7th CONCORDi Conference
Innovation for Industrial Transformation
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# What did we learn?
# What is in there for policy related to « New technologies, structural change, and industrial transformation"?

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OECD
BETTER POLICIES FOR BETTER LIVES

# Rehinilde, Chiara and I have been asked to……

Summarise in less than 30’ the discussion had in 20 sessions

Yes Pietro:
**WE CAN**
accomplish
this mission
impossible!

# New technologies, structural change, and industrial transformation

(I C) **R&D gaps and dynamics**

(II A) **Digital transformation**

(II C) **Global and local innovation**

(III A) Industry 4.0

(V A) **Advanced Manufacturing: local and global aspects**

(VI B) Firm dynamics and barriers

# R&D GAPS AND DYNAMICS

Chair: Carolina Castaldi

# R&D gaps and dynamics

Common theme: try and **unpack R&D dynamics**, going beyond aggregate figures.

**Moncada-Paterno'-Castello and Grassano** investigate the relative weight of structural (driven by different sectoral composition) and intrinsic (driven by firm-level differences) determinants in explaining the R&D intensity gap of Europe VS the US.
They find evidence for both effects: the US have more R&D intensive firms in high-tech sectors, while in the EU most R&D happens in low-medium tech sectors.

**Dzikowski** focuses on Poland and investigates the ability of sectors to come up with product and process innovations. In the Polish case, high tech sectors appear have both higher process and product innovation levels. This calls for a better understanding of the factors behind such innovations in both high tech and low-medium tech sectors.

Finally, **Gisele Basso and Porto** look at R&D output using patents. They reconstruct technological trajectories in the pharmaceutical industry and use information on firms and collaborations to understand the drivers of invention processes.

# DIGITAL TRANSFORMATION

Chair: Katarzyna Śledziewska

# Digital transformation

**Staccioli** and colleagues rely on text analysis to provide new evidence on the development of human-replacing robotic technologies. They use USPTO data and find, among others, that it is the labour-intensive firms that apply for patents for labour-saving robotics. Many robot patents belong to firms that aim to apply them (like Amazon or UPS)
They identify areas where labour is likely to get soon at least partially displaced by robotics-related developments (e.g. logistics, healthcare).

**Dachs'** paper about digital servitisation of manufacturing firms in Austria shows that adoption of digital technologies and service innovation are linked. However, impact on turnover is not visible in the data for most sectors analysed. Finally, they find that higher services utilisation tends to support new products development.

# Digital transformation

**Rückert and colleagues,** based on a survey of 1700 firms, examine the implementation of digital tools across the EU and the US.
They find that, despite a number of similarities emerging between UE and US companies, differences are significant between digital and non-digital companies. Digital firms or firms planning digital investments are more likely to be innovative, increase employment or enjoy greater market power. In terms of attributes, old small firms are most likely to be non-digital.

**Cséfalvay** investigates robotisation and its impact on the labour market, with the aime to shed light on the factors moderating robot adoption across Europe. He argues that when wages are high, investing in robots may allows to quickly recover the incurred costs (as the displaced labour was very expensive).
Countries differ in terms of the intensity of robot usage but also in terms of the diversity of applications. E.g. most robots are used in manufacturing, in automotive industries, but the extent varies across European countries.

# **GLOBAL AND LOCAL INNOVATION** (II C)

Chair: Raquel Ortega-Argilés

# Global and local innovation

The session centered on the **analysis of Global Value Chains (GVC).**

By analysing the GVC patterns in specific sectors / firms the papers pointed to the importance and complexity of GVC strategies, in a view to explain local industrial structure and performance and to understand the innovation strategies of multinationals.

***Analysing a sample of urban innovation systems…***

- Place-based innovation systems are shaped by participation in global value chains (GVC)
- Openness, accumulation of academic knowledge, joint innovation activities, market-driven commercialisation processes are all factors that characterise good place-based innovation systems.

***Looking at a set of developed countries …***

- GVC participation and the consequent reorganisation of the production process affects local productivity growth. Its effect depends to the type of GVC.
- Accounting for the extent of digitalisation reveals that there is a stronger effect on productivity growth from forward linkages in high and medium digital-intensive sectors compared to backward linkages.

# Global and local innovation

***Looking at a sample of the top world R&D performers…***

- Different types of Global Innovation Networks (GIN) emerge. One type is more geographically concentrated, and cooperation with university plays an important role. Another type is mainly based on outsourcing research tasks to internationally dispersed CROs (mainly in pharma and automotive). More geographically dispersed structures are difficult to capture in existing indicators.

- The vertical disaggregation of production leads to an increasing importance of suppliers of components and sub-systems in the R&D of final products.
As a result, MNE's Global Innovation Networks now include top tier suppliers.
This process is more important in modular products such as electronics and automotive than in industries such as pharmaceuticals.

- The geographical configuration of MNEs' manufacturing supply chains could have important implications for the dynamics of Global Innovation Networks.

# Global and local innovation

***Based on the German and Brazilian Machinery industry***
*(structural analysis for the whole industry and a series of interviews with CEOs in Brazilian top Machinery Industries)*

- Innovating and upgrading in machinery GVCs increases the size and complexity of a country's productive structure, i.e. both the *pace and* the *quality* of its growth and development dynamics.
- The upgrading of innovation initiatives are dominated by powerful transnational corporations (TNC).
- Mapping value chains is important to understand the structure of innovation activities in firms, industries and places.

# ADVANCED MANUFACTURING: LOCAL AND GLOBAL ASPECTS (V A)

Chair: George Chryssolouris

# Advanced Manufacturing: local and global aspects

***Holmén*** focused on additive manufacturing (AM) and industrial transformation to propose thirteen categories of research that deals different aspects of how AM relates with firms, industries or users. Categories are clustered on a position map relative to the factors that contribute to explain them (micro, meso and macro), and their main value orientation (value creation, value realisation or value capture).
The review shows that changes are taking place within all types but does not identify radical changes.

***Antonietti and Montresor*** look at regional diversification patterns and key enabling technologies (KETs) in Italian regions to assess the role that Key-Enabling-Technologies (KETs) play in the regional diversification of economic activities.
KETs drive the different trajectories that regions could follow to move from a 'replicative' (place- and path-dependent) diversification to a diversification marked by 'jumps' (at spatial and technological level).
A larger presence of KETs in the region corresponds to its higher capacity to move towards the more 'unrelated' patterns of diversification this occurs providing KETs knowledge gets combined with other non-KETs knowledge in the region, and with several nuances.

# Advanced Manufacturing: local and global aspects

**Vezzani and colleagues** look at "dual use inventions", to discuss specialisation VS hybridisation using data about military inventions. Understanding this relationship has implications on two levels:

1) it would help determine the optimum level of public financing of military expenses.
2) it would provide insights on the capacity of firms to capture military-oriented innovations and exploit them for civil applications.

Dual-use innovations need a longer time to be developed.

The US similarly has a better ground for this kind of spillovers, more than in Europe and Japan.

The emergence of dual-use inventions is more likely to occur from cross-border developments. This is an important result, if one considers that military inventions are subject to special limitations in disclosure.

# **FIRM DYNAMICS AND BARRIERS** (VI B)

Chair: Maria Savona

# Firm dynamics and barriers

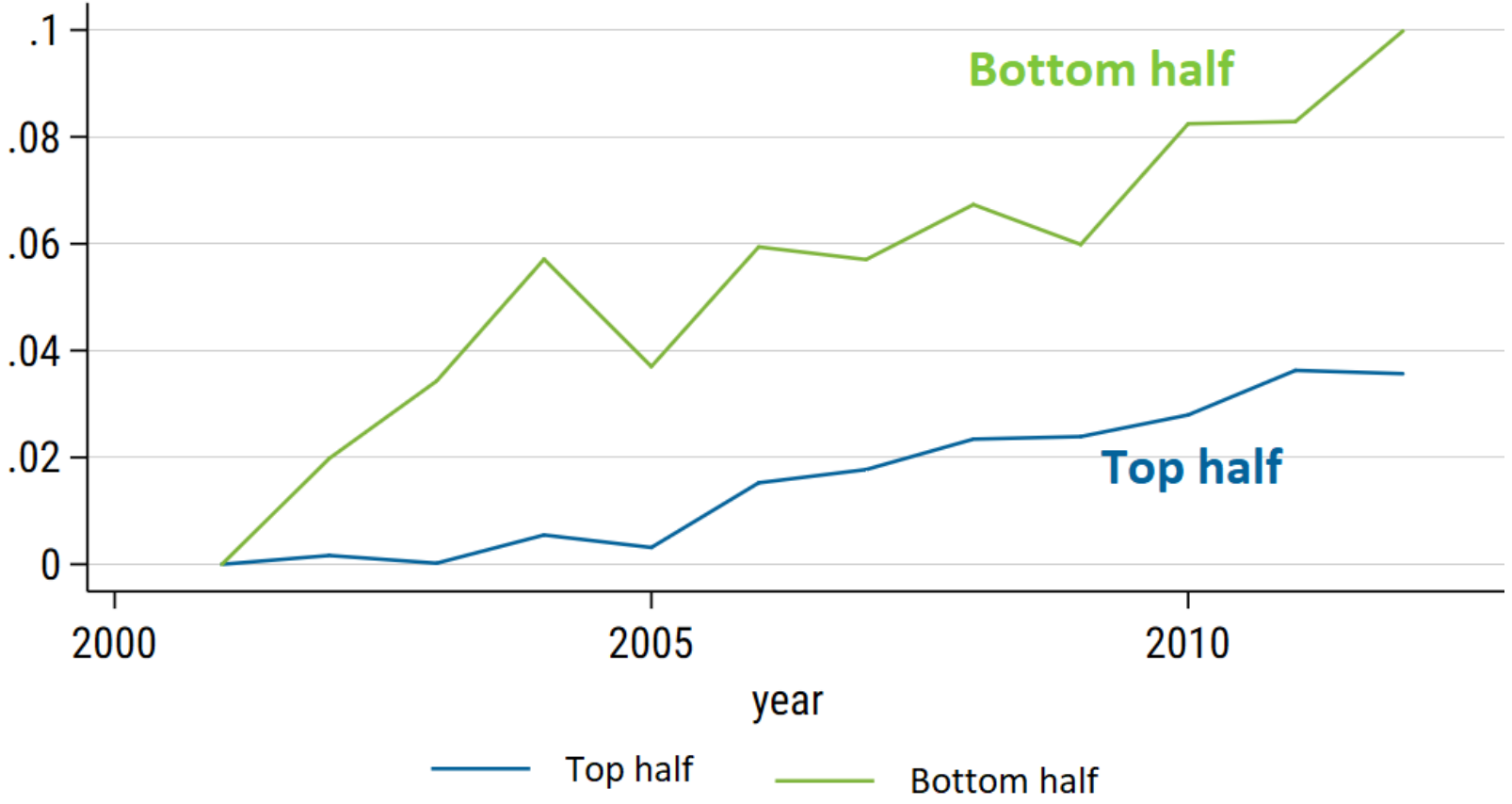
The session was on the effect of barriers on investments in intangibles, and a new methodology to assess the impact of the crisis on firms' failures and exit.

Policy: Financial barriers - in line with the extant literature in barriers - affect importantly investments in R&D.
Investment in R&D are in turn the most anticyclical ones, reason more to support them over the crisis.

Theory: there is a lot to be done to theoretically anchor work on intangibles and work on innovation investments. Boundaries are blurred both conceptually and methodologically. All the more important given the current and ongoing change in national accounts.

# The productivity slowdown has been accompanied by an increased dispersion in productivity

**Productivity dispersion at the top vs. the bottom of the productivity (LP) distribution**




*Note:* from Berlingieri et al. (2016), "The Great Divergence(s)". Year dummy estimates of a regression of log-LP VA dispersion at the top (90th and 50th percentiles ratio, blue line) and at the bottom (50th and 10th percentiles ratio, green line) within country-sector pairs. Countries: AUS, AUT, BEL, CHL, DNK, FIN, FRA, HUN, ITA, JPN, NLD, NOR, NZL, SWE.

# **INDUSTRY 4.0** (III B)

Chair: Kai-Ingo Voigt

# INDUSTRY 4.0

Paper 1: Artificial intelligence (Stefano Bianchini)

- High level empirical research
- Empirical insights on diffusion and impact of DL in science
- Valuable practical implications

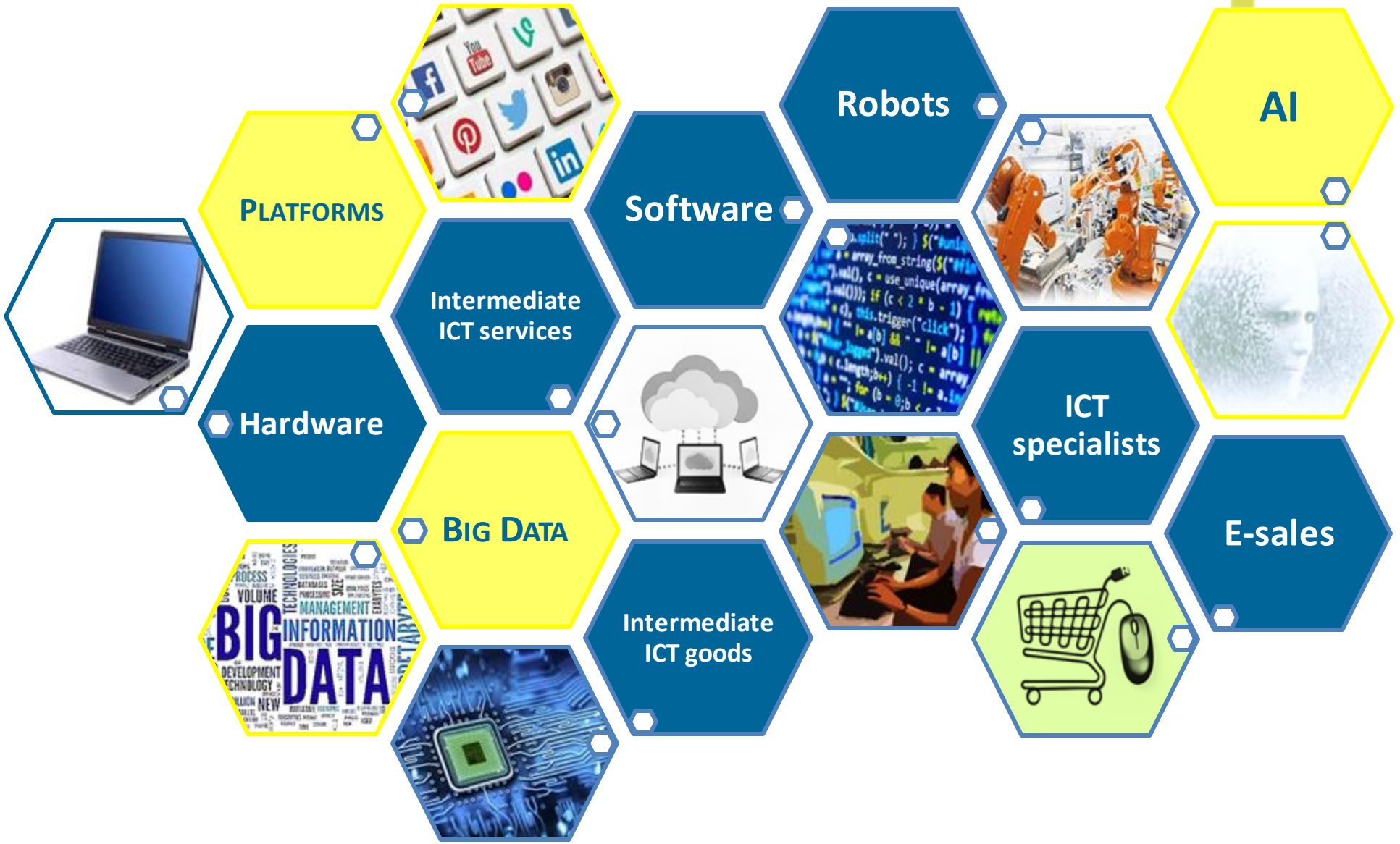
Paper 2: Impact of robots on labour productivity (Andre Jungmittag)

- High level empirical research, based on productivity theory
- Empirical insights how productivity is enhanced by robots
- Supports practical implications

Paper 3: Competences for in-house development of digital innovations (Steffen Kinkel)

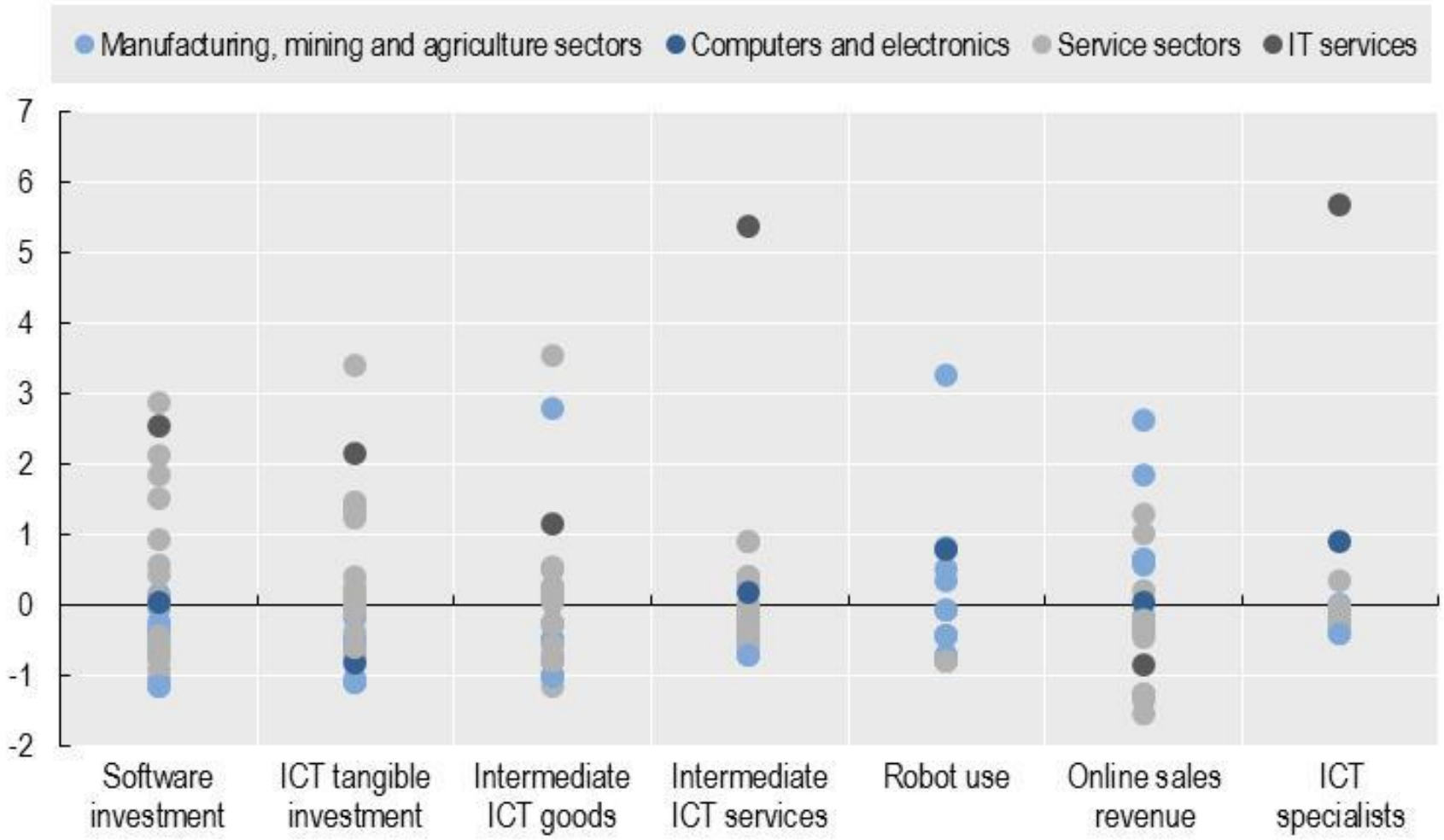
- High level empirical research, concentrated on German machinery industry
- Empirical insights on necessary competencies for digital industrial innovations
- Highly valuable and concrete practical implications

# THE DIGITAL TRANSFORMATION:
# A TALE OF MANY TALES…



# THE DIGITAL TRANSFORMATION: A TALE OF MANY TALES…

## Dispersion of sectors in each considered dimension of digitalisation, 2013-15




*Source*: OECD Science, Technology and Industry Scoreboard 2017 , Statlink: http://dx.doi.org/10.1787/888933618669 *Based on :* Calvino, Criscuolo, Marcolin and Squicciarini (2018)