

The joint impact of GVC and digital progress on job quality in Europe

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Growth Perspectives in Times of Technological Changes and
Booming AI
National Bank of Poland
September 15, 2023

Acknowledgement: Aleksandra Parteka: The research has been conducted within the project financed by the National Science Centre, Poland (2020/37/B/HS4/01302). Joanna Wolszczak-Derlacz: The research has been conducted within the project financed by the National Science Centre, Poland (Narodowe Centrum Nauki NCN) grant number 2015/19/B/HS4/02884..

Aim and contribution

- aim: to understand better **what affects working conditions** (the shift from economic to **social perspective**)
- empirical examination of **GVC involvement** and **technology** as determinants of workers' well-being
- extensive empirical analysis:
 - sample: almost 9,5 million observations (22 European countries, 2014)
 - SES employee-employer data combined with EWCS and WIOD
 - different aspects of working conditions (not only wage)
 - precise measures of GVC and technological exposure

Literature review: working conditions and GVCs

- the use of **wages** as working conditions' indicator - justified by **social upgrading concept**
- empirical literature on social consequences of trade and GVCs, going beyond wages, gives **contrasting results**:
 - positive relationship - improvement in labour standards in companies more involved in international trade (Nadvi et al., 2004; Bair and Gereffi, 2001)
 - but greater GVC involvement may not produce better pay or working conditions (Gimet et al., 2015; Lee and Gereffi, 2013; Lee et al., 2016)
- relationship GVC - working conditions **going beyond wages**: mainly from the perspective of developing countries
- **for Europe the evidence is country- and/or industry-specific** (Flecker et al., 2013 for Austria; Hummels et al., 2016 for Denmark; Pawlicki, 2013 for Romania; Smith and Pickles, 2015 for Slovakia; Weinkopf, 2009 for Germany)
- Nikulin et al. (2021): how GVCs affect various aspects of working conditions (earnings, working hours and additional payments) of workers from 24 European countries

Literature review: working conditions and technology

- numerous studies on labour market implications of technological progress, mainly **substitution of automated processes for human skills** (Autor et al., 2003; Acemoglu and Restrepo, 2018, Frey and Osborne, 2017; Graetz and Michaels, 2018; Goos, 2018)
- the impact of digital technologies on working conditions - addressed in **health and safety** literature (Badri et al., 2018)
- the impact of newest technologies on workers' well-being is **complex**:
 - big **challenge to workers' well-being** posed by: internet addition, 'technostress', blurred boundaries between work and personal life, or work overload (Tarafdar et al., 2007; Salanova et al., 2014; Berg-Beckhoff et al., 2017)
 - **AI** is likely to change the work environment by **reshaping the content of jobs** (i.e. transforming occupations), affecting relations between workers and human-machine interactions (Lane and Saint-Martin, 2021)

Aim of this study

To broaden our understanding of complex changes in Europeans' well-being at work by:

- developing a **job-quality adjusted wage measure**, containing detailed information on working conditions (from EWCS),
- assessing *jointly* the role played by the dependence of European labour markets on **GVC** and **Advanced Digital Production (ADP) technologies**.

Data (1) - micro-level information on workers

- **Structure of Earnings Survey (SES)**: employee data with employer's characteristics for 22 European countries, 9.5 mln observations, release 2014
 - individual workers' characteristics (sex, age, education)
 - firms' characteristics (length of service in enterprise, public/private, type of contract)
- **European Working Conditions Survey (EWCS) 2015**
 - six indices of working conditions: physical environment, work intensity, working time quality, social environment, skills and discretion, prospects

Data (2) - GVC and technology indicators

- World Input-Output Database (WIOD), release 2016; 43 countries, 56 sectors: manufacturing and services, 2000 - 2014
 - GVC (1) - FVA/Export: Foreign value added in exports (Wang et al. 2013)
 - GVC (2) - OFF: offshoring - share of imported intermediates in industry's total output (Feenstra and Hanson, 1999)
 - GVC (3) - GII: Global Import Intensity - imports of goods and services from all backward stages of production (Timmer et al., 2016)
 - + industry-level productivity
- occupational technology exposure measures: software, robot and AI exposure (Webb, 2020),
- digital taxonomy of industries from Van Ark et al. (2019): digital producing and (least or most) digital intensive using industries

Data (3) - additional statistics

- additional country level variables:
 - Penn World Table
 - Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts, ICTWSS Database version 5.1, Visser (2016)

Our approach to quantify working conditions

We use the combination of EWCS and SES data to compute, for every worker present in the dataset, **job-quality adjusted wage**:

$$w_{adj_{io}^k} = wage_i \times \frac{w_{cond_{oc}^k}}{\frac{\sum_{i=1}^{N_c} w_{cond_{oc}^k}}{N_c}}$$

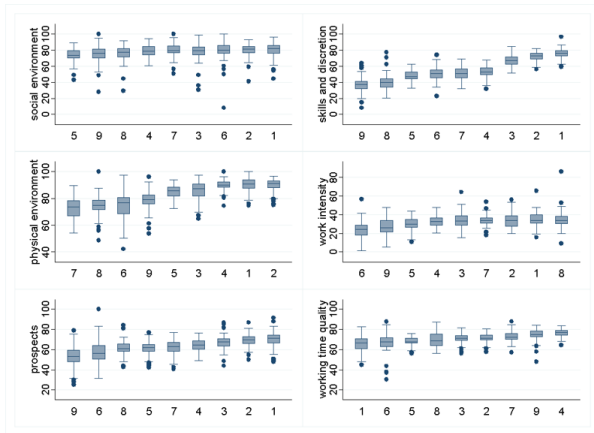
where:

w_{cond} is working condition index of type k (derived from EWCS) typical for occupation o in country c

$wage_i$ is the monetary hourly wage of worker i (data from SES)

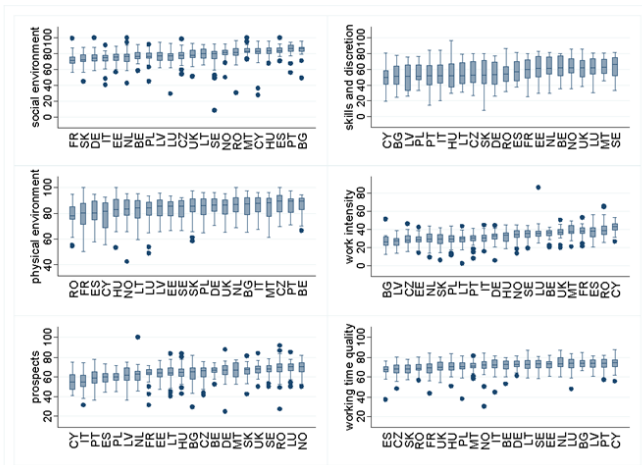
The set of k working conditions includes: physical environment, work intensity, working time quality, social environment, skills and discretion, prospects.

Working conditions in Europe – variation across occupations (1-9)



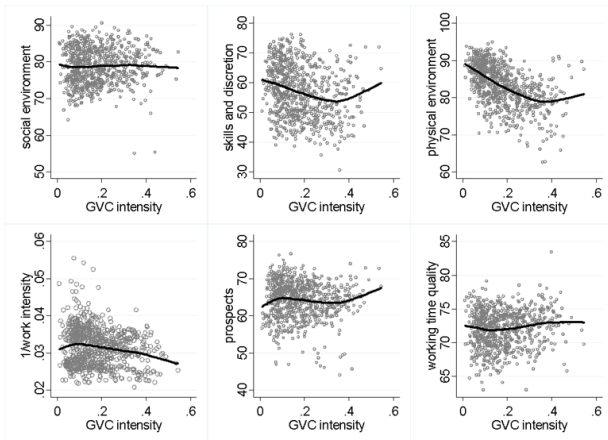
Notes: workers grouped into one digit ISCO-08 occupations: 1-Managers, 2-Professionals, 3-Technicians and associate professionals, 4- Clerical support workers, 5-Service and sales workers, 6-Skilled agricultural and fishery workers, 7-Craft and related trades workers, 8-Plan and machine operators, and assemblers, 9- Elementary workers. High work intensity index should be interpreted as bad working condition

Working condition in Europe - variation of job quality indices across countries

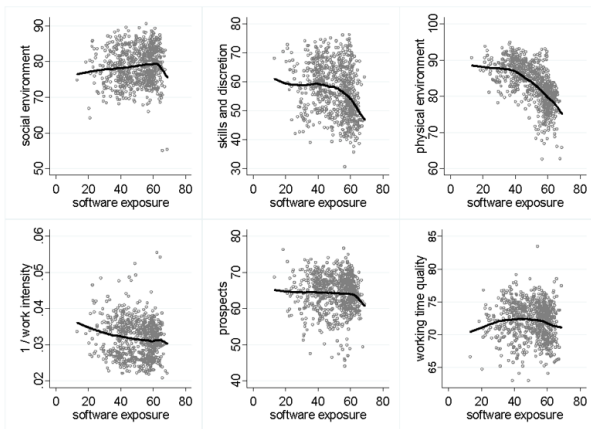


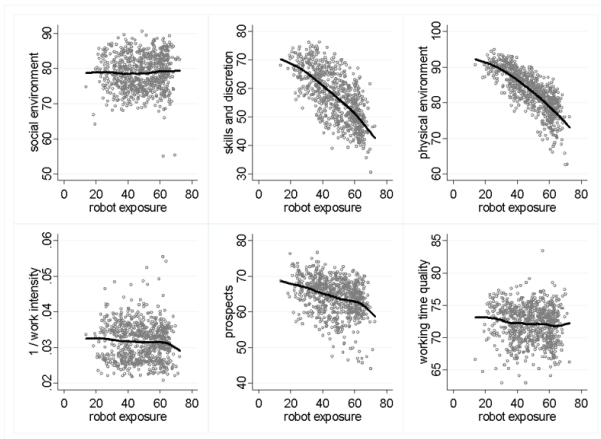
Notes: High work intensity index should be interpreted as bad working condition. The figures are computed using the sample of more than 9.5 millions of workers from 22 European countries with weights based on grossing-up factor for employees (from SES). The list of countries is provided in Table 1A, while job quality EWCS indices are described in detail in Table S2.

Relationship between working conditions in Europe and GVC intensity

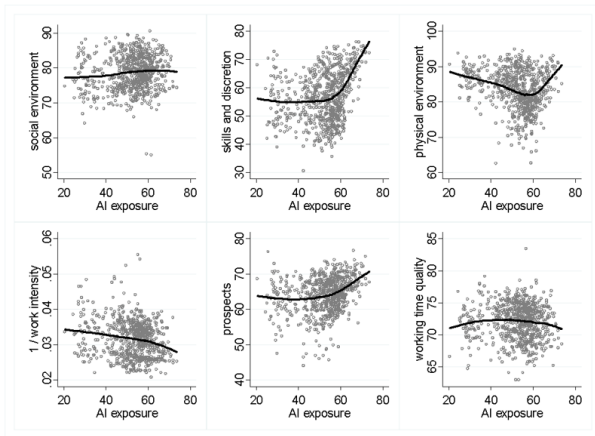


Relationship between working conditions and software exposure



Relationship between working conditions and robot exposure

Relationship between working conditions and AI exposure



Model specifications:

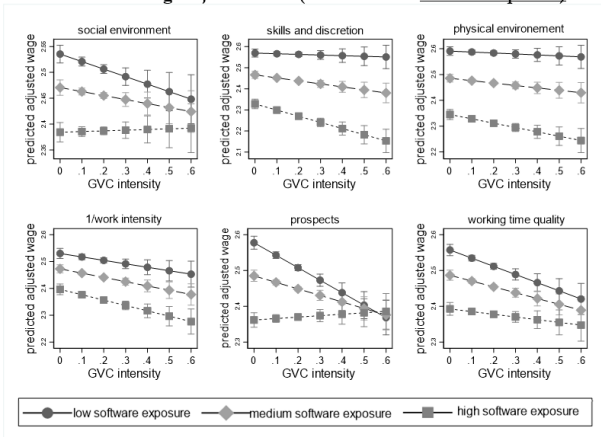
$$\ln(w_adj_{iojsc}^k) = \alpha + \beta_1 Worker_i + \beta_2 Firm_j + \beta_3 Prod_s + \beta_4 GVC_{sc} + \beta_5 Tech_o + \beta_6 GVC_{sc} \times Tech_o + D_c + D_s + \epsilon_{iojsc}(1)$$

where:

- i - worker; o - occupation; j - company; s - sector of employment, c - country, k - the type of wage adjustment due to a specific working condition measure
- $Worker$: vector of individual characteristics such as: sex, age, education, type of employment (full-time/part time job binary variable)
- $Firm$: firm characteristics (length of service in the enterprise, form of economic and financial control (public/private))
- $Prod$: industry productivity (the log of the ratio of value added to the total number of hours worked by employees)
- GVC : sectoral GVC intensity measured as the share of FVA in exports
- $Tech$: technology related features of the occupation, captured via software, robot or AI exposure measures
- D_c, D_s : country and industry-specific characteristics

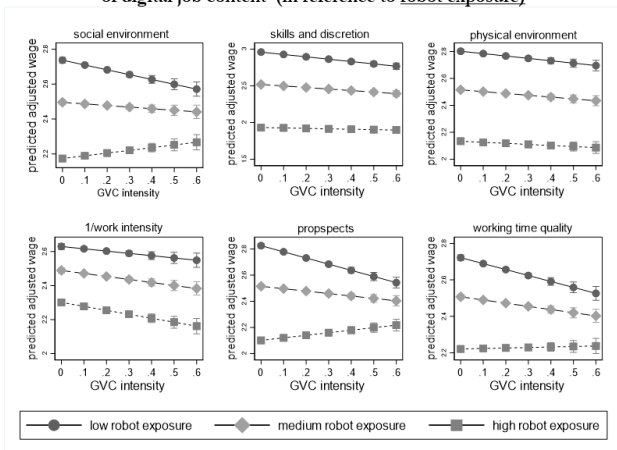
Estimation results: the association between GVCs, working conditions and software exposure

Predicted adjusted wages due to the changes in GVC at different levels of digital job content (in reference to software exposure)



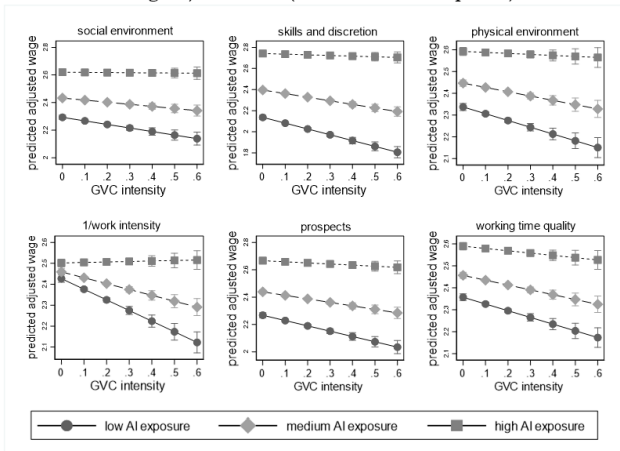
Estimation results: the association between GVCs, working conditions and robot exposure

Predicted adjusted wages due to the changes in GVC at different levels of digital job content (in reference to robot exposure)



Estimation results: the association between GVCs, working conditions and AI exposure

Predicted adjusted wages due to the changes in GVC at different levels of digital job content (in reference to AI exposure)



Conclusions (1)

- working conditions differ significantly within countries and economic sectors (i.e. between occupations);
- once the monetary information contained in wage data is enriched by factors related to job quality, even 60 percent of European workers face (hypothetical) downward wage adjustment;
- the difference between monetary wages and job-quality adjusted wages depends on working condition aspect;
- whether a worker benefits from a job quality adjustment or not, also depends on sector, occupation and individual characteristics;
- the upgrading pattern concerns highly educated workers and such occupations as managers and professionals.

Conclusions (2)

- the information contained in wages of less educated employees, elementary workers, plan and machine operators, assemblers or agricultural and fishery workers should be deflated by their relatively bad working conditions;
- workers from more GVC intensive sectors and employed in occupations of high software and robot exposure - worse off than workers in AI exposed occupation;
- the negative link between GVC and well-being at work can be mitigated by positive effects of job digitalisation in AI exposed occupations.
- **Perspectives for the CEE Region**

Thank you for your attention!

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