A TAXONOMY OF DIGITAL INTENSIVE SECTORS

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THE DIGITAL TRANSFORMATION:
A TALE OF MANY TALES...

Sectors differ in:

The extent to which develop and adopt new technologies;
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The extent to which develop and adopt new technologies;

Their human capital endowment;
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A TALE OF MANY TALES…

Sectors differ in:

The extent to which develop and adopt new technologies;

Their human capital endowment;

Their structure and organisation of production.
Propose a taxonomy of sectors mirroring the extent to which they have gone digital.
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Account for some of the DT's main facets, especially Technology, Market and Human Capital - related features.
THE DIGITAL TRANSFORMATION: THE MEASUREMENT CHALLENGE

Propose a taxonomy of sectors mirroring the extent to which they have gone digital.

- Account for some of the DT's main facets, especially **Technology, Market** and **Human Capital** - related features

- Rely on data **Comparable Across Countries & Over Time**, harmonise classifications, deflate
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Provide an **Operational Tool** helping analysts and policy makers understand the sectoral heterogeneity of the transformation
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- Provide an **Operational Tool** helping analysts and policy makers understand the sectoral heterogeneity of the transformation

**Benchmark Sectors** among each other – does not measure the size of the digital economy !!!
Measure considered for STAN industry A38 (excluding 97-household production and 98-international organisations).

Data for 12 countries (AU, AT, DK, FI, FR, IT, JP, NL, NO, SE, UK, US):
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Data for 12 countries (AU, AT, DK, FI, FR, IT, JP, NL, NO, SE, UK, US):

**ICT investment intensity**: ICT tangible GFCF / total GFCF (both deflated);
INVESTMENT IN ICT EQUIPMENT (i) AS A % OF NON-RESIDENTIAL GFCF (OVER TIME)

Source: Calvino et al. (2018)
INVESTMENT IN ICT EQUIPMENT (ii) AS A % OF NON-RESIDENTIAL GFCF (ACROSS COUNTRIES)

Source: Calvino et al. (2018)
Measure considered for STAN industry A38 (excluding 97-household production and 98-international organisations).

Data for 12 countries (AU, AT, DK, FI, FR, IT, JP, NL, NO, SE, UK, US):

- **ICT INVESTMENT INTENSITY**: ICT tangible GFCF / total GFCF (both deflated);
- **SOFTWARE INVESTMENT INTENSITY**: software GFCF / total GFCF (both deflated);
INVESTMENT IN SOFTWARE & DATABASES
AS A % OF NON-RESIDENTIAL GFCF
Digital intensity of sectors:

Indicators

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- **Intermediates ICT Goods**: purchases of ICT intermediate goods (ICT and electronic equipment sector) / output (both deflated);
PURCHASES OF INTERMEDIATE ICT GOODS AS A % OF OUTPUT

Source: Calvino et al. (2018)
Digital intensity of sectors: Indicators

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- **Robot Intensity**: Stock of robots / employment (manufacturing);
ROBOTS STOCK
PER HUNDREDS OF EMPLOYEES

Source: Calvino et al. (2018)
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SHARE OF TURNOVER
FROM ONLINE SALES

Source: Calvino et al. (2018)
DigiCAL INTEMPEN SIENCY OF SECTORS:
INDICATORS

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- **ICT SPECIALISTS**: Number of ICT specialists in all countries / total employment over all countries.
ICT SPECIALISTS
AS A % OF TOTAL EMPLOYMENT

Source: Calvino et al. (2018)
Digital intensity of sectors: indicators

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

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

Digital penetration of sectors over time, growth rate, 2001-15

Source: OECD calculations based on Calvino et al. (2018)
Digital penetration of sectors over time, growth rate, 2001-15

- ICT tangible investment
- Software investment
- Robot use
- Intermediate ICT goods
- Intermediate ICT services
- Online sales revenues

Source: OECD calculations based on Calvino et al. (2018)
OF DIFFERENT SPEED, SCALE AND SCOPE

Digital penetration of sectors over time, growth rate, 2001-15

Source: OECD calculations based on Calvino et al. (2018)
## SECTORS BY QUARTILE OF DIGITAL INTENSITY
### Agriculture, Mining, Manufacturing, and Construction, 2013-15

<table>
<thead>
<tr>
<th>Sector</th>
<th>Bottom quartile</th>
<th>2nd quartile</th>
<th>3rd quartile</th>
<th>Top quartile</th>
<th>Not available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
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<tr>
<td>Mining</td>
<td></td>
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<tr>
<td>Food products</td>
<td>-1.2</td>
<td>-1.1</td>
<td>-1.0</td>
<td>-1.1</td>
<td>-0.7</td>
</tr>
<tr>
<td>Textiles and apparel</td>
<td>-0.5</td>
<td>-0.7</td>
<td>-0.8</td>
<td>-0.5</td>
<td>-0.1</td>
</tr>
<tr>
<td>Wood and paper</td>
<td>-0.1</td>
<td>-0.5</td>
<td>-0.3</td>
<td>0.0</td>
<td>-0.4</td>
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<tr>
<td>Coke and petroleum</td>
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<td>-0.6</td>
<td>-1.0</td>
<td>-0.6</td>
<td>-0.5</td>
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<td>Chemicals</td>
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<td>-0.6</td>
<td>-0.5</td>
<td>-0.3</td>
<td>-0.5</td>
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<tr>
<td>Pharmaceuticals</td>
<td>-0.7</td>
<td>-0.7</td>
<td>-0.5</td>
<td>-0.3</td>
<td>-0.5</td>
</tr>
<tr>
<td>Rubber, plastics and minerals</td>
<td>-0.4</td>
<td>-0.5</td>
<td>-0.3</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Basic metals</td>
<td>-0.4</td>
<td>-0.6</td>
<td>-0.3</td>
<td>0.3</td>
<td>-0.2</td>
</tr>
<tr>
<td>Computers and electronics</td>
<td>0.0</td>
<td>-0.8</td>
<td>0.2</td>
<td>0.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Electrical equipment</td>
<td>-0.2</td>
<td>-0.6</td>
<td>-0.2</td>
<td>0.8</td>
<td>0.6</td>
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<tr>
<td>Machinery</td>
<td>-0.1</td>
<td>-0.2</td>
<td>-0.3</td>
<td>0.6</td>
<td>-0.2</td>
</tr>
<tr>
<td>Transport equipment</td>
<td>-0.4</td>
<td>-0.6</td>
<td>-0.1</td>
<td>3.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Other manufactures</td>
<td>0.1</td>
<td>-0.5</td>
<td>2.8</td>
<td>-0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Electricity, gas and steam</td>
<td>-0.8</td>
<td>-0.6</td>
<td>-0.8</td>
<td>-0.3</td>
<td>-0.8</td>
</tr>
<tr>
<td>Water, sewerage and waste</td>
<td>-0.8</td>
<td>-0.6</td>
<td>-0.8</td>
<td>-0.3</td>
<td>-0.8</td>
</tr>
<tr>
<td>Construction</td>
<td>-0.6</td>
<td>-0.1</td>
<td>0.2</td>
<td>-0.6</td>
<td>-1.6</td>
</tr>
</tbody>
</table>

**Source:** [OECD Science, Technology and Industry Scoreboard 2017](http://dx.doi.org/10.1787/888933617434)
### SECTORS BY QUARTILE OF DIGITAL INTENSITY

**Services, 2013-15**

<table>
<thead>
<tr>
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<th>3rd quartile</th>
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<th>Not available</th>
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</thead>
<tbody>
<tr>
<td>Wholesale and retail</td>
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<tr>
<td>Transport services</td>
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<tr>
<td>Hotels and food services</td>
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<tr>
<td>Publishing and broadcasting</td>
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<tr>
<td>Telecommunications</td>
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<td>IT services</td>
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<tr>
<td>Finance and insurance</td>
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<tr>
<td>Real estate</td>
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<tr>
<td>Law and accountancy services</td>
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<td>Scientific R&amp;D</td>
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<tr>
<td>Other business services</td>
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<tr>
<td>Admin and support services</td>
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<tr>
<td>Public admin and defense</td>
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<tr>
<td>Education</td>
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<tr>
<td>Health services</td>
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<td>Care and social work</td>
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<tr>
<td>Arts and entertainment</td>
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WHAT’S NEXT?

- 1st version - new indicators are being built/considered:
  - **ICT task intensity** – moving beyond specialists
ICT TASK INTENSITY

Source: Calvino et al. (2018)
WHAT'S NEXT?

- 1st version - new indicators are being built/considered:
  - **ICT task intensity** – moving beyond specialists
  - **ICT patents by sector** – technology generation, not only adoption
THE ACCELERATION IN THE GENERATION OF TECHNOLOGIES

ICT PATENTS

Intensity and length of ICT patent burst

Low
Medium
High

Agriculture
Mining
Food
Textiles
Wood & paper
Coke & oil
Chemicals
Metals
Electrical equipment
Machinery
Transport equipments
Electricity & gas
Water & sewage
Transport & storage
Accomodation &...
Publishing & audiovisual
Telecommunications
It services
Real estate
Legal & accounting
R&D
Professional services
Admin & support services
PA & defence
Health services
Arts & entertainment
Other services

Source: OECD calculations based on Calvino et al. (2017) and Denis et al. (2016, https://doi.org/10.1007/s10961-015-9449-0)
WHAT’S NEXT?

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  ✓ **ICT task intensity** – moving beyond specialists
  ✓ **ICT patents by sector** – technology generation, not only adoption
  ✓ % firms with automated links to suppliers or customers (e.g. call centers) – equivalent of robots for service sectors
  ✓ “Embodied” ICT content – net ICT purchases from non-ICT related VA

☐ Different aggregation algorithms? (e.g. account for cross-country dispersion of intensities by sector)
THANK YOU

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