



Growing Inequality:
a Novel Integration of
transformations research



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D7.4 Report: Future challenges to shared prosperity: barriers, needs and opportunities

Scenario-based analysis on the future impact of digitalisation and globalisation on socio-economic inequality and skill demand

WP7 (Future scenarios: design, analysis and outcomes)

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Summary

This report examines the implications of four distinct scenarios on inequality and skills demand within the European Union up to 2030. The scenarios are based on potential trends in digital transformation—either stagnation or acceleration—and globalisation—either further globalisation or deglobalisation. Each scenario highlights unique barriers and opportunities for prosperity, socioeconomic equality and skills, necessitating tailored policy responses. The report addresses the increasing complexity of navigating inequality and skills demand in different contexts. It identifies the required responses across various action domains, including education, skills development, labour market regulation, migration and mobility and economic resilience.

While some policies can be applied robustly, their effectiveness varies across scenarios, highlighting the importance of adaptive policymaking. Key insights reveal that shifts in skill demands impact diverse groups unevenly in all scenarios, necessitating agile and adaptive reskilling and job-transitioning systems. Furthermore, economic resilience and inequality are closely linked, requiring policies that support small and medium enterprises (SMEs), ensure fair competition, and maintain economic stability. Flexible yet protective labour market regulations are essential to accommodate the evolving nature of work and career transitions. Effective integration of migrant workers can mitigate labour shortages and promote equality, calling for a directed European policy approach. The report also emphasises the critical role of fostering stakeholder cooperation to implement these policies effectively, promote equality and address labour shortages and skill mismatches.

By addressing the complex challenges of socioeconomic inequality and skills demands, this report moves the debate forward with a detailed, scenario-based analysis and a robust framework for policy adaptation. In an upcoming report under the GI-NI work package 8, we will expand on these policy implications, developing a more refined and focused policy approach that aligns with and complements existing policy frameworks and governance structures.

1. Introduction

European labour markets are experiencing significant changes driven by digitalisation, globalisation, and migration. These forces are reshaping skill demands and can exacerbate socio-economic inequalities through complex and uncertain trajectories. This report is part of the EU-funded GI-NI project, which aims to unravel the unique and interacting effects of the three forces of digitalisation, globalisation, and migration on skill demands and socio-economic inequalities, preparing various stakeholders and policymakers for different futures.

Historically, there has been a shift from a neo-liberal "hands-off" approach towards a more proactive governmental role in steering globalisation and technological advancements (Schot & Steinmuller, 2018). This shift necessitates critically evaluating strategies to maximise societal benefits and reduce inequalities. To this end, this report offers an evidence-informed foresight of four future scenarios to provide crucial insights into the challenges ahead. It proposes a comprehensive set of actions to equip policymakers with the tools needed to tackle the intertwined challenges of socioeconomic inequality and skills shortages or mismatches in an era marked by both opportunities and risks associated with technological and global shifts.

Strategic foresight, or the practice of exploring multiple potential futures for policy (Koen et al., 2023; Preenen et al., in press), is particularly useful for navigating the uncertain impacts of digitalisation, globalisation, and migration. This approach does not aim to predict exact future events but rather to sketch potential societies of the future to enhance preparedness for various possibilities the future may hold. By considering these futures, policymakers, private sector actors, social partners, and EU citizens can better equip themselves for the challenges and opportunities that lie ahead.

Anticipating Policy Needs: insights from the GI-NI Scenarios

This report builds on prior GI-NI research that established four scenarios in work package (WP) 7 (Mathijssen et al., 2024) based on potential trends in digital transformation—either stagnation or acceleration—and globalisation—either further globalisation or deglobalisation. Additionally, it considers developments in labour migration and mobility that these scenarios entail (more details of the scenarios are presented in Chapter 2 and Appendix A). This report discusses these scenarios' implications on the future policy repertoire needed to ensure prosperity and socio-economic equality.

This report provides an in-depth qualitative assessment of the four scenarios' underlying dynamics, the drivers and inhibitors of both positive and negative outcomes, as well as resulting policy challenges and needs. The policy challenges emerging from our scenario analysis require tailored solutions, which this report contributes to identify and structure into action domains for policymakers. We provide an extensive overview of potential policies to address future challenges. In subsequent GI-NI reports (GI-NI project WP8), we will build on this assessment to develop a more focused policy approach that aligns with current policy frameworks and governance structures.

Structure of the report

Chapter 2 summarises the principal methodology used for developing the scenarios. Chapter 3 introduces the scenarios as a result of previous foresight activities. Chapter 4 describes each scenario's barriers, challenges, opportunities, and policy needs. Chapter 5 discusses a policy repertoire to address the policy needs identified in Chapter 4 in the following five action domains: education, skills development, labour market regulation, migration, and economic resilience. Chapter 6 summarises and evaluates the preliminary robustness and adaptability of the policies discussed and formulates the main conclusion. A note on the methodology, extensive scenario descriptions, and extensive tables with barriers, challenges, opportunities and needs per scenario can be found in Appendices A, B and C.

2. Methodology

We followed an interactive approach to analyse the scenarios and shape the policy recommendations, developed in a prior GI-NI deliverable (Preenen et al., 2024). Scenarios were developed using a mixed-method foresighting approach, incorporating quantitative findings from the GI-NI studies WPs 3-6 ([DELIVERABLES – Gini-Research](#): Boza & Reizer, 2023; Los, de Vries & Ye, 2023a; Los, de Vries & Ye, 2023b; Los et al., 2023; Los & Ye, 2023; Nikoloya, 2023; Rademakers, 2023) on the impact of digital transformation, globalisation, and migration on skill demand and socio-economic inequality, alongside desk research and qualitative consultations with experts. These scenarios have undergone validation via interviews and workshops with international experts specialising in technology, migration, globalisation, skills, and inequality.

A series of internal workshops and meetings with TNO researchers were conducted to translate the impacts of globalisation, technological development and migration to underlying policy needs. We compiled a comprehensive list of outcomes for each scenario, including productivity and prosperity, skills gap and various aspects of socio-economic inequality. We deployed a backcasting approach to reveal a set of factors that were – in each scenario - either barriers or opportunities to more desired outcomes drawing upon previous GI-NI research ([DELIVERABLES – Gini-Research](#): Boza & Reizer, 2023; Los, de Vries & Ye, 2023a; Los, de Vries & Ye, 2023b; Los et al., 2023; Los & Ye, 2023; Nikoloya, 2023; Rademakers, 2023). Based on the combination of identified barriers and opportunities, we distilled the specific policy needs required to achieve the desired outcomes for each scenario. These needs were then consolidated into a comprehensive policy repertoire covering the four scenarios and categorised into the following five specific action domains: Education, Skill Development, Labour Market Regulation, Migration/Mobility, and Economic Resilience.

We selected policy options to ensure coverage of the most critical needs, with some policies relevant across all scenarios and others tailored to specific ones, reflecting the changes driven by technological advancements and globalisation. This approach resulted in a diverse set of measures designed to tackle the varied challenges anticipated in each scenario. This policy repertoire will serve as the foundation for the forthcoming reports of WP8 of the GI-NI project. More details on the methodology can be found in Appendix A.

3. Globalisation and digitalisation: key drivers of the scenarios

This section introduces the *why's* and *what's* of the scenarios. The scenarios are based on potential trends in digital transformation—either stagnation or acceleration—and globalisation—either further globalisation or deglobalisation (Figure 1).

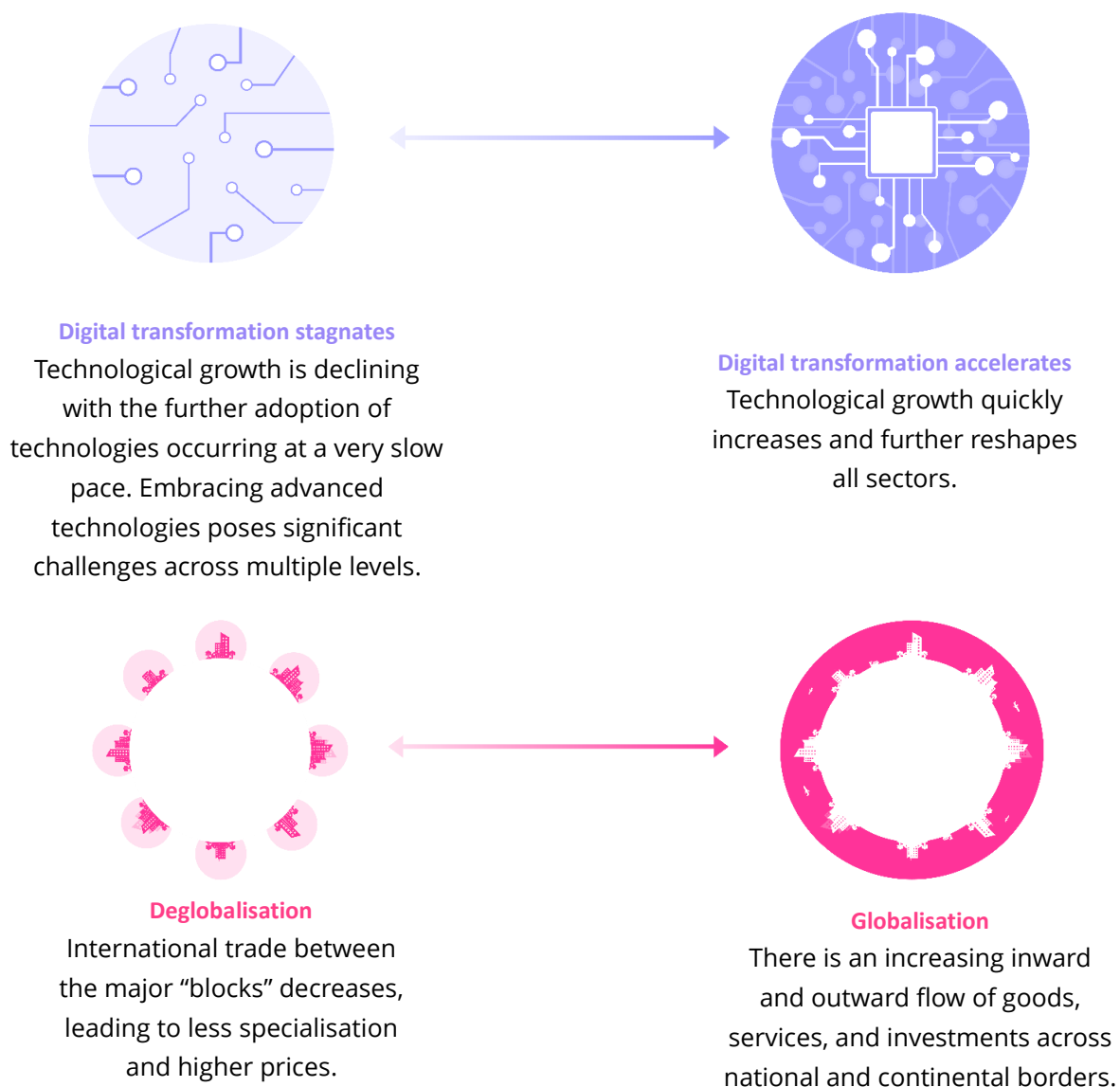


Figure 1. Forces Driving the GI-NI Scenarios

Digital Transformation: Acceleration or Stagnation

The pace of digital transformation hinges on whether it will continue to evolve rapidly. While the majority opinion is that digital transformation will persist (World Economic Forum, 2023), the speed

of its progress could either accelerate or plateau (Bloom et al., 2020). A key example is the development of AI. In the last decade, the integration of graphic processing units (GPUs) revolutionised AI significantly enhances its capabilities in pattern recognition and machine learning. However, realising AI's potential remains to be determined: substantial research budgets and large-scale projects do not guarantee breakthroughs. Also, in the face of rapid development, widespread adoption is not a given. Many experts argue that AI systems need to be more mature for reliable employment by themselves (Wilson & Daugherty, 2018). If breakthroughs and their adoption become a reality, however, the paradigm behind automation would drift away from the automation of routine tasks as in the last 50 years (Autor et al., 2003; Acemoglu & Autor, 2011; Arntz et al., 2024), towards the frontier automation of non-routine tasks. Despite researchers having made efforts to assess what tasks and occupations could be affected by this frontier automation (Brynjolffson and Mitchell, 2017; Frey and Osborne, 2017; Brynjolffson et al., 2018), uncertainties persist on the extent and labour market outcomes of AI adoption.

Globalisation or Deglobalisation

The future of globalisation—or its reverse, deglobalisation—poses the second significant uncertainty. Trends away from globalisation may either continue, stall, or reverse (Preenen et al., in press). Traditionally enabled by World Trade Organization (WTO) rules, the robust flow of goods, services, and investments, globalisation, supports the outsourcing of production to cost-effective regions, enhancing global value chains (GVCs) and focusing advanced economies on high-skilled activities like R&D. Conversely, geopolitical developments of the past decade, like Brexit, the Russian invasion of Ukraine, and Chinese-American trade disputes have rendered further deglobalisation more likely. This shift could reduce both imports and exports, aggregate demand and specialisation, increase self-reliance and potentially raise prices if production returns to domestic settings.

Interaction of the Two Drivers

Digital transformation and globalisation are deeply intertwined. Digital advancements have historically promoted a more interconnected world, as seen in communication and satellite technology improvements (Preenen et al., 2023). This interconnectedness drives innovation, with digital transformation playing a pivotal role (Skare & Soriano, 2021). Globalisation expands

businesses' access to diverse markets, while digital technologies enable efficient engagement with these markets, aiding the global expansion of operations.

The four scenarios in Figure 2 are based on the interaction between digital transformation and globalisation. These scenarios offer diverse perspectives on the future, each with unique implications for skill demand and socio-economic inequality. By 2030, it is improbable that any scenario will unfold precisely as envisioned. Instead, we will likely see a fusion of these dynamics, with elements from multiple scenarios manifesting concurrently. Leveraging insights from various aspects of these scenarios is crucial for informing policy development, particularly in contexts where hybrid scenarios prevail.

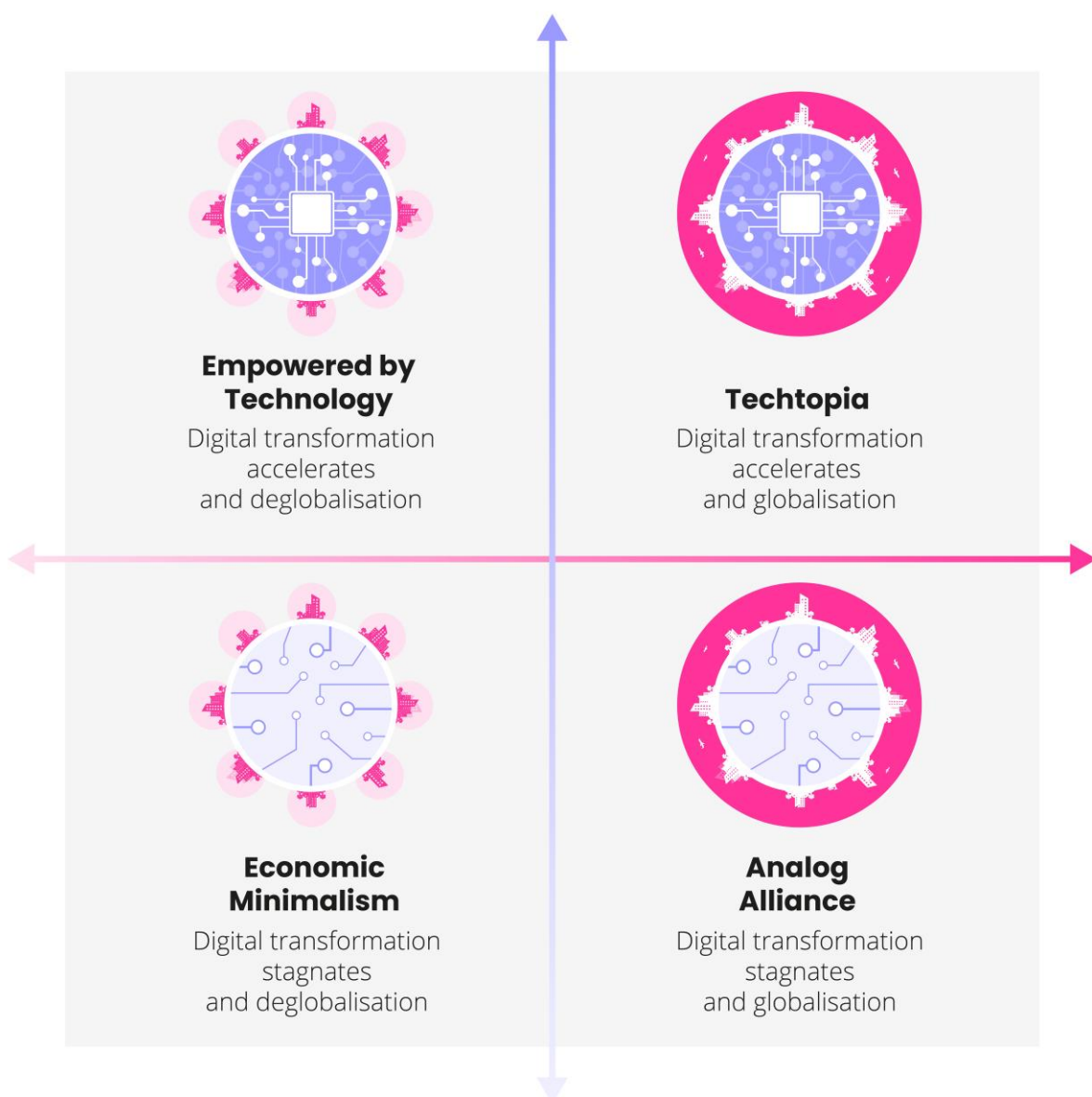


Figure 2. The four scenarios are based on two drivers: digital transformation (vertical axis) and globalisation (horizontal axis)

We also consider developments in labour migration and mobility. In this deliverable, labour migration is viewed as a factor influenced by globalisation and the specific developments within each scenario. Therefore, migration and mobility are discussed within the context of each scenario rather than as separate drivers.

Chapter 4 briefly describes each scenario and introduces its barriers, opportunities, and policy needs. Extensive descriptions of the scenarios are available in Appendix B, Hulsege et al. (2024), and Mathijssen et al. (2024).

4. Barriers, opportunities and policy needs per scenario

Identifying and understanding the potential barriers, opportunities, and needs that could emerge when examining future scenarios is crucial.

- **Barriers** refer to obstacles that impede progress within a scenario, often leading to undesirable outcomes or acting as inhibitors of favourable ones.
- **Opportunities** are favourable conditions that facilitate positive outcomes or prevent adverse outcomes.
- **Needs** are essential requirements that address barriers and capitalise on opportunities to ensure favourable outcomes.

Our analysis focused on four primary outcomes in each scenario: productivity, prosperity, skills demand, and socioeconomic inequality. This chapter describes each scenario's barriers, opportunities, and needs. A summary of the main needs per scenario can be found at the end of Chapter 4, in Figure 3. Tables with an overview of all barriers, needs, and opportunities are available in Appendix C.

Scenario 1: Empowered by Technology

This scenario entails a future where **digital transformation** rapidly advances, but **deglobalisation** sets in. Digital advancement causes processes to become more efficient and EU economies more productive. The demand for digital skills is rapidly increasing, and job profiles are evolving quickly. Deglobalisation hinders the transfer of innovative technical knowledge and concentrates its development and uptake within dominant power blocks, primarily led by the United States (US) and China. Similarly, deglobalisation decelerates migration and economic collaboration. This leads to less international political trust and adherence to multilateral trade agreements.

Barriers

Digital transformation drives the divide in job opportunities between high-skilled workers and others. Rapid changes in skill demand cause workers to need more digital skills or render them outdated, hindering them from participating in the labour market (Right, 2019). Those who can adapt thrive, especially higher-skilled workers. This is particularly pronounced between jobs with high and low shares of technical skills, as demand surges for high-skill positions with large technical jobs while low and medium-skill roles decline (Acemoglu & Autor, 2011; Autor et al., 2003). On the supply side, a shortage of skilled talent caused by demographic changes and reduced

availability of international talent outside the EU is expected to become a significant challenge (European Commission, 2018; OECD, 2023). In sum, increasing demand (and lowered supply) of advanced digital skills increases socioeconomic inequality between those in high-skilled relative to low and medium-skilled occupations.

Socio-economic gaps between large versus small to medium enterprises are expected to increase, particularly in sectors that produce or profit from technological innovation. Large multinational tech companies at the forefront of technological advancements with extensive internal know-how are expected to benefit over-proportionately from digitalisation, especially AI (Van Reenen, 2018; Autor, 2020). This advantage widens the resource gap between small and medium enterprises (SMEs), making large companies more attractive to technical talent and reinforcing a "success-to-the-successful" archetype (Van Reenen, 2018). Consequently, SMEs face increasing difficulties in competing for technical talent, risking their competitive edge and hastening the shift in market dynamics towards larger companies.

Gender inequality in job opportunities and wages is projected to rise because of digitalisation and deglobalisation. The rise in demand for technical skills and the increased share of wealth created through technical progress and digitalisation benefits men more than women, as men are overrepresented in STEM fields of labour. The labour market shift towards more technical jobs and increased automation of routine/low-skilled jobs create imbalances that disadvantage women's economic position, reducing women's labour market participation and widening the gender wage gap (e.g., Aksoy et al., 2021; Blau & Kahn, 2017). Women's limited access to digital education and services relative to men also widens the gender divide in digital skills (Wajcman et al., 2020). Women's limited involvement in digitalisation, especially in AI, might further exacerbate gender bias in AI systems (Wajcman, 2020). Furthermore, deglobalisation likely stagnates women's economic empowerment due to deteriorating foreign investments, global anti-discrimination policies, and health protection laws (e.g., Erixon, 2018).

Lastly, deglobalisation in this scenario increasingly burdens the reliability of international trade. Protectionism, national security concerns, populism and supply chain resilience concerns all reduce the trustworthiness of trade agreements (Zahoor et al., 2023). Multilateral organisations like the WTO and their conventions struggle to keep their say.

Opportunities

Technological progress also bears opportunities to address skill mismatches and mitigate some socio-economic inequalities. Two factors enable the workforce to counteract skills mismatches: First, increasing productivity can free up workforce capacities. In certain occupations, automating some tasks enables workers to focus on other tasks, reducing skill shortages. This is primarily limited to occupations with a low or moderate share of task automation and assumes complementary technology use and effective reorganisation (Autor, 2015). Second, AI, like other automation technologies, can also be vital in lowering skill requirements, augmenting workers' capabilities, and accelerating skill development and education. Thirdly, the existing economic interdependence, along with diplomatic relations and the legal foundations of bilateral trade relationships, are likely to facilitate the emergence and continuation of trade agreements and multilateralism after deglobalisation. These factors present an opportunity to sustain supply chain resilience.

Needs

A growing need for dynamic and accessible upskilling and reskilling opportunities emerges as the workforce faces mandatory career transitions. As skill demands change enormously and broadly, unemployment does not just temporarily increase like in times of economic downturn but becomes systematic as specific skills and tasks might not reemerge. Many individuals will require substantial support in navigating new career paths and developing relevant skills. A broad spectrum of digital, analytical, and ethical skills is demanded to complement the technological shifts and organisational changes being implemented. Without adequate support, disparities in how effectively people can adapt to new roles could widen, exacerbating income inequality due to skills mismatches, particularly among slower adapters. This is detrimental to the affected individuals and employers who face a less competent and adaptable workforce. This situation underscores the urgent need for tailored and inclusive reskilling policies.

Social safety nets need to become stronger and more guiding to support those at risk, including low-skilled, migrant, or precarious workers. Mandatory career changes impose particular challenges on workers who struggle to adapt. Safety nets need to mitigate these challenges and enable workers to transition to careers that they desire in the long term instead of what ensures financial survival in the short term.

Furthermore, labour market reforms are needed to facilitate career changes better. By shifting from diploma-based qualifications to competency-based permissions, individuals can engage in various trades based on proven skills rather than formal educational credentials.

Widening gaps in job opportunities between genders creates a need to direct women to STEM subjects. This could be achieved through policies that ensure equal access to education and the uptake of digital skills and innovations. Policies that stimulate women's entrance into technical educational programmes and jobs and reduce gender discrimination and bias towards women in STEM could reduce the gaps emerging in this scenario.

For the EU, promoting cooperation within the EU and with the US to establish new value chains is critical to achieving economic self-sufficiency. Beyond the desire for more resilient value chains, deglobalisation also requires reducing critical resource dependencies. For example, this might be obtained through economic circularity and strengthening bilateral relationships. This requires updating bilateral agreements, potentially deviating from trade conventions. Furthermore, focus on intra-European interests in the domains of financial autonomy and technological sovereignty may become increasingly important.

Scenario 2: Tectopia

In this scenario, digital transformation and globalisation thrive simultaneously. Technological advancements, especially in AI and robotics, fulfil their potential by significantly enhancing efficiency and productivity. This, in turn, propels economic growth and improves overall economic welfare. Investments in research and development open more job opportunities and increase wages. Furthermore, global collaboration intensifies, which boosts international trade, sparks innovation and leads to more outsourcing. Countries and continents increasingly specialise in specific industries and niches.

Barriers

In this scenario, multiple factors increase socio-economic inequality: automation, offshoring and outsourcing. The combination of high technological development and globalisation can reduce wages as well as employment opportunities for low-skill, medium-skill and non-tech high-skill workers in the EU. Rapid changes in skill demand would increasingly challenge workers trying to keep up with the labour market needs. This would disproportionately affect workers whose skill profiles are less in demand and those with limited opportunities for further education or skills development due to precarious employment conditions or lower educational attainments. On one hand, this leads to short-term job losses; on the other hand, it exacerbates inequalities across different education levels and sectors. Workers with a technical background, particularly highly educated and relatively young workers, are expected to profit disproportionately from these developments, while others lag behind. Given that technical workers are predominantly men, gender inequalities in wages and labour force participation are expected to widen further.

A rapidly evolving labour market presents a significant challenge that requires workers from all educational backgrounds to acquire new skills. If shifts in labour demands are quicker than workers' ability to catch up, the labour market risks outpacing itself; skills mismatch, and thus employment and welfare losses, are projected consequences. Mismatches in this scenario would mainly occur in digital, technical, communication, and intercultural skills.

Women's limited presence in STEM fields and higher-skilled roles widens gender pay gaps. Like in Scenario 1, men's economic benefit from digital innovation is higher. This disparity is exacerbated by unequal access to digital services and education, widening the gender gap in digital skills. These factors reinforce gender discrimination and stereotypes, making it harder for women

to pursue tech-driven education and work, leading to precarious employment opportunities in a technology-driven world.

SMEs run behind large multinational corporations, as companies must deal with fast operative transformations and outsourcing within their value chains. Struggling late-adopting SMEs impose a risk for the functionality of markets, particularly those with strong SME representation, as they incrementally lose their competitive edge. Furthermore, market dynamics are threatened by the disappearance of SMEs and the rise of existing and new superstar firms. Firms that leverage technical developments best increase their productivity and reap the benefits of AI and automation. Potential consequences of such - partly foreign – superstar firms can range from further market volatility up to the takeover of whole service sectors, which priorly were essential employers for the local economy.

Increased labour supply due to migration might worsen the position of migrant and native workers in non-shortage occupations. New immigration affects the labour market position of 'native workers'. Their pay may be affected downwards, and job searches might be impeded as labour supply increases. Furthermore, this could decrease the negotiation power of employees, exposing them to worse job conditions. This would mainly be the case for occupations for which there is no shortage and which underlie no rigid accreditation procedures. However, it must be noted that these adverse effects also affect migrant workers themselves.

Opportunities

Labour shortages in the EU are counteracted by productivity increases and migration in essential sectors if they are competitive with another sector. Productivity increases, facilitated by technological development, and workers' capacities are freed up everywhere where production is not increased. Alongside labour migration, which increases labour supply, both can help mitigate labour shortages in essential sectors. Furthermore, an advancement in the application of AI might also be beneficial for the workforce. Next to reducing repetitive tasks, AI could lower entry barriers and enable workers to perform more complex and demanding tasks, augmenting their capabilities. However, productivity increases can also create solid economic sectors with high production, making employment in essential work comparatively less attractive.

Globalisation spreads trade openness, democracy, and protection of human rights, which primarily benefits women, particularly in the global South. Globalising markets and human

rights policies grant women more opportunities to play critical societal roles. This protects the position of vulnerable groups and contributes to women's economic empowerment in the global South (e.g., Potrafke & Ursprung, 2012). Furthermore, globalisation and combined technological advancement offer opportunities for flexible, remote work, which benefits women as they more often need to combine paid work with unpaid care responsibilities.

Needs

An essential challenge in this scenario will be managing rapidly shifting skill supply and demands. While detailed shifts in skill demand are subject to deep uncertainty and could only be outlined in directions such as digital or software skills, it can be assumed that the shifts in demand will be fast and intensive. As of now, there are no institutions to deal with this. A dynamic system for facilitating reskilling must be set up to ensure the labour market receives aligned guidance and does not outpace itself. Particular importance should be given to supporting those most impacted by these transitions, with guidance and support tailored to reduce income inequality. This entails additional attention to enable low-skilled and migrant workers to transition into new careers. Additionally, there is an increasing need to integrate gender equality into policies to foster equal wages and labour force participation.

Addressing the stability of markets and the functionality of new technological monopolies is critical. Policies should prevent the rise of new tech monopolies that could dominate the existing economic fields, potentially displacing employment opportunities to a few – potentially foreign – companies, which may threaten the financial resilience of EU countries. Furthermore, markets will benefit from stability by supporting a significant presence of SMEs, which should be aided in transitioning and potentially even safeguarded in the short-term as they navigate this evolving landscape, where they must reassess their position in the market, invest in digitalisation and explore opportunities to outsource and specialise.

Addressing socio-economic inequality by providing equal access to STEM jobs and skills aids women and other disadvantaged workers. Policies that stimulate women's entrance into STEM educational programmes and employment and reduce gender discrimination and bias towards women in STEM are needed to avoid further gender gaps in job security and pay. However, technological skills can also help other disadvantaged groups. They should be considered a vital lever in reducing inequality in this scenario, as they provide entry into a quickly shifting labour market.

Another critical area is preserving collective bargaining opportunities for workers, as technology and globalisation could destabilise their position. Maintaining collective bargaining opportunities is essential to reducing socioeconomic inequality and ensuring workers can negotiate fair wages and conditions despite shifting economic dynamics.

Increasing migration and mobility of workers within the EU should be regulated wisely to prevent adverse effects on socio-economic inequality. To ensure that migration contributes positively to the labour market without exacerbating social inequalities or economic disparities, migrant workers must be equipped to position themselves in the labour market and adapt to changes. Legal hurdles or fully undirected migration can reduce outcomes for migrant workers and labour markets.

Scenario 3: Economic Minimalism

This scenario entails a future where digital transformation stagnates and globalisation regresses. Reduced cooperation and knowledge exchange between blocs further impedes digital transformation. The slowdown in technological progress diminishes labour productivity and global trade, triggering economic growth deceleration and contributing to broader global economic struggles. Escalating country tensions emphasises national sovereignty, curtailing migration between blocs and exacerbating polarisation within and across the EU.

Barriers

The decline in international trade causes companies to experience a decrease in global earnings. While reshored industries present opportunities, there's also the risk of failed efforts in reshoring or adapting to new value chains. Furthermore, geopolitical tensions, protectionist policies, national security concerns, populism, and concerns about supply chain resilience all contribute to a further reduction in global trade and prosperity. Additionally, companies face reduced access to international talent.

Reduced economic activity will exacerbate employment barriers, especially for vulnerable groups, including low-skilled workers, migrants, and women. During economic downturns and periods of job scarcity in this scenario, competition intensifies, potentially resulting in high and medium-skilled workers displacing the lower-skilled workers. Vulnerable groups are exposed to increased precarity of labour contracts. While stagnation of digital innovation alleviates gender inequality in the sense that men's relative economic profit from being overrepresented in STEM jobs declines (as opposed to HEED jobs (healthcare, early education, and domestic roles)), deglobalisation in itself forms a barrier to gender inequality on a global scale. It hinders global gender mainstreaming efforts and threatens social protection laws and policies for women and other minorities in countries that do not measure up to international standards (Gray et al., 2006).

Even with technological skills becoming less critical, reskilling will remain essential and could burden low-skilled and middle-skilled workers. With technological growth stagnating, the demand for advanced technology decreases across all education levels. However, changes in GVCs still require workers in specific regions, occupations, and companies to reskill. Economic downturns further strain educational systems, complicating reskilling efforts as workers are less equipped. Economic struggles increase competition for well-paid jobs, generally benefiting higher-skilled workers with more development opportunities, while lower-skilled workers face limited

growth prospects and competitive disadvantages. High-skilled workers experience fewer negative impacts from changing labour market dynamics. It is always crucial for companies to keep up with essential innovations, necessitating the continued need for high-skilled workers. In periods of economic struggle, high-skilled workers may also take over the roles traditionally held by medium-skilled workers.

Opportunities

Low technological development will reduce the gap between high-skill and low- and medium-skilled workers' technological skills, decreasing inequality in job opportunities. An opportunity for stabilising socio-economic inequalities emerges as the rate at which high-skilled workers gain an advantage in technical skills over others declines. Not just the gap in digital and technical skills between low-skilled versus high-skilled workers but also men versus women narrows. This reduced the qualification disparity and allowed previously disadvantaged workers to catch up on the job market.

Reshoring of industries, particularly manufacturing, may increase job opportunities for low-skilled and medium-skilled workers. Reshoring of value chains that were globalised in the past allows for the emergence of new productive industries that generate new demand for jobs. This would greatly benefit many low- and medium-skilled workers who worked in these industries at one point in their careers. Workers displaced from their positions through the recession may also find opportunities in these rising industries, with high-skilled workers having better prospects for transitioning to available roles.

Making optimal use of existing technologies can maintain productivity levels or increase as late adopters catch up, benefitting competition and reducing inequality. As technological progress slows, technological diffusion is not necessarily affected. If late-adopting companies manage to integrate existing technologies into their processes, the productivity of EU economies might remain stable or even increase. As frontier companies have less opportunity to outpace their late-adopting counterparts, markets will face increased competition, which can boost EU economies' resilience. Consequently, the gap between high-earning workers in frontier companies and the others declines.

Needs

Stabilising labour markets with declining demand requires multifaceted policy measures distributed over multiple action domains.

There is a critical need for protection and support for vulnerable groups to prevent labour precarity, safeguard livelihoods, and promote economic stability. Second, guiding the labour market in response to shifts in GVCs is essential to create new job demand for workers at all levels. Supporting companies in adapting to changing business models and market trends is crucial to ensure their resilience and competitiveness. Reforming collective labour agreements is crucial to maintain productivity by fostering collaboration and efficiency within the workforce and also preventing precarious employment.

Reskilling remains essential during the economic downturn, especially in equipping workers at risk with the means to continue participating in the labour market.

Following the relocation of industries, skill demands shift back towards more essential and broad skills, away from high specialisation. During the expected economic struggles, it is crucial to have comprehensive support systems in place to guide and equip those at risk of being overlooked or marginalised. By facilitating their transition through reskilling initiatives that promote inclusivity and equity, these initiatives not only facilitate smoother transitions for affected individuals but also contribute to developing a skilled and agile workforce.

Two-sided challenges through technological stagnation and deglobalisation require heightened investment for economic resilience.

Increased global fragmentation calls for more independence from other countries, yet maintaining a commitment to openness remains crucial. This requires a comprehensive policy strategy that includes rethinking production systems to mitigate supply chain risks and prioritise the production of strategic goods and services either within the Global North or with more reliable partners. In addition, technological sovereignty has become increasingly relevant. This calls for more self-reliance, optimal use of existing technologies, and strengthening innovation through creative solutions that boost productivity.

Scenario 4: Analog Alliance

This scenario entails a future where digital transformation stagnates and globalisation rises. It reflects diminished enthusiasm for rapid technological uptake, leading to a digital transformation plateau. Technological investments fail to deliver expected productivity boosts, stalling economic growth and reducing EU labour demand. At the same time, globalisation persists, with thriving global trade and cultural exchanges. Employment opportunities rise, in particular for medium-skilled workers.

Barriers

Vulnerable groups are expected to be particularly exposed to the consequences of stalling technological development. As digital development stagnates, EU economies are negatively affected by expected stagnating productivity. Vulnerable groups, including low-skilled workers, migrants, and women, are likely to face heightened challenges as economic growth stalls and periods of job scarcity occur. In such times, high-skilled and medium-skilled workers tend to outcompete their low-skilled counterparts, further disadvantaging those with precarious employment contracts.

The gap in job opportunities between low- and medium-skilled and high-skilled workers is expected to widen. Expanding international trade elevates the demand for high-skilled workers with specialised skills. At the same time, the growth in GVCs and the outsourcing and relocation of low-skilled jobs reduce employment opportunities and wages for low-skilled workers (Fons-Rosen et al., 2015). The increasing use of current technologies, including automation of routine tasks, is expected to reduce the number of jobs available to low-skilled modestly. Furthermore, globalisation will be accompanied by an increased inflow of migrants, intensifying competition in the labour market in specific sectors, which could impose a risk with regard to exploitive labour practices for those working at the end of global supply chains.

Skill demand will modestly increase for specialised and intercultural skills and plateau or drop for technical skills. The necessity for skill development is expected to continue as demands shift across sectors, posing a risk to the socioeconomic equality between individuals of varying skill levels, especially vulnerable groups. Upskilling and reskilling are expected to be demanded by specialising industries and increasingly complex GVCs. However, technical or digital skills will differ from what is requested, highlighting variable skill demands across scenarios.

Opportunities

Globalisation enables international protection of women against discrimination, improving women's labour market outcomes globally. High levels of global trade create alignment with trade partners, facilitating the adoption of and adherence to international labour standards and practices that help protect women from discrimination. This reduction in discrimination, coupled with increased opportunities to participate in the labour market, enables women to improve their labour market outcomes.

The reduced pace of technological progress hinders high-skilled technical jobs from outpacing medium jobs, which benefit from globalisation. High-skilled jobs with a large share of technical skills will face setbacks or reduced demands when technological progress slows. Companies may scale back investments in advanced technologies or require fewer highly skilled workers. Consequently, the demand for high-skilled technical workers drops, while there is a relative increase in demand for medium-skilled jobs, depending on factors such as industry and job role.

Needs

Emphasis should be put on measures to protect vulnerable workers from job precarity and exploitation. Addressing the challenges of this scenario requires safeguarding and supporting vulnerable groups, particularly in competitive GVCs enabling further outsourcing of labour. This includes measures to prevent job precarity and the prevention of indecent/exploitative work conditions. A further avenue is to strengthen collective bargaining opportunities in new companies and employment systems, such as platform-based work.

Stabilising labour markets with declining demand requires multifaceted policy measures distributed over multiple action domains. Support and guidance in the labour market amid the evolving GVCs are necessary, as well as exploring new revenue streams that can offer employment opportunities across skill levels. Strong worker representation is vital to safeguard job quality as new roles emerge. Reskilling initiatives following industry relocations demand a resilient and adaptable reskilling system. During the expected economic stagnation, comprehensive support systems must be in place to aid those at risk of slipping through the cracks, ensuring inclusivity and equity in developing a skilled and resilient workforce.

Globalisation necessitates a workforce ready for intercultural relations and high specialisation, directing reskilling demands. As trade globalises, firms are incentivised to specialise and require adequately skilled workers. Moreover, increased trade with new international partners requires intercultural competencies, which were neglected in the past, as the Global North dominated trade.

Scenario 1 – Empowered by Technology	Scenario 2 – Techtopia
- Directed dynamic reskilling of workforce matching changing skill demands (Including monitoring of skill demand changes) - Strengthened social safety to support those at risk of unemployment. - Increased promotion of women's access to STEM jobs - Economic self-sufficiency for the EU	- Directed dynamic reskilling of workforce matching changing skill demands (Including monitoring of skill demand changes) - Strengthened social safety to support those at risk of unemployment - Prevention of technological monopolies, economic regulation in favour of SMEs - Increased promotion of women's and other disadvantaged groups access to STEM jobs - Strengthened collective bargaining opportunities. - More dynamic and comprehensively regulated labour mobility
Scenario 3 – Economic Minimalism	Scenario 4 – Analog Alliance
- Labour market stabilisation through multi-domain policy approaches (especially Economic resilience, Labour Regulation) - Focus on employability and less specialised skills as workers have the chance to catch up with skill demands. - Heightened investment for economic resilience	- Prevention of job precarity and increased outsourcing of jobs - Labour market stabilisation through multi-domain policy approaches (especially Economic resilience, Labour Regulation) - Reskilling towards intercultural and language skills

Figure 3. Summary of the main needs per scenario

5. Policy Repertoire per action domain

In this chapter, we delve into various policy needs linked to the five action domains required to address the complex challenges in a scenario-overarching manner effectively. The action domains are *Education, Skill Development, Labour Market Regulation, Migration/Mobility, and Economic Resilience*. Each paragraph starts with the definition of the action domain. However, it is essential to note that there will be some overlap and links between domains. We then discuss the policy needs, their underlying causes, the implications these policies bear, and the extent to which they are scenario-specific or universally applicable. We subsequently provide a policy repertoire per policy need per action domain. We have divided the repertoire between different types of actors, primarily governmental (national or occasionally specified to the EU), and public-private partnerships (PPPs). Per action domain we provide a summary of the policy repertoire in the text, of the longlist in the tables. The order in which action domains and policy challenges appear is arbitrary; there is no hierarchy of importance.

Education

Definition and Actor Domain

Education refers to programmes aimed at personal growth and knowledge acquisition, with formal education occurring in structured instructional settings such as schools. After completing this process, an individual typically holds a qualification, which is a recognised certification of their educational attainment. After this process, education is also a person's property, usually confirmed by a formal and generally accepted qualification (Descy & Tessaring, 2004).

Education policy is typically the domain of governmental or provincial actors. However, PPPs are essential to foster collaborations between firms, educational institutions, and curricula-setting governmental institutions to ensure education programmes align with industry needs.

Policy Needs and Policy Repertoire

Efforts to close the technical skills gap, resulting from digital transformation and deglobalisation, require an increase of technical skills provided by the education system.

Labour shortages result from declining workers and international talent and rising demand for digital and technical workers. This represents a significant challenge in scenarios marked by accelerating digitalisation, and the challenge intensifies further in the context of simultaneous

deglobalisation. Various policies are needed to address this, including financial incentives for educational institutions to invest in STEM education and keep up with the rapid pace of digital innovations in the high-tech industry, marketing campaigns to alter the field's perception, and partnerships between governments, educational bodies, and tech companies to align educational programmes with industry needs. **(Scenarios 1 and 2)**

Demand for cross-cultural communication skills grows due to increased globalisation and international collaboration. Businesses benefit from specialisation and need workers with the necessary skills as trade becomes more globalised. Furthermore, increased trade with new international partners necessitates intercultural competencies that were previously overlooked due to the Global North's dominance in trade. This can be addressed by integrating intercultural and language skills into educational curricula at all levels and expanding international exchange programmes. **(Scenarios 2 and 4)**

Horizontal gender disparities can be addressed by increasing the number of women entering STEM education. Disparities arise as women are underrepresented in STEM educational programs, which traditionally are connected to higher salaries and career growth opportunities. In contrast, women are overrepresented in relatively low-paid, low-status HEED educational programs. Such disparities could be reduced by creating more aligned inflows into STEM and HEED between men and women. Proposed policies include creating scholarships and mentorship programmes for women in STEM, revising curricula to highlight gender diversity, reducing gender stereotypes, discrimination and unequal financial reward in STEM vs HEED fields (Cheryan et al., 2009; Master et al., 2021; van Laar et al., 2024), expanding digital literacy, and fostering partnerships across governments, educational institutions, and industries to promote gender diversity in all sectors. **(Scenarios 1 and 2 (in specific EU regions also scenario 3))**

In summary, addressing the primary challenges identified in the education policy domain is crucial for equipping the labour force with the necessary skills and reducing disparities. Initiatives should include aligning education with industry needs through partnerships and incentives, integrating global communication skills into curricula, and tackling gender disparities in STEM through supportive measures like scholarships and mentorship programmes.

Table 1 details each need, underlying challenges, relevant scenarios, and suggested policy measures. **Table 1.** Policy Repertoire for Education

Policy challenges, needs, and specifications of the applicable scenario	Potential Policies
Challenge: Digital transformation and deglobalisation lead to fewer international expats and more technological jobs, causing specific labour shortages Need: Increase output of technical graduates and fill the tech-worker gap Scenario: 1 and, to a lesser extent, scenario 2	Governmental actions 1. Offer financial incentives for technical universities and institutions to encourage number of graduates 2. Launch campaigns aimed at changing the gender biased perceptions of technical labour to include a focus on emerging fields like AI, thereby attracting more women to these areas 3. Develop initiatives to improve the school-to-work transition for STEM graduates, focusing on supporting women. 4. Expand inflow to STEM education for underrepresented groups, including women and minorities, through scholarships, targeted outreach programmes, and inclusive curriculum development. Public-private initiatives 5. Foster collaborations between governments, educational institutions, and tech companies to ensure education programmes are aligned with industry needs
Challenge: Globalisation creates larger GVCs, which drive the possibility of working in international teams and companies Need: Need for skills in cross-cultural communication, the ability to effectively work in diverse teams, digital tools for global collaboration Scenario: 2 and 4	Governmental actions 1. Integrating intercultural and language skills into primary, secondary, and higher education curricula. 2. Providing comprehensive training for educators on intercultural sensitivity and teaching methods for foreign languages to ensure they are equipped to deliver these curricula effectively. 3. Expanding support for international student exchange programmes
Challenge: In the context of accelerating technological advancements, gender labour market segregation benefits men more than women Need: Equal opportunities to access labour markets with high digital innovation (STEM) and revaluation of low-paid jobs in care, education, domestic labour (HEED) and reduce gender discrimination in STEM education Scenario: 1 and 2 (in specific EU regions, also scenario 3)	Governmental actions 1. Create scholarships, grants, and mentorship programmes specifically designed to support women pursuing studies and education in STEM fields 2. Expand access to digital skills education for all genders, focusing on both foundational and advanced digital literacy. 3. Revise educational curricula to highlight the importance of gender diversity in all job sectors, including encouraging men to pursue careers in HEED and women in STEM Governmental actions and public-private initiatives 4. Foster partnerships between governments, educational institutions, and industry to collectively work towards gender diversity in all industries

Footnote: This list of potential policies is not exhaustive or comprehensive but offers concrete suggestions for policy measures that could address the policy needs.

Skills Development

Definition and Actor Domain

Skills development refers to the process of consciously acquiring relevant knowledge and experience needed to perform a specific task or job. Our definition excludes training and knowledge gained in the education sector. Training can take place on the job as well as off the job, the latter usually being organised as programmes offering a sequence of courses. The training a person has obtained is usually measured in quantitative terms (duration, frequency), discriminating between types (initial, continuing), degrees of formality and place (Pfeiffer, 2001). Results are capabilities, sometimes certified, but no diplomas.

Currently, executing actors are employers and employees; governmental actors are context-setting. However, we call for the establishment of platforms and institutions which facilitate reskilling in a centralised manner, allowing for more flexible labour markets. This would increase the importance of governmental or EU actors and would call for alignment with firms through PPPs.

Policy Needs and Policy Repertoire

Changes in skill demands render some skill profiles obsolete. Which workers are affected differs significantly over scenarios, requiring adaptive reskilling and lifelong learning institutions. Technology-biased skill demand changes mainly occur with high technological progress, whereas non-routine tasks are increasingly automated. However, skill demand changes are not limited to the consequences of automation. Changes in skill demands occur across all scenarios, each leading to different skill mismatches. In scenarios with high deglobalisation, companies are decreasing in specialisation, leading to less demand for highly specialised skills. Conversely, scenarios of high globalisation call for demand for more specialised, communicational and intercultural skills. Overall scenarios, a need for well-functioning job transitioning and reskilling systems emerges to address skill mismatches as effectively as possible. Particular attention should be paid to policies that guarantee improved access to and opportunity for upskilling and reskilling among female workers, older workers and those with precarious employment conditions (Wajcman et al., 2020). These systems should be adaptive, data-driven, and aligned with firms to accommodate different potential challenges. **(All scenarios)**

With deglobalisation and technical progress, migration falls short to compensate for declining skills supply through demographic change, benefitting from cross-sector mobility.

Two avenues to increase the supply of technical skills remain and must be used more extensively: Career changers and graduates (secondary and tertiary). The former could provide a short- to mid-term influx into technical jobs but requires stimulating and enabling workers to transition. However, as the pool of workers is limited and these technical jobs might outcompete others, as well as essential jobs in attractiveness, a risk of too many workers leaving for tech jobs exists.

(Scenario 1)

Social safety nets need to be reoriented towards more guidance and more robust support for low-educated, precarious and migrant workers as they face strenuous transitions.

This requires a multi-domain approach and is further discussed in the action domain labour market regulation. In this action domain, the “guidance” in “more guidance and stronger support” is considered. Barriers to transitions often are higher for those with lower levels of education, language barriers, and precarious employment. This becomes especially problematic if skill demand changes away from already vulnerable jobs, rendering transitions more straining and requiring more resources of social safety nets. Ultimately, this emphasises the role of social safety nets in guiding and accompanying those who need in-person interactions, for instance, through coaching and workshops. **(Scenarios 1 and 2, partially 4)**

Globalisation drives demand for intercultural workforce readiness, for which workers are often under-equipped, increasing the need for intercultural and language training.

Should globalisation increase and the link to China, for instance, strengthen institutions for training on intercultural sensitivity and foreign languages, it could empower workers and simultaneously satisfy skill demands. Moreover, such training can be subsidised for companies and increase opportunities for economic activity and integration of non-EU employees. However, this is not the standard in many firms, which alternatively seek employees with cross-cultural experience.

(Scenarios 2 and 4)

To conclude, skills development requires adaptive and flexible policy approaches as different extents of globalisation and technological progress impose a heterogeneous set of challenges. A more robust observation is necessary for institutions that enable workers and SMEs to facilitate the necessary transitions, as their priorities differ over scenarios. An additional important consideration of such reskilling institutions is an appropriate connection to state-led social safety

nets, as their role in guiding workers becomes increasingly pronounced. Nonetheless, the widespread need for adaptive labour markets necessitates strong alignment with firms and, according to PPPs. These adjustments are essential to align the workforce with the evolving demands of the global labour market.

Table 2 details each need, underlying challenges, relevant scenarios, and suggested policy measures.

Table 2. Policy Repertoire for Skills Development

Policy challenges, needs, and specifications of the applicable scenario	Potential Policies
Challenge: Digital transformation and deglobalisation lead to fewer international expats and more technological jobs, causing specific labour shortages Need: Enhance cross-sector occupational mobility Scenario: 1	Governmental actions 1. Stimulate and facilitate career changes for technical jobs by offering subsidies for training and educational programmes in high-demand areas 2. Establish incentives for employers that actively recruit, support, and retain STEM graduates, and in particular women 3. Implement a certification system that formally recognises transferable skills across sectors 4. Subsidise development and distribution of AI systems which reduce skill requirements 5. Monitor job transitions to ensure that demand for essential workers remains met in the face of attractive technology company employers Public-private initiatives 6. Ensure alignment between education programmes and industry needs
Challenge: Increasing mismatch in available and needed skills due to changing labour markets. Some workers face the necessity of transitioning due to the disappearance of their tasks, roles, occupations Need: Need for re- and upskilling of workers to facilitate task, role and occupational transitions Scenario: 1, 2, 3, 4	Governmental actions 1. Develop a comprehensive EU-wide skills data infrastructure to track and analyse current and future skills demands across industries 2. Establish and support dynamic adaptive reskilling institutions, focusing on alignment between skills supply and demand across EU countries 3. Create an EU-wide recognised skill certification system that validates the skills individuals acquire through various learning pathways, improving employability by providing a standardised recognition of skills. 4. Promote formal, informal, and non-formal continuous learning systems within workplaces and communities to foster a societal shift towards lifelong learning 5. Offer comprehensive career counselling and planning services that help individuals understand their career paths, including transitions between sectors or occupations. 6. Ensure equal access to upskilling and reskilling for female, older workers and those in precarious jobs Public-private initiatives 6. Enhance access to specialised education by government programmes or partnerships with online education platforms like Coursera

Challenge: Globalisation creates larger GVCs, which drive the possibility of working in international teams and companies Need: Need for skills in cross-cultural communication, the ability to effectively work in diverse teams, digital tools for global collaboration Scenario: 2 and 4	Governmental actions 1. Subsidies for the training of intercultural and language skills in/through companies 2. Creation of institutions that provide comprehensive training on intercultural sensitivity and foreign languages to workers Public-private initiatives 3. State-of-the-art digital tools and platforms that facilitate global collaboration, ensuring teams can work effectively across different locations and time zones
Challenge: In the evolving labour market, individuals with unstable employment contracts, particularly women, those over 50, and low-skilled workers, face higher risks of job loss and encounter difficulties in securing positions that match their skills, posing significant risks to their welfare Need: Accelerated and more supportive processes to aid those who struggle with adaptation in acquiring new skills and increasing their employability Scenario: 1, 2 and 4	Governmental actions 1. Implement comprehensive reskilling and upskilling programmes targeted at vulnerable groups to improve their adaptability and competitiveness in the job market. Focus on digital literacy, soft skills, and emerging industry needs 2. Encourage continuous improvement of employability targeted at vulnerable groups through incentives such as tax benefits, subsidies for education, and recognition of non-formal and informal learning to keep the workforce's skills relevant 3. Invest in comprehensive upskilling and reskilling programmes targeted at low- and medium-skilled workers and other vulnerable groups to improve their employability in the digital economy. Facilitate inclusive anti-discrimination hiring policies Public-private initiatives 4. Provide flexible working arrangements to accommodate diverse needs, including part-time options, remote work opportunities, and flexible hours 5. Facilitate inclusive anti-discrimination hiring policies

Footnote: This list of potential policies is not exhaustive or comprehensive but offers concrete suggestions for policy measures that could address the policy needs.

Labour Market Regulation

Definition and Actor Domain

Labour Market Regulation refers to the domain of regulating labour markets through legislation. This domain defines the context in which companies and workers act, or, in other words, the boundaries of the labour market.

Labour market regulation is key to ensuring rights and certainty for workers and employers in their employment relationships (WEC, n.d.). It traditionally is the sole responsibility of EU and governmental actors, who are encouraged to align themselves with the needs of workers and firms. Certain efforts, like empowering women in entrepreneurship, can also benefit from PPPs.

Policy Needs and Policy Repertoire

Social safety nets need to be reoriented towards more guidance and more robust support for low-educated, precarious and migrant workers as they face strenuous transitions. This challenge requires a multi-domain policy approach and has also been addressed within the action domain of Skills Development. In this action domain, the “support” in “more guidance and stronger support” is considered. In this context, the challenge yields different and more rigorous implications for labour market regulation, as the goal is to safeguard workers as they are still in employment or ensure acceptable living standards as they enter the support systems. Several avenues were identified: increased worker participation in company governance, like worker representation in executive boards, the strengthening of social safety nets, and measures to protect at-risk groups from precarious employment and discrimination. **(Scenarios 1, 2 and 4)**

Workers could lose opportunities to participate as they fall behind quickly changing labour markets, but existing policy approaches could aid if expanded appropriately. Long delays in career changes (i.e., child penalty among women; Kleven et al., 2023) cause skill gaps and inefficient labour markets, limiting workers' opportunities to participate in labour markets. However, the most significant barrier to a career change is recognising qualifications rather than obtaining needed skills. Opportunities include improving regulatory frameworks to accelerate career transitions into skill-based employment, effectively closing labour market gaps, improving worker outcomes, and relieving bottleneck occupations. This can be facilitated by introducing an EU-wide skills certification and recognition system, which has already happened with the Europass. However, inevitable frictions within the Europass persist. One example is the difficulty of linking jobs and

skills to vacancies. Moreover, Europass has not yet helped people transition from one occupation to another using a skills-based approach. To enable skill-based career changes, a system like the Europass platform needs an EU skills supply and demand monitor, which allows for meaningful direction of workers in transition. **(All scenarios)**

As technological transformation accelerates, inequality increases between high-skilled and other workers, and there will also be more struggles related to human labour and automated systems. This necessitates adaptations to the tax and wage systems. These issues originate from a growing wage disparity between tech-savvy, highly educated and tech-exposed, low-educated workers and human labour losing the competitive edge towards technology. Even if human labour is equally productive as a machine, it is taxed much higher than capital, incentivising firms to automate where possible. In scenarios of high technological progress, this would lead to decreasing amounts of tax paid on a growing economy, paid for by the dropping labour share of income. To counteract this, a tax shift away from labour and towards capital (or machines in particular) could level the playing field. Furthermore, redistributing total tax burdens from low-income to high-income occupations, alongside dynamically adjusting minimum wages based on sector-specific labour productivity and cost of living, could reduce the need for more invasive redistributive actions. **(Scenarios 1 and 2)**

It is important to address the gender inequalities following the rapid advancement of digital transformation. Due to higher representation in technical roles, men often gain more economic benefit as digitalisation advances, further entrenching gender inequalities. To address this, it is crucial to expand opportunities for women to enter and participate in STEM careers, and for men to enter and participate in HEED careers (Blau & Kahn, 2017). Furthermore, governmental policies should ensure more balanced financial rewards for labour requiring high levels of digital skills versus human-centred skills, as such status imbalances (**Sullerot's Law**; Pollitzer et al., 2018) significantly contribute to the gender wage gap. The first proposed policy suggests integrating flexible working arrangements and non-linear career path opportunities into labour regulations, particularly in STEM sectors currently characterised by fixed ideal worker norms and employment arrangements, which negatively affect women. This would notably support women in STEM careers by allowing them to balance professional growth with personal responsibilities. Secondly, policies that require companies to disclose pay scales and salaries internally could reduce gender discrimination in financial rewards, thereby helping to ensure fair compensation across genders. Third, low financial compensation and unattractive career prospects (particularly for men) in HEED

careers should be improved to ensure gender equity across labour market sectors that accelerate at different digital speeds (Moss-Racusin et al., 2022). **(Scenarios 1 and 2)**

In conclusion, effectively future-proofing labour markets in transition requires multi-faceted approaches, incorporating other action domains such as skill development but considering what can contribute and what is needed. Close cooperation with firms and integration of workers allows for good stakeholder representation and intelligence on what needs to emerge within labour markets. Moreover, future-proof labour markets require inclusive regulatory frameworks, which facilitate worker participation and ensure equal opportunities among workers.

Each of the needs, underlying challenges, relevant scenarios, and suggested policy measures are detailed in Table 3.

Table 3. Policy Repertoire for Labour Market Regulation

Policy challenges, needs, and specifications of the applicable scenario	Potential Policies
Challenge: In the evolving labour market, individuals with unstable employment contracts, particularly women, those over 50, and low-skilled workers, face higher risks of job loss and encounter difficulties in securing positions that match their skills, posing significant risks to their welfare Need: Additional support for the more vulnerable groups, social safety nets as a safety for those for whom the reskilling system failed, and less gender stereotyping Scenario: 1, 2, 4	Governmental actions 1. Encourage continuous professional development for unemployed people in job transitions, subsidies for education, and recognition of non-formal and informal learning to keep the workforce's skills relevant 2. Strengthen social safety nets by increased funding and streamlining administrative processes, and possibility tailored to the vulnerable groups 3. Support collective bargaining for those in precarious work situations, irrespective of domain (e.g., labour union for unemployed) 4. Prevention of Labour precarity and better working conditions (e.g., tighten regulations around the use of precarious labour contracts and enact and enforce legislation that sets higher standards for working conditions) 5. Targeted regulation for at-risk groups (e.g. specific regulations that protect certain groups against labour market discrimination)
Challenge: In a rapidly changing labour market, an excessive emphasis on formal qualifications can disadvantage skilled workers who lack specific degrees, forcing them to undertake time-consuming education that may hinder their employment prospects and impede labour market fluidity Need: Skills-based hiring as the labour market standard, not a too strict fixation on diplomas or “qualifications” Scenario: 1, 2, 3, 4	Governmental actions 1. Develop a comprehensive EU-wide skills data infrastructure to track and analyse current and future skills demands across industries 2. Create an EU-wide recognised skill certification system that validates the skills individuals acquire through various learning pathways, improving employability by providing a standardised recognition of skills 3. Introduce regulatory flexibility that allows for the rapid adaptation of qualification requirements in emerging fields where traditional degrees may not yet exist or be relevant 4. Implement public campaigns to promote the value of skills-based hiring among employers and the general public
Challenge: Digital transformation increases inequality between low, medium and high-skilled workers Need: Reduction in existing income inequality growth between skill levels (also if inequality growth is negative until the “desirable” state is reached) Scenario: 1, 2	Governmental actions 1. Implement a Progressive Tax Structure 2. Raise minimum wage levels or establish mechanisms for the regular review and adjustment of minimum wage levels based on cost of living, inflation, and productivity growth
Challenge: Technological innovation in a deglobalising world widens cross-national gender gaps in access to and profit from digital innovation. Need: Improve universal access to education and digital skills development across all global regions, in particular for women Scenario: 1, 2	Governmental actions 1. Increase in flexible working opportunities, including regulations that encourage or require companies to offer flexible working options 2. Enact policies requiring companies to disclose pay scales and gender pay gaps both within organisations and across sectors 3. Invest in initiatives designed to diminish gender bias and discrimination in career choices and opportunities Public-private initiatives 4. Support women entrepreneurs and innovators (e.g. funding of mentorship programmes or networks and platforms for women in the digital or technological field)

Footnote: This list of potential policies is not exhaustive or comprehensive but offers concrete suggestions for policy measures that could address the policy needs.

Migration and Mobility

Definition and Actor Domain

The action domain Migration and Mobility refers to policies that aim to change the flow of people moving within or into the EU regarding employment opportunities. Labour migration refers to the movement of people from an origin country outside the EU to stay in an EU host state for a job. In contrast, labour mobility refers to the movement of people from an origin country within the EU to remain in an EU host state for an employment opportunity (Preenen et al., 2024). These actions will be addressed mainly by governments, with the role of public-private initiatives to develop training programmes that match industries' skill needs with the potential of migrant workers.

Policy Needs and Policy Repertoire

To ensure migrant workers can achieve stable and fulfilling employment, there is a pressing need to enhance their labour market outcomes . Migrants, as a particularly vulnerable group within evolving labour markets, face significant challenges when adapting to new job environments. These challenges include difficulties in finding or retaining jobs that match their skills, which can significantly compromise their welfare. To tackle this challenge, a range of policies is essential, including establishing an EU-wide recognised skill certification system, adopting flexible educational frameworks, housing policies enabling mobility, additional supervision in occupational transitions, cultural integration programmes and PPPs with training programmes for migrant workers. **(Scenarios 2 and 4)**

Demographic shifts concern labour shortages, requiring some influx of migrant workers. However, such an influx can be designed to correspond to the labour market and migrant needs. As demographic shifts reduce EU labour forces, labour shortages will increase and spread to system-relevant sectors. Recent research projects labour shortages in advanced economies, including EU economies, to become systemic (Feist, 2024). One way to increase labour supply is through migration. However, prior policy approaches to migration management in the EU have led to tense political climates regarding migration. The EU recently agreed on a common strategy for handling asylum seekers and migrants, which also incorporates the qualifications of migrants but no comprehensive strategy to address labour shortages with migration (European Council, 2024). Concerns about labour migration can be addressed with a sustainably designed influx of migrant workers, which also considers that migrants are enabled to obtain qualifications desired

by EU labour markets. This can be operationalised by dual-track Global Skills Partnerships (GSPs) facilitating training and qualification, employer-employee matches, government-aided integration for working migrants into societies, easier visa application processes, and, in general, easing bureaucratic labour market hurdles where necessary (Clemens, 2015; ILO, 2024). **(Scenarios 1, 2 and, to a lesser extent, 4)**

Policies are also needed to address the barriers to labour mobility across regions. Another solution for the challenge of labour shortages, as a consequence of demographic shifts, is internal EU mobility. Housing-related issues, such as selling, buying, and taxes, frequently play a significant role in transition to a new location. Additionally, in many European countries, workers who transition to different occupations encounter challenges with institutional savings for their retirement period. These issues are even larger transitioning between countries. Policies regarding social security, pensions, and housing can facilitate the movement of workers across borders. To support adaptation through relocating to other regions or switching occupation, these policies at large call for cooperation and coordination between the EU Member States, and across national, regional, and local governments. **(Scenarios 1, 2 and, to a lesser extent, 4)**

Migrant inflow will remain a constant factor in the different scenarios, though it will vary in intensity. Effectively addressing the challenges for migrant workers in the EU necessitates a multifaceted approach, including establishing an EU-wide skill certification system, flexible educational opportunities, and supportive housing policies to improve job adaptation and skill alignment. Additionally, to mitigate labour shortages, promoting a sustainable influx of migrant workers through GSPs, streamlined visa processes, and reduced bureaucratic barriers is essential.

Table 4 details each need, underlying challenges, relevant scenarios, and suggested policy measures.

Table 4. Policy Repertoire for Migration and Mobility

Policy challenges, needs, and specifications of the applicable scenario	Potential Policies
Challenge: In changing labour markets, migrants are less able to adapt and find jobs, more often lose jobs or may encounter challenges in securing jobs that fit their skills, which endangers their welfare Need: Improvement of labour market outcomes for migrant workers Scenarios: 2, 4 and, to a lesser extent, 1 and 3	Governmental actions 1. Establish an international framework for the accreditation of academic institutions and professional certifications. 2. More flexible education enabled by the EU, including modular, flexible learning pathways that acknowledge prior learning and work experience 3. Create a that validates the skills individuals acquire through various learning pathways. This would facilitate mobility within the EU and improve employability by providing a standardised recognition of skills. 4. Housing policies enabling mobility, like tax write-offs for high rent and increasing the supply of affordable housing in urban areas with high demand for labour 5. Additional supervision in occupational transitions for migrant workers, including subsidised retraining and upskilling programmes for migrants, especially in sectors that face rapid digitalisation 6. State-subsidised language and cultural integration programmes that go beyond basic language training to include understanding local customs, social norms, and workplace etiquette Public-private initiatives 7. Develop training programmes that match the skill needs of industries with the potential of migrant workers
Challenge: As demographic shifts inhibit sustainable retainment of EU-labour forces, labour shortages increase and spread to system-relevant sectors Need: Sustainable influx of migrant workers Scenarios: 1, 2 and, to a lesser extent, 4	Governmental actions 1. (Dual-Track) Global Skills Partnerships, facilitating employer-employee matches, preferably like the German Triple-Win Programme 2. Streamline work visa application processes, making them more transparent and less time-consuming, and possibly introduce fast-track visa processing for sectors facing labour shortages 3. Government-aided integration for working migrants into societies, aiming not to replicate prior mistakes like French banlieue-based segregation or German under-guidance 4. Easing of bureaucratic labour market hurdles where necessary, which prevents available workers from entering the workforce
Challenge: Changes in skill demands render the skill profile of parts of the workforce obsolete, while there are shortages in other industries Need: Labour mobility between EU countries Scenarios: 1, 2 and, to a lesser extent, 4	Governmental actions 1. Implement policies to facilitate the movement of workers across borders by addressing issues related to social security and pensions 2. Develop policies to alleviate housing-related constraints (such as sale, purchase, and taxes) that affect workers when moving to a new location Public-private initiatives 3. Collaborations between governments and private housing developers to help address housing-related constraints, making it easier for workers to relocate

Footnote: This list of potential policies is not exhaustive or comprehensive but offers concrete suggestions for policy measures that could address the policy needs.

Economic Resilience

Definition and Actor Domain

Economic Resilience (Economic development and diversification) is the capability of an economy to sustain itself, cope with adverse shocks and uncertainty, and adapt to changes (European Commission, 2017). Within the context of GI-NI, this refers only to shocks and changes that, to some extent, affect socio-economic inequality and skill demands.

These are primarily governmental actions, with public-private initiatives, and cooperation is crucial.

Policy needs and Policy repertoire

Deglobalisation demands the development of alternatives and the promotion of a circular economy for material reuse and recycling. It poses significant challenges to the EU's self-sufficiency in critical materials that are scarce, hard to exploit or not naturally found in Europe. This underscores the need for substitutes and a more circular economy to achieve material self-reliance through reuse and recycling. Support for these initiatives can come from investments in research and innovation to develop alternatives to critical materials, engagement in diplomatic and trade relations to secure supplies and encouraging a circular economy through targeted taxes and subsidies. **(Scenarios 1 and 3)**

Furthermore, the threat of disrupted trade agreements necessitates a critical revaluation and adaptation of trade paradigms and agreements, alongside efforts to strengthen supply chain resilience. Deglobalisation puts pressure on existing trade agreements and disrupts supply chain stability. Some of the biggest EU economies were structured to enable significant exports, often at the expense of wages and internal demand. This both-sided threat to exports and imports calls for revaluation and adaptation. Furthermore, as emerging economic powers gain prominence, it becomes crucial to reaffirm the significance of trade and external economic relations in shaping the EU's global role. This could be achieved by further facilitating infrastructure and subsidies to shift towards localised markets within the EU, restructuring GVCs, reforming trade agreements, evaluating diplomatic and trade relations and investing in them at the hand of prospected reliability. **(Scenarios 1 and 3)**

It is necessary to enhance short-term survival and support system-relevant late adopters following fast digital transformation. Fast technological acceleration threatens companies that are conservative and hesitant to adopt new technologies and innovate (late adopters (Rogers,

2003)), potentially causing job loss and reduced prosperity. It is essential to help organisations modernise business with subsidies or government-funded advisory services for digital adaptation, foster collaborations between the government, educational institutions, and the private sector, and increase awareness through digitalisation campaigns. **(Scenarios 1 and 2)**

It is also essential to ensure fair competition in global markets by preventing monopolies and protecting SMEs. Contrary to late adopters, early adopters – the companies that adopt innovations quickly – are likely to attract technical talent, gain resources faster than competitors, and may become industry giants, leading to monopolistic markets and unequal wealth distribution. Maintaining fair competition in global markets by preventing monopolies and safeguarding SMEs is crucial, thereby fostering a more equitable and diverse economic landscape. To tackle this challenge, several policies can be implemented: enhancing and strictly enforcing antitrust laws to prevent monopolistic behaviours and ensuring that large firms do not abuse their market position; supporting SMEs by providing them access to modern technology and necessary resources; investing in national digital infrastructure to ensure that all regions, including rural and underserved areas, have access to high-speed internet and digital services; promoting the use of open standards and interoperability among products and services; adopting public procurement policies that favour SMEs; providing support for SMEs in protecting their intellectual property rights; and implementing tax regulations that ensure large organisations pay their fair share, such as minimum taxes and strict enforcement of intellectual property licenses. **(Scenarios 1 and 2)**

Lastly, the stagnation of digitalisation can lead to substantial revenue losses for companies. This calls for optimal use of existing technologies and adaptation to new successful business models amidst changing markets. The stagnation of digitalisation contributes to the stagnation of labour productivity. Especially during economic struggles following the changing markets, this can lead to substantial revenue losses for companies. This necessitates enhanced use of existing technologies and adaptation to new business models. This can be addressed by creating a favourable business climate to retain or attract critical companies, implementing economic stimulus measures to support businesses, particularly SMEs, facing revenue shortfalls, and offering grants and financial incentives to encourage ongoing investment in digital technologies, thereby providing tailored support for sectors facing challenges. These strategies will not only enhance the integration and welfare of migrant workers but also support the EU's economic resilience and growth. **(Scenario 3)**

In summary, a comprehensive strategy is essential to tackle the challenges identified in the economic resilience policy domain. This includes embracing a circular economy, supporting companies, especially SMEs, through subsidies and guidance, and ensuring fair competition. Collectively, these actions will strengthen the EU's economic landscape against current and future challenges and provide necessary conditions for addressing socioeconomic inequality.

Table 5 details each of the needs, underlying challenges, relevant scenarios, and suggested policy measures.

Table 5. Policy Repertoire for Economic Resilience

Policy challenges, needs, and specifications of the applicable scenario	Potential Policies
Challenge: Deglobalisation challenges the EU's self-sufficiency in critical materials not naturally found in Europe Need: The EU needs alternatives for critical materials, including a more circular economy to achieve self-reliance in materials through reuse and recycling, diversification of suppliers, increasing domestic production Scenario: 1 and 3	Governmental actions 1. Investments in research and innovation to develop alternatives and substitutes for critical materials 2. Engage in diplomatic and trade relations with more reliable countries and international partners 3. Stimulate a circular economy by taxes and subsidies
Challenge: Deglobalisation puts pressure on existing trade agreements and disrupts supply chain stability Need: Re-evaluation and adaptations of trade agreements and strengthening of supply chain resilience Scenario: 1 and 3	Governmental actions 1. Subsidise and guide the restructuring of GVCs 2. Reform (bilateral) trade agreements 3. Reevaluate diplomatic and trade relations at the hand of prospected reliability 4. Promote cooperation within the EU block through subsidies and lifting of restrictive trade regulation 5. Investments in infrastructure critical to supply chain resilience, including transportation, logistics, and digital infrastructure
Challenge: Technological acceleration imposes a threat to late adopters in the labour market, causing job loss and prosperity reduction Need: Enhancing the short-term survival of and assistance support to (system-relevant) late adopters. Help organisations to modernise business Scenario: 1 and 2	Governmental actions 1. Subsidies for digital adaptation 2. Implement government-funded or subsidised advisory services 3. Increase awareness through campaigns regarding digitalisation Public-private initiatives 4. PPPs to drive innovation, research, and development.

Challenge: Early adopters attract technical talent, gain resources faster than competitors, and rapidly become industry giants, which can lead to monopolistic markets and unequal wealth distribution Need: Ensure fair competition in global markets by preventing monopolies and protecting SMEs, thereby fostering a more equitable and diverse economic landscape Scenario: 1 and 2	Governmental actions 1. Enhance and strictly enforce antitrust laws to prevent monopolistic behaviours and ensure that large firms do not abuse their market position 2. Support SMEs to have access to modern technology and necessary 3. Invest in national digital infrastructure to ensure that all regions, including rural and underserved areas, have access to high-speed internet and digital services 4. Promote the use of open standards and interoperability among products and services to reduce barriers to entry and enable SMEs to compete on a level playing field with larger firms 5. Adopt public procurement policies that favour SMEs 6. Provide support for SMEs in protecting their intellectual property rights 7. Implement Tax regulation that ensures large organisations pay their fair share (e.g. Minimum taxes, non-lenience with IP licences, etc.) Public-private initiatives 8. Provide resources, networking opportunities, and industry-specific knowledge to support firms in their digital transformation
Challenge: Stagnating digitalisation and global crises cause revenue loss for companies Need: Enhance the optimal use of existing technologies and support organisations to adapt to these changes in business models and changing markets (GVCs are broken) Scenario: 3, and to a lesser extent 4	Governmental actions 1. Favourable business climate for key companies potentially moving away 2. Implement stimulus measures designed to inject liquidity into the economy, supporting businesses facing revenue shortfalls, with specific attention to SMEs 3. Offer grants and financial incentives to encourage continued investment in digital technologies. (Implementing sector-specific policies that address unique challenges and opportunities can provide more effective support.) Public-private initiatives 4. Offer digital tools, platforms, and services that enable firms to adopt and implement digital technologies effectively

Footnote: This list of potential policies is not exhaustive or comprehensive but offers concrete suggestions for policy measures that could address the policy needs.

6. Conclusion

This report has explored the implications of four distinct scenarios of digital transformation and globalisation on inequality and skills demand within the European Union, as well as the necessary policy needs. Each scenario highlights unique barriers and opportunities, necessitating tailored policy reactions. The report then analysed the policy needs across various action domains, discussing their applicability regardless of scenario specifics and mapping them to the general respective actor domains (Public, PPPs, Firms). A comprehensive set of policy recommendations has been proposed to address these needs and tackle the challenges arising from each scenario. This analysis equips stakeholders with a robust framework to understand and address the complexities posed by different levels of technological advancement, globalisation and migration. In the following section, we summarise the key findings of this report and discuss their implications for effective policy-making in response to these evolving challenges. In an upcoming report in GI-NI WP 8, we will expand on these policy implications, developing a more refined and focused policy approach that aligns with and complements existing policy frameworks and governance structures.

To ensure positive outcomes, scenario-adaptive policymaking is necessary. Depending on the specific circumstances within each scenario, policies should be customised to the challenges, opportunities and needs. This report has analysed the policy needs across various action domains, and explored their applicability to scenario specifics. Few policies are universally applicable across all scenarios. Even when the same policy can be implemented effectively, it often requires customization to fit specific contexts. In some instances, policies effective in one scenario may need significant adjustments in others because they either fail to address the most crucial issues or, in the worst cases, can cause harm. For instance, while it is generally beneficial to increase the number of women in STEM fields and to integrate more migrants into the workforce, the effectiveness of these policies can vary significantly across different scenarios. In a world driven by digitalisation, such strategies can be crucial for addressing labour shortages and promoting a diverse, innovative workforce. However, in a scenario characterised by a deglobalising world, where labour markets could be more saturated, it might not be so relevant and even potentially complicate the balance between job availability and sector-specific demands, exacerbating unemployment in specific sectors. Therefore, we advise implementing policies consistently with scenario-specific adjustments because of the complexity and nuanced nature of the issues within the broader economic and social contexts.

There is a need for adaptive reskilling and transition support institutions capable of responding quickly to changes in the labour market, with a focus on promoting equality. In all scenarios, shifts in skill demands can unevenly impact different groups within labour markets, leaving some groups behind while disproportionately benefiting others, thereby widening the disparity. These changes often occur at a pace that prevents workers from catching up, underscoring the need for dedicated reskilling and job-transitioning institutions. However, the specific groups affected can vary significantly across different scenarios, complicating the design of these support systems. For instance, high-skilled workers with technological skills will likely mainly benefit. Still, they can also find themselves at risk if their specialised skill sets become obsolete due to deglobalisation and stalling technical progress. Consequently, policymakers must develop agile and adaptive reskilling and transition support systems capable of responding quickly to changes in the labour market. This requires enhanced monitoring of skill changes in the labour market and proactive involvement from public and private sector actors to ensure effective implementation. It should be noted that the scenarios also highlight specific vulnerable groups that struggle more than others across all scenarios. This includes migrants, women, older workers, low-skilled workers, SMEs and companies struggling with adapting to available technologies. Therefore, particular attention in policies regarding reskilling and transition support systems to assist these groups seems essential for any future.

Inequality is closely linked to fundamental economic market mechanisms and calls for effective macroeconomic regulation. Based on the scenarios explored, several policy needs emerge to enhance economic resilience in the EU. One connection between inequality and economic resilience is the widening gap between large corporations and SMEs fuelled by technology and globalisation, unbalancing or even disabling dynamics of competitive markets. Another connection is the steep drop in welfare for those whose wages were kept low under the flag of competitive exports when the promise of solid exports proves untrue in scenarios of deglobalisation. The resulting drop in aggregated demand can heavily impact the resilience of domestic markets. Accordingly, combatting socioeconomic inequality mandates maintaining economic resilience. This requires support for smaller companies (SMEs) through subsidies and guidance and ensuring fair competition, for example, with tax and wage regulations. Furthermore, economic challenges in general underscore the significance of trade and external economic relations in shaping the EU's global role. Collectively, these actions will strengthen the EU's

economic landscape against current and future challenges and provide necessary conditions for addressing socioeconomic inequality.

Future labour markets benefit from solid yet flexible regulation for all types of workers. As career changes become increasingly necessary, workers may be disadvantaged by sector-specific retirement systems or overly rigid accreditation rules for entering new occupations. While labour market regulations exceeding EU minimums vary significantly across countries, there is a growing need for these regulations to be agile and adaptive. Regulations moreover need to account for a broader set of working arrangements beyond classical full-time employees. It is also vital to ensure that reforms aimed at increasing flexibility are not mistaken for an opportunity to reduce worker protections. Instead, it should be recognised that inflexible systems may inadvertently weaken protection, such as when less legally restrictive contractor agreements become the norm due to feasibility constraints. This underscores the need for carefully balanced regulations safeguarding worker rights while adapting to the evolving labour market.

Effectively addressing the challenges migrant workers face can enhance equality and the functioning of the labour force, particularly in mitigating labour shortages. Challenges that migrant workers face include occupational segregation, deskilling, and over-qualification, which intensify disparities within the labour market. A unified European policy approach will foster cooperation among various stakeholders to dismantle the barriers migrants face, facilitating the integration of migrants and promoting equality within labour markets. This cooperative strategy is essential for harnessing the full potential of the workforce.

To address complex challenges, multi-domain approaches are crucial. While single-domain approaches can be effective, they are limited in their scope and impact. Multi-domain approaches are essential for addressing complex, interconnected policymaking and strategic planning issues. For instance, tackling horizontal gender disparities in labour markets across STEM and HEED fields, gender inequality exacerbated by digitalisation transformation requires coordinated actions across multiple action domains. This includes implementing a multi-level approach to educational initiatives that target both formal institutions; (e.g. scholarships for women in STEM; anti-discrimination laws in access to education) and informal culture (e.g. fostering gender-inclusive learning climates and debunking gender-biased ability beliefs), to labour market regulation (e.g. transparency in pay rates across groups, sectors and occupations; (gender) inclusive employment conditions), and measures increasing economic resilience (e.g. funding women entrepreneurs).

While some challenges primarily require policy strategies in one domain, most complex issues need integrated solutions spanning multiple action domains of formal structure and informal culture.

This report has methodological limitations related to the sources and approaches used. First, our scenarios required balancing detail and clarity. We opted for an approach that best illustrates the impact of a single force on others by choosing a 2x2 scenario matrix, but this approach limits the nuance within those forces. Second, while our foresight methodology is equipped to handle uncertainties in the manifestation of different forces, it does not fully address uncertainties regarding the impact of these forces on outcomes. Our analysis is grounded in the existing scientific literature, yet this foundation does not enable us to make predictions. In line with the objective of strategic foresight studies, our approach is not aimed at predicting the future but at delineating potential scenarios. This strategy allows us to offer policy implications for various possibilities, equipping policymakers with the tools to anticipate and adapt to diverse future developments effectively. Lastly, despite our best efforts to provide a well-rounded and detailed set of policy measures, a report as such does not suffice to discuss the intricacies and complexities associated with our proposed policy measures.

Our analysis revealed the impacts of digital transformation and globalisation on productivity, prosperity, skills gaps, and equality. Successfully navigating transformations necessitates strategies addressing inequality, especially supporting vulnerable groups. Ensuring prosperity is essential in all scenarios and requires stable revenue streams from critical industries. In addition, stimulating skill development within existing industries is crucial for maintaining economic vitality and competitiveness. Achieving such positive outcomes requires a strategic combination of policies across multiple action domains.

This report aimed to unveil the unique and interacting effects of the three forces of digitalisation, globalisation, and migration on skill demands and socio-economic inequalities. This effort is conducted to prepare various stakeholders and policymakers for different futures. Further analysis will be conducted in subsequent reports (GI-NI project WP8) so that policy implementation can be designed with appropriate consideration of respective details and existing policies.

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Appendix A. Method

A Dutch scenario research team developed the four scenarios through a multifaceted approach (European Foresight Platform, 2024; Koen et al., 2023), blending quantitative analysis results (Boza & Reizer, 2023; Los, de Vries & Ye, 2023a; Los, de Vries & Ye, 2023b; Los et al., 2023; Los & Ye, 2023; Nikoloya, 2023; Rademakers, 2023), literature review, and qualitative methods including interviews and workshops (Hulsegge et al., 2024). The 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 development, eleven renowned international experts with backgrounds in economics, policy, and social science, and with specialisation in skills, inequality, migration, international trade, and technology, were engaged. These experts are 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 Agdar, Norway; University of Utrecht, the Netherlands; European University of Flensburg, Germany; The University of the Basque Country, Spain.

In the first step of scenario development, we made an overview of the most critical external developments that may influence skill demand and socioeconomic inequality in the future.

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 globalisation, but other essential parameters determined in the previous step were also taken into account. We developed the narratives of four scenarios and validated them in several workshops with the scenario research team. The scenario narratives were validated using semi-structured interviews with four international experts. In a workshop with eleven international experts, the enhanced scenarios were validated. In the third step of scenario development, the impact of the four scenarios was determined using several internal and external workshops.

In formulating the underlying policy needs, a series of internal workshops and meetings were conducted with Work package partners where the outcomes were validated. Initially, we compiled a comprehensive list of outcomes for each scenario (productivity, prosperity, skills gap, equality). We mapped out barriers, opportunities, and needs associated with each outcome, drawing upon previous GI-NI research and conducting a backcasting techniques. Backcasting is a type of foresight tool that involves envisioning a specific future situation and then working back to identify the steps

needed to get there (Koen et al., 2023). During the workshops, this process revealed a spectrum of external forces and internal factors, elucidating their roles as either barriers or opportunities to more desired outcomes (equality, matching skills demand, prosperity) for each of the four scenarios. These needs were then translated into a desired policy repertoire allocated to a specific action domain (Education, Skill Development, Labour Market Regulation, Migration/Mobility and Economic Resilience (Economic development and diversification)) to foster more favourable outcomes and reviewed by the international GI-NI team. We selected the policy options so that the essential needs are covered, with some policies relevant in all scenarios and others only in specific ones according to the needs that derive following the transformations in technology and globalisation. The culmination of these efforts yielded a comprehensive policy repertoire, encompassing a diverse array of measures tailored to address the multifaceted challenges anticipated in each scenario.

Appendix B. Scenario Descriptions

Scenario 1: Empowered by Technology – Digital Transformation Accelerates and Deglobalisation

Scenario Description

Technological progress

Technological innovations are quickly adopted, with significant technological progress in the mid-2020s driven by labour shortages, compelling businesses to enhance productivity through substantial technological investments. The accelerated development of Artificial Intelligence (AI) by 2024 will facilitate its integration into nearly every facet of our lives and business processes by 2030. This surge in technology raises the demand for highly skilled workers to develop and adopt these advancements. Unlike previous technological disruptions, generative AI significantly impacts relatively higher-skilled workers. AI systems assist higher-skilled workers in specific complex tasks, leading to additional responsibilities such as real-time data analysis and process adjustments. As technology takes over more non-routine tasks, work becomes more efficient, contributing to higher labour productivity. Technological advancement, particularly through generative AI, may significantly enhance job quality for many high-skilled workers by allowing them to tackle more sophisticated tasks and improving working conditions, such as work-life balance and income. However, it also presents a considerable challenge to conventional high-skilled roles, making them more prone to changes and possible replacement. This situation can lead to the reevaluation of certain high-skilled positions and could result in job displacement within some industries.

The positive impact of technological progress on income levels is not universal. Changes in global trade patterns and labour-saving technological advancements beyond AI led to the automation of non-routine tasks. This transformation posed challenges for low- and middle-skilled workers in Western European countries, requiring them to relocate to new jobs.

Global Trade Decreases, Particularly Between the Major "Blocks"

Driven by economic and geopolitical factors, a trend towards deglobalisation has emerged. After numerous conflicts, tensions, and wars, the world has been divided into power blocks, primarily led by the EU/US and China. This division strongly requires governments to become more self-reliant in strategic sectors, including advanced technology, parts, and raw materials. Nations within

the blocks collaborate to support combined technological efforts, with intense competition between power blocks to stay at the forefront of technology. Blocks are increasingly vying to acquire knowledge from each other through espionage and other illicit means, escalating conflicts and digital security threats. There is a significant trend of reshoring, with activities being brought back. However, it does not necessarily result in more jobs for low- and middle-skilled workers, as automation and robotics are deployed instead. Many countries are affected by numerous export restrictions across the power blocks imposed by governments, limiting the growth of the global economy.

Migration

Work-related migration between power blocks decreased due to strict agreements and boundaries. However, migration within power blocks increased, fostering the already increased knowledge exchange. This surge in migration within power blocks has not only led to a physical movement of people but also has profoundly impacted Europe's social and cultural dynamics. Migration flows have contributed to enhanced interaction among different communities, strengthening cultural ties in the EU.

Impact on Skills Demand and Inequalities

Impact on Skills Demand

The rapid evolution of technology changes the demand for jobs. Workers must continuously learn to stay relevant in an ever-evolving technological environment. 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. Occupations with medium to high-skill levels are transforming as work processes change due to AI technology, creating a surge in demand for specialised skills. Cutting-edge technologies (like AI) require complementary skills and organisational change. AI assists higher-skilled workers in facilitating specific complex tasks. The skills required depend on the technologies prevalent within sectors and regions. Most new jobs require technological, digital, advising, and analytical skills, with broader acceptance of technologies like AI. All employees, especially those with higher academic education, must be familiar with these technologies. AI replaces jobs requiring intellectual knowledge, leading to additional responsibilities for academically educated employees, such as data analysis and process adjustments based on real-time data. In the digital era, skills in cybersecurity, data protection, and ethical considerations become crucial.

Low and medium-skilled employees in specific industries are encouraged to cultivate soft skills that machines lack, such as empathy, critical thinking, information literacy, and problem-solving. Academically educated employees engage in complex tasks requiring innovative solutions and strategic thinking, while cultural sensitivity and teamwork become increasingly valuable.

Reshoring often goes hand in hand with adopting advanced technologies and automation to enhance productivity. This can increase demand for employees with technological skills, such as programmers, technicians, and engineers. The increasing diversity in urban areas has fuelled innovation and creativity, bringing together diverse perspectives and areas of expertise. Skills like cultural sensitivity and effectively working in diverse teams will be valuable.

Impact on Inequality

Digitalisation, while enhancing prosperity and work efficiency, contributes to social unrest due to rising inequality. New technologies lead to significant shifts in job structures, skills gaps, and increased inequality. Highly skilled workers are expected to benefit the most from the deployment of generative AI, especially those with specific skills, technological knowledge, and financial resources. Higher-educated individuals progress faster, invest in continuous learning, and might undertake additional tasks. Job opportunities may decrease in specific high-skilled occupations where AI can take over many tasks, such as accountancy.

Workers with routine tasks or in fields affected by trade changes struggle to adapt, which exacerbates disparities in income, employment opportunities and overall job quality. Low-skilled workers, women, and older workers, in particular, face difficulties finding suitable jobs, reducing self-confidence and social pressures. The challenge of job displacement and seeking alternative employment becomes high. Reshoring efforts sometimes fail to improve the situation for workers with routine tasks, as machines or computers take over instead of people regaining their jobs. Automation poses a significant risk to low- and medium-skilled work, leading to increased unemployment periods and diminished opportunities for suitable employment.

Regional Inequality

Regional disparities widen in a deglobalising world, particularly in non-Western, non-democratic, underdeveloped countries with traditional cultural values. This rise stems from an inward focus on national cultural values. The withdrawal from international collaborations disadvantages certain regions, especially companies that are losing revenue from outside Europe. Conversely, rapid technological evolution enhances access to remote and online education, providing flexible work

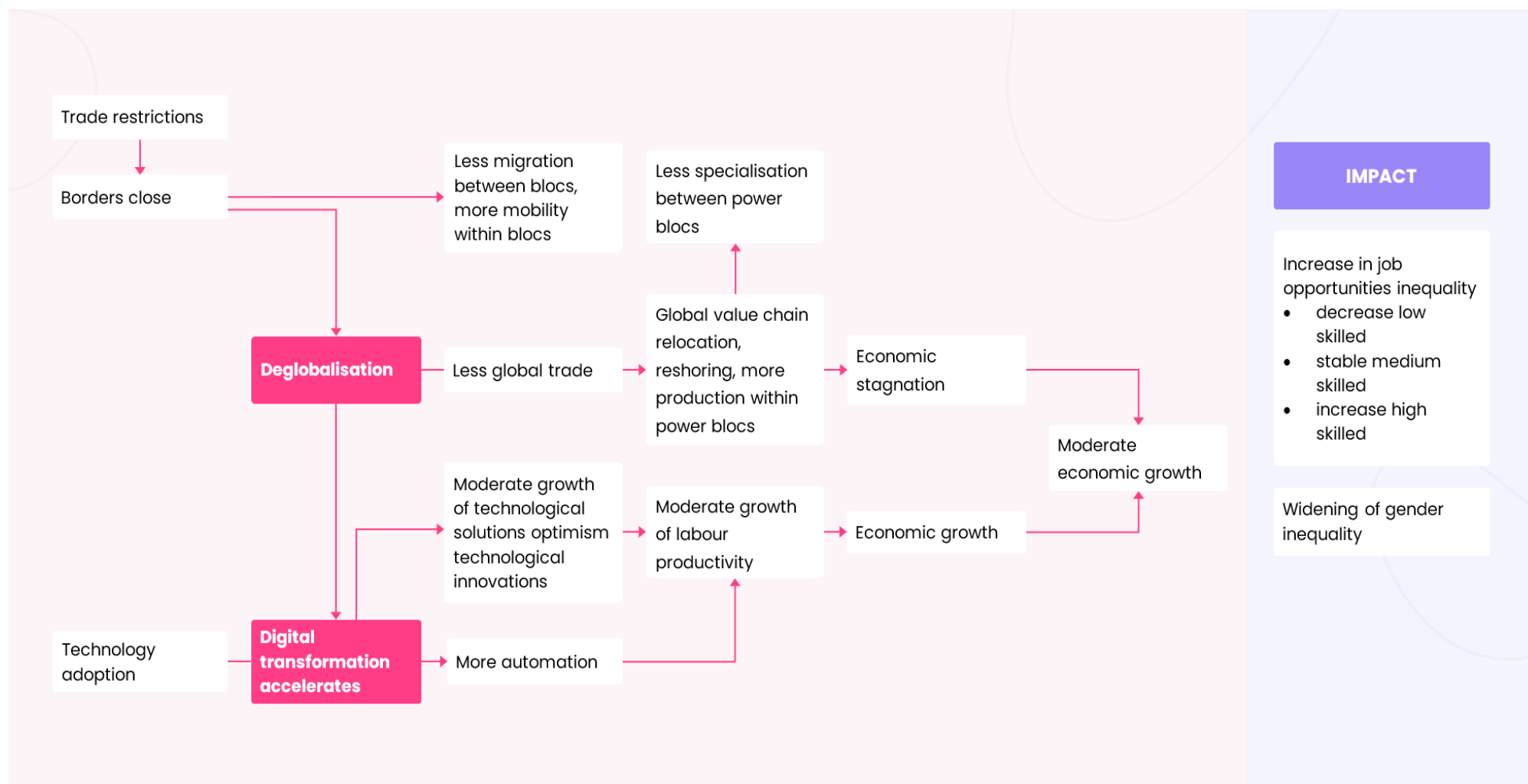
arrangements. The acceleration of digital transformation will cause high-skilled regions to prosper more than low-skilled regions, driving inequality.

Gender Inequality

In a technology-driven labour market, gender inequality increases, even further so against the backdrop of deglobalisation. Gender inequality increases because women less often work in or enter high-paying, innovative firms that thrive in this scenario. Women are underrepresented in high-paying tech firms, paid lower wages, and face barriers to developing digital skills. In this scenario, gender bias accelerates in the design of AI technology itself, reproducing gender biases in inequalities in generative AI. Deglobalisation further stagnates women's economic empowerment, particularly in global south regions, due to digital access barriers and a lack of gender mainstreaming of human rights and economic protection acts.

Figure B.1 provides a comprehensive overview in a flow diagram, featuring the key factors shaping this scenario. The left side illustrates the precursors to, and the impact of, digitalisation and globalisation on productivity, migration, and economic growth. On the right, a concise summary highlights the effects on inequalities, including socio-economic disparities based on workforce job opportunities and gender.

Figure B.1. Scenario description **Empowered by Technology** (technological growth increases and deglobalisation).



Scenario 2: Tectopia – Digital Transformation Accelerates and Globalisation Increases

Scenario Description

Technological Advancement

Between 2024 and 2030, technological growth has accelerated, driven by increasing global collaboration and open markets. There is widespread optimism surrounding technological innovations, with advancements in AI and robotics fulfilling their promises. Governments and companies have allocated significant budgets for research and development, fostering continued innovation. This has led to healthy competition and the breakup of tech giants like Google, Apple, and Meta. Organisations have become more resilient by being less reliant on specific suppliers. However, not every company can adopt the available technological solutions, as implementing technology involves restructuring costs for workers and firms competing globally.

The demand for new skills has risen, particularly for high-skilled jobs. Technology has automated specific tasks, altering the nature of occupations and fostering more employment opportunities in some industries and less in others. Advanced technology has notably enhanced working conditions by enabling digital work from anywhere, which supports the service economy, and allows technology to perform routine tasks, thereby creating more room for varied activities. However, the shift towards more digital work can reduce face-to-face interpersonal interactions, and the increasingly dynamic nature of workplaces may adversely affect job security.

Globalisation: Dynamic International Trade

Global collaboration has rendered international trade dynamic and complex, with political and legal differences diminishing. There is a global understanding that prosperity cannot be achieved in isolation. China, the US, and the EU have promoted international trade, with companies focusing on profit generation and shareholder satisfaction. This pursuit of profit leads to more relocation or outsourcing of specific production processes to globally favourable locations, triggering innovation and technological advancement. Companies access foreign knowledge and face enhanced international competition. Tech companies flourish in this open-border environment, impacting global labour demand and economic dynamics. Countries and continents specialise in industries and specific activities.

Migration

Technological changes trigger scarcities and surpluses in labour market segments, thus influencing migration. Migration addresses skill shortages within ageing populations, leading to a global increase. Western Europe recognises 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 migrant acceptance from outside the EU. Globalisation has diversified urban landscapes, influenced by various cultural traditions. Metropolises attract migrants, further strengthening urbanisation.

Impact on Skills Demand and Inequalities

Impact on Skills Demand

Technological advancements and globalisation have significantly shifted job market dynamics in the EU, creating demand for high-skilled and medium-skilled positions. Due to automation and outsourcing, low-skilled workers face job losses and a skills demand mismatch. Anticipated technological advancements, especially in AI, increase the need for technical expertise. Automation and outsourcing enhance productivity, enabling flexible work arrangements and shifts to different roles, leading to a rise in remote digital work. However, significant skills mismatches are anticipated for low-skilled workforces, particularly in the manufacturing sector, while the demand for medium- and high-skilled jobs increases. With technology handling routine tasks, the importance of human interaction and soft skills rises. Burnout symptoms and mental resilience become more significant concerns as workers adapt to dynamic job market shifts. Due to globalisation, tech providers can build monopolies more easily and wield significant power, attracting high-skilled workers.

Impact on Inequality

This scenario sees the income and job opportunities gap between lower and higher-educated individuals widen due to international markets and technological developments. Higher-educated individuals benefit most from globalisation and technological change advantages. New technologies often displace low-skilled workers, who find adapting challenging, face higher unemployment risks and struggle to secure alternative employment. In low-educated job sectors,

where migrants often concentrate, employers are less likely to invest in training, and accessible, affordable language courses for migrants are often lacking, widening inequality.

Regional Inequality

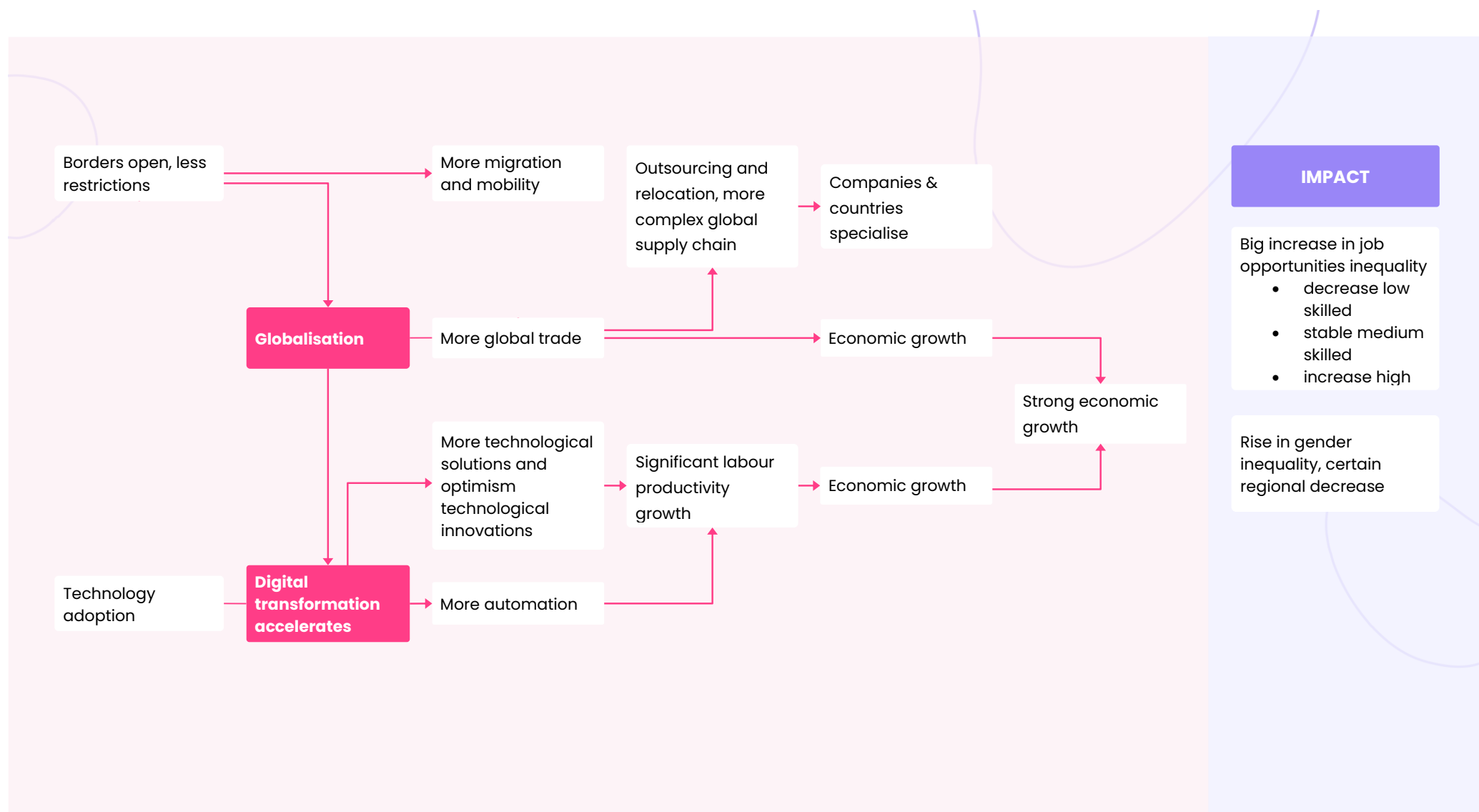
Globalisation exacerbates regional inequality, particularly in countries with significant manufacturing sectors, like Germany, affecting medium- and low-skilled workers. Digital transformation favours high-skilled regions, and increased globalisation benefits entrepreneurial areas more than resilient areas. Low-skilled regions may face unemployment due to decreased globalisation or low growth due to decreased technological development.

Gender Inequality

In a technology-driven labour market, gender inequality is likely to increase but can be mitigated in a globalising world. Gender-segregated labour markets and gendered digital skills gaps cause men to benefit more than women, both in job opportunities and wages. Also, women face greater job vulnerabilities due to automation. The rise of digitalised global platform economies poses a greater challenge to employment security and decent labour conditions for women than men. At the same time, online global platforms provide a collective voice for women to advocate for equal rights. Global trade increases demand for human-centred soft skills, improving access to education and offering flexible work arrangements, which benefit women's economic empowerment, especially in developing economies in global south regions.

Figure B.2 provides a comprehensive overview in a flow diagram, featuring the key factors shaping this scenario. The left side illustrates the precursors to, and the impact of, digitalisation and globalisation on productivity, migration, and economic growth. On the right, a concise summary highlights the effects on inequalities, including socio-economic disparities based on workforce job opportunities and gender.

Figure B.2. Scenario description **Techtopia** (technological growth increases and globalisation).



Scenario 3: Economic Minimalism – Digital Transformation Stagnates and Deglobalisation

Scenario Description

Deglobalisation

A backlash against globalisation, characterised by a rise in protectionist policies, has been triggered by the intensification of trade and foreign direct investment. High interest rates, sustained inflation, geopolitical tensions, and the lingering effects of the COVID-19 pandemic have led to economic downturns, contributing to broader global economic struggles. Governments have restricted business freedom, and companies have reconsidered their sourcing strategies. Escalating tensions between countries are causing international conflicts, with a focus on strengthening national sovereignty. Populism and nationalism are rising globally, impacting elections and leading to exits from international alliances. The EU faces internal divisions, particularly regarding major transitions like energy and digital transformations, diminishing global cooperation. Both national and international borders are closing for trade and migration, reducing imports and exports and hindering the economy. Power blocks (US, China) emerge, collaborating on technological efforts, which demand more high-skilled workers. Relocation of global value chains within these blocks increases demand for (low- and) middle-class work in traditional industries.

Migration

Work-related migration between blocks is declining. The increased nationalistic parties and the desire for sovereignty have also caused divisions within Europe. However, the number of people desiring a better life increases in regions facing economic challenges, fuelling international tensions and non-work-related migration.

Technological Stagnation

By the late 2020s, power blocks have significantly reduced the exchange of newly developed knowledge and resources. This diminished interaction between and within power blocks has decreased benefits from innovations and foreign knowledge, slowing technological advancements and stagnating labour productivity. Strict AI regulations and national restrictions have impeded technological progress, undermining consumer confidence and triggering economic contraction. Despite a decrease in total employment opportunities, employment rates rise slightly due to a

shrinking labour force (ageing) and government intervention. Relocation and restrictions on outsourcing reinstate jobs for low- and medium-skilled workers, stabilising wages. This affects job demand. People experience reduced competitive pressure. Technological slowdown eases societal pressure, fostering a tendency towards de-urbanisation and a focus on family well-being. Communities bond over shared values, care, basic needs, and human-scale appreciation.

Impact on Skills Demand and Inequalities

Impact on Skills Demand

Although firms still invest in innovations, the stagnant growth of technological developments creates less 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 groups of workers need to acquire new skills. The pace of development aligns with the speed at which individuals can readily learn new skills. While technological stagnation may imply a reduced to constant demand for highly educated workers, Western European countries continue to rely on such skilled individuals to drive advancements in research and development, marketing, and the service sector. Meanwhile, Eastern European 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, especially since the limited technological advancements most impact them.

Impact on Inequality

Income disparity will slightly reduce because the demand for highly skilled individuals becomes lower than for low- and medium-skilled workers. However, this does not mean that highly skilled workers are the most disadvantaged in this scenario. In times of economic crisis, highly educated individuals take over some jobs from medium-skilled workers. Still, the job quality and the level of challenge decrease in general. This is mainly the case for highly skilled workers due to less dynamic tasks and reduced investment in innovation. Despite reinstating some jobs for low-skilled workers, reshoring does not always result in better labour market outcomes. Also, the relatively slow degree of digitalisation or automation may have replaced specific tasks, impacting the nature of work for lower-skilled individuals. Overall, economic stagnation contributes to reduced income and job opportunity inequality between low, medium, and high-skilled workers.

Regional Inequality

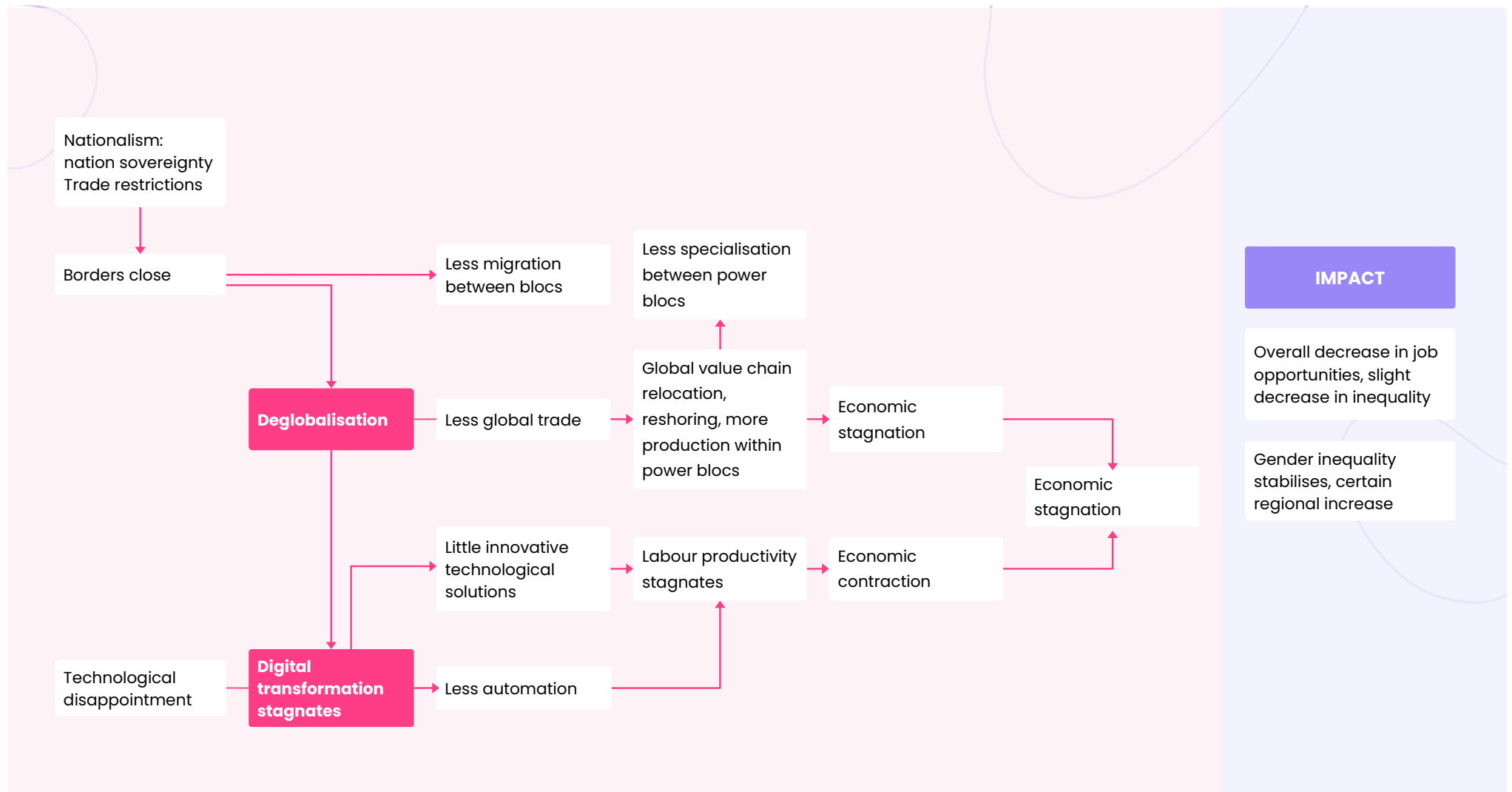
Regional disparities grow in a deglobalising world, especially in non-Western, non-democratic, underdeveloped countries with traditional cultural values due to an inward focus on national cultural value systems. Strong nationalist positions and withdrawal from international collaborations disadvantage certain regions, particularly companies that lose revenue from outside Europe. Due to their flexibility, other entrepreneurial regions will benefit if companies gain revenue from their role in emerging power blocks and the changed market dynamics.

Gender Inequality

Stagnating technological growth stabilises gender inequalities due to a shift away from demand for highly skilled, digitally skilled labour, where men are typically overrepresented. Women less often work in sectors vulnerable to technological stagnation. Continued demand for human-centred low- and medium-skilled labour attenuates gender gaps in employment opportunity and wage disparity. Regional contrasts in socio-economic gender inequalities may rise in this scenario due to a lack of global gender mainstreaming of human rights and protection acts. Notably, women in developing countries that lack democratic political value systems and do not strictly adhere to global human rights protection acts become vulnerable.

Figure B.3 provides a comprehensive overview in a flow diagram, featuring the key factors shaping this scenario. The left side illustrates the precursors to, and the impact of, digitalisation and globalisation on productivity, migration, and economic growth. On the right, a concise summary highlights the effects on inequalities, including socio-economic disparities based on workforce job opportunities and gender.

Figure B.3. Scenario description **Economic Minimalism** (technological growth stagnates and deglobalisation).



Scenario 4: Analog Alliance – Digital Transformation Stagnates and Globalisation Increases

Scenario Description

Globalisation

After years of economic restrictions due to conflicts in the early 2020s, globalisation is resurging, shifting focus towards international integration. While conflicts have receded, new challenges, such as national crises and issues in Russia, have emerged. Despite these, global trade and cultural exchanges are thriving, driven by the understanding that prosperity is a collective effort. China, the US, and the EU increasingly promote international trade and lift trade restrictions, allowing firms to relocate parts of their production processes to the most favourable locations worldwide. This drives specialisation between countries.

Caution in Adopting Technological Developments

The initial enthusiasm for technological advancements, particularly in AI, has waned, leading to a reassessment of human-technology collaboration. Between 2020 and 2025, technological changes altered the nature of work, but promises of rapid advancements have fallen short. The development of new technologies has slowed, with heightened scrutiny leading companies to appraise potential repercussions more carefully before proceeding. This cautious approach has resulted in deferred or terminated innovative projects, impacting companies' innovation capabilities and financial standing. Governments and the EU now play a prominent role in technology development, emphasising societal impacts. This shift allows companies in less developed countries to catch up and implement technologies more efficiently. However, the slowdown in technological adoption impacts the EU's economy, with minimal growth between 2025 and 2030. Productivity remains stable, and wage growth lags behind expectations, leading to reorganisations and layoffs in tech companies, hindering innovation capabilities. The decline in technological advancements and innovation can lead to less variety and fewer challenging tasks in the workplace. Coupled with pressure on wages, it can decrease job quality.

Migration

Migration sees slight growth, particularly in Eastern Europe, as labour-intensive tasks regain importance over technology for solving intensive physical tasks. Western Europe recognises the value of educated migrants in addressing skill shortages. Still, with the technological slowdown,

there is an effort to limit labour migration, reflecting the changing dynamics of the global workforce.

Impact on Skills Demand and Inequalities

Impact on Skills Demand

With few technological advancements, there is less need and necessity to learn new skills. The pace of development allows individuals to learn new skills at a manageable rate. While technological stagnation suggests a reduced demand for highly educated workers, Western European countries still rely on such skilled individuals to drive advancements in research and development, marketing, and the service sector. Meanwhile, Asia and, to a lesser extent, Eastern European countries with lower wages see a potential rise in demand for low- and medium-skilled work in manufacturing, traditional industries, and manual labour. The necessity for high-skilled workers persists, particularly for significant international trade requirements, indicating an increasing demand for reskilling or acquiring specific skills for sectors driven by international trade.

Impact on Inequality

Globalisation boosts living standards worldwide but increases the gap within countries, leading to greater inequality between nations. Within nations, there is a more significant disparity between low-skilled and high-skilled workers, while the level of inequality between medium-skilled and high-skilled workers remains stable. The uneven distribution of gains contributes to skills inequality and job polarisation, particularly affecting low-skilled workers who face reduced job opportunities due to globalisation and routine task automation. Disappointing outcomes from tech companies result in fewer job opportunities, especially for low-skilled jobs due to relocation and outsourcing, and, to some extent, highly skilled workers due to technological stagnation.

Disparities in wages and job opportunities between natives and migrants increase as they are not equally distributed across occupations. In low-educated job sectors, where migrants often concentrate, employers are less likely to invest in training. Accessible and affordable language courses for migrants are also often lacking. These entry barriers to occupations and economic sectors contribute to inequality and hinder the integration of migrants into the labour. This always plays a role but is mainly the case in this scenario where there is (much) more migration, as it becomes a relatively more significant issue.

Regional Inequality

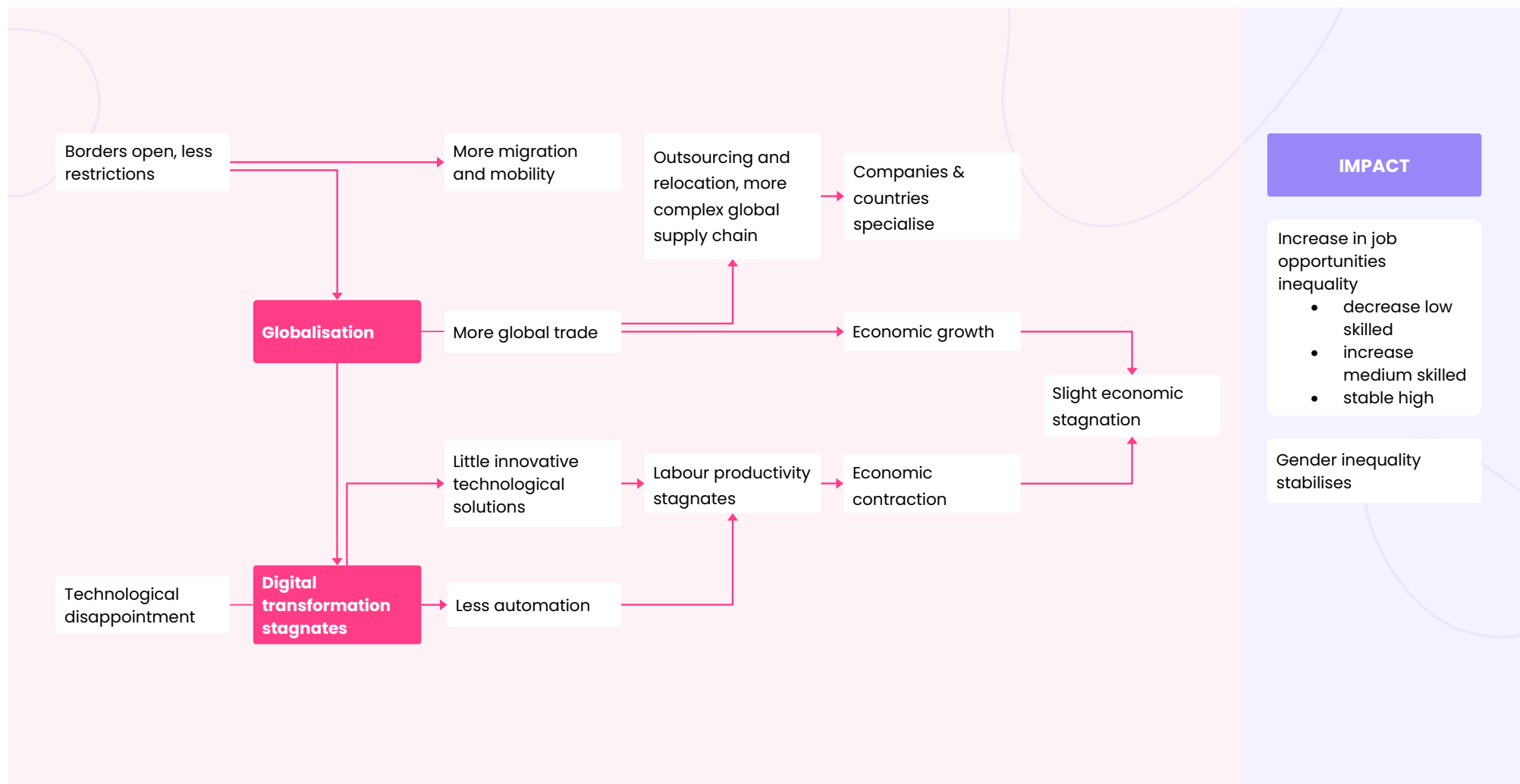
Socioeconomic inequality is reduced in Eastern Europe, where demand for low-skilled jobs rises. However, low-educated workers in Western Europe face much competition and challenges due to outsourcing, relocation of low-skilled jobs, and further automation of routine tasks, creating greater inequality between highly—and low-educated workers.

Gender Inequality

Initial promises of digital innovations fade and shift towards human-centred jobs that benefit women more than men, especially in medium-skilled labour. Globalisation impacts male manufacturing workers in Western Europe more, reducing gender wage inequality while economic sectors in which women are overrepresented remain stable. Gender inequalities stemming from horizontal gender segregation decline in this scenario because digital skill demands in male-dominated technology-based sectors stagnate. In contrast, demand for soft skills and human-centred jobs remains stable. Globalisation fosters international trade, foreign investments, democratic values, and gender mainstreaming of human rights, improving women's economic positions worldwide. However, the rise of globalised, competitive, and specialised markets causes vertical gender inequalities to persist, especially in Western, highly educated, rich countries, where women, particularly those in low-skilled and low-paid roles, face significant job security challenges and discrimination in high-powered leadership positions.

Figure B.4 provides a comprehensive overview in a flow diagram, featuring the key factors shaping this scenario. The left side illustrates the precursors to, and the impact of, digitalisation and globalisation on productivity, migration, and economic growth. On the right, a concise summary highlights the effects on inequalities, including socio-economic disparities based on workforce job opportunities and gender.

Figure B.4. Scenario description **Analog Alliance** (technological growth stagnates and globalisation).



Appendix C. Tables barriers, opportunities and needs

Building on the scenario description, we carried out internal work sessions to specify the barriers, barriers, opportunities and needs per scenario divided over positive and negative outcomes. Positive outcomes being: productivity and economic prosperity/equality in job opportunities, between gender and skill levels/skills fit or skills match between demand and supply. The negative outcomes we focused on: economic poverty and productivity loss/inequality equality in job opportunities, between gender and skill levels /skills gap or skills mismatch between demand and supply.

Table scenario 1. Empowered by Technology: Digital Transformation Accelerates and Deglobalisation

Positive outcomes	Barriers that stand in the way of positive outcomes	Opportunities that ensure we achieve positive outcomes	Needs
Increased productivity and prosperity	• Export restrictions • Less specialisation • Availability raw materials • Costs for EU (reshored) production; reshoring failures	• Technological progress • Significant knowledge exchange and open borders within the power blocs • Potential for more resilient value chains	• Reliably available raw materials for industrial production (More circular economy) • Autonomous EU-economy
Negative outcomes	Buffers that reduce negative outcomes	Drivers that strengthen negative outcomes	
Inequality in job opportunities between low/medium/high increases - Decrease in low-skilled jobs (especially west-EU) - Medium jobs change, some sectors lose jobs, others grow (especially west-EU) - Demand for high skill (technical positions) increases	• Restructuring supply chains: reshoring and reduced outsourcing provide new jobs • Knowledge exchange and open borders that increases mobility within the power blocs	• Shortage international talent increases demand for high skilled jobs • Productivity gains are shared unequally: Large (tech) companies benefit over-proportionately from digitalisation and AI	• Increased possibilities for labour and educational mobility within EU-countries • Ensure fair competition in global markets by preventing monopolies and protecting SMEs

Income inequality between low/medium/high increases - Low-skilled workers that lose jobs have limited possibilities finding new jobs	• Technology might reduce skills requirements for tasks, preventing job loss • Learning, supportive organisations	• Low-skilled workforce faces mismatch between skill demand and skills availability as their skills are partly replaced by digitalisation	• Strong and adaptive educational, reskilling and lifelong learning systems • Skills-based hiring and measures instead of relying on diplomas • Support for vulnerable groups to enable reskilling
Skill gap increases especially for medium & high skilled workers	• High-educated and medium-educated workers can adapt to the shifting job market • Increasing productivity can free up workforce capacities, reducing skill shortages	• The further adoption of "Industry 4.0" substantially alters tasks, requiring reskilling. • Deglobalisation leads to less specialisation and a broader range of work, requiring reskilling	• Increased possibilities for upwards occupational mobility within skill groups • Strong and adaptive educational, reskilling and lifelong learning systems
Gender inequality in job opportunities and wage gaps increases - Gender gap in digital skill widens	• Ongoing initiatives for gender equality in labour markets (Women in STEM, equal representation, mobility of women)	• Increasing employment and pay in technical jobs, where men are more prevalent, especially in higher positions • Women's limited access to digital education and services relative to men widens the gender divide in digital skills • Relative reduction in employment and pay in jobs typically held by women • Gender stereotypes about women's competence in STEM / digital skills • Gender bias in design of digital technologies / generative AI	• Equality in pay between women and men • Equality in Labour force participation between men and women • Gender equal numerical and normative representation of women in digital innovations and labour markets • Improve access and availability to digital technologies for women
International Trade becomes increasingly difficult	• Economic interdependence • Legal binding (if enforcement mechanisms exist) • Comparative advantage will keep international trade attractive • Diplomatic relations	• Protectionism • National Security concerns • Populism • Economic Nationalism • Supply chain resilience concerns	• Economic Autonomy • Technological Sovereignty • Cooperation within the EU and with the US to establish new value chains

Abbreviations: AI: Artificial Intelligence; EU: European Union; SME: Small and Medium-sized Enterprises; STEM: Science, Technology, Engineering, and Mathematics; US: United States.

Table scenario 2. Techtopia: Digital Transformation Accelerates and Globalisation Increases.

Positive outcomes	Barriers that stand in the way of positive outcomes	Opportunities that ensure we achieve positive outcomes	Needs
Increased productivity and prosperity	- Companies that cannot adjust to the GVC and specialisation risk going out of business - Late adopters will stay behind - Digital transformation might bring undesired side effects, which are difficult to be tamed in global competition - Risk of development of superstar firms, unfair distribution of prosperity	- AI drives productivity, more efficient work because AI takes over other tasks - Global trade increases revenue - Significant knowledge exchange and open borders within the power blocs - Increased migration mitigates labour shortages	- Short-term survival of and assistance to (system-relevant) late adopters - Strong and adaptive educational, reskilling and lifelong learning systems for those who lose their job - Prevention of monopolies and support for SMEs in digital transformation and market repositioning
More job opportunities	- Automation/AI inhibits employment demand - Offshoring - Too high pace of change inhibits effective and efficient matching of skills supply and demand - Increased labour supply due to migration might worsen the position of current workers in non-shortage occupations	- Higher productivity enables firms to expand production and increase employment - Financial possibilities for research and development	Strong and adaptive educational, reskilling and lifelong learning systems
Negative outcomes	Barriers that prevent us from negative outcomes	Drives that cause negative outcomes	Needs
Inequality in job opportunities between low/medium/high increases -Income and job gaps widens, disproportionately affecting low and medium-skilled workers and challenges them in alternative employment	Limited employee adaptivity	- Tech advancements and globalisation reshapes the EU job market, increasing the need for high and medium-skilled positions - Short-term unemployment spikes for automatable jobs, which are more often low skilled jobs	- Strong and adaptive educational, reskilling and lifelong learning systems - Reduction in existing income inequality between skill levels - Collective Bargaining Opportunities

Gender inequality in job opportunities and wage gaps increases -Gender gap in digital skill widens	• Ongoing initiatives for gender equality in labour markets (Women in STEM, equal representation, mobility of women) • Increased opportunities for remote work	• Increasing employment and pay in technical jobs, where men are more prevalent, especially in higher positions; • Less opportunities for women, because of the gender stereotypes about women's competence in STEM / digital skills • Gender bias in design of digital technologies / generative AI	• Equality in pay between women and men • Gender equal numerical and normative representation of women in digital innovations and labour markets • Higher rates of women in entrepreneurship and engagement in innovation • Remote and flexible work arrangements with digital technologies
Skills gap increases -Low skilled – keeping up technological advancements and more monitoring -Medium skilled – keeping up technological advancements and improving soft skills -High skilled - strategic thinking	• AI helps to perform, might even lead to overskilling	• Digitalisation leads to increase demand for digital and analytical skills • Especially low and migrant workers are vulnerable groups that struggle more with acquiring new skills	• Strong and adaptive educational, reskilling and lifelong learning systems • Occupational mobility opportunities for groups with less access to education (e.g. low-skilled workers and migrants)

Abbreviations: AI: Artificial Intelligence; EU: European Union; GVC: Global Value Chains; SME: Small and Medium-sized Enterprises; STEM: Science, Technology, Engineering, and Mathematics; US: United States.

Table Scenario 3. Economic Minimalism: Digital Transformation Stagnates and Deglobalisation

Positive outcomes	Barriers that prevent us from achieving positive outcomes	Opportunities that ensure we achieve positive outcomes	Needs
Equality in job opportunities between low/medium/high skilled workers increases	• Crises disproportionately burden vulnerable groups with precarious labour contracts	• Highly skilled individuals are most affected by the limited technological advancements • Relocation provides more jobs for low/medium-skilled • Less high skilled expats (migrants)	• Sufficient job opportunities for lower-skilled workers • Reduced Economic Volatility • New mobility concepts to address high mobility of high-skilled workers • Prevention of labour precarity
Equality in job opportunities between women/men slightly increases	• Job stereotyping gender with more favourable outcomes for men • Men more often in position of power • Manual labour is generally more common among men • Economic crises have historically proven to over proportionately burden women • Lack of global protection acts that ensure elimination of discrimination against women	• More tech companies and technologically innovative companies employ women • With less opportunities for men, more equality • Changing labour market requires other skills (e.g. health care) • Due to aging population more 'women' HEED jobs are needed	• Sufficiently available job opportunities for women in high- and middle-skill full-time employment • Prevention of and reduction in job stereotyping
Skill gap is stable or decreases for low/medium/high skilled workers	• Some reskilling due to relocation • Educational progression may be limited	• The pace of development aligns with the speed at which individuals can acquire new skills. There is less need and necessity to learn new skills.	• Favourable business climate to prevent companies from relocating • Opportunities for upwards educational and occupational mobility • Strong and adaptive educational, reskilling and lifelong learning systems • Skills-based hiring and measures instead of relying on diplomas

			Support for those who fall through the gaps of the reskilling system
Negative outcomes	Buffers that prevent us from negative outcomes	Drivers that cause negative outcomes	Needs
Decrease in productivity and prosperity	(High-skilled) workers that lose jobs transition to available jobs - Continuous use of existing technologies - Late adopting companies have a chance to catch up by integrate existing technologies	- Decreased productivity after technological stagnation - Loss of global revenue - Risk of failure in reshoring or adaption to new value chains	- Social agreements to stimulate productivity - Optimal use of existing technologies - Innovative strategies to boost creativity - Companies that adapt to changing in business model trends and markets - Investments in economic resilience
Less job opportunities	- Relocation of jobs, e.g. manufacturing jobs, after deglobalisation - Changing market provides opportunities for new, productive Industry - Fewer high-skilled expats available creates more job opportunities for residents	- Companies losing international revenue lose jobs - Risk of failure in reshoring or adaption to new value chains - Economic struggles and less collaboration between economic blocs increase risk of conflict, which influences resources	- Strong and adaptive educational, reskilling and lifelong learning systems - Support for those who fall through the reskilling system, the vulnerable groups - Strong worker representation
International Trade becomes increasingly difficult	- Economic interdependence - Legal binding (if enforcement mechanisms exist) - Comparative advantage - Diplomatic relations	- Protectionism - National Security concerns - Populism - Nationalism - Supply chain resilience concerns	- Economic Resilience - Adaptability to global shifts - Technological Sovereignty

Abbreviation: HEED: Higher Education and Economic Development.

Table Scenario 4. Analog Alliance: Digital Transformation Stagnates and Globalisation Increases

Positive outcomes	Inhibitors that prevent positive outcomes	Drivers that promote positive outcomes	Needs
Inequality in job opportunities between women/men decreases	Men generally have more job opportunities, while women are overrepresented in certain vulnerable jobs	- Globalisation enables international protection of women against discrimination - Slower pace of technological progress prevents male-dominated tech companies from outpacing other companies	- Promote equal access to technological advancements and training for both men and women - Develop targeted programs to increase job opportunities for men and women in vulnerable sectors
Skills gap decreases high	Higher demand of intercultural relations and high specialisation	Lower technological pace requires less upskilling or reskilling – workers outpace technological developments	- Strong and adaptive educational, reskilling and lifelong learning systems - Globalisation necessitates a workforce ready for intercultural relations and high specialisation
Skills gap decreases low skilled workers	Ongoing developments that change skills demand, in particular in relation to intercultural relations and specialisation	Reduced need for new technical or advanced analytical skills	Strong and adaptive educational, reskilling and lifelong learning
Inequality in job opportunities between low/medium/high decreases	- Outsourcing and relocation of low-skilled jobs - Ongoing automation of routine tasks	- Increasing demand for low- and medium skilled jobs because of reduced digitalisation - Reduced pace of technological progress hinders high-skilled jobs from outpacing middle and low skill jobs	- Favourable business climate to prevent companies from relocating abroad - Strong worker representation - Support for those who fall through the gaps of the reskilling system - Prevention of labour precarity
Negative outcomes	Inhibitors that prevent negative outcomes	Drivers that promote negative outcomes	Needs
Decreased productivity and prosperity	High levels of trade increase economic activity	Increasing need for specialisation due to globalisation	- Social agreements to stimulate productivity - Optimal use of existing trade agreements

		• Ongoing automation of routine tasks	• Companies that adapt in response to changes in business model trends and markets • Investments in economic resilience
Less job opportunities - Especially for low-skilled workers		• Outsourcing and relocation of low-skilled jobs • Further automation of routine tasks • Higher migration of workers (Higher supply)	• Raise educational levels and promote up-skilling, in particular to increase medium-level skills • Favourable business climate to prevent companies from relocating abroad • Support for vulnerable groups, e.g. to reskill • Collective bargaining opportunities
Less job opportunities - Especially for high-skilled workers		• Slowdown in technological advancements lowers demand for high-skilled workers	• Companies remaining in EU • Strong worker representation • Support for the vulnerable groups • Prevention of labour precarity

Abbreviation: EU: European Union.

List of Abbreviations

AI - Artificial Intelligence

EU - European Union

GINI - Growing Inequality: a Novel Integration of transformation research

GPU - Graphics Processing Units

GSPs - Global Skills Partnerships

HEED - Healthcare, Early Education, and Domestic Roles

ILO - International Labour Organization

PPPs - Public-Private Partnerships

R&D - Research and Development

SMEs - Small and Medium Enterprises

STEM - Science, Technology, Engineering, and Mathematics

TNO - Toegepast Natuurwetenschappelijk Onderzoek (Dutch Organisation for Applied Scientific Research)

US - United States of America

WP - Work Package

WTO - World Trade Organization

Definitions

Digital Transformation: Digital transformation encompasses the application of digital technologies — including artificial intelligence (AI), cloud computing, cyber-physical systems, and smart factories - particularly through their integration by businesses and organisations. This process involves strategically harnessing critical resources and capabilities to enhance the performance and reach of an entity substantially, be it an organisation, business network, industry, or society as a whole. The main focus of this booklet is the impact of new technologies on society, particularly through changes in the labour market.

Globalisation: Globalisation refers to the cross-border flow of goods, services, and investments, coupled with the innovative and operational functions employed by businesses and organisations to initiate, support, and manage these flows. It encompasses the economic exchanges and the exchange of ideas and cultural practices that facilitate and are facilitated by these economic transactions.

Migration and Mobility: Migration signifies the relocation of individuals from one country to another, intending to reside in the host country for a significant period. This movement can be motivated by various factors, including employment, family reunification, study, or fleeing from conflict, persecution, and disasters. Intra-EU mobility, as opposed to third-country migration, captures the free movement of labour within the EU as part of the four freedoms—goods, capital, services, and people—that underpin the European Single Market.

Skill Demand: Skill demand refers to the competencies and attributes that organisations require from their workforce to ensure effective and efficient operation, both presently and in the future. Skills are defined as expandable personal capabilities and qualities—traits that can be enhanced through training and development. The workforce is broadly categorised into low-, medium-, and high-skilled workers based on their skills.

Inequality: Inequality is manifested in various forms within society. This includes:

- **Socio-economic Inequality** is the unequal distribution of opportunities across different segments of society. It encompasses economic disparities (such as income and wealth) and imbalances in an individual's capabilities and access to resources (e.g., education, and health) for adapting to change.
- **Gender Inequality:** The observed differences between the genders (e.g. men and women) on various social and economic indicators, such as pay and health, that are driven by gender bias and unequal gender rights, opportunities and treatments (Based on Shang, 2022)

- **Regional Inequality:** The disparities in living standards and employment opportunities between various regions, focusing on the availability and accessibility of job opportunities (Based on Dunford, 2009).

Based on Preenen et al. (2024) from Seghir et al. (2022).

Education: Education refers in this report to programmes of learning with general objectives relating to the personal development of the learner and their acquisition of knowledge. Formal education takes place in a structured and taught manner normally in schools or other educational institutions. Education is also a property that a person possesses after going through this process, usually confirmed by a formal and generally accepted qualification (Descy & Tessaring, 2004).

Skills development: Skills development refers to the process of consciously acquiring relevant knowledge and experience needed to perform a specific task or job. Our definition excludes training and knowledge gained in the education sector. Training can take place on-the-job or off-the-job, the latter usually being organised as programmes offering a sequence of courses. The training a person has obtained is usually measured in quantitative terms (duration, frequency), discriminating between types (initial, continuing), degrees of formality, and place (Pfeiffer, 2001).

Labour Market Regulation: Labour Market Regulation refers to the domain of regulating labour markets by means of legislation. This domain defines the context in which companies and workers act; in other words, the boundaries of the labour market. Labour market regulation is key to ensuring rights and certainty for workers and employers in their employment relationships (WEC, n.d.) and is the responsibility of EU and governmental actors.

Economic Resilience: Economic Resilience (Economic development and diversification) is the capability of an economy to sustain itself, cope with adverse shocks and uncertainty and adapt to changes (European Commission, 2017).

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