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Globalization and digital transformation: are impacts on skills and inequality in four future scenarios converging?

Gerben Hulsegge [a*], Steven Dhondt [ab] and Marieke Van Den Tooren [a]

[a]*Unit Health & Work, The Netherlands Organization for Applied Scientific Research, TNO, Leiden, The Netherlands;* [b]*Center for Sociological Research (CESO), KU Leuven, Belgium*

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This research examines how varying degrees of globalization and digital transformation affect skill demand, socioeconomic inequality and convergence in the EU by 2030. The study employs a comprehensive scenario-mapping approach using state-of-the-art literature, existing econometric analyses conducted within the GI-NI project used as contextual inputs and expert insights. Four scenarios are developed based on potential trends in digital transformation (stagnation or acceleration) and globalization (further globalization or deglobalization). These scenarios highlight essential changes needed to improve skills and alleviate inequality. In all scenarios, the future labour market demands a rapidly evolving skill set, with persistent risks of skills mismatch across educational groups and a strong focus on digital, technical, analytical and communication skills. Three scenarios suggest worsening inequality, particularly affecting low-skilled workers, women and older individuals, while high-skilled workers adapt more quickly. The study shows that communication technology can drive between-region economic convergence, depending on the interaction with globalization and the pace of digital transformation. However, accelerated digital transformation with deglobalization poses divergence risks, as some EU regions may struggle to adapt quickly. The scenarios underscore the complex interplay between digital transformation and globalization, necessitating multifaceted policy responses to foster inclusive growth and mitigate the adverse effects on vulnerable populations.

KEYWORDS: Globalization; digitalization; socioeconomic inequality; skills; labor market; convergence; artificial intelligence

Introduction

In recent years, the European Union (EU) has implemented policies addressing both the opportunities and challenges of the digital transformation and globalization. From the Machine Directive and the AI Act to the Digital Services Act, along with initiatives aimed at reducing socioeconomic inequality in the labour market, such as minimum wage schemes, there has been a collective endeavour to foster a more inclusive and equitable European society. Despite these efforts, new socioeconomic inequalities – between

*Corresponding author. Email: gerben.hulsegge@tno.nl

migrants and natives, old and young, skilled and unskilled, men and women, unemployed and employed – continue to rise (Chancel et al. 2021). This points to a more profound dissonance between current policies and labour market realities, mainly manifesting as skills mismatches within the EU (McLennan 2021; Nolan and Valenzuela 2019).

Recent studies, including those by Arntz et al. (2024), Dabed, Genz, and Rademakers (2023), and Boza and Reizer (2024), highlight the multifaceted challenges posed by the digital transformation and globalization. These challenges range from the increasing routinization of jobs (Arntz et al. 2024) to reskilling due to globalization, affecting both the North-Western and Eastern EU (Boza and Reizer 2024). However, interpreting data on these issues is complex, raising critical questions for policymakers: What strategies should be implemented to mitigate these challenges and prepare for future developments effectively? This question is pivotal in devising policies that not only respond to immediate needs but also anticipate long-term global trends.

As Eichhorst et al. (2018) contend, (digital) technology and globalization are closely linked forces driving permanent structural change in employment, affecting the global distribution of economic activities and jobs. However, the future of skill demand and socioeconomic inequality in the context of globalization and digital transformation remains uncertain and complex. Historically, O'Rourke and Williamson (1999) showed that globalization declined during the period up to the 1950s. Since then, globalization has been on the rise. Williamson (1995) has already pointed out the need for economists to pay greater attention to those adversely affected by globalization. Those adversely affected by globalization may even be the world's leading economies (G7) (Baldwin 2016). Against dominant thinking, Baldwin (2016) sees the developing and developed economies converging. This convergence is at the loss of the developed world. More recently, perceptions of technology and globalization as undisputed drivers of progress have been challenged by issues like deglobalization (WTO 2023) and unproductive technologization or misplaced technologization, as Acemoglu and Restrepo (2019) point out with their concept of 'so-so technology', which reveal a gap between expectations and reality. Bloom et al. (2020) observe technological stagnation, highlighting that our economies lack productive ideas.

Recent empirical studies reinforce and nuance Baldwin's (2016) argument that the current phase of globalization is characterized less by further convergence and more by structural limits shaped by digital technologies and global value chains. Evidence from OECD countries shows that digital transformation and digital trade do not produce uniform productivity or distributional outcomes but instead generate divergent trajectories across countries depending on their position in global production networks and their institutional capacity to absorb digital technologies (OECDa 2024a). Consistent with Baldwin's emphasis on the unbundling of production and the declining effectiveness of traditional policy tools, empirical analyses indicate that digital technologies may initially support productivity growth and reduce inequality, but that these gains are often unevenly distributed and difficult to sustain (Baffour Gyau, Li, and Appiah 2025).

As digital intensity increases, several studies identify non-linear and threshold effects, whereby productivity gains become increasingly concentrated and winner-takes-most dynamics emerge, particularly in economies where skill formation systems, regulatory frameworks and complementary investments lag behind technological change (Baffour Gyau, Li, and Appiah 2025; Zhang and Choi 2025). These findings lend empirical support to the view that convergence is contingent rather than guaranteed, and that advanced economies may incur relative losses when digital globalization outpaces institutional and policy adaptation.

Where does this leave policymaking? Theoretical frameworks, such as those by Frey and Osborne (2017) on technology substitution and the neo-Ricardian perspective on globalization (Costinot and Donaldson 2012; Nower 2019), suggest several future paths. These range from increasing digital transformation and polarized societies to a potential reduction in globalization. In line with Baldwin's (2016) argument and recent empirical evidence, these frameworks suggest that policy outcomes are highly path-dependent and sensitive to institutional and technological configurations, complicating efforts to design one-size-fits-all policy responses. Nolan and Valenzuela (2019) therefore question which policies create more value for citizens, noting a shift from a neo-liberal 'hands-off' approach to more proactive government involvement in shaping globalization and the digital transformation.

This paper addresses this policy uncertainty and suggests a way forward using scenario planning to explore possible futures. We focus on understanding the impact of trends in globalization and the digital transformation on skill demand and socioeconomic inequality. Should we continue current trends, or are alternative paths viable? This paper provides policymakers with insights to develop strategies for navigating skill demand and socioeconomic inequality from 2025 to 2030 and beyond. The digital transformation and globalization present opportunities and threats during this period, making informed policy decisions crucial. The key question is whether different scenarios of globalization and digital transformation lead to converging or diverging impacts in the European context. Given Baldwin's (2016) observation that technology brings economic convergence, is this still true in rapidly changing landscapes? Can we expect more convergence in economic impacts on skills and socioeconomic outcomes in the EU? Although all EU countries are influenced by globalization and digital transformation, they experience these phenomena both similarly and uniquely.

Our study's research question is: How do varying degrees of globalization and digital transformation impact skill demand and socioeconomic inequality within and between EU countries? Assessing these developments from a scenario perspective is valuable, as different occupations and countries may experience varying demands for skills and levels of socioeconomic inequality.

Theoretical background on globalization, digital transformation and welfare outcomes

Globalization vs. deglobalization

Globalization is defined as the inward and outward flow of goods, services and investment across national and continental borders, along with the functions – including functions related to innovation – that enterprises and organizations use to set up, support and manage these flows (Seghir et al. 2022). More globalization means an increasing inward and outward flow of goods, services and investments across national and continental borders. In the case of deglobalization, international trade between countries or major 'blocks' decreases. Below, we delve into the development of globalization and its possible impacts on employment.

The idea that globalization enhances welfare is an old idea, already suggested by David Ricardo (1817). Costinot and Donaldson (2012) used a novel approach to show the current relevance of Ricardo's theory of 'comparative advantage' between countries, suggesting that countries benefit from specializing in producing goods they can make most efficiently. Specialization drives international trade and is closely linked to globalization, which promotes further global integration through modern IT and other digital

technological innovations, leading to declining costs of international transactions (Eichhorst et al. 2018). This understanding has facilitated the development of international multilateral trade and institutions like the World Trade Organization (WTO).

After China had been allowed to enter the WTO in 1999, the expectation was that globalization would continue to rise. By 2015, 95% of global goods trade was covered by WTO rules, and more than 50% flowed between Regional Trade Agreements (RTAs) (WTO 2023). However, forces opposing globalization have grown significantly in the past decade. Unilateral trade agreements have re-emerged, with Brexit being a prime example of a move away from regional integration. The number of trade concerns at the WTO has quintupled in 2015-2022, and countervailing measures doubled in the same period. These developments have prompted the WTO to prioritize re-globalization (WTO 2023).

Research also emphasizes that globalization is not irreversible; it fluctuates over time. O'Rourke and Williamson (1999) analyzed trade, migration and international capital flows in the Atlantic economy before 1914 – the first great globalization boom. Williamson identified the period after World War I until the 1950s as one of deglobalization, followed by a new era of globalization. Baldwin (2016) argues that we are witnessing the limits of current convergence in economic trade rather than outright deglobalization. Advances in communication technology have transformed globalization, resulting in significant knowledge transfer from the global North (the G7) to the global South. This has led to the unbundling of industries in ways that disadvantage the North. Baldwin (2016) suggests that traditional policies, such as education, tax breaks and research and development, can no longer support competitiveness. He says, 'old-style development policies are dead' (Baldwin 2016, 14).

Global integration depends not only on economic calculation, as Ricardo (1817) suggested, but also on political decisions to remove and reinstate trade barriers. Political decisions shape globalization's impact on the further development of employment patterns (Eichhorst et al. 2018). In the past decade, defending the benefits of global trade has become increasingly challenging for politicians. Murdock (2020) argues that Ricardo's theory of comparative advantage is less applicable in the current global economy, particularly criticizing China for not adhering to market-based economy principles. A primary focus in EU and US policymaking is reducing dependency on international trade with partners considered unreliable. US and European politicians now argue that globalization can only continue if the West maintains its technological advantage (Murdock 2020). Global trade has recently been seen as a new form of international warfare. An illustrative example is Russia's significantly reducing natural gas supplies to European countries and the West's decision to exclude Russia and China from critical technologies. Another current example is the Dutch lithography company ASML, which is no longer allowed to export the newest lithography machines to China (Fuller 2023).

Globalization has significantly impacted labour markets. In theory, it creates greater economic value in supportive countries. Los, de Vries, and Ye (2023a) have shown that all deglobalization scenarios negatively impact growth in the European trade area. Gozgor (2017) analyzed globalization's direct effects on structural unemployment in 87 countries from 1991 to 2014, finding that trade openness was associated with a lower structural unemployment rate. Globalization, therefore, seems a logical choice for policymakers aiming to support their citizens. However, Eichhorst et al. (2018) note that workers are asymmetrically affected by technology and globalization, leading to employment polarization and societal and political challenges. The impacts of globalization are complex and multifaceted. Selecting a strategy of deglobalization does not necessarily

yield positive outcomes either; it may even lead to economic stagnation and increased inequality, as evidenced by historical analysis (Chase-Dunn, Álvarez, and Liao 2023; Williamson 1995).

Digital transformation accelerates vs. stagnates

Digital transformation is defined as the systemic and innovative use of digital technologies (including AI, cloud computing, cyber-physical systems and smart factories) that is accompanied by the strategic leverage of critical resources and capabilities, aiming to radically improve an entity (e.g. organization, business network, industry, or society) (European Commission 2021). This transformation is accompanied by the strategic leverage of critical resources and capabilities to radically improve the efficiency, productivity and overall performance of entire systems (e.g. economic, social, industrial). If digital transformation accelerates, technological growth quickly increases and reshapes all sectors. If digital transformation stagnates, technological growth declines and the further adoption of technologies occurs very slowly.

The constant release of new technologies is the leading indicator for an accelerating digital transformation. The introduction of ChatGPT, for example, has given rise to new technology investments and development. Humlum and Vestergaard (2024) see users' quick adoption of such Large Language Models in Denmark, with workers identifying substantial productivity potential. However, several issues raised in the literature suggest that we may not observe sufficient impact of these technologies. Bloom et al. (2020) observed that companies require more investment to create progress. An example is the Dutch lithography company ASML, which made its newest EUV technologies with less than 4000 researchers in its R&D department. Currently, ASML relies on more than 15.000 researchers. This investment does not bring the same breakthrough technologies it had in the 2000s. Discovering novel ideas and utilizing their exponential growth potential is increasingly challenging (Bloom et al. 2020).

Another area for improvement is the slow adoption of new digital technologies. Arntz et al. (2024) studied the spread of Industry 4.0 technologies in German companies from 2011 to 2016, finding limited adoption among frontier companies. Many companies continue to invest in older technologies to remain competitive. Arntz et al. (2024) also noted significant changes in service sectors, highlighting the importance of strategic implementation over merely acquiring state-of-the-art technology.

Several factors influence whether countries and firms experience accelerating or stagnating digital transformation, including political choices such as taxation policies. Brynjolfsson, Thierer, and Acemoglu (2024) advocates a more equitable taxation approach between capital and labour to improve company decision-making and technological adoption. Restrictions on critical technologies between countries, as seen with ASML's export limitations, can also hinder digital technological spread.

Predicting how employment will evolve amid these digital technological changes is challenging. Previous technological revolutions have been skill-biased, favouring high-skilled workers (Acemoglu 2002). Acemoglu (in Brynjolfsson, Thierer, and Acemoglu 2024) distinguishes 'good' and 'bad' automation, emphasizing that the type of technology adopted influences worker opportunities. Good automation increases productivity and creates new jobs, while bad automation fails to deliver productivity benefits and has negative distributional consequences. Recent patterns suggest more bad automation than good, with limited success in creating quality jobs and increasing equality (Brynjolfsson, Thierer, and Acemoglu 2024).

Automation has contributed to higher levels of skill mismatch due to its rapid implementation, which often outpaces the ability of the workforce to adapt. Therefore, companies should focus more on enhancing workers' qualifications to avoid these negative consequences (Brynjolfsson, Thierer, and Acemoglu 2024). Furthermore, inequality arises as leading firms capture most wealth (Autor, Mindell, and Reynolds 2020), and further job routinization occurs in some companies (Arntz et al. 2024). Acemoglu (in Brynjolfsson, Thierer, and Acemoglu 2024) argues that automation has not significantly increased productivity or job growth to offset losses, highlighting the need for balanced approaches to leveraging automation and AI and managing their socioeconomic consequences.

While the literature on the digital transformation and globalization largely emphasizes their productivity-enhancing potential, more recent work suggests that these effects cannot be understood independently from environmental and industrial transformation dynamics. In particular, a growing strand of studies links digital trade and ICT diffusion to green growth outcomes, showing that digital trade can contribute to improvements in green total factor productivity, but that these effects are often non-linear and depend on countries' stage of development and institutional capacity (Zhang and Choi 2025). Evidence further indicates that ICT expansion supports trade in both goods and services, yet with diminishing marginal returns for goods trade as digital maturity increases (Park and Choi, 2025). Recent empirical evidence from non-OECD contexts further supports the notion that ICT and digital trade generate heterogeneous effects across goods and services and depend strongly on institutional and infrastructural conditions (Nguyen and Choi 2025).

At the same time, research on green industrial policies highlights that targeted industrial transformation can reduce environmental pressures while reshaping skill demand and regional development patterns. For example, analyses of the *Made in China 2025* policy show that industrial upgrading and human capital development can jointly lower carbon emissions and air pollution, although with uneven spatial spillovers across regions (Zhang, Yin, and Choi 2025). Together, these findings suggest that the impacts of the digital transformation and globalization are closely intertwined with green transition pathways, reinforcing the need to examine future labour-market and inequality outcomes under different combinations of technological, trade and policy trajectories.

Materials and methods

Given the research question and the theoretical background, we used scenario planning as the foresight method. According to the World Economic Forum (Woeffray and Carvalho 2023), foresight helps to explore and anticipate the future, identifying challenges and opportunities from multiple signals and drivers of change. Scenario planning enables us to model opposing developments in globalization and digital transformation. It yields four scenarios describing different developments in the economic-technological field, allowing us to assess their impact on skill demand and socioeconomic inequality.

We used a multifaceted approach to develop the impact assessment of each scenario (European Foresight Platform 2024; Preenen et al. 2023). Expert judgment in interviews and workshops informed the impact assessment, complemented by existing econometric analyses conducted in parallel within the GI-NI project (Boza and Reizer 2024; Dabed, Genz, and Rademakers 2023; Los, Konietzny, et al. 2023; Los and Ye 2023; Los, de Vries, and Ye 2023a; Los, de Vries, and Ye 2023b; Nikolova 2023) and literature review to achieve method triangulation. Several members of Expert Group 1 were also involved in these parallel econometric analyses and drew on both their quantitative

findings and domain expertise during the scenario validation. Subsequently, we analyzed the impact assessments provided by experts for each scenario to understand if there is a convergence in policy reactions.

All work has been done between 2022 and 2024. The scenario research team consisted of nine researchers with a wide array of thematic and methodological expertise in areas including foresight, skills, inequality, international trade, digital transformation and other labour market trends. Throughout all stages of scenario assessments, eleven renowned international experts with backgrounds in economics, policy and social science and specialization in skills, inequality, migration, international trade and technology were engaged (Group 1). These experts were affiliated with the following institutions: University of Groningen, the Netherlands; Centre for European Policy Studies, Belgium; National Conservatory of Arts and Crafts, France; University of Agder, Norway; University of Utrecht, the Netherlands; European University of Flensburg, Germany; The University of the Basque Country, Spain. Three additional groups were consulted: 27 Dutch labour experts (Group 2) and 15 experts from education, industry and science across the Netherlands, UK, Spain, Portugal and other undisclosed EU countries (Group 3). The contributions and roles of different expert groups are further detailed below.

A detailed description of the expert elicitation instruments, workshop protocols, response formats, aggregation rules and reporting of uncertainty is provided in the Supplementary Materials S1.1–S1.3.

Step 1 – setting the parameters

In the first step of scenario development, we overviewed the most critical external developments that may influence skill demand and socioeconomic inequality in the future. The full horizon-scanning methodology, discussion prompts and expert survey used in this step are documented in detail in Preenen et al. (2023) and summarized in Supplementary Section S1.1. This has been done with three activities (Preenen et al. 2023):

- Literature analysis. Twenty-five relevant trends in the six DESTEP categories (demographic, economic, sociocultural, technological, ecological and political-legal) were identified using the scenario research teams' knowledge and search of the literature of the last ten years. The literature search was performed on scientific literature, grey literature (reports, presentations, webpages) and documents and reports from OECD Strategic Foresight and EU Strategic Foresight. The scenario research team de-duplicated the list of developments, combined certain developments and separated others and identified the most relevant external developments using guided brainstorming in which each one individually ranked the trends by relevance.
- Expert workshop (1). In a workshop, eleven international experts from Group 1 discussed the trends, including their potential development, impact and uncertainty.
- Expert survey. Using an online survey tool, 27 Dutch labour experts of Group 2 rated the list of trends by their potential impact on socioeconomic inequality and skill demand on a scale from 0 (minimal impact) to 10 (huge impact). We calculated the average mean (M) and standard deviation (SD) of the impact of each trend on skill demand and socioeconomic inequality. The average was 6.0. Trends that scored above this threshold were identified as significantly essential and were primarily considered for inclusion in the scenario development. That were technological change ($M = 7.9$), the realization of the energy transition ($M = 7.7$), the

increasingly tight labour market ($M = 7.2$), stronger EU policy focus on twin transition ($M = 7.0$), aging workforce ($M = 6.8$), the EU's market leadership in various technologies ($M = 6.8$), labour migration ($M = 6.6$), economic growth ($M = 6.4$), higher educated population ($M = 6.3$), intensification of trade ($M = 6.1$) and shifts in the global economic order ($M = 6.1$) and climate change ($M = 6.0$). Other factors exerted a below-average impact on skill demand and socioeconomic inequality and were only included if their significance was suggested in expert workshops and validation sessions. It should also be noted that although trends in energy transition are considered necessary, they were not explicitly included in the scenario construction due to their complexity and uncertainty and because they fell outside the expertise of the scenario research team and the international expert groups. Their potential implications are therefore discussed only qualitatively when interpreting the results.

Step 2 – scenario construction

In the second step of scenario development, the scenarios were constructed. As outlined in the introduction, the focus centred on two main dimensions: digital transformation and globalization, but other essential parameters determined in the previous step were also considered. We developed the narratives of four scenarios and validated them in three further activities (see for more details Supplementary Materials S2):

- Workshop (2 and 3). The scenario development process began with a workshop involving the scenario research team to draft the initial narratives. This workshop focused on critical external developments (see 'setting the parameters'), emphasizing globalization and digital transformation (acceleration versus stagnation). Discussions revolved around which developments were pivotal within each scenario and their implications, outlining the transition from the present to the projected scenario around 2030 and identifying key stakeholders and their roles within these scenarios. Two scenario research team members wrote the scenario narratives in between workshops. During the second workshop, the scenario research team refined and enhanced the narratives of the scenarios.
- Expert interviews. The scenario narratives were validated using semi-structured interviews with four international experts from Group 1.
- Validation workshop (4). Next, the enhanced scenarios were validated in a workshop with the international experts from Group 1. All experts had read the enhanced scenario narratives before the workshop. In the session, the focus was on evaluating the plausibility of the scenarios and their alignment with scientific insights, particularly those derived from existing econometric analyses conducted in parallel within the GI-NI project by experts from Group 1, which were used as contextual and plausibility inputs in the scenario validation (Boza and Reizer 2024; Dabed, Genz, and Rademakers 2023; Los, Konietzny, et al. 2023; Los and Ye 2023; Los, de Vries, and Ye 2023a; Los, de Vries, and Ye 2023b; Nikolova 2023). The scenario research team developed the final scenarios based on this validation workshop.

Step 3 – determining the impact on skill demand and socioeconomic inequality

In the third step of scenario development, we assessed the impact of four scenarios on skill demand and socioeconomic inequality. Skills are defined as qualities required for effective and efficient work, which can be enhanced through training (Preenen et al. 2023). We

focus on skill demand and the systemic requirements for skills across sectors, driven by digital technological advancements and market dynamics. We also examine socioeconomic inequality in the labour market, specifically the unequal distribution of opportunities in income and job opportunities (Seghir et al. 2022).

The impact of the scenarios on skill demand and socioeconomic inequalities was determined using several internal and external workshops, following an iterative triangulation process primarily based on expert elicitation and plausibility checks against econometric analyses conducted in parallel within the GI-NI project:

- Stakeholder workshop (5). In a fifth workshop with participants from Group 3, the effect of the scenarios on skill demand was determined using the online tool Mentimeter. Questions were directed at skills that become more or less important (i.e. analytical, communication, digital, technical skills) and which groups based on the educational level will experience skills mismatches in the scenarios. We focused the questions around skills and skills mismatches as that was the primary expertise of this specific group, and included only complete cases in our analysis ($N = 15$).
- Internal workshop (6). The results were discussed in a workshop with the scenario research team. Causal loop diagrams were developed to map the assumed causal relationships, and conclusions were drafted about required skills, skills mismatch for low, medium and highly skilled workers and inequality in job opportunities.
- Validation workshop (7). The refined scenario narratives and causal loop diagrams were validated in a seventh workshop with eleven international experts from Group 1. Using an online discussion tool, participants could express their agreement or disagreement with the proposed impact of each scenario on skill demand and socioeconomic inequality (Supplementary Materials S3). Experts were explicitly invited to draw on their own empirical and econometric research, including analyses conducted in parallel within the GI-NI project. If a participant (partially) disagreed, they provided their reasoning, prompting a group discussion on whether to modify the scenario's impact.
- In examining the impact on skills and socioeconomic inequality within the EU, the research team also assessed whether socioeconomic inequalities between EU countries would increase (divergence) or decrease (convergence). This assessment was based on existing quantitative analyses of historical trends in socioeconomic indicators across EU countries (Astarita 2024; Garmann Johnsen et al. 2024) and Baldwin's Convergence theory (Baldwin 2016; 2019) and validated by an expert of Group 1.

Operationalizing digital transformation and globalization

In the scenario framework, digital transformation is operationalized as the pace of diffusion and adoption of digital technologies across sectors, ranging from acceleration to stagnation. Acceleration refers to rapid and widespread adoption, whereas stagnation reflects slower diffusion and more limited technological uptake. Globalization is operationalized as the degree of international economic integration, reflected in cross-border trade, global value chain participation and the mobility of goods, services and knowledge. While continued globalization remains plausible, rising geopolitical tensions and a growing policy focus on strategic autonomy introduce credible pathways toward deglobalization. Together, these two dimensions constitute the core axes of the scenario framework.

Operationalizing convergence and divergence

In line with our research question, convergence and divergence are defined with respect to socioeconomic inequality within and between EU regions. Within-country convergence or divergence refers to changes in inequality between social and labour-market groups within EU member states, operationalized by educational level (low-, medium- and high-skilled workers). Between-region convergence or divergence refers to changes in socioeconomic disparities between EU regions (e.g. Western/Northern versus Southern/Eastern Europe). The analytical focus is limited to socioeconomic inequality in job opportunities and related welfare outcomes. Skill demand and skill mismatches are analyzed as key mechanisms shaping these outcomes, rather than as separate dimensions of convergence. All assessments primarily refer to expected developments up to around 2030. References to long-term risks of divergence indicate potential developments beyond this horizon if current dynamics persist; they do not constitute a separate analysis of post-2030 outcomes.

Results

Scenario identification

The scenarios are built around two central dimensions derived from the theoretical and methodological framework: digital transformation and globalization. By combining variation along these dimensions, acceleration versus stagnation of digital transformation and globalization versus deglobalization, we identify four distinct scenario logics that describe alternative futures for the EU around the 2030 horizon (Figure 1):

- Empowered by Technology: A scenario where digital transformation accelerates while globalization recedes, resulting in a more segregated world with digital technological advancement.

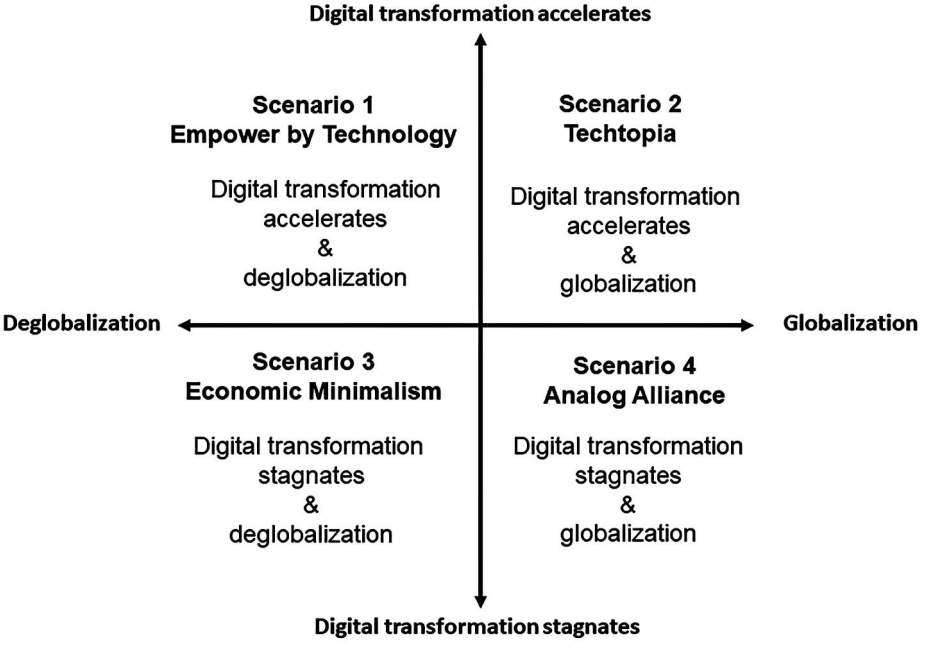

Figure 1. Overview of the four scenarios.

- Techtopia: Both digital transformation and globalization accelerate, presenting a highly connected and technologically advanced future.
- Economic Minimalism: Digital transformation stalls and globalization diminishes, leading to a more insular and technologically conservative world.
- Analog Alliance: Digital transformation stagnates, but globalization persists, focusing on maintaining international ties without rapid technological advancement.

Scenario narratives

The four scenarios are described based on the identified drivers and the scenarios developed with the experts. Unless some differences between Western and Eastern Europe are highlighted, the scenarios are defined for the whole EU.

Scenario 1: empowered by technology

This scenario envisages a world where digital transformation rapidly advances industries through swift digital technology adoption. However, this progress coincides with a decrease in globalization. As the world gravitates towards economic power blocks predominantly led by the US or China, geopolitical and economic factors forge these blocks, escalating tensions that negatively affect technology supply chains and lead to widespread export restrictions. This pressures governments to become more self-reliant in strategic sectors, including (hi-)technology, components and raw materials. Countries within the blocks join forces more intensely to bolster collective technological efforts, intensifying rivalry among the blocks to lead in technological advancements. The EU sees moderate economic growth driven by the digital transformation but limited by export restrictions and decreased global trade.

The surge in the digital transformation raises the demand for highly skilled workers to innovate and implement these (new) technologies. In contrast to previous technological disruptions, generative AI will significantly impact the work of relatively higher-skilled workers. AI systems assist higher-skilled workers in complex tasks, adding additional responsibilities like real-time data analysis and process adjustments. Changes in global trade patterns and labour-saving digital transformation beyond AI lead to the automation of non-routine tasks. This transformation poses challenges for low- and middle-skilled workers in Western European countries, requiring them to relocate to new jobs.

Work-related migration between power blocks decreases due to strict agreements and boundaries. However, mobility within power blocks increases, fostering the already increased knowledge exchange. This surge in mobility within power blocks will lead to a physical movement of people and profoundly impact Europe's social and cultural dynamics. Mobility flows will enhance interaction among different communities, strengthening cultural ties in the EU.

Scenario 2: techtopia

In this scenario, digital transformation and globalization are flourishing, driven by enhanced global collaboration and open markets. There is widespread optimism about the digital transformation as advancements in AI and robotics are realizing their potential. These technological advancements boost efficiency and productivity, leading to economic growth and welfare. Significant budgets are allocated to research and development,

resulting in more job opportunities and higher wages, particularly for high-skilled workers. As political and legal barriers diminish, global collaboration strengthens, resulting in more dynamic global interactions and promoting international trade and innovation. There is more relocation and outsourcing of specific production processes to the most favourable production locations worldwide, where costs and production factors are optimal. Companies access foreign knowledge and face enhanced international competition. Tech companies flourish in this open-border environment, impacting global labour demand. This approach not only increases industry resilience by reducing reliance on few suppliers but also encourages countries and continents to specialize in distinct industries.

Technological changes trigger scarcities and surpluses in labour market segments, thus increasing migration. Migration addresses skill shortages resulting from rising demands and aging populations. Western Europe recognizes the immense value of educated migrants as valuable human capital, enhancing the skilled labour pool and addressing high-skill occupation shortages. More work is available for cheaper labourers, especially in Eastern Europe, where more production work exists. Controlled migration is accepted within most European countries, focusing on desired migration flows. Western Europe faces challenges absorbing large inflows into their labour markets, leading to selective acceptance of migrant from outside the EU. Globalization has diversified urban landscapes, influenced by various cultural traditions. Major city metropoles attract migrants, further strengthening urbanization.

Scenario 3: economic minimalism

In this scenario, the global pace of digital transformation halts as geopolitical tensions and escalating protectionist policies limit cooperation and knowledge exchange between power blocks, predominantly led by the US or China. Governments enforce business operation constraints, prompting companies to overhaul their sourcing strategies. The relocation of global value chains within these blocks increases the demand for (low- and) middle-class work in traditional industries. Despite a decrease in overall employment opportunities, employment rates rise slightly due to industry relocation and a shrinking labour force, primarily attributed to the aging population and government intervention on migration.

International tensions escalate, fuelling a resurgence of national sovereignty and a surge in populism and nationalism. This shift significantly influences elections, prompting withdrawals from international alliances. The EU struggles with internal conflicts over energy and digital transitions, weakening global collaboration. Trade and migration barriers rise, reducing available talent, imports, exports and economic activity. The slowdown in the digital transformation decreases labour productivity, further slowing economic growth. Escalating country tensions highlights the need for stronger national identities, limiting migration and increasing internal and EU polarization. By the late 2020s, the reduced interchange of knowledge and resources among power blocks limits innovation and technological progress. Stricter AI regulations and national barriers are additional obstacles to technological development, undermining consumer confidence and precipitating an economic downturn.

Scenario 4: analog alliance

In this scenario, China, the US and the EU promote international trade by lifting trade restrictions, enhancing firms' opportunities to relocate production to optimize costs and

availability of production factors. This globalization fosters specialization across countries. On the other hand, the expected benefits of digital transformation between 2025 and 2030 have not materialized due to the complexities of technology adoption, stricter regulatory environments and pervasive economic uncertainty, prompting companies to adopt a more cautious R&D investment approach. As global collaboration flourishes, companies increasingly view outsourcing and relocating parts of their production processes to the most advantageous locations worldwide as more favourable investments.

Despite the opportunities for further globalization, the EU's economy faces challenges, with negligible growth and stable productivity due to disappointing digital technological progress. This triggers corporate restructurings and layoffs, diminishing innovation capabilities. Concurrently, labour migration slightly increases, particularly in the Eastern EU, as labour-intensive tasks regain importance over technology, challenging the notion of technology replacing the still-existing physical tasks. Migration addresses worker shortages stemming from an aging population, with the Western EU valuing educated migrants to fill skill gaps. However, as technological progression slows, Western EU nations seek to limit labour migration, adjusting to the evolving dynamics of the global workforce.

Table 1 provides a standardized overview of the core scenario assumptions and bottlenecks that shape skill demand across EU countries up to around 2030.

Impact on skill demand and skills mismatch within EU countries

Scenario impact on skill demand

According to 15 international experts of Group 3, each of the four scenarios shows a significant impact of digital transformation and globalization on skill demand. Table 2 shows that communication and collaboration skills were deemed crucial in three of the four scenarios. Analytical skills were also highlighted as consistently necessary in all scenarios, particularly in Scenario 1. The experts also judged the likelihood that workers with different educational levels will become underskilled in the four scenarios. Workers with lower education were consistently viewed as more likely to become underskilled in all scenarios, especially in scenario characterized by accelerating digital transformation. For medium- and high-educated workers, the percentage of experts who expected them to become underskilled is similar in Scenarios 2 and 3. Medium-educated workers were expected to face underskilling more often in Scenario 1 compared to high-educated workers, who were more likely to become underskilled in Scenario 4. The outcomes of this expert workshop have been validated and refined through additional internal and external workshops, leading to the following impact descriptions for each scenario.

Scenario 1: empowered by technology

Occupations with medium to high skill levels are transforming as work processes change due to AI technology, creating a surge in demand for specialized skills. Cutting-edge technologies (like AI) require complementary skills and organizational change. AI assists higher-skilled workers in facilitating specific complex tasks. Integrating AI and organizational changes requires proficiency in digital, analytical and ethical skills, particularly for high-skilled workers. Also, low and medium-skilled employees are encouraged to cultivate soft skills that machines lack, such as empathy, critical thinking, information literacy

Table 1. Scenario assumptions and bottlenecks shaping skill demand by 2030.

Scenario	Trade regime	Migration regime	Technology diffusion	Industrial policy posture	Labour market institutions	Education and training adaptability	Core bottlenecks
Scenario 1: Empowered by Technology	Restricted, bloc-based trade; export controls	Limited cross-bloc mobility; intra-bloc flows	Fast but uneven; frontier-led diffusion and uneven absorption	Strategic autonomy; reshoring	High transition pressure; limited and uneven adjustment capacity	Rapid, large-scale reskilling	Unequal adaptation capacity
Scenario 2: Techtopia	Open trade; deep global value chains	Increased, partly selective migration	Fast and widespread; rapid adoption across sectors	Pro-innovation; competition-oriented	High labour market dynamism; restructuring costs unevenly distributed	Continuous up-and reskilling; strong bias towards high-skilled learners	Skill-biased upgrading
Scenario 3: Economic Minimalism	Protectionist; reduced trade	Strongly reduced migration	Slow; reliance on existing tech	Stabilization-oriented; intervention	Low dynamism; job scarcity risks	Limited, targeted reskilling; lower skill-obsolescence	Economic contraction
Scenario 4: Analog Alliance	Open trade; specialization	Slight growth; selective inflows	Slow, cautious adoption	Coordination; optimization of existing tech	Risk of precarity in some sectors	Incremental, targeted reskilling	Asymmetric skill pressure across educational groups

Table 2. The impact of the four scenarios on skill demand and underskilling was judged by 15 experts.

	Scenario 1: Empowered by Technology	Scenario 2: Techtopia	Scenario 3: Economic Minimalism	Scenario 4: Analog Alliance
Ranking of the demand for different types of skills (the most critical skill is shown first)*				
	1. Analytical skills (1.8)	1. Communication & collaboration (2.1)	1. Communication & collaboration (1.6)	1. Communication & collaboration (1.5)
	2. Communication & collaboration (2.5)	2. Analytical skills (2.3)	2. Analytical skills (2.0)	2. Analytical skills (2.1)
	3. Digital skills (2.7)	3. Digital skills (2.6)	3. Technical skills (3.1)	3. Technical skills (3.1)
	4. Technical skills (3.0)	4. Technical skills (3.1)	4. Digital skills (3.3)	4. Digital skills (3.3)
Percentage of experts that judge workers with different educational levels to become underskilled				
Low educated	80%	100%	67%	60%
Middle educated	53%	27%	33%	27%
High educated	13%	27%	33%	40%

*The scores in brackets represent the average skills ranking by the 15 experts. Scores can range from 1 to 4, with lower scores indicating greater importance compared to other skills.

and problem-solving. The low-skilled workforce faces a significant skills mismatch as routine work, such as data entry, telemarketing, customer service and assembly line work, is increasingly replaced by robot and AI technologies, necessitating the search for different jobs.

Scenario 2: techtopia

In this scenario, skills mismatches and the need for new skills are most pronounced. The digital transformation and globalization are transforming the EU job market, heightening the demand for high and medium-skilled workers. Anticipated technological advancements, especially in AI, increase the need for technical expertise. Automation and outsourcing bolster productivity, stimulating adaptable work arrangements and transitions into diverse roles. This trend propels the surge in remote digital work. Still, it also exacerbates substantial skills mismatches for low-skilled workers, particularly in the manufacturing sector, who now face heightened necessity to transition between jobs. With technology handling routine tasks, the significance of human interaction and soft skills, including creativity and problem-solving abilities, becomes increasingly paramount.

Scenario 3: economic minimalism

Although firms still invest in innovations, the stagnating digital transformation creates less of a need and necessity to learn new (technical, digital, analytical and cultural) skills. However, due to job relocation and the need for workers to seek employment in different sectors, certain workers need to acquire new skills. The pace of development aligns with the speed at which individuals can readily learn new skills. While stagnation of the digital transformation may imply a reduced demand for highly educated workers, Western EU countries continue to rely on such skilled individuals to drive advancements in research and development, marketing and the service sector. Meanwhile, Eastern EU countries with lower wages see a potential rise in the demand for low- and medium-skilled work in manufacturing, traditional industries and manual labour. The demand for highly skilled individuals has plateaued significantly since the limited technological advancements most impact them.

Scenario 4: analog alliance

Due to limited advancements in the digital transformation, there is a diminished urgency to acquire new skills, as the pace of development matches the rate at which individuals can adapt. While stagnating digital transformation implies a reduced demand for highly skilled workers, Western EU countries continue to rely on such qualified individuals to try to drive advancements again in research and development, marketing, the service sector and global cooperation. Due to the necessity for specialization in a globalized world, medium-skilled workers still have many employment opportunities. This indicates potential avenues for reskilling or acquiring specific skills, as there is a demand for specialized knowledge on a global scale, particularly in sectors driven by international trade.

Impact on socioeconomic inequality within EU countries

Each scenario presents unique dynamics that influence inequality. Overall, most scenarios predict an increase in socioeconomic inequalities within EU countries, driven by both

similar and distinct mechanisms. The specific differences in socioeconomic inequalities within EU countries are discussed below.

Scenario 1: empowered by technology

The digital transformation boosts prosperity and work efficiency but also contributes to social unrest through growing inequality. New technologies, including generative AI, reshape job structures and widen skill gaps, mainly benefiting highly skilled workers with specific expertise, technology knowledge and resources. Higher-skilled individuals progress more rapidly by investing in continuous learning and possibly taking on extra tasks compared to low- and medium-skilled workers. However, AI may reduce job opportunities in specific high-skilled fields, like accountancy, where it can replace many tasks. Workers with routine tasks or in fields affected by trade changes struggle to adapt, exacerbating disparities in income, employment opportunities and overall quality of life. Low-skilled workers, women and older individuals struggle, in particular, to find suitable jobs. The challenge of job displacement and finding new work becomes higher. Reshoring efforts often do not help routine task workers, as automation replaces jobs, posing significant risks to low- and medium-skilled employment, leading to more extended unemployment and fewer suitable job opportunities.

Scenario 2: techtopia

While economic growth and productivity gains are most pronounced in this scenario, inequalities are also experiencing the most significant increase. The income gap and job opportunities between lower and higher-skilled individuals widen the most, driven by globalization and the digital transformation. Adopting new technologies frequently leads to the displacement of low-skilled workers, who encounter challenges adapting to these changes. Consequently, they face heightened unemployment risks and difficulties securing alternative employment amidst technological and global trade shifts. In contrast, high-skilled workers who adapt well to technological changes enjoy more job opportunities and increased wages.

Scenario 3: economic minimalism

Socioeconomic disparity marginally diminishes as the demand for high-skilled individuals declines relative to low- and medium-skilled workers. However, this reduction is tempered by the overall economic stagnation, where higher-educated individuals are most likely to smoothly transition to available jobs and take over some jobs from lower-skilled workers. In addition, this shift brings about a decline in the quality of work and level of challenge, particularly affecting high-skilled workers due to a decrease in dynamic tasks and diminished investment in innovation. Despite the reshoring of some jobs for low-skilled workers, it does not consistently yield improved labour market outcomes. Additionally, the relatively slow pace of the digital transformation or automation still poses a threat of task displacement for lower-skilled individuals, further widening the gap in job opportunities.

Scenario 4: analog alliance

The gap between low-skilled and high-skilled workers is expanding, whereas the disparity between medium-skilled and high-skilled workers decreases. This trend is primarily

attributed to the diminishing job prospects for low-skilled workers, driven by factors such as increased outsourcing, moving production processes outside the EU and the automation of routine tasks. Conversely, there is a rising demand for medium-skilled workers, while the demand for high-skilled workers remains unchanged, particularly for significant international trade requirements, indicating an increasing demand for reskilling or acquiring specific skills for sectors driven by global trade.

Socioeconomic inequality and convergence across the EU

Table 3 summarizes how the four scenarios shape patterns of convergence and divergence in socioeconomic inequality within and between EU regions. The scenario-specific dynamics underlying these patterns are described below.

Table 3. Conditional convergence and divergence channels shaping socioeconomic inequality within and between EU regions.

Scenario	Key convergence/divergence channels	Within-country inequality	Between-region inequality (EU)
Scenario 1: Empowered by Technology	Rapid digital transformation with limited diffusion across regions; weak labour-market adjustment; restricted trade integration	Divergence	Divergence
Scenario 2: Techtopia	Fast technology diffusion enabled by globalization; strong trade integration; uneven skill upgrading across groups	Strong divergence	Convergence (conditional)
Scenario 3: Economic Minimalism	Slow structural change; limited competition; reshoring of production; constrained labour mobility	Convergence (but fragile)	Convergence, but long-erm risk for divergence
Scenario 4: Analog Alliance	Globalization without strong technological pressure; lower adjustment demands; increasing specialization	Mixed	Convergence

Scenario 1: empowered by technology

Scenario 1 leads to divergence in impacts within the EU. Within the EU, Western and Northern regions, which are more high-skilled, benefit the most from the accelerating digital transformation. These regions are better equipped to harness new technologies and innovations, leading to more significant economic gains. In contrast, Eastern and particular Southern regions, which may lack the same technological infrastructure and skilled workforce, lag behind, exacerbating regional inequalities.

Scenario 2: techtopia

Although socioeconomic inequalities increase within EU member states, this scenario leads to between-region convergence within the EU. Within the EU, socioeconomic inequalities are expected to decrease between Western/Northern and Southern/Eastern regions as globalization drives economic growth and international trade. The widespread

adoption of new technologies, facilitated by global connectivity and cooperation, allows lagging regions to catch up. However, there is a risk of divergence if some regions fail to adopt new technologies promptly, potentially creating more inequality.

Scenario 3: economic minimalism

Scenario 3 will likely lead to some short-term between-region convergence within the EU, despite an overall economic contraction. Within the EU, inequalities are expected to decrease slightly in the short term as less advanced countries catch up technologically, albeit at a slower pace due to deglobalization. The limited international trade and cooperation mean that the digital transformation spreads more slowly, but this also means less competition for lagging regions to contend with, allowing them to make gradual progress. Additionally, Southern and Eastern EU countries may benefit most from reshoring and nearshoring. However, in the long term, there are risks of divergence. Lower job opportunities across all skill levels and sustained economic stagnation can increase disparities, particularly affecting vulnerable groups. For example, medium-skilled workers may displace lower-skilled workers in periods of job scarcity.

Scenario 4: analog alliance

Scenario 4 fosters between-region convergence within the EU. Within the EU, inequalities are expected to decrease as less advanced countries catch up technologically and utilize widely available knowledge. The stagnation of digital transformation means that technological advancements are not rapidly outpacing the capabilities of lagging regions, allowing them to make steady progress.

Overall, the scenarios present a mixed picture of the future of socioeconomic inequality within and between EU regions. While Scenario 1 leads to between-region divergence within the EU due to uneven acceleration of the digital transformation and economic gains, Scenario 2, 3 and 4 generally promote between-region convergence, albeit through different mechanisms. Scenario 2, despite having the strongest increases in within-country inequalities, drives between-country convergence through globalization-driven economic growth and technological integration. This reflects that countries converge as average productivity and income levels rise, while within countries the gains from this growth mainly benefit higher-skilled groups. Scenario 3, with economic stagnations, achieves slight convergence due to the technological catch-up of less advanced regions, although at a slower pace due to deglobalization. Scenario 4, under conditions of economic stagnation, also fosters convergence as technological knowledge becomes more accessible and less advanced regions can utilize this knowledge to improve their international socioeconomic position. The interplay between digital transformation and globalization significantly influences whether regions and countries experience convergence or divergence in socioeconomic terms.

Discussion

The scenarios reveal complex dynamics between technological advancement and economic strategies, impacting skill demand and socioeconomic inequality. Except for the 'Economic Minimalism' scenario, all scenarios emphasize the need for quickly changing demand for new digital, technical and analytical skills. In addition, soft skills, especially in communication for global trade, also emerge as crucial. This highlights the necessity of a

balanced skill set for future labour market success. While previous studies (e.g. Kotsiou et al. 2022; Poláková et al. 2023) have identified problem-solving and communication as the most essential future skills, our findings stress their importance across almost all future scenarios. Moreover, our research emphasizes the need to quickly adapt to changing skill demands, which vary across different scenarios. For instance, in an accelerating digital transformation scenario, digital and AI skills may be more critical, whereas communication skills are more vital in a further globalizing scenario. Furthermore, all scenarios indicate that inequalities could be exacerbated. Low-skilled workers, women and older individuals may struggle to adapt, widening employment opportunity gaps. Conversely, high-skilled workers are better positioned to cope with changing market demands and benefit from new opportunities.

Baldwin's (2016) hypothesis posits that economic between-country or between-region convergence is driven by advancements in communication technology. Our findings support this, indicating between-region convergence within the EU in most scenarios, especially under globalization, which underscores the importance of technological skills and the economic growth potential of digital transformation. Andrei et al. (2023) also indicated that rapid digital transformation can foster regional convergence. However, between-region divergence risks also arise in scenarios with accelerated digital transformation, particularly if coupled with deglobalization, as some regions struggle to adapt swiftly. For instance, Southern EU member states have fallen behind in convergence in GDP growth per capita (Schout and van Riel 2022). This aligns with Garmann Johnsen et al. (2024), who found that while EU regions have shown convergence over the past 25 years in indicators such as unemployment rates, educational attainment and purchasing power standards, this trend is more pronounced in Eastern than in Southern EU countries. The social models in Southern EU countries seem to confine them to specific trajectories, hindering their ability to break free from established patterns and enhance their socioeconomic status. In line with Baldwin (2016), these findings indicate that convergence is conditional on the capacity of regions to adapt their institutions, labour markets and skill systems to the accelerating digital transformation.

Korinek and Stiglitz (2021) emphasize that new technologies often benefit developed countries through labour-saving, resource-saving efficiencies and winner-takes-all dynamics, necessitating inclusive policies to ensure convergence. Our findings confirm this perspective, showing that globalization combined with digital transformation generally promotes convergence by enabling economic growth and technological integration across regions. However, benefits may disproportionately favour already developed regions without inclusive policies, creating divergence risks. The complex interplay between digital transformation and globalization in shaping future socioeconomic developments underscores the need for policies promoting equal technological advancement distribution. Moreover, the scenario results point to non-linear dynamics, whereby higher levels of digital intensity may be associated with increasingly polarized outcomes, a pattern consistent with recent empirical evidence on threshold effects and winner-takes-most dynamics in advanced economies (Baffour Gyau, Li, and Appiah 2025).

Policy implications

Each scenario presents unique opportunities and challenges for achieving shared prosperity, particularly in skill development and socioeconomic inequality. Shared challenges across scenarios include persistent inequality and the need for upskilling and reskilling, especially for vulnerable groups such as those from disadvantaged socioeconomic

backgrounds, women, older individuals and migrants. At the same time, the scenario analysis shows that the relative importance of policy levers differs across scenarios, implying the need for a comprehensive and flexible regional, national, EU and global policy approach to address these challenges.

Key policy recommendations include prioritizing continuous learning, reskilling and upskilling initiatives, particularly in sectors expected to grow due to emerging technologies. In scenarios characterized by accelerating digital transformation, such measures are especially critical to manage rapid shifts in task composition and skill demand and to prevent widening gaps between educational groups and firms. Second, financial support for companies, especially for SMEs, is needed to adapt to a rapidly changing labour market. Third, policies should focus on increasing occupational mobility and providing pathways for vulnerable workers to secure employment through transition support systems capable of responding quickly to labour market changes. This includes flexible working hours, accessible childcare and recognition of foreign qualifications using EU-wide skills certification frameworks, as also recommended by Draghi (2024). In scenarios marked by slower technological change or deglobalization, such mobility-oriented and stabilizing measures become particularly important to mitigate job scarcity and long-term exclusion.

Fourth, integrating cross-policy domains is crucial, as the results highlight the importance of incorporating social aspects, such as working conditions and socioeconomic equality, into EU industrial policy. Fifth, lagging regions need more support. Although convergence is expected in most scenarios, the risk of lagging regions remains with deglobalization and rapid digital transformation. This implies that policies aimed at fostering between-region convergence need to be complemented by targeted measures addressing within-country inequality, particularly across educational groups. This tension is particularly evident in scenarios such as Techtopia, where between-country convergence coexists with rising within-country inequality. Schout and van Riel (2022) indicate that the primary responsibility lies at the national level and that the quality of institutions plays the most prominent role. They argue that economic policy initiatives, rules, regulations and oversight at the EU level have been ineffective, underscoring the need to strengthen national institutions. Baldwin (2016) suggests that policies should shift towards enhancing service-sector employment over manufacturing, focusing on creating good quality jobs without solely relying on the manufacturing sector, supporting and encouraging firms' participation in global value chains and focusing on protecting workers rather than jobs.

From a policy perspective, these findings caution against assuming that continued digital transformation or deeper globalization will necessarily reduce inequality. Instead, the effectiveness of policy interventions appears to be conditional on institutional capacity and the broader technological context, echoing Baldwin's (2016) critique of one-size-fits-all policy approaches. This underscores the need for adaptive and inclusive policymaking that explicitly accounts for the uneven social consequences of technological and economic change.

Regional, national and EU-level policymakers must prepare for all scenarios by ensuring flexibility, resilience and the ability to adapt quickly using multi-domain approaches to address complex challenges. Policies should be designed to handle both anticipated and exceptional scenarios, fostering a mindset of long-term thinking and rapid decision-making.

Strengths and limitations

The strength of our study lies in its comprehensive approach, which incorporates state-of-the-art literature and insights from existing quantitative econometric analyses conducted

within the GI-NI project, used to inform and validate the qualitative scenario assessment. It also involves a wide range of renowned international experts in subsequent rounds, thereby strengthening the validity of the scenarios.

The study also has some limitations. Developments related to the energy transition were not explicitly incorporated or weighted in the scenario construction, even though empirical evidence shows that decarbonization is closely linked with skills demand, task reallocation and labour-market adjustment in Europe (OECD 2024b). Existing research indicates that more ambitious energy-transition pathways tend to accelerate shifts in skill requirements across sectors, intensifying reskilling needs and adjustment pressures, particularly in emission-intensive and related activities (OECD 2024b). In scenarios characterized by rapid digital transformation (i.e. scenarios 1 and 2), a simultaneous acceleration of the energy transition would therefore further amplify skills demand, reinforcing pressures on task reallocation and workforce adaptation beyond those driven by digital transformation alone. Workers in emission-intensive activities face higher risks of job loss and more difficult transitions, which without sufficiently strong accompanying labour-market and social policies, may increase within-country inequality (EPRS 2024; Malerba 2022). Conversely, slower or fragmented energy transitions may temporarily dampen adjustment pressures, but risk locking workers and regions into lower-productivity trajectories, thereby weakening longer-term convergence prospects (Grashof and Basilico 2024). This implies that conclusions on convergence and divergence, particularly within countries, should be interpreted with caution where the digital transformation, globalization and energy-transition dynamics interact. Future research could therefore extend the scenario framework by explicitly incorporating energy transition pathways alongside the digital transformation and globalization dynamics.

Second, while our analysis is grounded in existing scientific literature and informed by existing econometric analyses from parallel GI-NI research, this foundation does not enable us to make precise predictions. In line with the objective of strategic foresight studies, our approach aims not at predicting the future but at delineating potential scenarios. Nonetheless, our study meets the quality criteria for qualitative research, including trustworthiness, credibility, authenticity and plausibility (Given 2008). This strategy also allowed us to offer policy implications for various possibilities, equipping policymakers with the tools to anticipate and adapt to diverse future developments effectively.

Conclusion

The theoretical debate on globalization and digital transformation points to several possible futures. In this study, we leveraged this heterogeneity to identify four precise scenarios. These scenarios enable European and international experts to assess anticipated socioeconomic inequality and skill mismatches. Four distinct scenarios were analyzed to understand how varying developments in digital transformation and globalization could shape the world by 2030 and beyond. The assessment of these scenarios reveals that economic growth occurs with accelerating digital transformation, irrespective of globalization or deglobalization. Conversely, economic stagnation is observed when digital transformation slows, even with increased globalization. Economic contraction is evident when stagnation of the digital transformation coincides with deglobalization.

Regarding skill mismatches, the scenarios emphasize the need for workers to invest in a diverse skill set. Most scenarios highlight the importance of digital, technical and analytical skills. Soft skills, particularly communication for global trade, are also crucial in several scenarios. The ‘Economic Minimalism’ scenario is an exception,

where advancements in digital transformation stagnate and therefore, relatively more practical skills are needed. A balanced combination of technical and interpersonal skills is essential for success in the future labour market.

Technological progress and economic strategies can exacerbate socioeconomic inequality. Three of the four scenarios suggest that inequality may increase, particularly affecting low-skilled workers, women and older individuals. High-skilled workers are likely to fare better due to their ability to adapt to changing market demands.

Baldwin's (2016) hypothesis posited that advances in communication technology foster economic convergence, primarily between countries and regions. Our scenario analysis refines this insight by showing that such between-region convergence within the EU is highly conditional on the interaction between globalization and the pace of digital transformation. Across scenarios, similar patterns in skill demand emerge, pointing to shared structural pressures on labour markets. However, these common skill requirements do not translate automatically into convergent socioeconomic outcomes. Instead, our findings show that between-region convergence may coexist with persistent or increasing within-country socioeconomic inequality, particularly between educational groups. This highlights that digital transformation and globalization can align skill demand across the EU while simultaneously producing divergent distributional effects. Consequently, even where between-region convergence appears likely around 2030, addressing within-country inequality and skill mismatches remains a central policy challenge. This underscores the need for adaptive and inclusive policymaking that explicitly accounts for the uneven social consequences of technological and economic change.

Across the scenarios, different policy levers become important depending on the dominant adjustment mechanisms. When accelerating digital transformation leads to rapid task reallocation and rising skill requirements, reskilling and inclusive transition support are the main policy levers to prevent widening inequalities between educational groups. In scenarios where adjustment is constrained by limited job creation or economic stagnation, occupational and regional mobility becomes more important to reduce risks of exclusion. Where global integration reshapes labour markets without corresponding technological upgrading, inclusion-oriented measures, such as protection against job precarity and equal access to skills and employment, are crucial to prevent increasing within-country divergence. This shows that, while many policy instruments are relevant across scenarios, their emphasis and design need to remain adaptive in order to respond to scenario-specific adjustment mechanisms and distributional effects.

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Notes on contributors

Gerben Hulsegge received his PhD from University Utrecht, the Netherlands, in 2016. As a researcher at TNO (Netherlands Organisation for Applied Research), he studies technology and digitalization in relation to the labor market. His research primarily focuses on how technological advancements affect workforce employability, job quality and company competitiveness. He also develops and evaluates innovative solutions to tackle the challenges emerging in these areas. He co-authored book chapters in publications such as The Research Agenda for Workplace Innovation (Edward Elgar Publishing) and contributed to journals like the Journal of Innovation Management and Scandinavian journal of work, environment & health.

Steven Dhondt received his PhD from Leiden University, the Netherlands, in 2000. As a senior researcher at TNO (the Netherlands) and visiting professor at the KU Leuven (Belgium), he coordinates a major research program at TNO on Smart Working, developing insights on the impacts of robotics and digitization on organizational practices and major EU-granted research programs H2020 Beyond4.0, H2020 GI-NI, HorizonEurope Bridges 5.0 and HorizonEurope Seismec. Next to his research work, he has been pushing the European learning network on Workplace Innovation (EUWIN) since 2013, is on the Steering Board of the Community of Practice Industry 5.0 of the European Commission and advisor on working conditions survey for Eurofound. He has authored several books and co-authored papers in the European Journal of Workplace Innovation, New Technology, Work and Employment, Applied Ergonomics, Team Performance Management.

Marieke Van Den Tooren received her PhD from Eindhoven University of Technology, the Netherlands, in 2011. Marieke is work and organizational psychologist and has done much research into the relationship between working conditions and the well-being of employees. As a researcher at TNO (Netherlands Organisation for Applied Research), Marieke focuses on (regional) partnerships that connect working, learning and innovation; the inclusion of people with a vulnerable labor market position; and skills.

Data availability statement

Raw data were generated at TNO. Derived data supporting the findings of this study are available from the corresponding author [GH] on request.

Supplemental data

Supplemental data for this article can be accessed online at https://doi.org/10.1080/13511610.2026.2656886.

ORCID

Gerben Hulsegge http://orcid.org/0000-0003-4649-9436
Steven Dhondt http://orcid.org/0000-0002-8888-5231
Marieke Van Den Tooren http://orcid.org/0000-0001-7864-0110

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