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Review of the doctoral dissertation by Helena Anacka, “Digitally driven employment. Empirical evidence for the European countries”

The doctoral dissertation by Helena Anacka under review is entitled “Digitally driven employment. Empirical evidence for the European countries” (Polish: „Zatrudnienie oparte na technologiach cyfrowych. Wyniki badań empirycznych dla krajów Europy”). The dissertation was prepared in the discipline of economics and finance under the supervision of Professor Ewa Lechman at the Gdańsk University of Technology. The topic is highly timely and concerns one of the key issues of the contemporary economy: the impact of digitalisation and digital competences on employment in European countries, drawing on the author’s composite EDSI index and panel analyses for ten occupational groups. I evaluate the work positively as meeting the requirements set out in Article 187 of the Act of 20 July 2018-Law on Higher Education and Science; it combines theoretical reflection with extensive empirical material, although it is not free from shortcomings, which I indicate in the subsequent parts of this review.

Overall substantive assessment

The dissertation addresses a topic of high scientific and policy relevance: the relationship between digitalisation and labour markets in EU countries over 2008–2023. Its temporal and geographical scope, combined with anchoring in the main strands of research on

digital transformation and employment, makes it an important voice in the ongoing debate.

The core original contribution is the composite EDSI index (three dimensions, 18 components in total) and its use for quartile segmentation of countries, combined with analysis by ISCO occupational groups. The contribution is primarily measurement- and application-oriented, enabling the identification of heterogeneous effects.

The work is underpinned by a coherent data corpus and a clearly described analytical framework, and it consistently differentiates effects across occupations and across countries with varying levels of digital maturity. Results are presented in a way that allows persistent patterns to be identified, and both the index construction and the analytical design are transparent.

Some limitations are visible: the absence of quantitative validation of the EDSI's convergence with established measures (e.g. DESI/RTI); a tension between the central role attributed to EDSI and the use in the models of "internet users" as the main predictor of digitalisation; the risk of significance inflation given a total of 280 estimations without an explicit strategy for multiple-testing control; and ambiguity regarding the treatment of unobserved time heterogeneity and within-country correlation (year effects, clustered standard errors). Notwithstanding these reservations, my overall assessment is positive: the weight of the problem and the recognisable original contribution prevail, and the reported results provide a valuable basis for further discussion.

Concise summary of the dissertation

The dissertation sets out three interrelated objectives: to construct an original composite index of digital skills (EDSI), to use this index to segment European countries

into quartiles of digital maturity, and to estimate how digitalisation relates to employment across ten ISCO occupational groups within those quartiles over the period 2008–2023. Against this backdrop, the author formulates two testable hypotheses. The first posits that the impact of ICT on employment weakens as a country's digital maturity declines (H1). The second anticipates heterogeneity of effects across occupations (H2), reflecting task content and differential exposure to digital technologies.

The empirical strategy draws on harmonised data from Eurostat and the OECD. The author builds EDSI from eighteen indicators grouped into three dimensions, applying min–max normalisation and transparent weighting to obtain annual country scores. Exploratory relationships between digitalisation measures and employment are first inspected using LOWESS curves. The main identification relies on panel regressions with fixed effects selected on the basis of a Hausman test, with countries grouped into EDSI quartiles to allow for cross-country heterogeneity. The analysis covers twenty-six European countries, ten ISCO groups, and multiple model specifications, yielding a comprehensive set of estimates for the 2008–2023 horizon.

The principal findings indicate that the relationship between digitalisation and employment varies both across EDSI quartiles and across occupations, lending support to the stated hypotheses. Estimated effects tend to be stronger and more systematic in higher-maturity country groups, while results in lower-maturity quartiles are weaker or statistically fragile. Evidence for employment polarisation is mixed: some occupational groups display patterns consistent with polarisation, whereas others do not, suggesting that the dynamics of digital transformation are contingent on both national digital maturity and occupational task structures.

Detailed assessment - cross-cutting themes

Literature review and theory

The literature review engages substantively with the canonical strands of SBTC, the ALM task framework, and routine-biased technological change, and it situates the research question within these traditions in a convincing manner. At the same time, several peer-reviewed cornerstones are absent, which narrows the evidential base for key claims. In particular, Acemoglu & Restrepo (2020, JPE) on robots and jobs, Hershbein & Kahn (2018, AER) on task shifts in vacancy data, Dingel & Neiman (2020, JPubE) on teleworkability, and Deming (2017, QJE) on the rising value of social skills are not incorporated. The systematic review protocol lacks transparency: search strings, temporal coverage, selection flow (PRISMA-type accounting), and any formal appraisal of study quality are not reported, which limits replicability and makes it difficult to assess potential selection bias.

Construction and validation of EDSI

The internal logic of the index is clear: the three-dimensional structure is well motivated, the selection of eighteen indicators is explained, and the normalisation and weighting scheme is described in a straightforward way. However, the empirical validation of the measure is incomplete. Convergence with established indices (such as DESI or RTI/digital-tasks metrics) is not documented quantitatively; sensitivity to alternative weighting or normalisation choices is not assessed; the extent of imputation by indicator and year is not disclosed; and readers are not provided with a compact “dictionary” table enumerating the eighteen components with definitions and sources. These gaps weaken the evidentiary status of EDSI as a proxy for cross-country digital skills.

Econometric strategy

The econometric design follows standard practice by adopting fixed effects after a Hausman test and by applying logarithmic transformations to key variables. Yet several aspects of the identification environment remain unspecified. The treatment of common time shocks is unclear (no explicit statement on year effects or two-way FE), as is the handling of within-country dependence in the error structure (no information on clustered or heteroskedasticity-robust standard errors, nor on tests for serial and cross-sectional dependence). The scale of the exercise-280 regressions across quartiles and occupations-raises a non-trivial multiple-testing problem that is not addressed. Finally, there is a conceptual dissonance between the central role attributed to EDSI in the design and the reliance in the regressions on “internet users” as the primary proxy for digitalisation, with no parallel specifications using EDSI or its sub-indices.

Interpretation and implications

The interpretive narrative emphasises employment polarisation, but the empirical support is uneven and contingent on EDSI quartile and ISCO group. In several instances the reported patterns are mixed or statistically fragile, which weakens the force of general claims about polarisation. The policy dimension is present only implicitly: the discussion hints at differential country needs by digital-maturity quartile and at occupation-specific dynamics, yet it stops short of articulating concrete implications grounded in the reported heterogeneity.

Chapter-by-chapter assessment

The Introduction effectively motivates the inquiry into the relationship between digital transformation and employment in Europe and delineates three objectives that structure the dissertation; its framing within the broader debate is clear and sets

appropriate expectations for an empirical study spanning countries and occupations. At the same time, the abstract does not mirror the aims as stated later, which blurs the promised contribution, and the hypotheses remain implicit rather than articulated with expected directions of effects. The opening pages also repeat definitional material later developed in the theoretical chapter, which dilutes focus at the outset. The theoretical chapter provides a competent overview of SBTC, task-based approaches, and routine bias, anchoring the research in established traditions and thereby offering a conceptual baseline for the empirical work. The original decomposition of “technology” into processes, algorithms, knowledge, and tools appears as an unreferenced proposition, and the link from that discussion to the three-dimensional design of the European Digital Skills Index is not made explicit, leaving the rationale for exactly three dimensions under-explained. The literature review maps an extensive body of work on digitalisation and labour-market outcomes and documents the salience of occupational heterogeneity; in parallel, several peer-reviewed cornerstone studies are absent and the systematic character of the review is not verifiable, as databases, search phrases (including terms such as “robots,” “automation,” “AI,” or “telework”), time windows, selection flow, and any appraisal of study quality are not reported. The data-and-methods chapter is a strong point: Eurostat/OECD sources are appropriate, the construction of EDSI is described transparently, and the empirical plan combines exploratory LOWESS diagnostics with panel estimation after a Hausman test in a coherent manner. Yet the evidential status of EDSI is weakened by the lack of a compact table enumerating all eighteen components with definitions and sources, by the absence of information on the extent of imputation by indicator and year, and by the lack of sensitivity checks to alternative normalisation or weighting schemes; the criteria for country quartiles are also left ambiguous with respect to fixed thresholds versus annual reclassification. The role of NACE in the dataset is not made explicit, and no mapping from ISCO groups to skill tiers is shown. Within the modelling section, the treatment of

common time shocks and within-country error dependence remains unspecified (no explicit year effects, no statement on clustered or heteroskedasticity-robust standard errors, no diagnostic tests), and the reliance on “internet users” as the operative proxy for digitalisation creates a conceptual tension with the centrality of EDSI in the design. The results chapter helpfully differentiates estimates across EDSI quartiles and the ten ISCO groups, making heterogeneity visible and tying patterns back to the motivating questions. However, the highest-maturity quartile comprises a very small set of countries, a limitation that is not foregrounded; the section titled as sectoral analysis reports occupational evidence without NACE-based results; and the differences among specifications labelled FE_1 to FE_7 are largely confined to annexed tables, with no cross-model visualisation and no discussion of multiple-testing risks given the 280 estimations. The concluding chapter synthesises the main empirical regularities and reiterates the central message about heterogeneity across countries and occupations, thereby returning to the wider debate. It does not explicitly map the conclusions back to the three declared objectives or reference the hypotheses in a direct manner, and the general statements on employment polarisation sit alongside earlier mixed and quartile-contingent evidence. Overall, each chapter contains valuable elements-motivation, theoretical anchoring, careful data work, and systematic estimation-while the noted gaps in alignment, documentation, and exposition temper the force of the claims.

Formal and editorial assessment

The manuscript shows insufficient attention to proofreading: typographical errors and translation calques remain, and terminology is not standardised across chapters. Graphical elements are uneven; axis labels and units are not consistently formatted, and legends are at times incomplete or detached from figures. A compact “dictionary of variables” is missing, as is a table mapping ISCO groups onto broad skill tiers, which

complicates navigation through the empirical sections. The organisation of tables and appendices reduces accessibility: key elements, notably the definitions of the FE₁–FE₇ specifications and the lists of countries by EDSI quartile, appear only in the annexes, leaving the main text without concise summaries of these pillars. These formal shortcomings affect readability and traceability, while not undermining the substantive contribution.

Summary

Despite the critical remarks noted above, I evaluate Helena Anacka's doctoral dissertation positively as meeting the requirements set out in Article 187 of the Act of 20 July 2018 - Law on Higher Education and Science (Journal of Laws of 2022, item 574, as amended). The dissertation constitutes an original solution to a scientific problem, demonstrates the candidate's broad theoretical knowledge, and evidences the ability to conduct independent research.

I request that the candidate be admitted to the subsequent stages of the doctoral procedure.