



National Technical University  
of Athens



# Intangible investments and digitalization of Large firms and SMEs: Evidence from the Globalinto Survey in 7 European Countries

Yannis Caloghirou, Professor Emeritus, LIEE-NTUA

Aimilia Protogerou, Senior Researcher , LIEE-NTUA

Panagiotis Panagiotopoulos, Post-doc Researcher , LIEE-NTUA

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# Why and How to Measure Intangible Investments?

- The productivity puzzle (Solow, 1987: the impact of Computer Age could be seen everywhere but in productivity statistics) and the growing importance of Intangible Assets and the growing dominance of the Intangible Economy in the transition to the Knowledge economy.
- The story of how intangibles can be measured can be considered as “the late episode of a much bigger story: the great invention of GDP and systems of national accounts” (Jonathan Haskel and Stian Westlake book (2018), *Capitalism without Capital- The rise of Intangible Economy*, Princeton University Press, ch3)
- Going back to the time of the Great Depression (1929..): How much the whole production had fallen? How to avoid the problem of double-counting (You can't just add up all the outputs in all the industries)-→ by the late 1940s, the systems we use to day to measure GDP were just becoming mainstream. In this post World War 2 context (rebuilding industrial capacity) measuring investment was critical and perceived seriously, but it was strictly limited to Physical Stuff.
- Machlup Fritz (Austrian émigré, NYU) book (1962) entitled *The Production and Distribution of Knowledge in the United States*, He started measuring spending from R&D to Advertising and Branding to training. Machlup's book exerted an influence to the NBER, OECD (Chris Freeman and the Frascati Manual), the establishment of SPRU by Chris Freeman at the University of Sussex (1966).
- 1980s: spreading of computers and the productivity puzzle.
- 1990s: Computer software as “knowledge written down in line of codes” → Software ought to be treated as investment. Up to that time, investment surveys were focused on spending in tangible assets (computers, machinery, vehicles, and buildings)
- Early 2000s: The idea of knowledge economy emerged → examine the role of knowledge investment more generally → spending significant amounts of money on things that had no physical presence, but they were valuable and durable including R&D et al, but also organizational arrangements.
- The broadening of investments to include ideas, knowledge, and networks.

- **Basic objectives of the Survey:**

- 1. To measure the enterprises' investments in a broad range of Intangible Assets (IAs) contributing to the improvement of micro level measurement approaches.**
- 2. To investigate the factors influencing the IAs investments, the impact of IAs on enterprise performance, the role of relevant policy measures and the impact of Covid-19 crisis on IAs.**

**Not an ad hoc, one-off survey but oriented towards the possibility of regular data collection at National Statistical Institutes**, or possible integration of core elements into existing survey instruments (i.e. measurement of IAs in a sustainable manner).

**Limited number** of business surveys on intangible assets in Europe:

- ONS (Office for National Statistics), Imperial College London and NESTA (UK), 2009 & 2011
- Eurobarometer survey, 2013
- INAPP and ISTAT (Italy), 2013 & 2020 (survey in progress)

## Policy and Business Implications

- The survey aims at providing **evidence-based implications for coherent public policies as well as business strategies**:
  - **Policy Implications**: Informing policy formulation (system of policies & mix of measures diversified per sector, firm type etc.) at a EU and national level to support IAs development and effective use.
  - **Business Implications**: Informing strategic decisions on the appropriate mix of IAs investments and developing specific organisational capabilities so as to improve innovation and long-term economic performance.
- These implications are more significant after the **outbreak of Covid-19 crisis**
  - Impact of the Covid-19 business disruption on the importance of ICT investments and their complementarity with other types of IAs

- The objective:
  - GLOBALINTO will provide new measures of intangible assets at the firm level, filling an important gap in measurement which has restricted statistical production, micro-based analysis and evidence-based policymaking.
  - It will analyse the various potential explanations of the productivity puzzle, both at micro and macro levels.
- Partners:
  - University of Vaasa (Finland)
  - University of Hamburg (Germany)
  - Aarhus University (Denmark)
  - National Technical University of Athens (Greece): **WP Leader for the Globalinto Survey**
  - University of Ljubljana (Slovenia)
  - University of Manchester (UK)
  - Statistics Norway
  - University Paris-Sud (France)

# Investments in Intangible Assets

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# Intangible Assets Taxonomy

1. **R&D and external knowledge acquisition**
  - a) **R&D:** Creative and systematic work undertaken (in-house or provided by external providers) in order to increase the stock of knowledge and to devise new applications of available knowledge.
  - b) **External knowledge acquisition:** Purchase of patents and non-patented inventions, know-how, process blueprints and other types of knowledge.
2. **Training of the enterprise's staff**, either provided by an external organisation or using internal resources.
3. **Organisation / Business process improvement** through purchased consultancy services and/or in-house investment of managerial time.
4. **Software/Databases:** Purchase and/or in-house development/customization of software and databases.
5. **Design:** In-house and/or contracted out activities to design or alter the shape, appearance or usability of products and services.
6. **Reputation/Branding:** Funding of any in-house and/or contracted out activities to improve reputation or brand values, either of the enterprise as a whole or individual product or service lines.

# The majority of firms report some training activity followed by in-house R&D. Design had the lowest incidence.

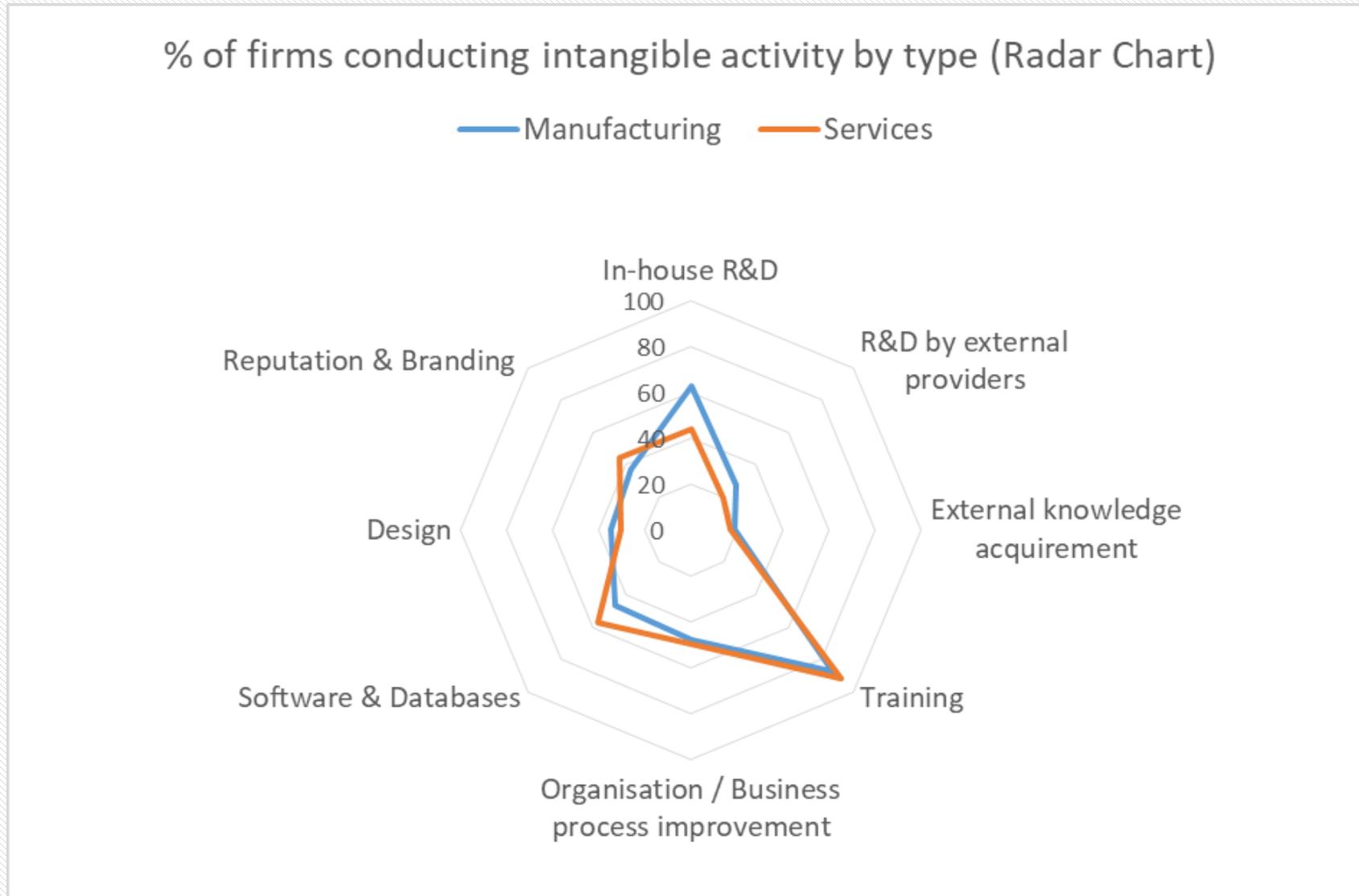
**Expenditures in intangible assets: a) % of firms conducting intangible activity (among all firms), b) average expenditure as % of turnover (among firms with expenditures by category)**

	<b>% of firms</b>	<b>External Providers (% of turnover)*</b>	<b>Internal Resources (% of turnover)*</b>
In-house R&D	<b>55</b>	-	6,61 (3)
R&D by external providers	<b>24,5</b>	1,92 (1)	-
External knowledge acquirement (patents etc.)	<b>18</b>	1,84 (0,5)	-
Training	<b>89</b>	1,06 (0,5)	1,21 (0,5)
Software & Databases	<b>51,1</b>	1,69 (0,9)	1,59 (0,18)
Organisation / Business process improvement	<b>48,9</b>	1,15 (0,4)	1,53 (0,5)
Reputation & Branding	<b>39,8</b>	1,21 (0,5)	1,28 (0,5)
Design	<b>33</b>	1,42 (0,3)	3,22 (0,5)

Highest avg. expenditure as % of turnover

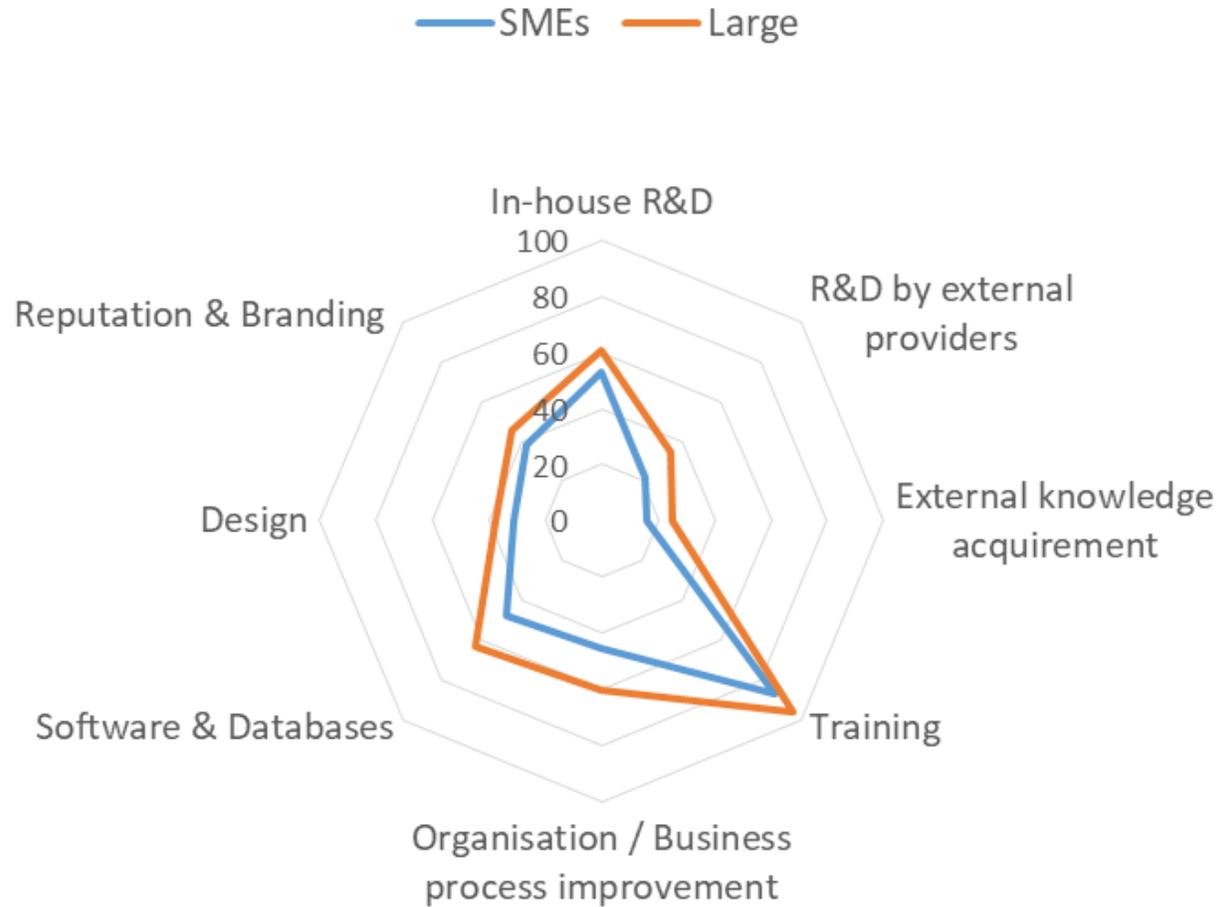
\*Mean (Median)

More firms in manufacturing are involved in R&D activity (62,6%) than firms in services (43,6%)  
More firms in services conduct software/databases (57,4%) and reputation/branding (44,2%)  
activities than firms in manufacturing (46,9% & 36,9% respectively)



# SMEs conduct less intangible activity than larger firms across all asset categories

% of firms conducting intangible activity by type (Radar Chart)



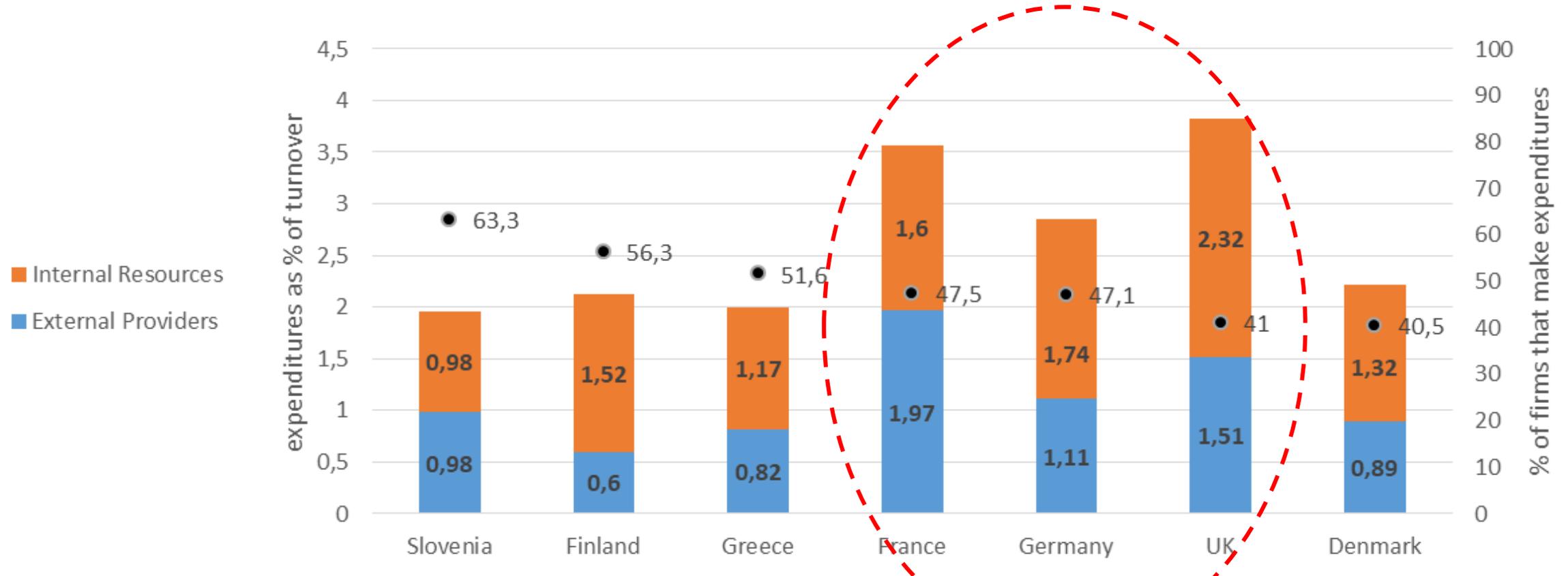
# Expenditures in In-house R&D: a) % of firms that make expenditures (among all firms), b) mean of expenditures as % of turnover (among firms with In-house R&D)

	% of firms conducting in-house R&D	% of turnover (mean)	% of turnover (median)	Business R&D Expenditures as % of GDP*	National Expenditures as % of GDP*
Denmark	<b>52,6</b>	5,59	3	1,82	2,91
Finland	<b>60,5</b>	6,18	2	1,83	2,79
France	<b>47,1</b>	5,04	3	1,44	2,19
Germany	<b>52,9</b>	8,79	4	2,19	3,18
Greece	<b>49,8</b>	5,18	2	0,59	1,27
Slovenia	<b>65,6</b>	6,59	2,5	1,51	2,04
UK	<b>59,3</b>	7,60	3	1,19	1,76

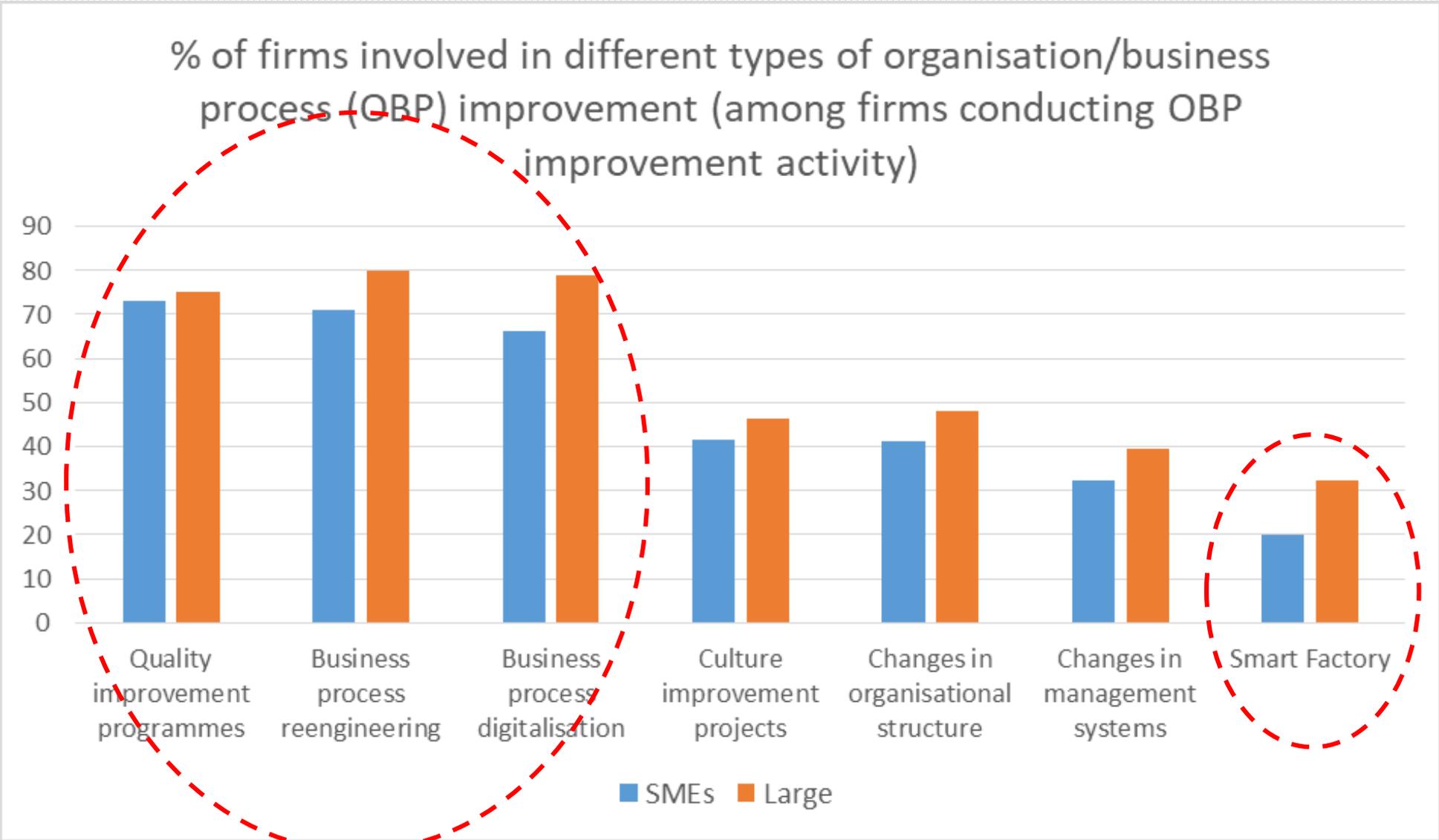
\*Eurostat data for 2019

# Firms in large countries (UK, FR, DE) spend more on Organisation / Business process improvement than firms in smaller countries

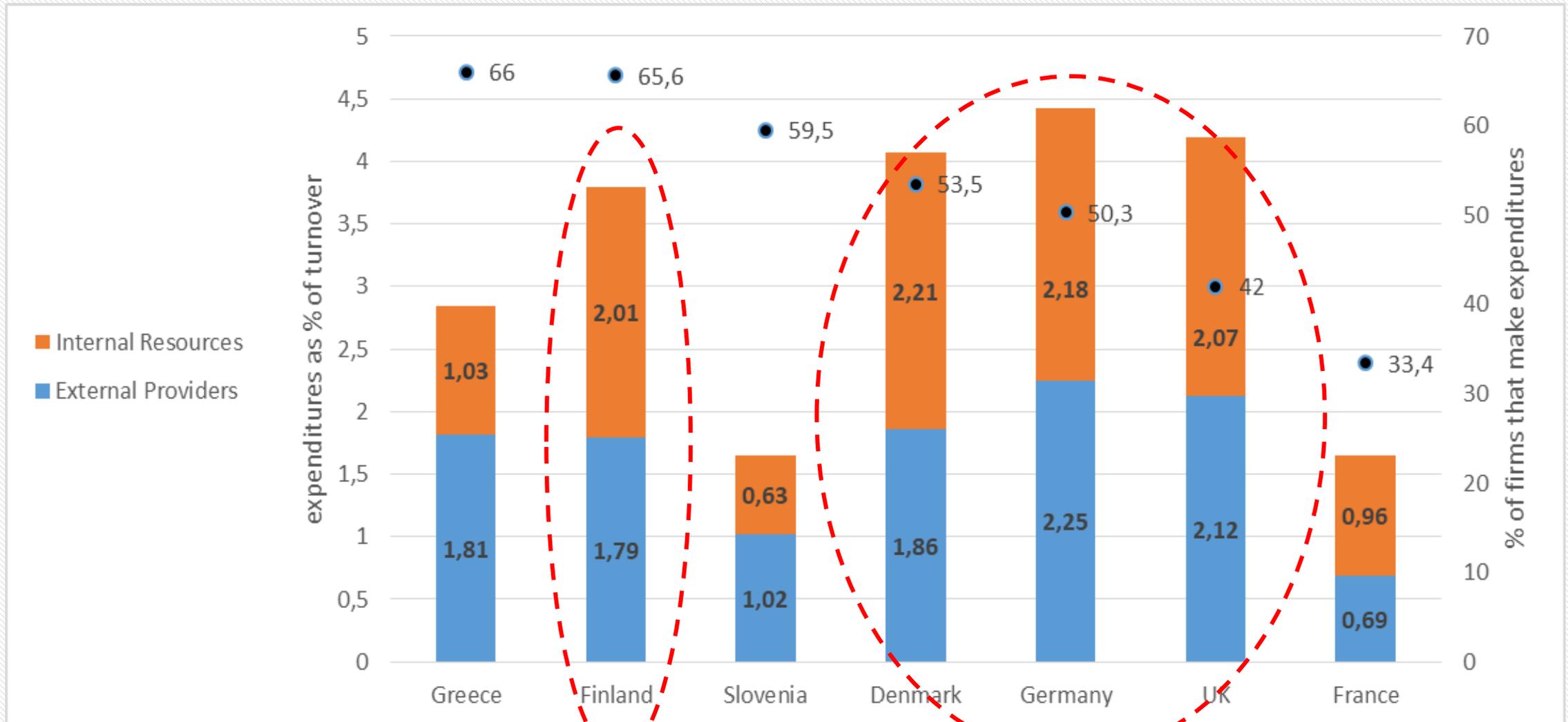
**Expenditures in Organisation / Business Process (OBP) improvement:** a) % of firms that make expenditures (among all firms, scatter), b) mean of expenditures as % of turnover (among firms conducting OBP improvement activity, columns)



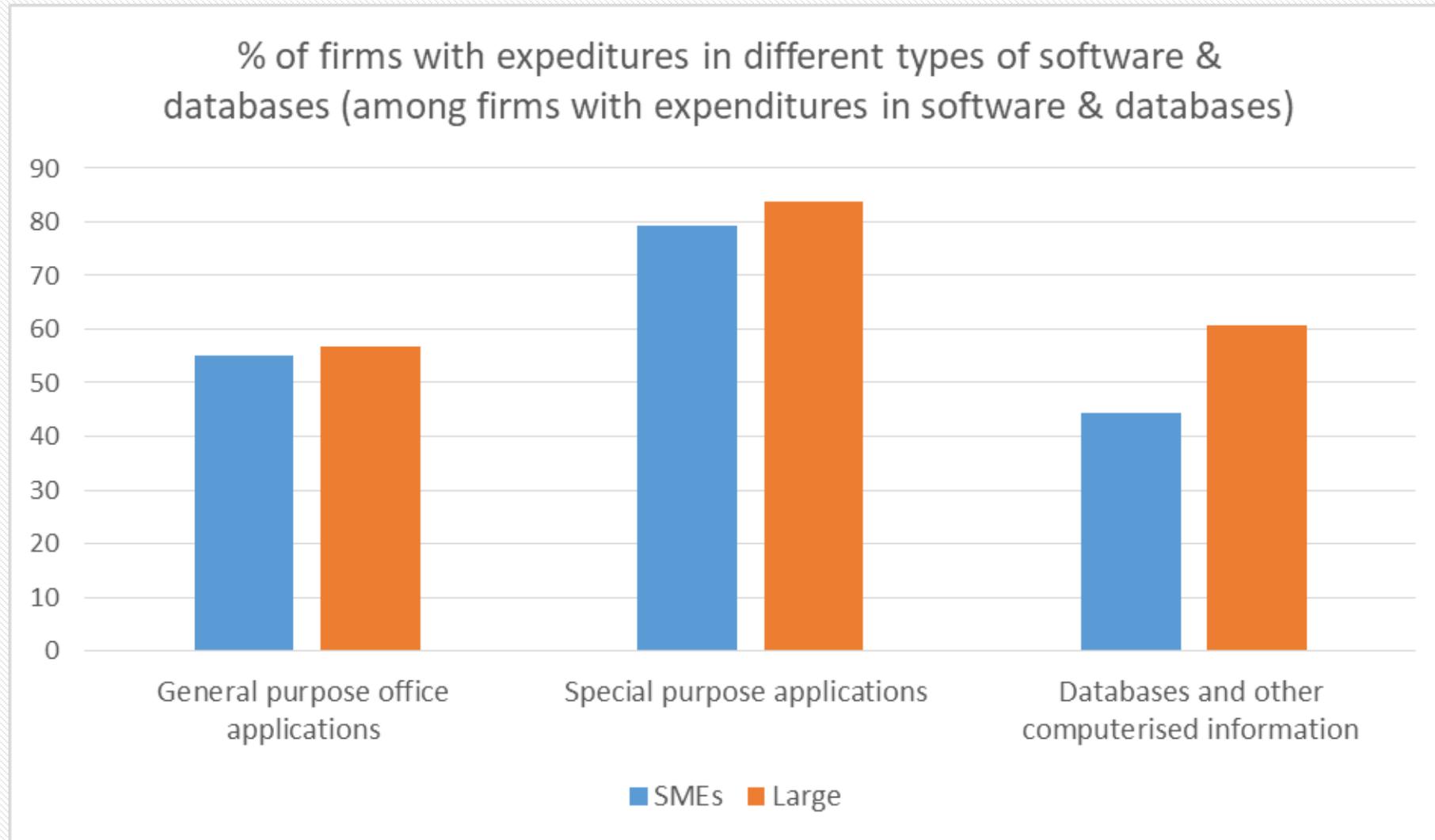
The most “popular” types of OBP in both SMEs and large firms are Quality improvement, BPR and Business process digitalization.



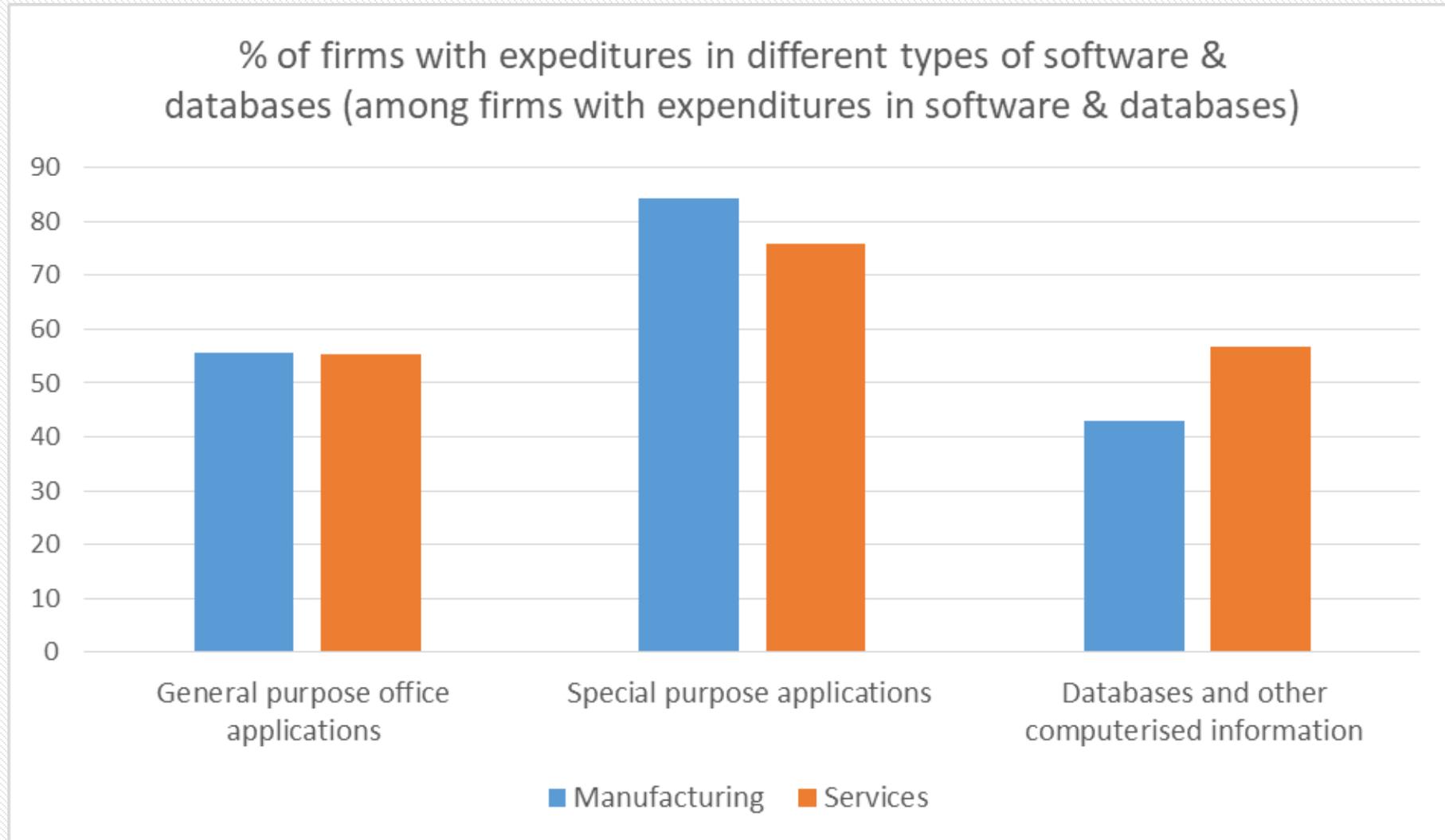
# Firms in Northern European Countries seem to spend more in Software & Databases (S&D)



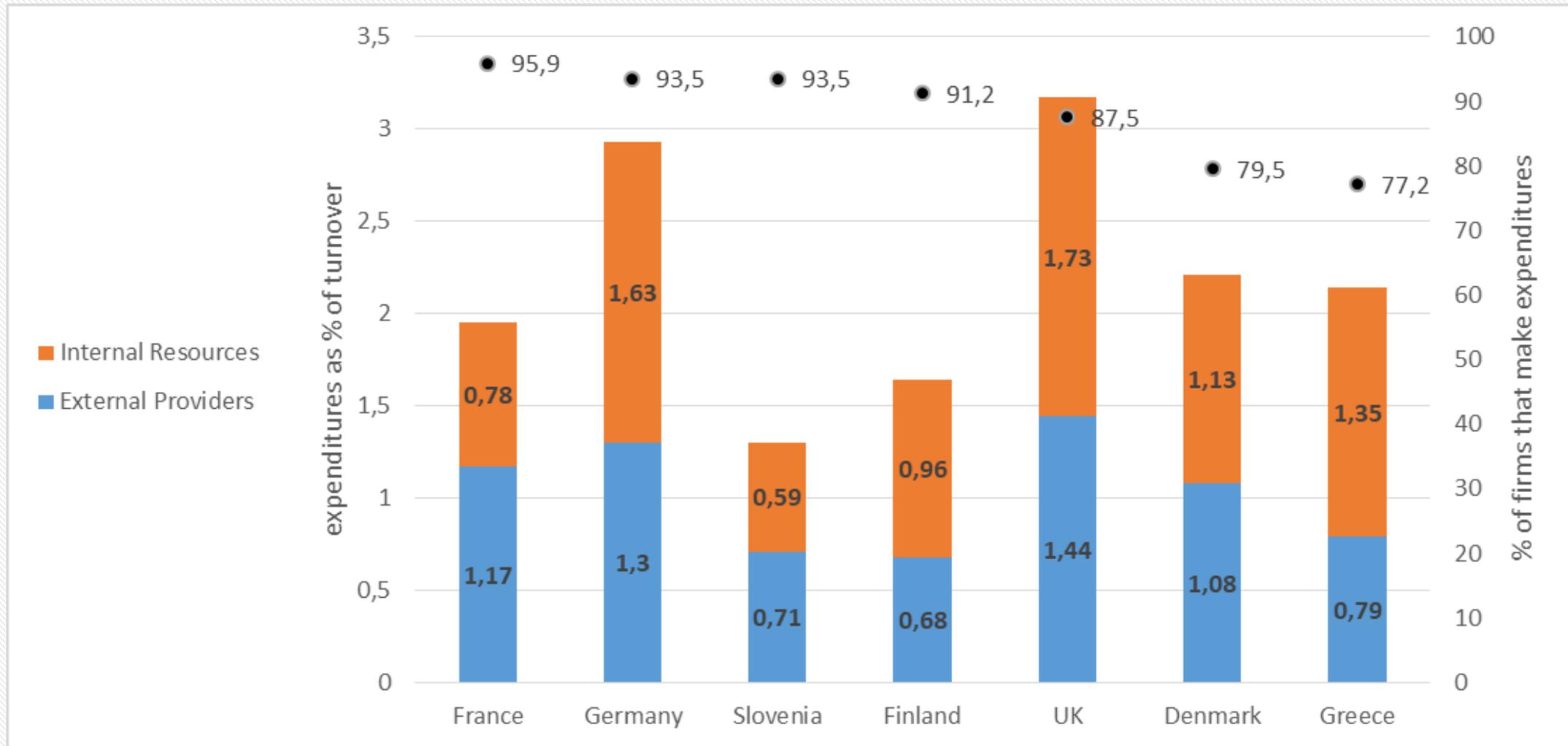
The most “popular” type of S&D spending in both SMEs and large firms is spending in Special purpose applications. Large firms spend more in Databases than SMEs.



The most “popular” type of S&D spending in both manufacturing and service firms is spending in Special purpose applications. Firms in services spend more in Databases than firms in manufacturing.



**Expenditures in Training activities:** a) % of firms that make expenditures (among all firms, scatter), b) mean of expenditures as % of turnover (among firms with Training activities, columns)



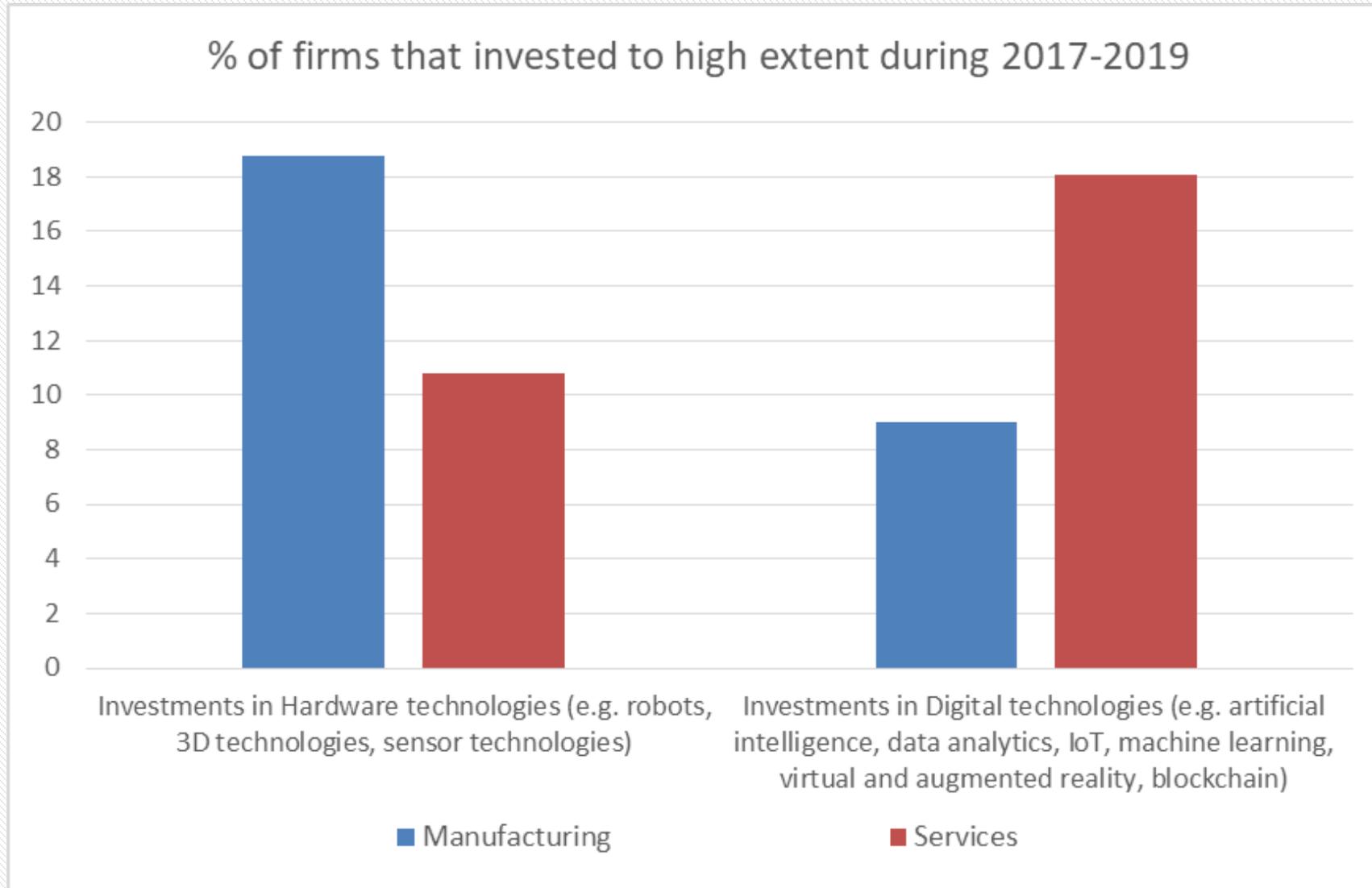
**Expenditures in Design activities:** a) % of firms that make expenditures (among all firms), b) mean of expenditures as % of turnover (among firms with Design activities)

	TOTAL		
	% of firms	External Providers (% of turnover)	Internal Resources (% of turnover)
Denmark	27,4	0,65	4,05
Finland	16,3	0,73	1,98
France	30,6	2,18	4,39
Germany	24,8	1,18	4,40
Greece	44,7	1,18	1,99
Slovenia	54	0,66	0,51
UK	36,2	2,57	5,33

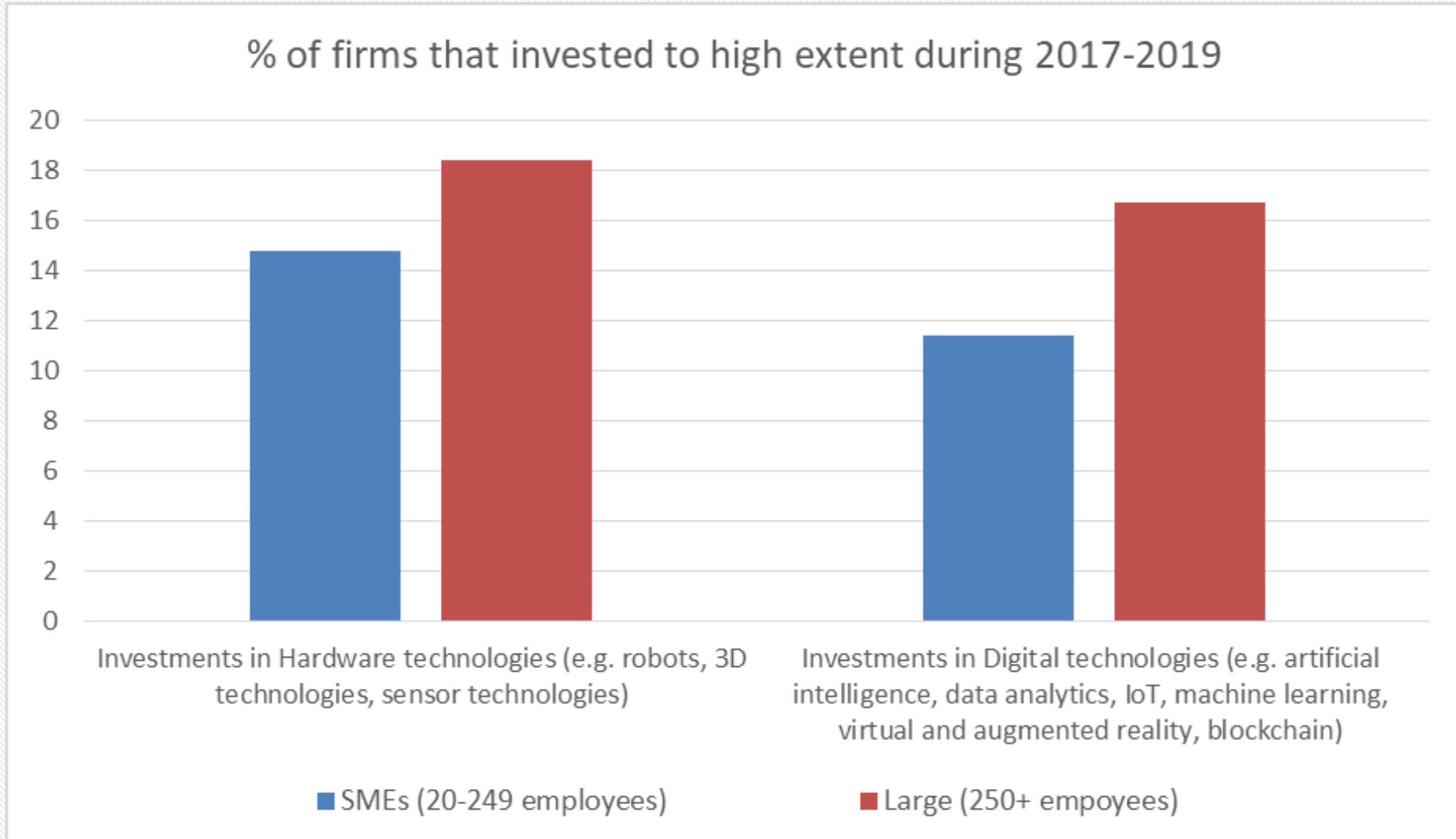
# Investments in Industry 4.0 Technologies, Digital Capabilities & Usage of Digital Platforms

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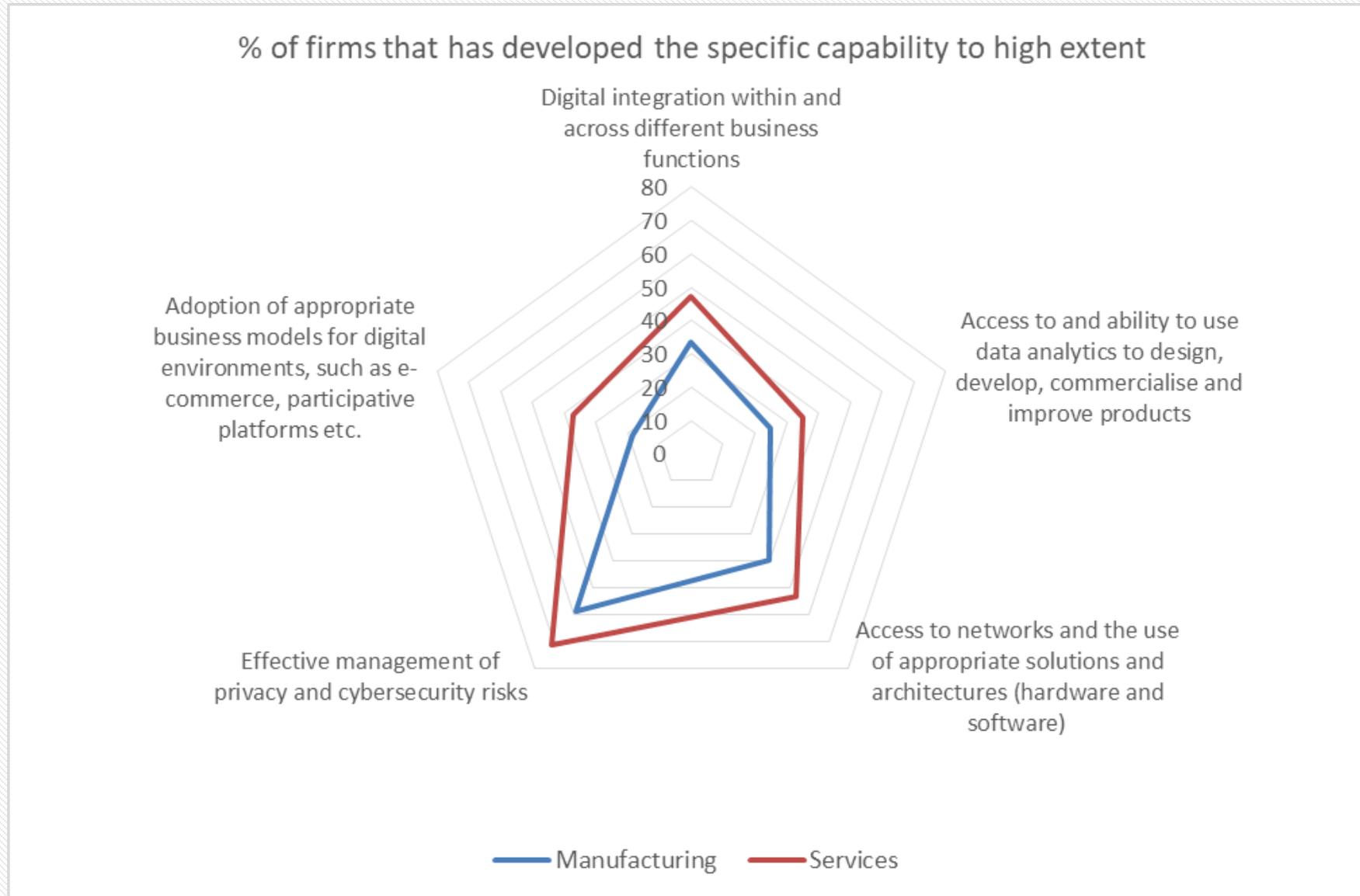
# Firms in Manufacturing spend more in Hardware Technologies than firms in Services. The opposite occurs for Digital Technologies.



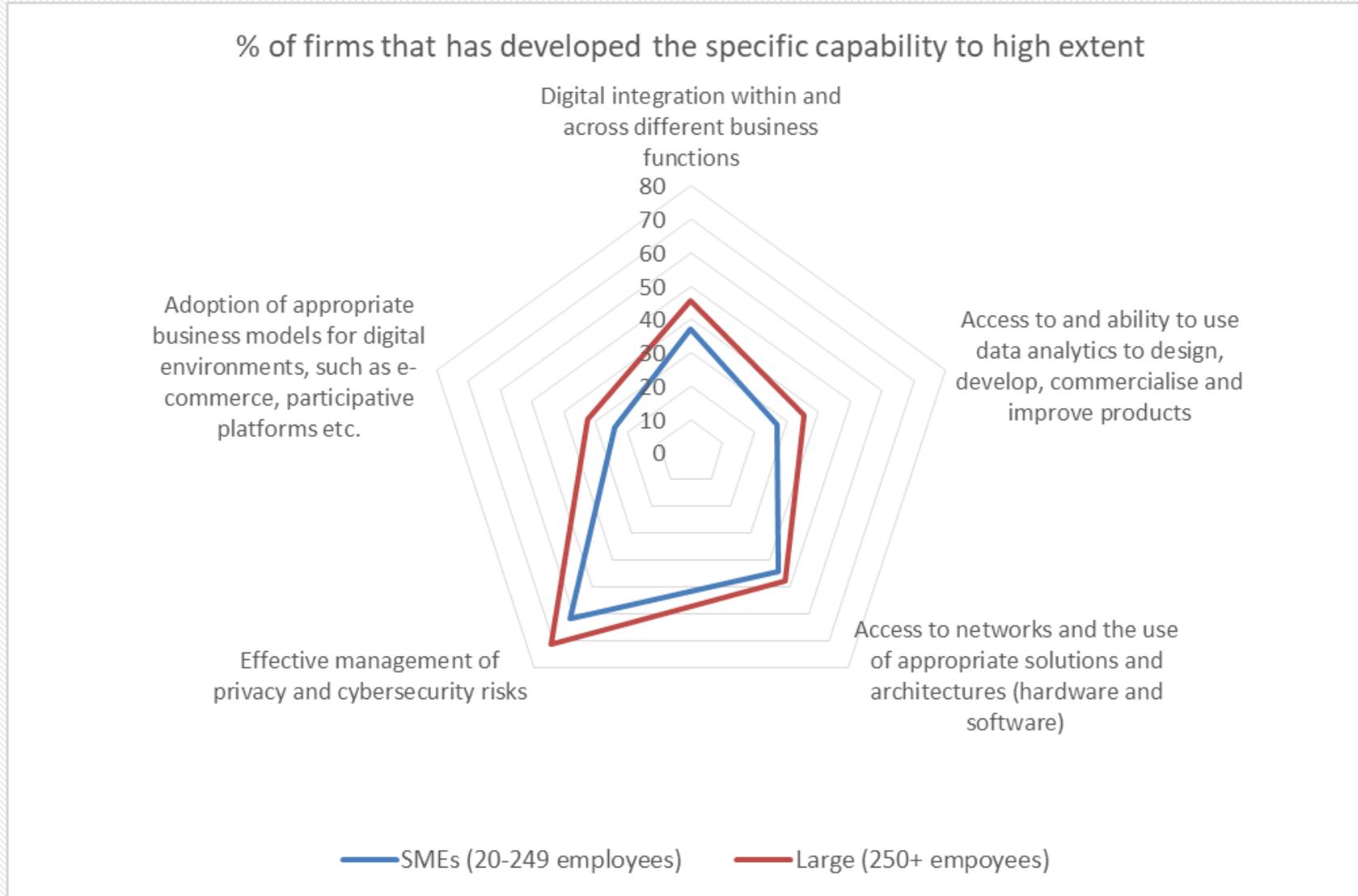
# Large firms spend more in Industry 4.0 Technologies than SMEs



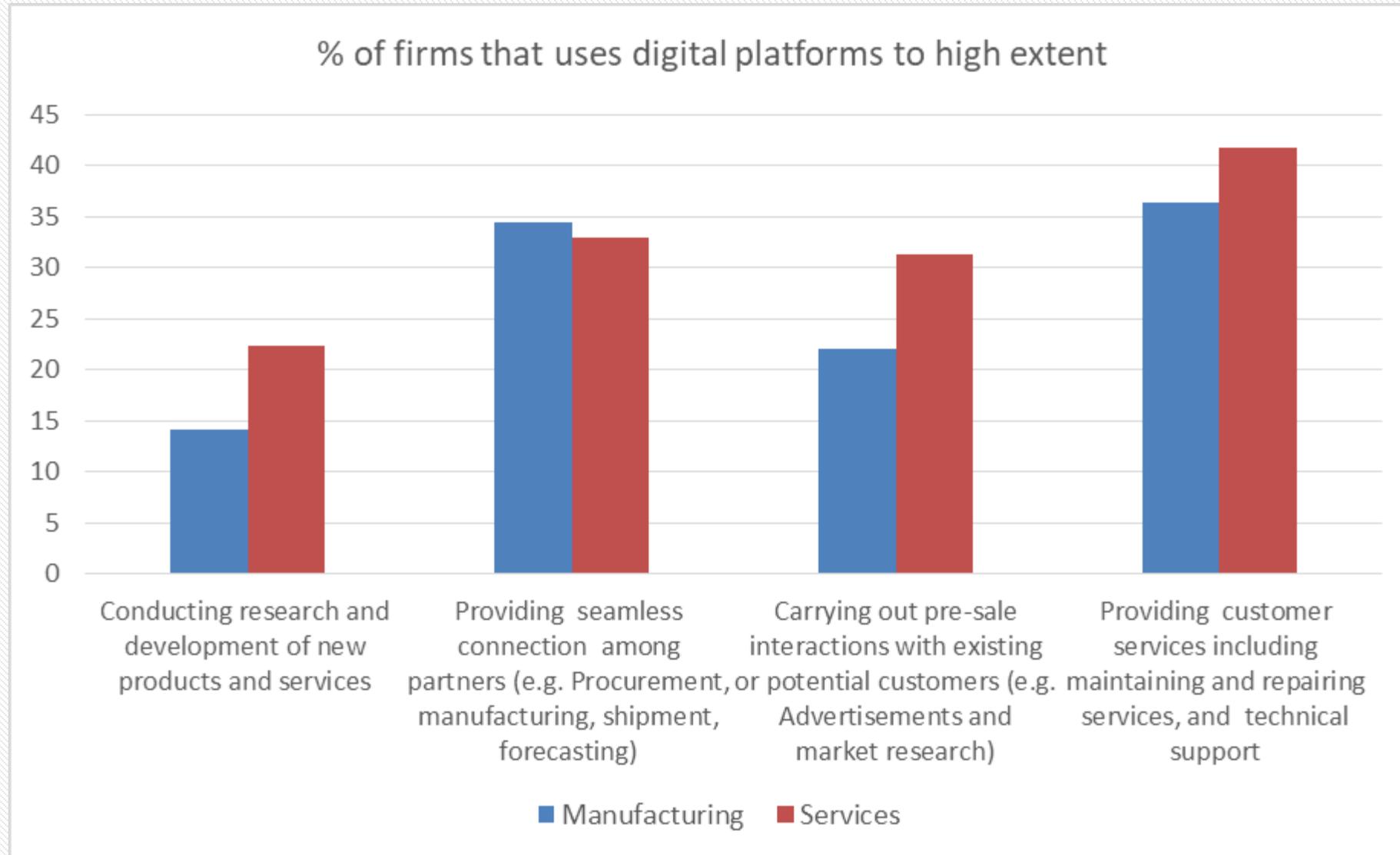
# Firms in services have much higher digital capabilities than firms in manufacturing



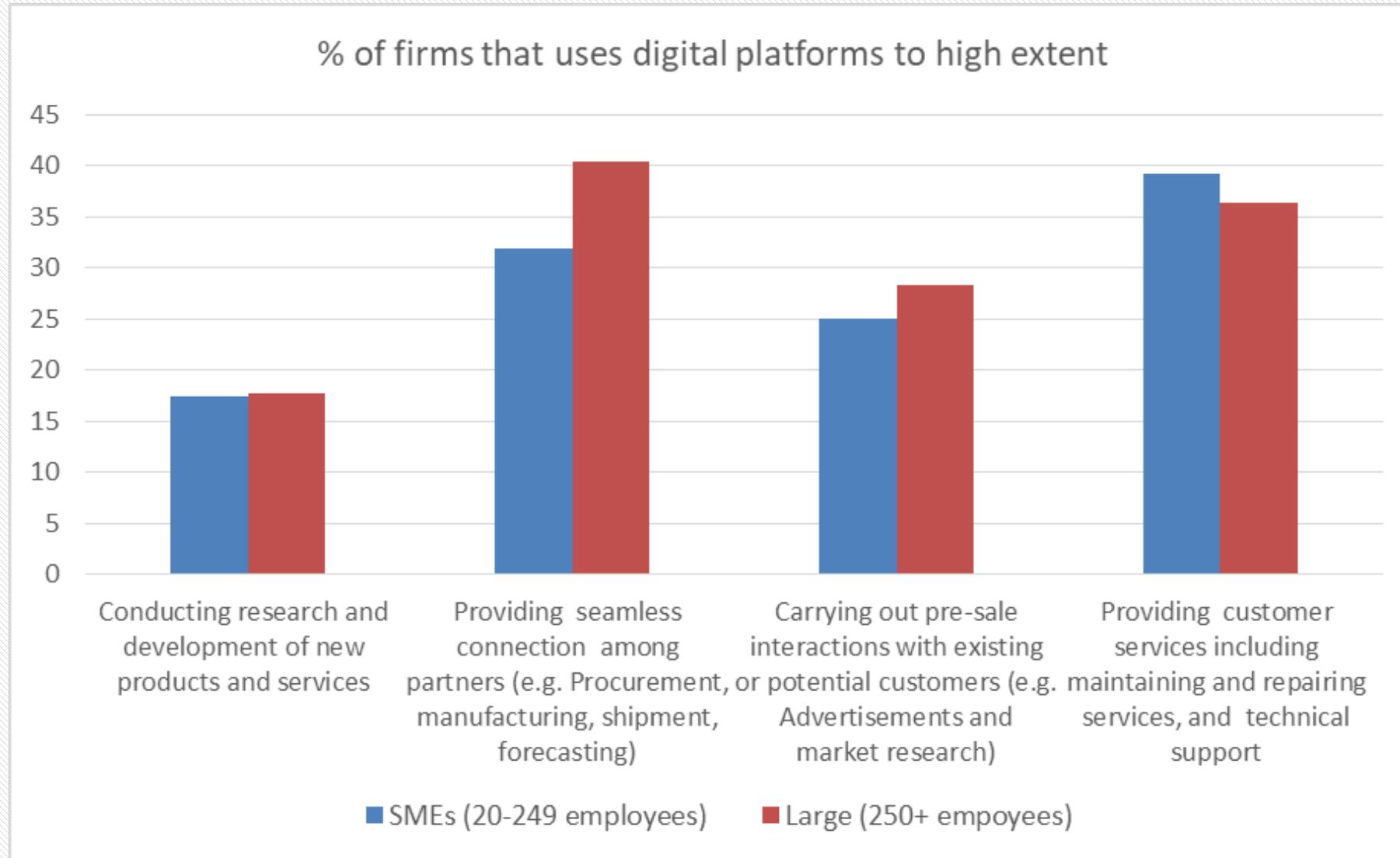
# Large firms have higher digital capabilities than SMEs



# Firms in services use digital platforms to a higher extent than firms in manufacturing



# Large firms use digital platforms to a higher extent than SMEs only for providing seamless connection among partners

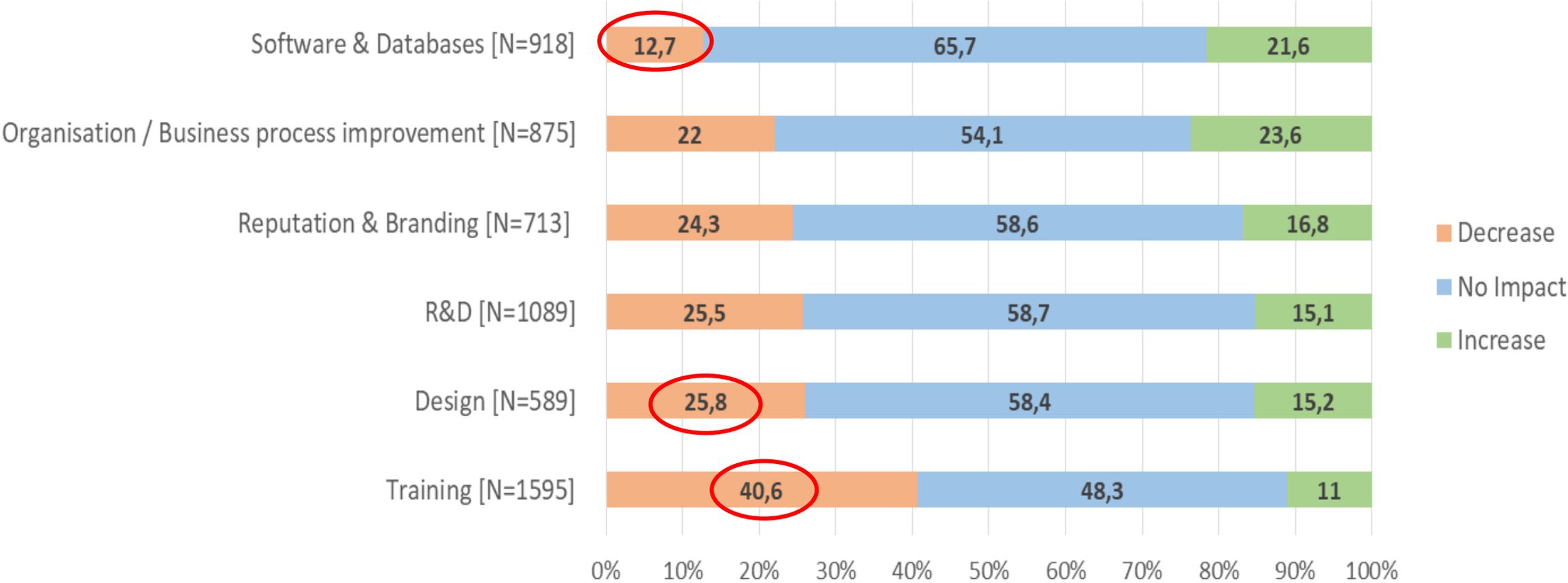


# Covid-19 crisis

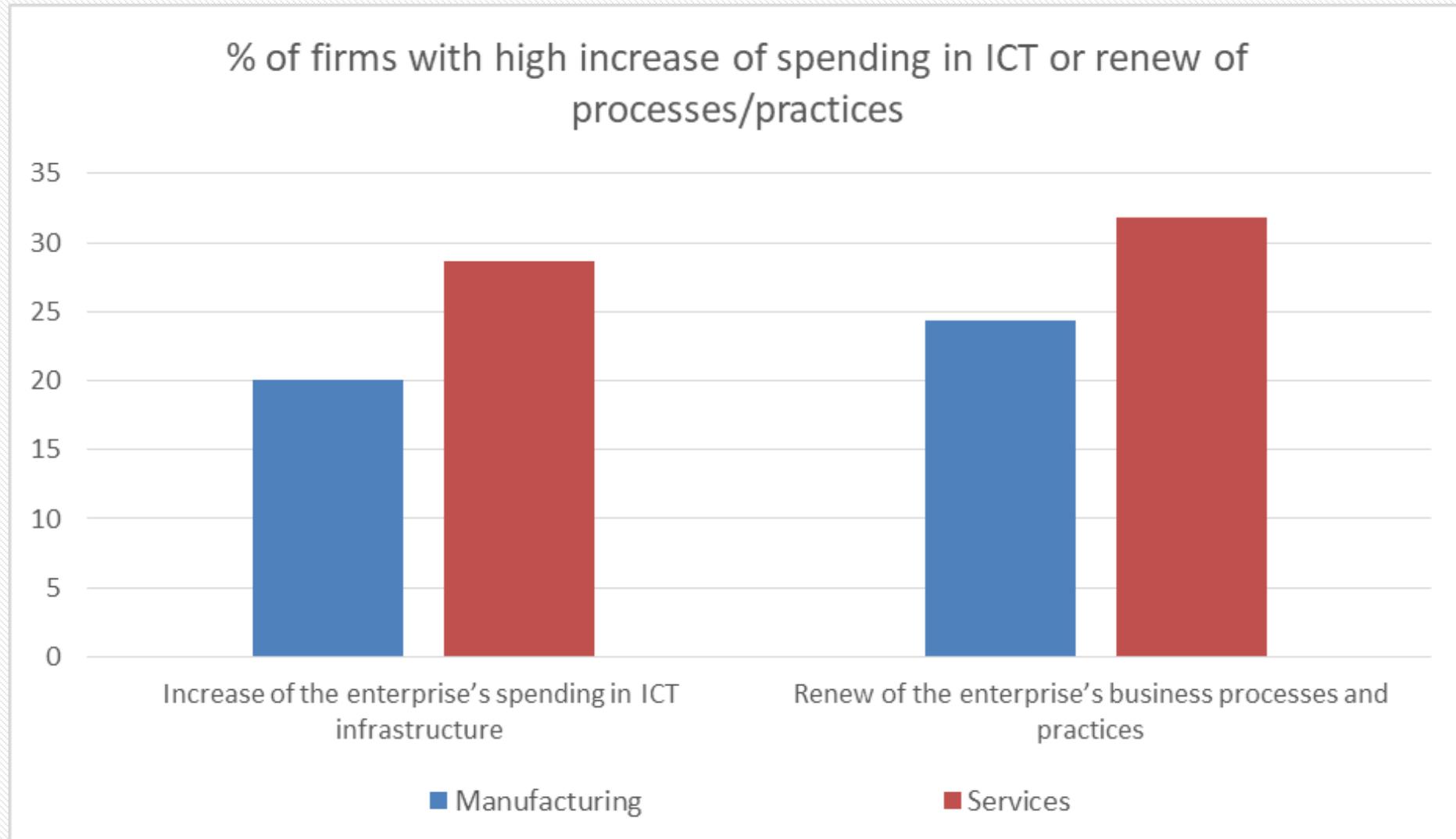
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Most firms reported “no impact” on their intangible assets spending in 2020. Training is most affected by Covid-19 followed by design and R&D. Software and databases is the less affected activity followed by organization/business process improvement.

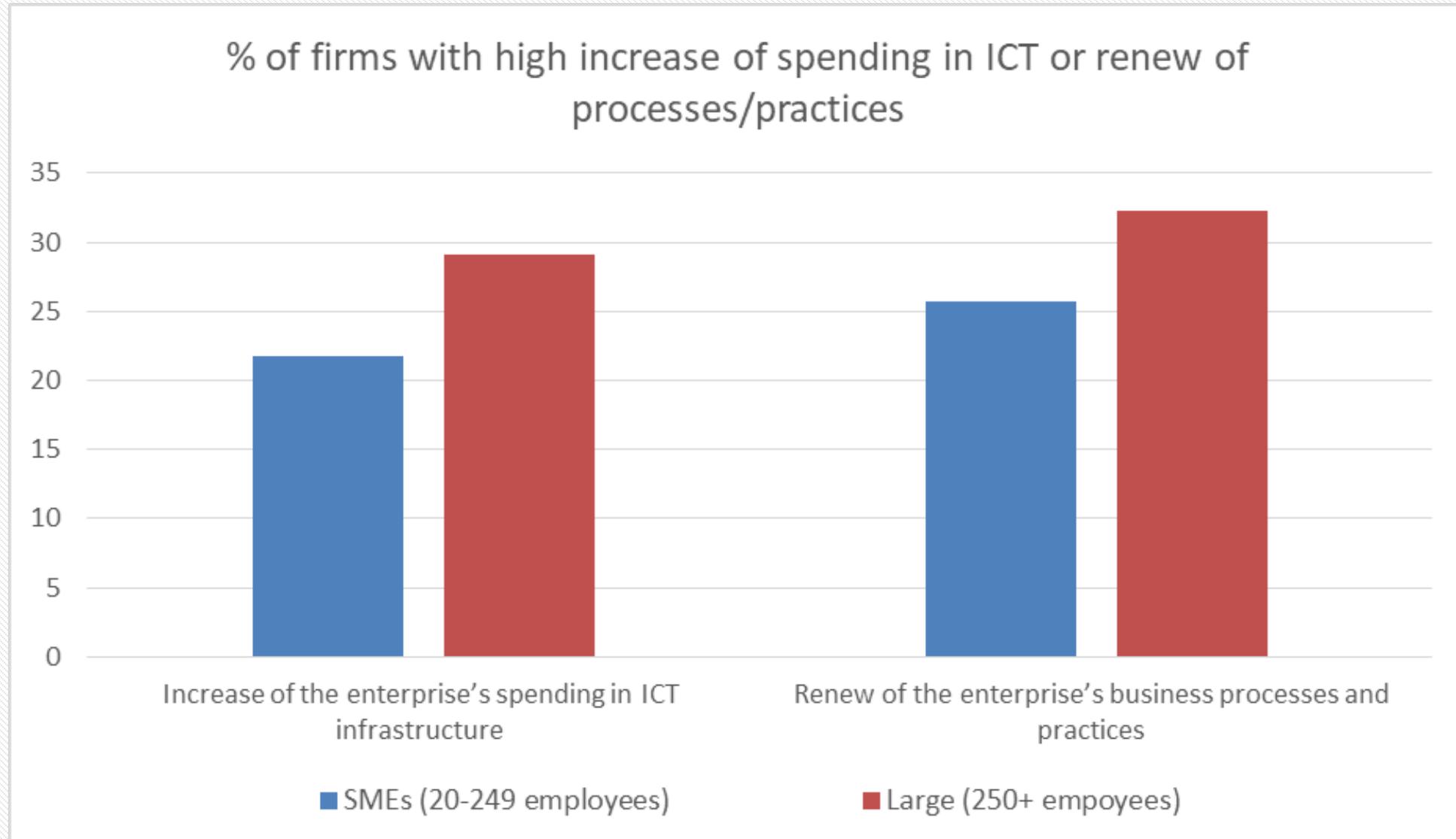
Impact of Covid-19 crisis on intangible assets spending in 2020 [compared to 2019] (% of firms per asset category)



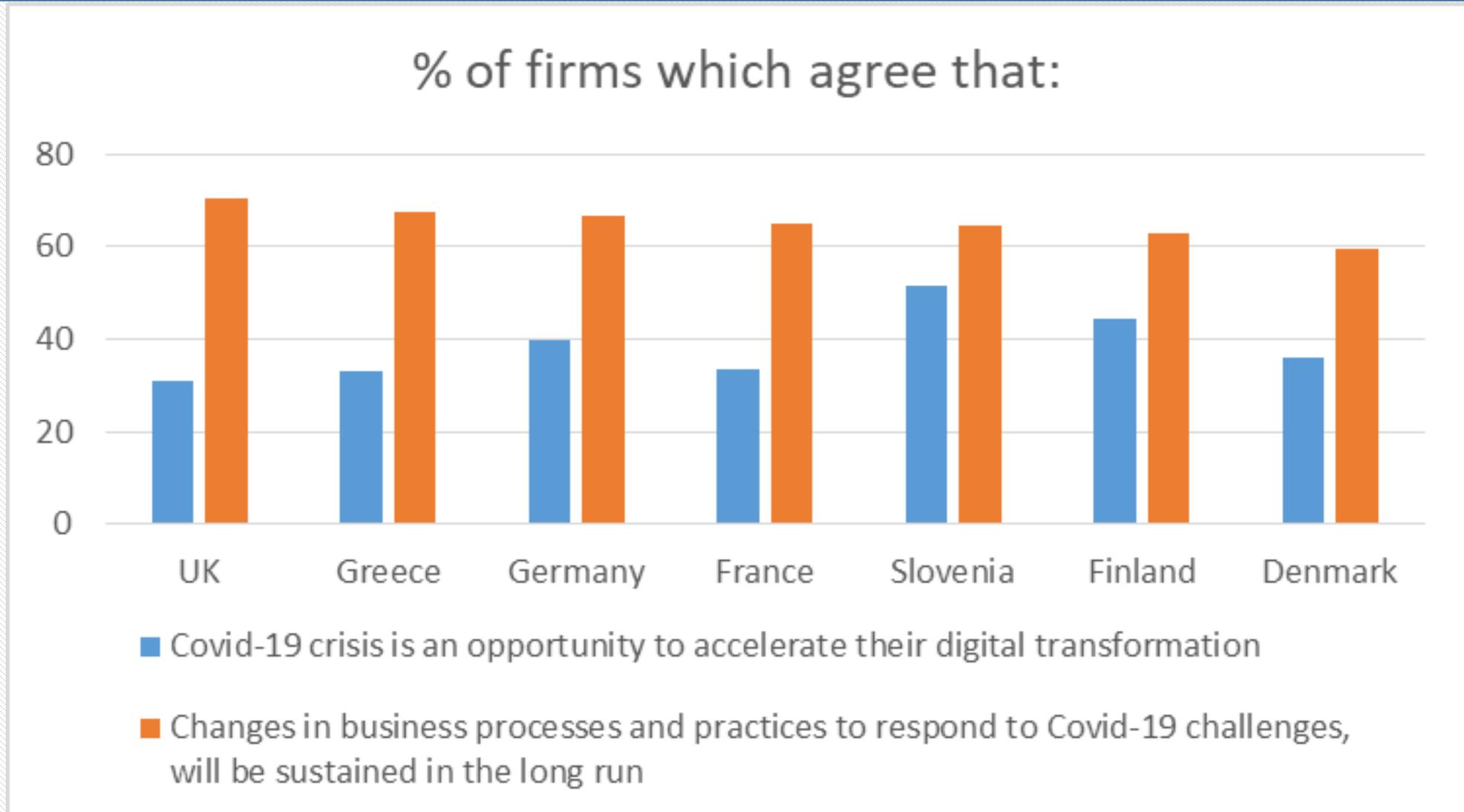
# Firms in Services exhibited higher reaction (i.e. increase of ICT spending & renew of processes and practices) to the increasing requirements for digital transformation during the Covid-19 crisis than firms in Manufacturing



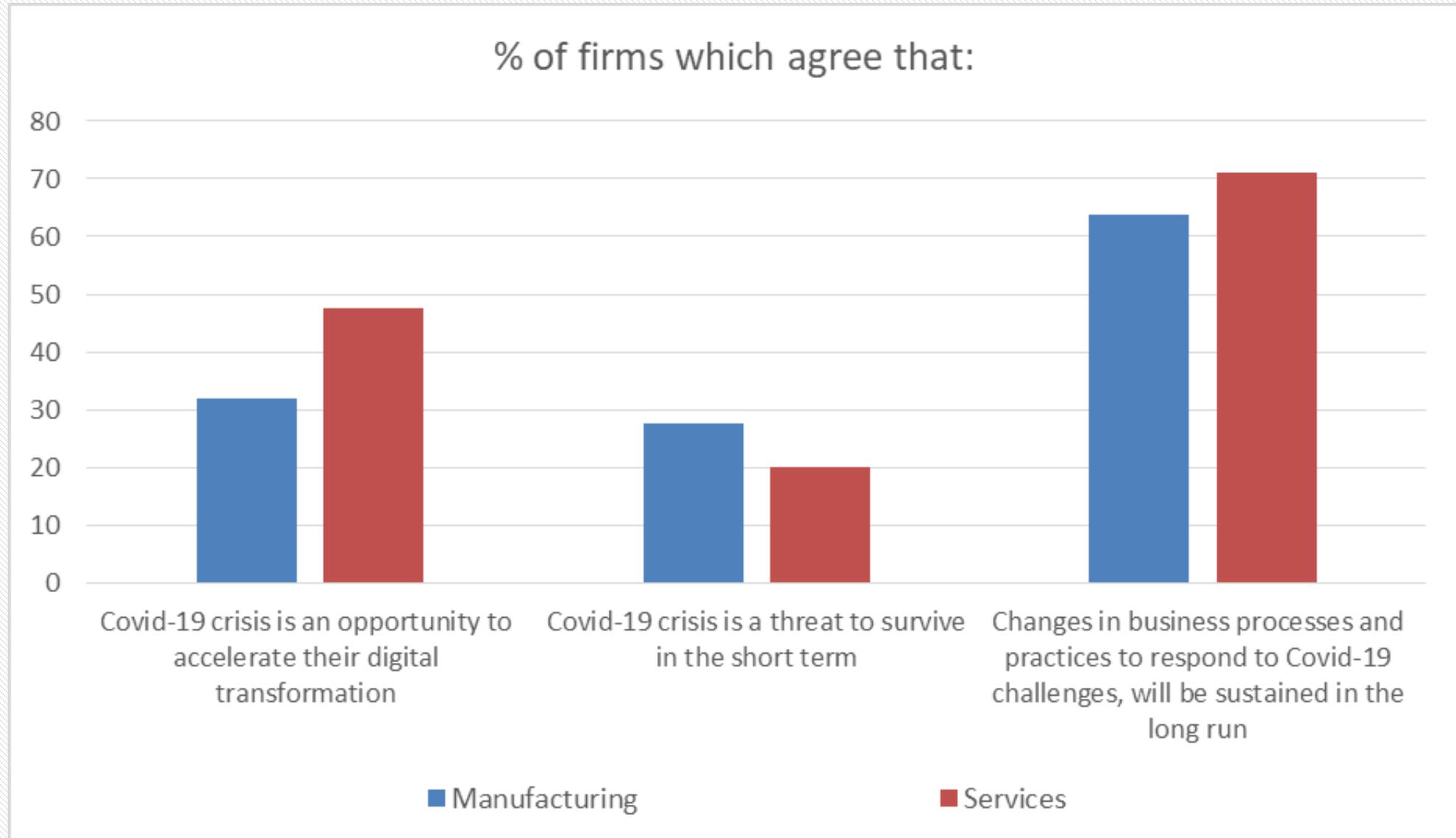
# Large firms exhibited higher reaction (i.e. increase of ICT spending & renew of processes and practices) to the increasing requirements for digital transformation during the Covid-19 crisis than SMEs



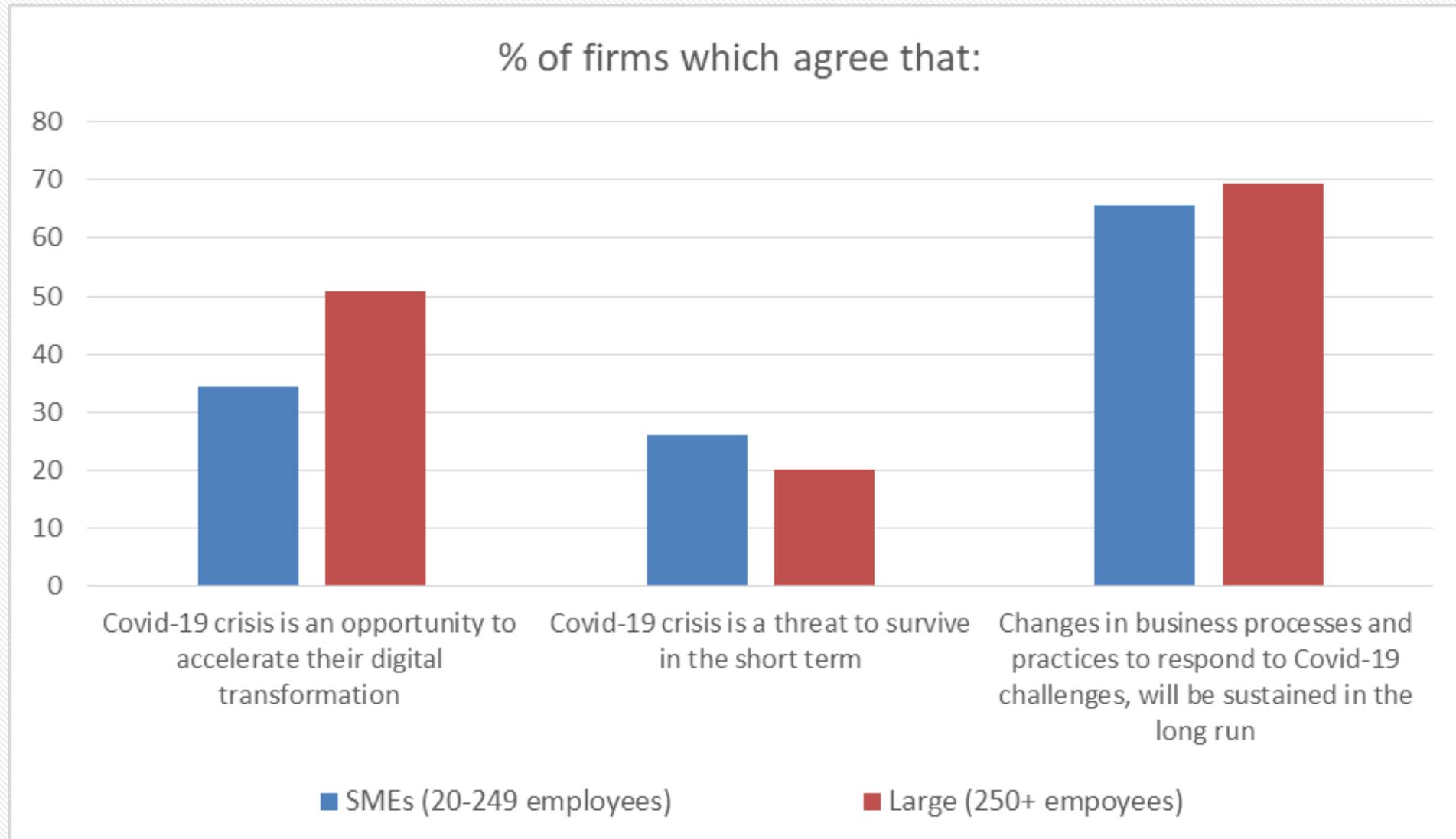
2 out of 3 sample firms will sustain changes in business processes and practices in the long run. Approx. 4 out of 10 firms see Covid-19 as a digital transformation accelerator



# Firms in Services see Covid-19 as a digital transformation accelerator to a higher extent than firms in Manufacturing



# Large firms see Covid-19 as a digital transformation accelerator to a higher extent than SMEs



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- **Training** is the most frequent Intangible activity among firms followed by **In-house R&D** whereas Design had the lowest incidence. However, training is most affected by Covid-19 followed by design and R&D.
  - More **firms in manufacturing** are involved in R&D activity than firms in service. On the other hand, more **firms in services** conduct software/databases and reputation/branding activities than firms in manufacturing.
  - **Firms in Services** (compared to firms in Manufacturing):
    - a) implement larger investments in databases and digital Industry 4.0 technologies,
    - b) have more developed digital capabilities and use digital platforms to a higher extent,
    - c) are characterized by higher increase in ICT spending and more intense renew of processes and practices so as to respond to the increasing requirements of Covid-19 crisis, and
    - d) see Covid-19 as a digital transformation accelerator to a higher extent.

- **Large firms** (compared to SMEs):
  - a) conduct more intangible activity in general,
  - b) implement larger investments in databases, business software reengineering & digitalization, smart factory and Industry 4.0 technologies,
  - c) have more developed digital capabilities,
  - d) are characterized by higher increase in ICT spending and more intense renew of processes and practices so as to respond to the increasing requirements of Covid-19 crisis, and
  - e) see Covid-19 as a digital transformation accelerator to a higher extent.
- The phenomenon of digital transformation seems to be accelerated by Covid-19 crisis.