

Accelerated Digital Transformation and Skill Mismatch

Evidence from Europe

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- **Research question:** how does the accelerated digital transformation (induced by COVID-19), have an impact on skill mismatch?

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- **Research question:** how does the accelerated digital transformation (induced by COVID-19), have an impact on skill mismatch?
- **Data:** The second wave of the European Skills and Jobs Survey, Covid-19 stringency index, and occupational level AI exposure index

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- **Data:** The second wave of the European Skills and Jobs Survey, Covid-19 stringency index, and occupational level AI exposure index
- **Method:** Augmented Inverse Probabilistic Weighting and Instrumental Variable

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- **Data:** The second wave of the European Skills and Jobs Survey, Covid-19 stringency index, and occupational level AI exposure index
- **Method:** Augmented Inverse Probabilistic Weighting and Instrumental Variable
- We identify the impact of accelerated digital transformation on demand for further training and skill mismatch.

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- **Data:** The second wave of the European Skills and Jobs Survey, Covid-19 stringency index, and occupational level AI exposure index
- **Method:** Augmented Inverse Probabilistic Weighting and Instrumental Variable
- We identify the impact of accelerated digital transformation on demand for further training and skill mismatch.
- We find that if the individual is affected by COVID-19-accelerated digitization, he or she would be less likely to report vertical skill mismatch (occupation sorting) and request more IT skill training.

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- Substantial progress in the use of digital technology (Acemoglu et al., 2022; Kovbych, 2022)
- Digital transformation changes **skill demand** and causes **skill mismatches**, as it takes time for people to adopt new skills

Research Question: Using the COVID-19 pandemic to capture external shocks that accelerate the digital transformation, we intend to examine the causal effects of skill mismatch as a consequence of digital transformation.

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Section 3. Data and Methodology

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Survey Data

- The second wave of the European Skills and Jobs Survey (ESJS2)
- Timeframe: 2021
- A representative sample of adult workers aged 24 to 65 from the 28 Member States of the EU and EU neighborhoods
- EU workers' adaptability to technological change through initial education and on-the-job training

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Indices Data

- COVID-19: Stringency Index
 - Country-level
 - measure based on nine response indicators including school closures, workplace closures, travel bans, and etc.
 - value: [0,100]
 - average across May-August 2021
- AI exposure index
 - Occupational-level (ISCO 4 digit)
 - constructed by Engberg et al. (2024)
 - Based on data on AI capabilities and occupational work content
 - Detailed register data from Denmark, Portugal and Sweden over two decades

COVID-19: Stringency Index

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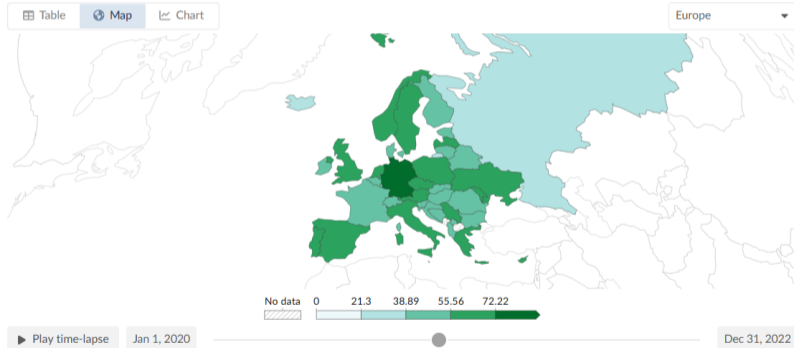
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COVID-19: Stringency Index, May 22, 2021

The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest).

Our World
in Data



Data source: Blavatnik School of Government, University of Oxford (2023) - [Learn more about this data](#)

AI Exposure Index: Most affected

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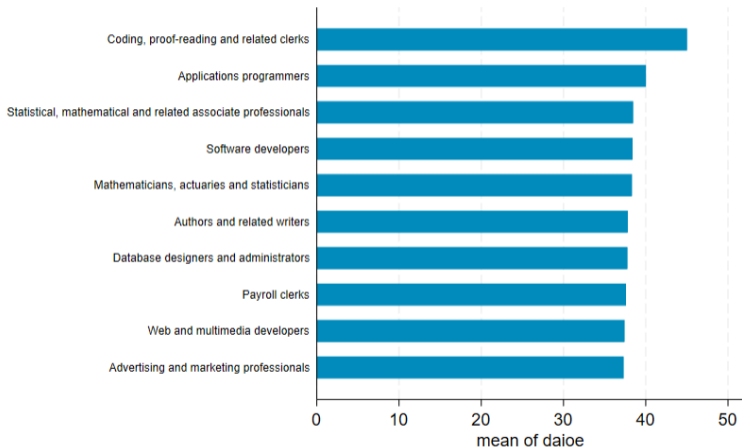
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AI Exposure Index: Least affected

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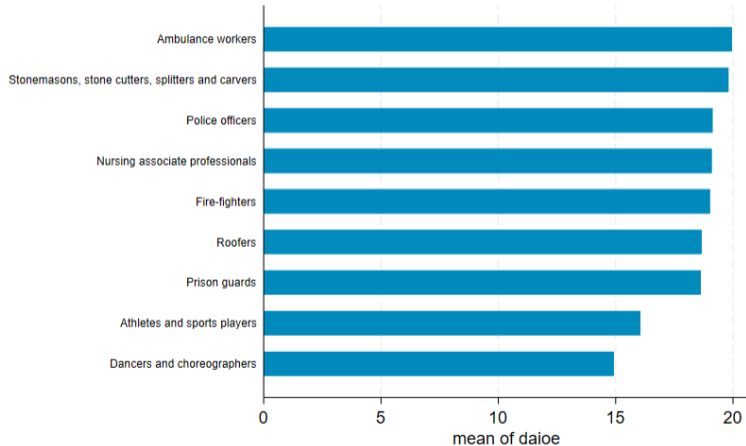
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Descriptive Method

- Augmented Inverse Probabilistic Weighting (AIPW)
- Double Machine Learning
- controlled both individual characteristics and workplace characteristics
- **Intuition:** comparing similar individuals within a country who have the same sex, age, education level, work experience, contract, income, and tasks at work

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Identification Strategy

- Instrumental Variable
- Using AI exposure and its interaction with COVID-19 stringency index as instruments for demand for skills
- **Intuition:** Estimate the increased demand for skills driven by COVID-19 accelerated digitization, further link to skill mismatch
- causal interpretation

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Main Results

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Table: AIPW Main Results

| | Horizontal mismatch | Vertical mismatch | IT skill demand | General skill demand |
|---------------|---------------------|-------------------|-----------------|----------------------|
| | (1) | (2) | (3) | (4) |
| ATE | 0.006 | -0.039*** | 0.105*** | 0.059*** |
| Robust SE | 0.0048 | 0.0058 | 0.0065 | 0.0050 |
| Number of obs | 30,701 | 30,701 | 30,701 | 30,701 |

- No significant difference in reporting horizontal skill mismatch between two groups.
- Less likely to report vertical skill mismatch for exposure group.
- More likely to demand IT and general skill training for exposure group.

Robustness check

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Table: Robustness check using double ML

| | Horizontal mismatch | Vertical mismatch | IT skill demand | General skill demand |
|---------------|---------------------|-------------------|-----------------|----------------------|
| | (1) | (2) | (3) | (4) |
| ATE | 0.006 | -0.037*** | 0.105*** | 0.067*** |
| Robust SE | 0.0036 | 0.0055 | 0.0059 | 0.0049 |
| Number of obs | 30,701 | 30,701 | 30,701 | 30,701 |

- Same conclusions as before.

Instrumental Variable Estimations

Table: Instrumental Variable Estimations

| | Horizontal mismatch | | Vertical mismatch | |
|------------------|---------------------|----------|-------------------|----------|
| | (1) | (2) | (3) | (4) |
| IT skill demand | | 0.57* | | -0.82** |
| Robust SE | | (0.3284) | | (0.3685) |
| IT skill trained | 0.11 | | -0.02 | |
| Robust SE | (0.0813) | | (0.1001) | |
| F Statistics | 60.655 | 10.975 | 60.655 | 10.975 |
| Number of obs | 30213 | 30213 | 30213 | 30213 |

- Trained IT skill experiences does not contribute to decreased reported skill mismatches.
- Increased IT skill demand would contribute to increased horizontal mismatch and decreased vertical mismatch.

Heterogeneous Analysis: Gender

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Table: Heterogeneous Results: Gender

| | Horizontal mismatch | Vertical mismatch |
|------------------------|---------------------|-------------------|
| | (1) | (2) |
| IT skill demand*Female | 0.41* | -0.92*** |
| Robust SE | (0.2413) | (0.3156) |
| IT skill demand*Male | 0.36 | -0.85*** |
| Robust SE | (0.2334) | (0.3002) |
| F Statistics | 16.665 | 16.665 |
| Number of obs | 30213 | 30213 |

- Higher impacts on female.

Heterogeneous Analysis: Urban and Rural

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Table: Heterogeneous Results: Urban and Rural

| | Horizontal mismatch | Vertical mismatch |
|-----------------------|---------------------|-------------------|
| | (1) | (2) |
| IT skill demand*Rural | 0.31 | -0.71** |
| Robust SE | (0.2368) | (0.2856) |
| IT skill demand*Urban | 0.44* | -0.51* |
| Robust SE | (0.2526) | (0.2810) |
| F Statistics | 15.701 | 15.701 |
| Number of obs | 30213 | 30213 |

- Higher impacts on rural for vertical mismatch.
- Industry differences

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Other factors tested but insignificant

- Age group

To be tested: industry

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- COVID-19 accelerated digital transformation has an impact on increased for IT skill training
 - firms invest in on-the-job training
 - government sponsored training program
- Target vulnerable group: female and rural workers

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Thank you for your attention!
Please let me know if you have any questions.

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