models, pay-by-hour, ..)

- Services are difficult to scale up, lack economies of scale
 - They are often based on the competencies of people

- No transition to a service-centered company (Gebauer et al., 2005; Vargo and Lusch, 2008)
 - manufacturing firms lack accompanying investments and do not adapt appropriate business models and a service-dominant logic

Digitalization

- Digital manufacturing technologies (aka IoT, Industrie 4.0) include sensors, networked production, cyber-physical systems, 3D printing, advanced robotics, Big Data ...
- These technologies are seen by many as the most important driver for future productivity growth (OECD 2017, UNCTAD 2017).
- Another hope: new data as the basis for new services
 - 'digital servitization' (Paschou et al. 2018, OECD 2018 and others)

How can digitalization help to overcome these challenges?

- Digitalization allows new services based on data and technology
- these new services are also more scalable

- Digitalization provides new revenue models, such as outcome-based, or usage-based or transaction-based revenue models
 - These may help firms to make the value of the service more visible

- *H1: The degree of servitization is positively related with the intensity of use of digital production technologies.*

Digital servitization helps firms in innovation

- Information collected from customers can help manufacturers to design better products (Mey Goh and McMahon, 2009)
 - Digitalization provides real-time data on product usage, while before digitalization, servitized manufacturers had to rely on personal interaction with the client (Rymaszewska et al. 2017)
- *H2: The degree of servitization is positively related to the propensity of firms to introduce new products and the use of digital production technologies.*

Data

- I use data from the 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
 - digital production technologies
 - service turnover and new product-related services
 - innovation input and output
 - 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 firm-level data for 230 manufacturing companies from Austria, reference year is 2018

Technologies

Groups	Technologies
<u>Cyber-physical systems (CPS)</u>	Products with interactive interfaces
	Connected products for automated data exchange
	Products with sensors
<u>Logistics</u>	Products with identification tags
	Mobile devices for programming and controlling
	Solutions to transfer drawing, schedules etc. directly to the shop floor
	Enterprise resource planning (ERP)
	Digital exchange of data with suppliers / customers
	Near real-time production control systems
	Product-lifecycle-management systems
	Systems for automation of internal logistics
<u>Additive Manufacturing</u>	Additive Manufacturing for prototyping
	Additive Manufacturing for production
<u>'Old' robotics</u>	Industrial robots for manufacturing
	Industrial robots for handling
	Autonomous industrial robots
<u>'New' robotics</u>	Collaborating industrial robots
	Mobile industrial robots
	Equipment that automatically stores data

Empirical model

- Dependent variables:
 - H1: Share of services on turnover (metric), new services introduced (dummy)
 - H2: product innovation (dummy)

- Independent variables:
 - Firm size
 - Industry dummies
 - Digitalization intensity (technologies employed by the firm aggregated in an index OR aggregated in technology groups)
 - Service share on turnover (H2)

- OLS and probit estimation

Some descriptive results

- 80% of all firms offer some type of service,
- but only 30% generate revenue with these services

- The share of services on total turnover is around five percent on average
- Service turnover is higher in more technology-intensive sectors

- 18% of all firms have introduced a new service in the last two years,
- compared to 58% which have introduced a new physical product to the market

Digitalization and servitization

H1: The degree of servitization is positively related with the intensity of use of digital production technologies.

- I find a positive association between digitalization intensity and *service turnover share* only at an error level of 10% or more and with a very small coefficient
- However, there is a significant and positive association between digitalization intensity and *service innovation* (new services introduced)
- Digital technologies seem to be related only to new services, and not with total service turnover of firms

Digitalization and servitization

- At the level of technologies:
 - a positive association with the service turnover share only exists for ‘Cyber-physical systems’ (products with sensors, automated data exchange)
 - There is even a negative association between ‘new robotics’ (collaborative, mobile robots) and service turnover (distinct strategies in digitalization?)

Servitization and product innovation

H2: The degree of servitization is positively related to the propensity of firms to introduce new products and the use of digital production technologies

- There is a significant and positive association between product innovation and service turnover
- However, there seems to be no association between product innovation and the digitalization index or individual technologies, with the exception of 'new robotics'
- The information function of services is still largely a result of the interaction of employees with customers in the process of service generation, not of digitalization!

Conclusions

- Servitization can be a viable strategy for manufacturing firms to commercialize their knowledge.
- However, digital servitization is still in a premature stage.
 - Early stage of development of the underlying technologies. Another reason may
 - digital servitization is not only a matter of technology, but also requires investments in skills and new capabilities by the firms.
- What policy can do
 - I believe that technology is not the bottleneck for digital servitization.
 - Rather, it is the lack of business models, and a lack of examples how firms can monetarize data
 - We need more promotion of these types of innovation
 - R&D tax incentives has shifted the focus of innovation policy back to R&D and technological innovation

That's it, thanks a lot for your attention

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