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## ARTICLES

CENTRAL EUROPEAN REVIEW OF ECONOMICS & FINANCE  
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Paulina Bojanowska<sup>1</sup>, Oskar Zbiciak<sup>2</sup>, Rafał Czupryn<sup>3</sup>

### **CAREER GUIDANCE AS A MECHANISM SUPPORTING OCCUPATIONAL AND FINANCIAL DECISION-MAKING UNDER LABOUR MARKET UNCERTAINTY**

#### **Abstract**

The article analyses the role of career guidance in supporting occupational and financial decision-making. The point of departure is the assumption that educational, vocational and employment choices are increasingly interdependent with household income, financial stability, creditworthiness, capacity to save, investment in human capital and long-term economic security. The article is conceptual and analytical in character. It synthesises selected literature from career development theory, vocational guidance, labour pedagogy, behavioural economics, decision psychology, financial literacy and personal finance. Particular attention is paid to Donald Super's life-span, life-space theory, social cognitive career theory, Mark Savickas's career construction theory, the lifelong guidance approach, career management skills, bounded rationality and behavioural determinants of decision-making. The analysis indicates that career guidance should not be reduced to the selection of occupation or educational pathway. It should

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be understood as a process of strengthening agency, reflexivity, career adaptability and economic awareness. The article argues that career counselling may reduce educational, occupational and financial risks by supporting the recognition of interests, competences, labour-market opportunities, income consequences, employment instability and costs of qualification development. The conclusions emphasise the need to integrate career guidance with financial education, labour-market information, risk assessment and long-term life planning.

**Keywords:** career counselling; career decisions; financial decisions; financial education; career; labour market; economic competencies.

**JEL classification:** I25, J24, J62, D14, D91, G53.

**Paper type:** conceptual article.

### **Introduction**

Contemporary educational and occupational choices are increasingly difficult to separate from financial decisions. The choice of school, field of study, occupation, form of employment, sector, place of residence, mobility strategy and further training affects not only professional identity, but also income trajectories, employment stability, social security entitlements, creditworthiness, ability to accumulate savings and subjective financial well-being. In this sense, career decision-making is also economic decision-making. It concerns the allocation of personal resources, especially time, effort, learning capacity, mobility, social capital and future income expectations.

The increasing importance of career guidance results from structural changes in labour markets (Cedefop et al., 2020; Nota et al., 2014). Career paths are less linear than in the industrial model of work. Technological change, platform work, flexible contracts, migration, demographic shifts, skills mismatch and repeated transitions between education, employment, unemployment and retraining increase the number of decisions individuals must make across the life course. The classical assumption that a young person chooses a profession once and then follows a stable occupational trajectory is no longer sufficient. Contemporary career development is more often described in terms of adaptability, lifelong learning, employability, agency and career management skills (Savickas, 2013; Sultana, 2012; Watts, 2006).

The problem addressed in this article concerns the extent to which career guidance can support not only occupational choices, but also financially responsible life decisions. The key research questions are as follows: first, how does career guidance influence the quality of occupational and educational decisions? Second, in what sense are career choices also financial decisions? Third, how can vocational counselling strengthen financial awareness, agency and long-term economic security? Fourth, what psychological and social mechanisms distort occupational and financial decision-making? Fifth, how should career guidance be developed in order to reduce educational, occupational and financial inequalities?

The article is based on a narrative and analytical review of selected theoretical and empirical literature. It does not present original empirical research. Its purpose is conceptual synthesis. The analysis combines career development theory, labour pedagogy, social cognitive theory, decision psychology, behavioural economics, financial literacy research and public policy approaches to lifelong guidance.

### **1. Theoretical foundations of career guidance**

Career guidance is usually defined as a set of activities supporting individuals in understanding themselves, educational opportunities, occupational options and labour-market conditions in order to make informed career decisions. In contemporary approaches, it is not limited to diagnostic testing or matching a person to an occupation. It includes counselling, information provision, skills development, reflective dialogue, career education, transition support and the strengthening of decision-making competences (Brown & Lent, 2013).

One of the classical foundations of career guidance is Donald Super's life-span, life-space theory. Super conceptualised career development as a lifelong process connected with self-concept implementation, changing life roles and developmental stages (Super, 1990). From this perspective, career choice is not a single event, but a sequence of decisions embedded in maturation, exploration, establishment, maintenance and disengagement. The relevance of this theory for the present analysis lies in the fact that financial consequences of career decisions also unfold over time. Educational investment, occupational entry, professional stabilisation, career interruption, retraining and retirement are all linked with income, savings capacity and economic vulnerability.

The social cognitive career theory developed by Lent, Brown and Hackett introduced another important perspective. It emphasises self-efficacy beliefs

(Bandura, 1997), outcome expectations and personal goals as central mechanisms in career development (Lent et al., 1994). Individuals are more likely to choose and persist in career paths in which they believe they can succeed and from which they expect valued outcomes. However, these processes are also shaped by contextual affordances and barriers, including family background, gender norms, access to information, economic resources and educational opportunities. This approach is particularly useful for analysing links between career guidance and financial decision-making because it shows that the same formal opportunity may be perceived differently by individuals with different levels of self-efficacy, social support and economic security.

The career construction theory proposed by Savickas shifts attention from career as objective progression to career as a narrative and adaptive construction. Career development is understood as the process through which individuals give meaning to work, adapt to transitions and construct life stories that integrate personal identity with social roles (Savickas, 2005, 2013).

The central concept of career adaptability includes concern, control, curiosity and confidence. These dimensions are directly relevant to financial decisions. Concern supports future orientation; control strengthens agency; curiosity encourages exploration of alternatives; confidence supports the implementation of difficult choices. A person who develops career adaptability is better equipped to compare educational investments, assess labour-market risks, consider retraining and resist passive acceptance of unfavourable employment conditions.

The lifelong guidance approach extends career support across the entire life course. It assumes that career guidance should be available not only to pupils and students, but also to adults, unemployed persons, workers at risk of displacement, migrants, older workers and people experiencing social exclusion (OECD, 2004; Watts, 2006). This approach is particularly important in economies characterised by rapid technological change and repeated occupational transitions. Lifelong guidance links individual career development with public policy objectives: employability, social inclusion, productivity, mobility and reduction of skills mismatch.

Finally, the concept of career management skills provides an operational framework for contemporary guidance. Career management skills include self-awareness, opportunity awareness, decision-making, transition management, networking, learning planning and the ability to use labour-market information (Sultana, 2012). These competences can be interpreted

as a bridge between career guidance and financial education. A person able to evaluate labour-market prospects, compare educational pathways, estimate opportunity costs and understand employment risks is also better prepared to make financial decisions related to income, credit, savings and investment in qualifications.

## **2. Career guidance as support for occupational decision-making**

Career guidance supports occupational decision-making by helping individuals recognise interests, values, abilities, personality characteristics, aspirations, competences and contextual constraints. Its role is not to make decisions for clients, but to structure the decision-making process. This distinction is crucial. Good guidance increases autonomy; it does not replace individual agency.

In the case of young people, guidance helps transform diffuse aspirations into more realistic educational and occupational plans. Adolescents often possess incomplete information about occupations, income prospects, required qualifications, working conditions and future labour-market demand. Their decisions may be strongly influenced by family expectations, peer groups, stereotypes or prestige hierarchies. Career counselling can broaden their field of vision by presenting alternative educational routes, vocational education opportunities, labour-market data and possible long-term consequences of choices.

In the case of students, career guidance supports the transition from education to employment. This transition includes not only finding the first job, but also understanding employability, developing professional identity, building social capital and learning how to evaluate employment offers. At this stage, the connection between career and finance becomes particularly visible. Graduates compare wages, unpaid internships, relocation costs, contract types, further education costs and potential career progression. Without adequate guidance, they may overvalue short-term prestige or immediate income while undervaluing learning opportunities, employment stability or long-term development prospects.

For adults, guidance often concerns career change, retraining, unemployment, occupational burnout, migration or the need to adapt to technological change. Adult decisions are usually more complex because they are embedded in household responsibilities, debt obligations, childcare, housing costs and accumulated professional identity. Career change may be

desirable from the perspective of employability, but financially risky in the short term. Guidance can help assess whether retraining is economically feasible, what support instruments are available, how long income interruption may last and which competences have transferable value.

The role of the career counsellor is therefore analytical, educational and supportive. The counsellor helps the individual identify decision criteria, examine assumptions, compare alternatives and understand constraints. This process is consistent with decision-making models in career guidance, which emphasise problem definition, information gathering, evaluation of alternatives, choice and implementation (Gati et al., 1996; Gati & Levin, 2014; Lent & Brown, 2020). Importantly, the counsellor also helps clients recognise emotional and social pressures that may distort decisions, such as fear of failure, low self-esteem, pressure to satisfy parents or the tendency to follow peers.

Career guidance also has an important preventive function. Poorly informed educational and occupational decisions may produce long-term costs: dropout, underemployment, mismatch between qualifications and work, low wages, unstable employment and reduced motivation for lifelong learning. These outcomes are not only psychological or educational problems. They also affect household income, saving capacity, pension accumulation and exposure to financial stress.

### **3. Occupational decisions as economic decisions**

The choice of occupation is often described in identity terms: as a question of interests, talents, values and self-realisation. This perspective is necessary, but incomplete. Occupational choice is also an economic decision because it influences the future stream of earnings, employment risk, access to social protection, working time, health risks, geographic mobility and opportunities for human capital accumulation.

Human capital theory explains education and training as investments that may increase productivity and earnings (Becker, 1964). Although this model should not be interpreted mechanically, it provides an important analytical framework. Educational choices involve direct costs, such as tuition, materials, transport and accommodation, and indirect costs, especially foregone earnings. The expected return depends on the quality of education, field of study, labour-market demand, institutional reputation, individual ability and macroeconomic conditions. Career guidance can help individuals interpret these factors without reducing education to a purely financial calculation.

Occupational decisions also shape income stability. Two occupations may offer similar average wages but differ significantly in employment volatility, seasonality, contract security, exposure to automation or access to benefits. The financial consequences are substantial. Stable employment supports regular saving, creditworthiness, insurance coverage and long-term planning. Unstable employment may increase dependence on short-term credit, reduce savings and intensify vulnerability to income shocks.

The form of employment is another important dimension. Standard employment, self-employment, platform work, temporary contracts and informal work differ in terms of autonomy, income variability, tax obligations, social insurance and risk allocation. A person entering self-employment may gain flexibility and higher potential income, but also assume responsibility for taxation, accounting, health insurance, pension contributions and periods without work. Career guidance that ignores these financial implications remains incomplete.

Occupational decisions also influence access to credit and housing. Banks and financial institutions assess income regularity, contract type, employment history and debt-to-income ratios. Thus, career paths affect mortgage eligibility, consumer credit conditions and household investment opportunities. Career guidance can help individuals understand that income level alone is not the only financial variable; predictability and documentation of income also matter.

Investment in qualifications is similarly a financial decision. Retraining may increase future employability and income, but it requires time, money and risk tolerance. In behavioural terms, individuals may avoid such investment because costs are immediate while benefits are uncertain and delayed. This is consistent with research on present bias and intertemporal choice, which shows that people may overvalue immediate costs or rewards relative to future outcomes (Laibson, 1997; O'Donoghue & Rabin, 1999). Career guidance can counteract this bias by making long-term scenarios more concrete and by dividing career change into manageable steps (Gollwitzer, 1999).

#### **4. Career guidance and financial awareness**

Career guidance can support financial awareness when it helps individuals understand the economic consequences of educational and occupational choices. This does not mean transforming career counsellors into financial advisers. Rather, it implies integrating basic economic reasoning into career conversations: income expectations, cost-benefit

analysis, risk assessment, budgeting during transitions and long-term planning.

Financial literacy is commonly defined as knowledge and skills enabling individuals to make informed financial decisions (Lusardi & Mitchell, 2014, 2023; OECD, 2020). Research indicates, however, that knowledge alone does not automatically translate into behaviour (Fernandes et al., 2014). Financial behaviour also depends on self-control, confidence, habits, social norms and situational pressures (Perry & Morris, 2005; Strömbäck et al., 2017). For this reason, career guidance can play a complementary role. It connects financial knowledge with concrete life decisions: choosing a school, accepting a job, relocating, starting a business, changing qualifications or entering a profession with irregular income.

A key area is the evaluation of educational profitability. Individuals should be able to compare the costs of different educational paths with likely labour-market outcomes, while remembering that education also has non-economic value. Career guidance can help avoid two opposite errors: treating education only as a consumption good detached from labour-market realities, and reducing education entirely to expected earnings. A balanced approach considers employability, personal meaning, social contribution, risk, flexibility and income potential.

Another area is budgeting during transitions. Entry into higher education, migration, unemployment, retraining or starting a business often requires temporary financial reorganisation. Guidance can include questions about expected income gaps, living costs, available support, family obligations and emergency savings. This is particularly important for low-income individuals, for whom even a beneficial career transition may be inaccessible without financial planning.

Career guidance can also support awareness of employment risk. Young people often compare occupations through prestige or visible income, but may underestimate instability, occupational health risks, automation exposure or limited advancement. Adults may remain in declining sectors because current income is familiar, while future risk is abstract. Guidance can make such risk visible by using labour-market information and scenario analysis.

The relationship between career planning and household financial well-being is especially important. Financial well-being includes the perceived ability to meet current obligations, feel secure about the future and make choices that allow enjoyment of life (Netemeyer et al., 2018). Career guidance contributes to this well-being when it helps individuals choose

paths that are not only subjectively meaningful, but also economically sustainable.

### **5. Psychological determinants of occupational and financial decisions**

Occupational and financial decisions are not made by fully rational actors possessing complete information and unlimited cognitive resources. Decision psychology and behavioural economics show that individuals operate under bounded rationality (Simon, 1955). They simplify complex problems, use heuristics, react to emotions and are influenced by framing, social norms and reference points (Kahneman, 2011; Tversky & Kahneman, 1974; Tyszka, 2010; Zaleśkiewicz, 2011).

In career decision-making, bounded rationality appears when individuals consider only familiar occupations, rely on anecdotal information, overgeneralise from a single example or choose the first acceptable option. This may be rational under time pressure, but can lead to mismatch. Career guidance reduces bounded rationality by expanding information, clarifying criteria and slowing down impulsive choices.

Heuristics also shape decisions. The availability heuristic may lead young people to overestimate the attractiveness of occupations frequently represented in media or family networks. The representativeness heuristic may reinforce stereotypes about “male” and “female” professions or about which social groups “fit” particular careers. Anchoring may occur when salary expectations are based on a single visible example rather than labour-market distributions. Guidance can help clients identify these distortions.

Loss aversion is another relevant mechanism. According to prospect theory, losses tend to have greater psychological weight than equivalent gains (Kahneman & Tversky, 1979). Adults considering retraining may focus more on the possible loss of current status, income or identity than on potential long-term benefits. Students may avoid demanding fields because the risk of failure is emotionally salient. Career counselling can help individuals distinguish between acceptable and unacceptable risk, rather than simply avoiding uncertainty.

Family and peer influence are equally important. Occupational choices are often embedded in social expectations. Families transmit values, aspirations, information and constraints. They may support exploration, but may also restrict choices by imposing prestige hierarchies, gender stereotypes or pressure to choose “safe” occupations. Peer groups may influence educational choices through conformity, fear of exclusion or shared myths about labour-market opportunities. These mechanisms affect financial

decisions as well, for example through status consumption, reluctance to discuss money or unrealistic expectations of income after graduation (Gašiorowska, 2014).

Self-efficacy and perceived agency are crucial. Individuals with low career decision-making self-efficacy may avoid exploration, delay choices or accept low-quality employment. Social cognitive career theory shows that self-efficacy beliefs and outcome expectations affect interests, goals and persistence

(Lent et al., 1994). Career guidance can strengthen agency by helping clients recognise competences, formulate goals and experience small decision-making successes (Lent & Brown, 2013).

Short-term thinking is another barrier. Educational investment, savings, skill development and career change require delayed gratification. Behavioural economics shows that individuals may prefer immediate comfort over future benefits, particularly under stress or scarcity (Laibson, 1997; Mullainathan & Shafir, 2013). This mechanism is important for economically disadvantaged individuals, because financial scarcity narrows attention and makes long-term planning harder. Guidance should therefore avoid moralising “bad choices” and instead recognise the structural and psychological constraints under which people decide.

## **6. Career guidance for youth, students and adults**

The role of career guidance differs across life stages. For youth, it primarily supports exploration, self-knowledge and the first major educational decisions. These decisions are consequential because they may structure access to later opportunities. Early guidance should therefore include not only interest inventories, but also labour-market education, financial awareness, information about vocational and academic pathways, and critical reflection on stereotypes.

For secondary school students, career guidance is particularly important because choices between general education, vocational education and specific fields may influence future earnings and mobility. Guidance should not rank paths simplistically. Instead, it should show that different pathways may be rational depending on interests, competences, local labour markets, family resources and further learning opportunities. Vocational education may offer faster labour-market entry, while academic education may increase long-term flexibility in some fields. The quality of the match matters more than symbolic hierarchy.

For university students, guidance should support employability, professional identity and transition management. Students often face uncertainty about how their field translates into occupations. Guidance can help them identify transferable skills, build portfolios, understand recruitment processes, evaluate internships and assess employment contracts. It should also include discussion of income expectations, relocation costs, unpaid work, postgraduate education and debt.

For adults, guidance is increasingly connected with lifelong learning. Technological change and restructuring make some competences obsolete while increasing demand for others. Adult guidance should help identify transferable skills, evaluate retraining opportunities, access public support and manage financial risks during transition. It should also address emotional barriers: fear of losing status, shame associated with unemployment, burnout and identity disruption.

For unemployed persons, guidance should combine activation with dignity. Unemployment is not only loss of income, but also loss of structure, social recognition and perceived control. Poorly designed guidance may become administrative pressure; well-designed guidance supports realistic planning, motivation and access to training. It should also address financial vulnerability, because unemployment often produces debt, delayed payments and reduced ability to invest in job search.

For people at risk of social exclusion, career guidance has a compensatory function. This includes people from low-income families, rural areas, persons with disabilities, migrants, early school leavers and those with limited social capital. In such cases, guidance may reduce information asymmetry and increase access to opportunities that are otherwise available mainly to privileged groups.

## **7. Career guidance, social inequalities and financial inequalities**

Access to professional career guidance may reduce educational, occupational and financial inequalities (Guichard, 2013). Inequality is reproduced not only through income differences, but also through unequal access to information, networks, confidence, role models and knowledge of institutional pathways. Individuals from families with high cultural and economic capital often receive informal guidance: advice about schools, professions, internships, negotiation, credit, housing and further education. Those without such support depend more heavily on public institutions.

The absence of guidance may lead to poorly informed educational choices, dropout, skills mismatch, low-quality employment and reduced

mobility. These outcomes can generate financial consequences: lower lifetime earnings, weak pension accumulation, debt, dependence on family support or social assistance and limited ability to absorb shocks. Thus, career guidance should be interpreted as part of social policy, not only educational service.

Career guidance can reduce inequalities by making hidden rules visible. It can explain recruitment practices, qualification systems, labour-market segmentation, professional networks and the economic implications of contract types. It can also challenge self-limiting beliefs. Young people from disadvantaged backgrounds may exclude prestigious or high-return pathways not because they lack ability, but because they perceive them as socially inaccessible. Guidance can expand perceived possibility while remaining realistic about barriers.

However, guidance itself may reproduce inequality if access is unequal or quality is low. Schools with fewer resources may provide less individual counselling. Adults in precarious work may lack time or awareness to use guidance services. Digital guidance tools may benefit those already equipped with literacy and confidence. Therefore, public policy should ensure universal, high-quality and lifelong access to guidance, supported by the professionalisation and training of practitioners (Cedefop, 2009).

Financial inequality also affects career decisions directly. A student from a wealthy household can accept unpaid internships, relocate or extend education; a low-income student may need immediate earnings. An adult with savings can retrain; a worker living paycheck to paycheck may remain in a declining occupation. Career guidance cannot remove these structural inequalities by itself, but it can help identify support mechanisms, reduce informational disadvantage and advocate for institutional solutions.

## **8. Practical recommendations for integrated career and financial guidance**

The analysis supports the need to develop career guidance that integrates occupational, educational and financial perspectives. This integration should not blur professional boundaries. Career counsellors do not need to provide specialised investment or tax advice. They should, however, be prepared to discuss the financial implications of career decisions at a basic and educational level.

First, career guidance should include labour-market information in an accessible form. Counsellors should help clients interpret wage data, employment trends, qualification requirements, regional differences and

sectoral risks. Information should be contextualised rather than presented mechanically. Average wages do not determine individual outcomes, but they help structure realistic expectations.

Second, guidance should include basic financial education connected with career transitions. This may include budgeting during study, unemployment

or retraining; understanding income variability; comparing direct and indirect costs of education; recognising risks of unstable employment; and planning emergency funds. Such content is especially important for students entering the labour market and adults changing qualifications.

Third, counselling should use scenario analysis. Clients can compare several career paths according to criteria such as required education, time to income, expected wages, stability, mobility, health risks, compatibility with values and long-term development. Scenario analysis supports reflective decision-making and reduces impulsive choices.

Fourth, guidance should develop career management skills. Schools, universities and labour-market institutions should teach self-assessment, opportunity analysis, decision-making, transition planning, networking and use of labour-market data. These skills should be assessed through applied tasks rather than only declarations.

Fifth, cooperation between institutions is necessary. Schools, universities, public employment services, social assistance institutions, employers, NGOs and financial educators should create referral pathways. A person facing career transition often needs more than one type of support: guidance, training, psychological support, childcare, financial counselling or legal advice.

Sixth, special attention should be given to vulnerable groups. Universal services are necessary but insufficient. People facing poverty, disability, migration, unemployment or regional exclusion may need proactive outreach and long-term support. Guidance should be culturally sensitive and adapted to local labour-market conditions.

Seventh, counsellor training should include behavioural decision science. Understanding bounded rationality, heuristics, self-efficacy, social pressure and present bias can improve counselling practice (Thaler & Sunstein, 2008). It helps counsellors avoid simplistic assumptions that clients merely need more information. Often they also need support in managing fear, uncertainty and perceived lack of control.

### **9. Synthesis: career guidance as a mechanism of economic agency**

Career guidance can be understood as a mechanism that strengthens economic agency. Economic agency means the ability to make informed, reflective and responsible choices concerning education, work, income, risk and future security. It does not imply full control over labour-market outcomes. Individuals operate within structural constraints: class, region, gender, disability, labour demand, institutional rules and macroeconomic conditions. Nevertheless, guidance can increase the quality of decisions within these constraints.

The relationship between career and finance is reciprocal. Career choices shape income, stability and financial well-being. Financial resources shape career choices by enabling or restricting education, mobility, entrepreneurship and retraining. This reciprocity explains why guidance should not treat financial issues as external to career development. For many individuals, especially those from less privileged backgrounds, financial feasibility is a central condition of career planning.

The theoretical perspectives discussed in the article converge around several conclusions. Super's theory highlights the lifelong and role-based character of career development. Social cognitive career theory explains the importance of self-efficacy, outcome expectations and contextual barriers. Career construction theory emphasises narrative, adaptability and meaning. Lifelong guidance frames career support as a public good across the life course. Behavioural economics and decision psychology show why information alone is insufficient. Together, these perspectives support a model of guidance that is reflective, developmental, contextual and economically informed.

### **Summary and conclusions**

The article addressed the role of career guidance in occupational and financial decision-making. The analysis leads to several conclusions.

First, career guidance should not be understood narrowly as help in choosing a profession. It is a broader process supporting individuals in making educational, occupational and economic decisions across the life course. Its purpose is to strengthen self-awareness, agency, adaptability, information use and decision-making competence.

Second, occupational decisions are also financial decisions. They influence income, employment stability, social protection, creditworthiness, saving capacity, pension accumulation, household security and quality of life.

This does not mean that career choices should be reduced to earnings. It means that their economic consequences should be explicitly analysed.

Third, career guidance can support financial awareness by helping individuals evaluate the costs and benefits of education, retraining, mobility and employment forms. It can also help them understand labour-market risk, income variability and the financial implications of unstable work.

Fourth, psychological mechanisms significantly affect career and financial choices. Bounded rationality, heuristics, loss aversion, present bias, family pressure, peer influence, low self-efficacy and fear of failure may distort decision-making. Effective guidance must therefore combine information with reflective and psychological support.

Fifth, career guidance can reduce inequalities. Unequal access to information, networks and confidence contributes to educational and occupational stratification. Professional guidance can partially compensate for these differences, especially when targeted at vulnerable groups.

Sixth, public policy should develop integrated systems of lifelong guidance. Schools, universities, labour-market institutions, employers, social services and financial educators should cooperate. Career guidance should include elements of financial education, labour-market analysis, risk management and long-term planning.

The general conclusion is that career guidance is a key instrument for supporting rational, conscious and responsible decisions concerning work, income, economic security and quality of life. In contemporary labour markets, where careers are increasingly fragmented and financial risks are increasingly individualised, guidance becomes not only an educational service, but also an element of social and economic resilience.

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## ARTICLES

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### **FIRM-LEVEL EVIDENCE ON THE RECONFIGURATION IN GLOBAL VALUE CHAINS**

#### **Abstract**

*Business evidence suggests that many multinational enterprises (MNEs) consider new investment projects in their home economies to balance their dependence on global sourcing due to dynamic geopolitical shifts. The research goal of this article is to investigate and explain changes in international configuration of MNEs during a period of time 2012-2021. Using firm-level data I measure the dynamics in the global structure of sourcing arrangements with respect to fixed assets and employment of multinational enterprises in domestic versus foreign subsidiaries. The sample of firms consists of 17,869 foreign subsidiaries, including 15,462 nearshore and 2,407 farshore units. I aim at contributing to the economic literature in two ways. The first one is providing empirical evidence regarding changes to global value chains (GVCs) with respect to operations of firms. The second novelty is applying data on structures of MNEs influencing their operations with respect to GVCs. From the micro perspective, the results suggest that that international organization of production is stable. It means that firms do not shift production from one location to another in response to short-term events. It can be explained by high fixed costs of establishing foreign operations. From the macro perspective, this study provides particularly valuable insights in the current context of protectionist policies introduced in the global economy. The results confirm limited transfer of jobs and investment into home economies of MNEs.*

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### **Introduction**

For many years there have been a rising trend towards offshoring, that is relocating business processes abroad. At the centre of the process have been the global value chains (GVCs) defined as “the complex network structure of flows of goods, services, capital and technology across national borders” (World Trade Organization 2019, v). It could be executed in arm’s length contracts referred to as offshore outsourcing or within the structure of a firm in the form of captive offshoring. Moving activities abroad, either of manufacturing or service processes, attracted a lot of attention of the researchers, politicians, the general public. From the economic point of view offshoring is considered as a possibility to fragment or disintegrate business processes internationally (Grossman and Rossi-Hansberg 2008).

The role of international fragmentation was boosted by the accession of China to the World Trade Organization in year 2001. Anyway, the value of GVCs during the Global Financial Crisis (GFC) was significantly reduced and the later growth was meagre, only with an exemption in 2017 (World Trade Organization 2019, 1). After the GFC, the economic problems have been translated into political decisions. In year 2016 Brexit voting and Trump’s first victory in presidential elections in the US were not only symbolic, but pronounced the new wave of economic isolationism. In this way we should see sanctions on Russia after annexation of Crimea in 2014 and the invasion on Ukraine in 2022.

Due to severe changes in the global economy there have been many arguments supporting backshoring or reshoring, that is relocation of production to a home economy or to its proximity (Barbieri, et al. 2020). Problems with international movement of goods and people, tensions between economies and market volatility confirmed that seamless international coordination of business processes is difficult (Schwellnus, et al. 2023). All these arguments fuel questions regarding changes in the GVCs. In spite of importance of the reshoring phenomenon there are still fundamental questions of whether we can observe a new trend in the global economy. Earlier propositions regarding decoupling from GVC have not been supported by results of simulating their potential economic impact (Eppinger, et al. 2021).

The role of firms in analysing GVCs has not been fully implemented, thus investigating changes in global configuration requires applying proxy measures. One of the solutions in combining industry-level trade data with firm-level characteristics (Antràs and Chor 2013). A very important element

of their study was distinguishing between trade with related or unrelated parties. Ratajczak-Mrozek and Małys (2012) distinguish between formal and informal cooperation with supply chains. Antràs et al. (2022) expanded the analysis of global sourcing by including MNEs in global sourcing arrangements. However, the lack of appropriate data is the main factor hindering the application of firm-level approach. Therefore in this paper I focus on the configuration of main participants of GVC, not their trade.

The research goal of this article is to investigate and explain changes in international configuration of MNEs due to dynamic geopolitical shifts. Using firm-level data I attempt to investigate changes in networks of sourcing of multinational enterprises over the period of time 2012-2021. I measure the dynamics in the global structure of sourcing arrangements with respect to fixed assets and employment of multinational enterprises in domestic versus foreign subsidiaries. Measures in this paper are related to productive factors within GVC.

I aim at contributing to the economic literature in two ways. The first one is providing empirical evidence regarding changes to GVC with respect to operations of firms. The most common approach to investigating GVC participation is measuring inputs and outputs of intermediates on various stages of the value chain e.g. (Johnson 2017). However, this understates the role of firms as key participants in GVC and their long-term strategies (Davis and Markusen 2021).

The second novelty is applying data on structures of MNEs influencing their operations with respect to GVC. I investigate the productive assets in home economies and offshoring destinations. The latter is divided into nearshoring and farshoring operations. Thanks to such an approach I analyse not only changes to home production factors versus foreign assets, but also reconfiguration between foreign destinations. I focus on MNEs because of their dominant role in the fragmentation processes within GVC in recent decades (Cadestin, et al. 2018). I do not expect a definite end of offshoring, or dynamic rise in reshoring or backshoring. The reconfiguration occurs in balancing multiple sourcing options enabling the proximity to customers and agility of operations inducing a hybrid approach to international configuration of production (Theyel, Hofmann and Gregory 2018).

The rest of the paper is organised as follows: section 2 provides the explanation of recent changes in GVC; section 3 presents the review of previous contributions to the topic firms' participation in GVC; section 4 provides description of data and some stylized facts; section 5 provides specification of the econometric model, section 6 presents results of the econometric analysis; section 7 contains discussion; section 8 delivers conclusions.

## **1. Background of changes to global value chains**

The business evidence confirms that many large multinationals consider large investment projects in their home economies to balance their overseas supply dependence (Temouri, et al. 2023). One of the examples is the 20 billion dollars chip factory of Intel in the US. It is in line with the president Biden's plans to support local semiconductors' production with the amount of 52 billion dollars in public support in order to boost the local supply. The Chief Executive Officer of the company said in a statement that "Intel's actions will help build a more resilient supply chain and ensure reliable access to advanced semiconductors for years to come. Intel is bringing leading capability and capacity back to the United States to strengthen the global semiconductor industry." (Intel 2022). During President Biden's term the US government doubled down on attracting production to the country by introducing hundreds of billions of support within a framework of Inflation Reduction Act or executive orders aimed at resilience of supply chains. President Trump put bringing manufacturing to the US as his paramount. These actions were put into the theoretical framework of the role of governments in supply chains by Grossman, Helpman and Lhuillier (2023).

There is an ongoing process of attracting the companies back to home countries (De Backer, Menon, et al. 2016). Importantly it is postulated by the important economies in world and those which responsible for large expansion of MNEs decades back (Capello and Cerisola 2024). It means that those economies, which supported global expansion, nowadays support reconfiguration of the global production networks. There are economies offering financial incentives to firms moving production to their shores. There are at the same time high expectations regarding institutional support for firms repatriating their operations. An act regarding reshoring of South Korean firms was introduced in 2013, have not encouraged many firms to relocate their operations to the country, and those which decided to do so, complained about difficulties they faced (Moon 2018).

The fact that GVCs attracted so much political and public attention not only highlights the role of international value creation, but even more importantly, poses some risks to optimal configuration of the chains. Politicising of GVCs seems to be inevitable. During the pandemic in year 2020, the unprecedented economic slowdown led to large scale interventions of governments and novelty policies, which frequently formulated requirements towards businesses regarding higher level of national responsiveness (Grossman, Helpman and Lhuillier 2023). For example, the government of France proposed to link the support towards a French car producer to repatriation of some activities to the home economy. This is an important event as it comes from the centre of EU. Similar solutions have been proposed by Japan with the amount of 2.2 billion dollars (Bloomberg 2020), which was later boosted

to approximately 4.4 billion dollars with the focus on semiconductors and vaccines (Kyodo 2021).

We can say that some of the advantages of global fragmentation eroded over a very short period of time. It forced many corporations to reconsider their strategies towards less dependence on the imports from China (Gur and Dilek 2023). The issue is also that firms from emerging economies expanded their production network internationally. This could be a counterintuitive situation when a Chinese firm produces in a high cost Germany or the US. However, there are many instances when the level of production cost was of much lower importance than proximity to customers or access to specialised factors. Therefore, backshoring cannot be only seen as moving production from low cost locations, but rather as a result of required local responsiveness and potential externalities of offshoring (Radi, Lamantia and Italo Bischi 2021). It also means that firms still focus on international expansion, however their sourcing strategies are more diversified. The flooding in Thailand and negative political developments in the economy induced many problems to the value chains that were based on the hub.

The issue that should be stressed when discussing the decision about organization of GVCs is the deteriorating security of assets abroad and trade disputes adding risks to global fragmentation of production. According to the research MNEs constitute the group of firms seeking the highest level of protection of their foreign investments due to the critical role of their internal networks (Kim, et al. 2019).

There is a new approach to strategic trade policy. Many economies consider that excessive dependence on distant suppliers of strategic supplies might be very risky, especially in constraint periods (Eppinger, et al. 2021). And the control of value chains may also become a geopolitical weapon. Thus backshoring is not solely related to the pandemic but rather to geopolitical shifts. Especially on the US-China axis. There is an intensifying rivalry for limited resources. There are several examples of high demand goods, such as microchips, batteries for electric vehicles or rare-earth minerals.

On the other hand, these are also very advanced economies with automation possibilities. It means they are capable of executing many processes without the significant engagement of labour force (which is expensive and/or scarce). Adidas opened its almost fully automated plants in Germany and the US to increase flexibility of deliveries to customers in Europe and the US, respectively. However after several years the expectations have not been materialised and the factories were closed (Lee and Lee 2022). It was interpreted as a failure of automation, however we can perceive in the broader term of changes to global value chains.

## **2. Previous theoretical and empirical contributions**

The main aim of this paper is to investigate the changing structures of multinational firms with respect to GVCs. Therefore it is crucial to introduce the changes to analytical frameworks of international division of work, which incorporated firms. However, there are various mismatches between conceptual approaches and availability of granular firm-level data. Moreover, the international business structures are evolving due to external changes and reshoring or backshoring are emerging as potential solutions to mitigate risks in GVCs. This paper merges several theoretical concepts to present a comprehensive picture of reconfiguration in international production.

Since more than two decades we can observe significant changes in the analysis and understanding the role of firms in international trade and production. The seminal paper by (Melitz 2003) brought a new approach to analysis of international trade with firms in focus. However, the empirical work, especially in multicountry framework has been hindered by the data availability. Even though the important databases emerge, the biggest issue is the accessibility to recent data. For example, World Bank's Exporter Dynamics Database provides data for the period of time 1990-2014. However, it is not useful for the recent analysis of changes in the global trade. „This firm-level approach to international trade initially involved only the exchange of final goods, but an active literature has adopted similar ideas to understand the rise of GVCs” (The World Bank 2020, 30). However, it is still imperfect in capturing the real operations of MNEs with respect to GVCs.

Baldwin and Venables (2013) divided firms participating in GVCs as “snakes” and “spiders”. Snakes organize processes sequentially and downstream activities rely on inputs from earlier stages. Spiders organise processes so that particular components are produced in various units, but then come together in one location. The role of particular subsidiaries within the structure of a MNE depends however of multiple internal and external factors (Dzikowska, 2019).

A comprehensive study of FDI and GVCs was conducted by (Davis and Markusen 2021). They analysed links between two types of FDI, that is vertical and horizontal, and participation of firms in the GVCs. The role of vertical and horizontal FDI and participation of firms in international sourcing was also raised by (Alfaro and Charlton 2009). They concluded that the role of vertical FDI has been underestimated due to aggregation of data. Indeed, when they applied detailed 4-digit SIC codes the dominant form of FDI became vertical. Antràs et al. (2022) merged data on FDI with trade data in order to specify sources of inputs with the focus on sourcing decisions by MNEs. In line with the concepts merging FDI and GVC, global sourcing in this paper is understood as activities related to acquiring inputs from internationally dispersed affiliates.

The decision regarding vertical integration versus international outsourcing is respectively based on the choice between costs of governance versus costs of searching for suitable partners (Grossman and Helpman 2002). Alfaro et al. (2019) studied firm-level approach to the control of over particular stages of GVCs. The question becomes even more timely as we can currently observe many disruptions to the flow of intermediates and it is difficult to establish the responsibility in this turbulent environment. The technological proximity between participants in GVC may also lead to more integration of the value chain, while the activities of dissimilar technologies are source through arm's length contracts (Del Prete and Rungi 2017).

Together with changes in GVC come issues of reshoring and backshoring. The idea of reshoring was pronounced as a potential outcome of "overshooting" in offshoring strategies as firms opted for proximity instead of cost advantage (Baldwin and Venables 2013). De Backer and Flaig (2017, 3) put the analytical reasoning this way: "The world economy is facing a number of structural shifts that may dramatically change the outlook of GVCs in the coming years. The empirical evidence evaluating the potential impact of these shifts however largely lags behind".

The theory suggests than firms will backshore if the market size shrinks, demand falters, or costs of offshoring are rising (Wu and Zhang 2014). The study for the US and UK firms found that both proximity to customers and rising costs of offshoring contribute to the decision regarding repatriation of manufacturing operations (Vanchan, Mulhall and Bryson 2018). The cost advantages are eroding as offshore destination are becoming more expensive.

Nevertheless, backshoring is difficult to detect. It is due to the nature of the process, which is difficult using the traditional analytic tools. One of the approaches is to use business surveys. Also the business perspective was easier to be spotted and via questionnaires the motivations of decision-makers could be investigated. One of the first attempt to detect backshoring was proposed by Kinkel and Maloca (2009). Their qualitative approach based on analysis of 39 German companies lead to identification of backshoring phenomenon. The reasons for backshoring were mainly lack of flexibility and quality issues. This small scale research was then followed by the larger sample of 1,484 German firms (Kinkel 2012). The study revealed a slowdown in the offshoring activities, however backshoring processes remained stable in the post-crisis period. Interestingly, according to his findings, the nearshoring operations (mostly in CEE) lost their appeal, while those farshore remained stable as firms aimed at economies and scale via concentration of their activities in limited number of locations. The source of information was European Manufacturing Survey. Later studies confirmed that in the period of time between 2013 and mid-2015 around 4% of firms analysed moved their production back to the home country (Dachs, et al. 2019).

There are also motives that backshoring has been in some cases motivated by unemployed capacity in the home economy (Dachs, et al. 2019). In such a case the production can be relocated from offshore destination and there may be some loss of jobs, however new jobs may not occur in the home economy.

Backshoring, however, is a difficult task (Kamakura 2022). It depends on the complexity of operations and the technology and knowledge base in the company. One of the important factors is the duration of outsourcing (Nujen, et al. 2018). Anyway, backshoring is very complex as the anecdotal search for lower production costs is no longer the main argument, it is rather about economies of scale and talents. Therefore in many cases the backshoring may not be a feasible option. It is not expected that there will be an abrupt move towards reshoring as MNEs are not willing to reverse their prior investment, but rather a gradual process of more equal regional distribution of operations (UNCTAD 2021). This is the view we follow in the paper and look for long term and gradual changes in the operation modes of MNEs across continents.

### **3. Data and variables**

The basic source of data for the econometric analysis is Orbis – the global database provided by Bureau van Dijk, a Moody's Analytics company. The database contains information on more than 365 million firms globally collected by more than 160 providers from hundreds of own sources (BvD 2020).

The database has been frequently used to study firm-level operations within GVC (e.g. Del Prete and Rungi, 2017). The database is very comprehensive, especially in the category of large enterprises, which are responsible for the largest chunk of GVC. I limit the study to firms with the employment of at least 10 people (either domestic or foreign subsidiary). A subsidiary is considered as foreign-owned if foreign investors control at least 50% of shareholding capital. Moreover, I exclude some of the units created abroad but not running business operations. I analyse 17,869 foreign subsidiaries, including 15,462 considered as nearshore and 2,407 considered as farshore units. Thanks to such a restriction I focus on firms organised in the form of MNEs. The majority of shareholders control one company abroad and the maximum number is 107 foreign subsidiaries.

The main interest is in the structures of MNEs as I aim to observe changes in networks of companies over the period of time. I analyse MNEs as they are responsible for the bulk of international production, investment and employment (Antràs and Yeaple 2013). Therefore changes to their international operations have a profound impact on the global economy and the macroeconomic indicators. Moreover, MNEs are systematically important as their role in global output has been estimated at around 30%, while share in global exports at around 50% (Cadestin, et al. 2018). MNEs

are in the top category of firms when sorted by their involvement in global production networks (Kim, et al. 2019). Lower categories include in ascending order: purely domestic firms, autonomous exporters and exporters in GVCs. The role of MNEs is distinctive due to their power to organize internalized trade within their own networks. It means that MNEs play the central role in related-party trade flows. Therefore they are valuable objects of analysis combining both external and internal flows.

The assumption that foreign units provide inputs to downstream production is in line with evidence that integration instead of outsourcing helps to control the flow of intangible assets such as managerial expertise (Hortacsu and Syverson 2009). There are also some limitations that firm-level data only focus on the captive mode of operations. It means that I observe if the company changes the value and volume of operations in affiliates in a home economy. It does not allow to observe, however, a situation when a company moves processes from an external supplier abroad to an external domestic supplier. Anyway, the focus of this paper on the organisation of processes within the boundaries of firms enables to systematically and reliably analyse international structures of firms. Such a narrower focus allows to investigate capital linkages as opposed to trade in intermediates irrespective of the ownership arrangement. It also mitigates risks related to outsourcing, such as incomplete contracts (Grossman and Helpman 2002).

The challenge is also to distinguish between vertical (cost oriented) and horizontal (market oriented) foreign subsidiaries. The issue of GVC concerns the former type, however the array of subsidiaries takes a complex form, what means that it is analytically difficult to establish this dichotomous division. According to Davis and Markusen (2021) horizontal FDI dominated operations of MNEs, however vertical FDI are more important with respect to participation in GVC. I also take into consideration that affiliates have not been established solely for providing input to other units of a MNE, but also sell their outputs in the country of expansion or third countries (Antràs, Fadeev, et al. 2022). Therefore, we should have a broader perspective of the operations of firms.

Orbis database provides detailed information about the location of headquarters and particular affiliates. I assume, in line with the theory and evidence, that headquarters' activities are separated from the production even in countries of origin (Carr and Markusen 1998). It means that a MNE in the study consists of headquarters, local production unit and foreign production unit (table 1). Moreover, the foreign production affiliates have been divided into those located in proximate countries (nearshoring) and distant locations (farshoring). Thanks to the unique setting of European firms I can distinguish between the two modes of foreign operations and focus only

on trade costs, which are small in the case of nearshoring and high in the case of farshoring.

I assume that greater distance between headquarters and affiliates increases the propensity for reshoring or backshoring. This is derived from the results of the study by Johnson and Noguera (2012), who confirmed that fragmentation in production tends to increase among nearby trading partners. I analyse changes in the variables of interest with respect to distance. It means that I can identify European companies, which reduce their supply from Asian destinations but at the same time they move some processes to Central and Eastern European (CEE) economies (table 1). The scenarios provide an illustration of possible changes in structures of multinational firms. However, this paper studies structures of multinational firms headquartered in 17 European economies having subsidiaries in any country in the world.

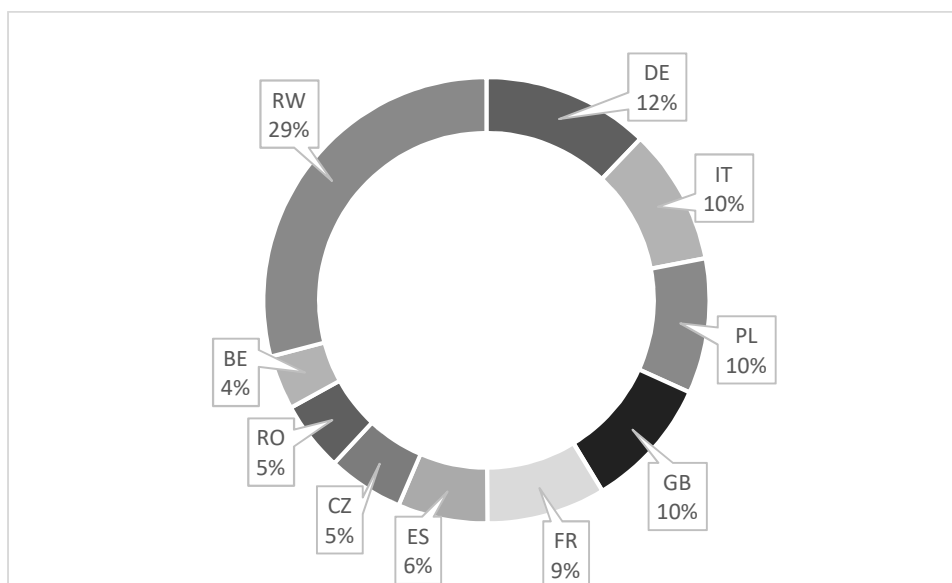
A study by Fan and Liu (2020) focuses on the EU as one of the regions in the world. However, the EU is a very heterogeneous region, where production relocation can occur also within EU as there are high and low cost locations. The role of CEE can be seen in two ways. First, it may lose some appeal to foreign investors as they backshore operations to a home economy. On the other hand, they can become preferable destinations for nearshoring.

**Table 1. Scenarios of European MNEs international configuration of GVC**

Case	Structure	Change in fixed assets/employment	Outcome
1	HQ and local production affiliate – Germany	+	Overall backshoring
	Intra-regional affiliate – Poland	-	
	Inter-regional affiliate – China	-	
2	HQ and local production affiliate – Germany	+	Intra-regional backshoring
	Intra-regional affiliate – Poland	-	
	Inter-regional affiliate – China	Null	
3	HQ and local production affiliate – Germany	+	Inter-regional backshoring
	Intra-regional affiliate – Poland	Null	
	Inter-regional affiliate – China	-	
4	HQ and local production affiliate – Germany	Null	Nearshoring (increase in intra-regional GVC)
	Intra-regional affiliate – Poland	+	
	Inter-regional affiliate – China	-	
5	HQ and local production affiliate – Germany	-	Farshoring (increase in inter-regional GVC)
	Intra-regional affiliate – Poland	-/Null	
	Inter-regional affiliate – China	+	

Source: Own elaboration

The distribution of foreign subsidiaries leans towards the nearshoring type with more than 85% in the sample. This is partially an issue of data accessibility, which is much higher for European firms than for other regions. Anyway this is also a natural result of the distance between the European headquarters and nearby destinations. European firms operate both in advanced and emerging Europe (fig. 1), however the former group of countries dominates in the sample. Importantly, among top destinations we can list traditional nearshoring destinations from Central and Eastern Europe, such as Poland, Czechia or Romania.



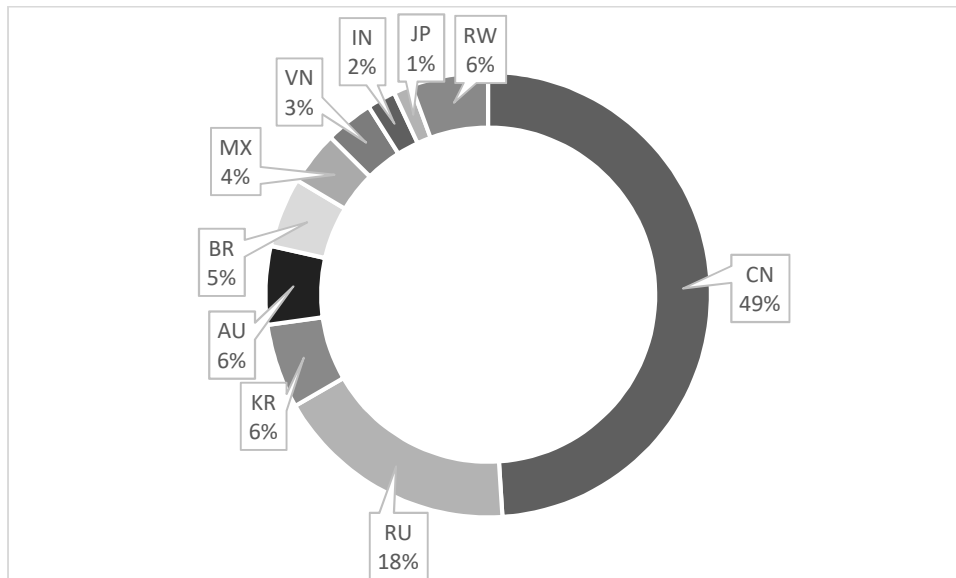
**Figure 1. Distribution of nearshore subsidiaries**

Source: Own elaboration based on Orbis data

Note: DE – Germany, IT – Italy, PL – Poland, GB – Great Britain, FR – France, ES – Spain, CZ – Czechia, RO – Romania, BE – Belgium, RW – remaining nearshore countries

When it comes to farshoring, the position of China is undisputed in comparison to other distant locations of subsidiaries (fig. 2). In general, there is a dominance of Asian economies confirming the central role of the Asian hub in global production networks. The position of China is important from the perspective of global diversification. On the one hand, it is clear that firms in the study are highly dependent on this location. On the other hand, there are more restrained political relations between China and the EU and the US, increasing the propensity toward the reconfiguration of the GVC. The inclusion of Russia in the category of farshoring has been justified not only by the

geographic fact that the majority of the territory of the country is in Asia, but also due to the trade barriers with EU (in the form of sanctions since 2014).

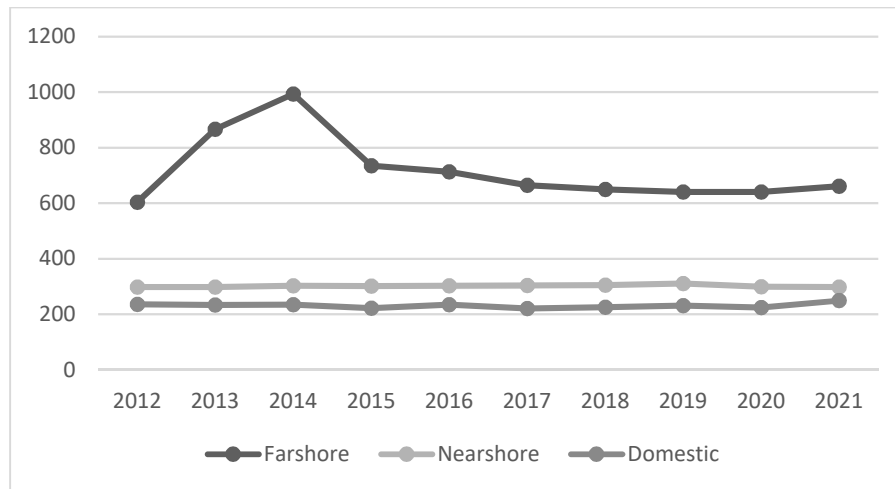


**Figure 2. Distribution of farshore subsidiaries**

Source: Own elaboration based on Orbis data

Note: CN – China, RU – Russian Federation, KR – South Korea, AU – Australia, BR – Brazil, MX – Mexico, VN – Vietnam, IN – India, JP – Japan, RW – remaining farshore countries

Comparison of average sizes of operations in home economy and abroad confirms the dominant role of the latter type (fig. 3). Crucial is here a comparison between nearshoring and farshoring operations. Those two lines are pretty flat, with an exemption for farshoring in 2013 and 2014. After that years we can observe a slight decrease in the size of farshore average employment. The values for nearshoring are on significantly lower level what can be associated with the differences in technologies employed, but also economies of scale and fact that European locations due to lower barriers of entry are more accessible even for smaller enterprises.



**Figure 3. Average employment according to the type of subsidiary**  
Source: Own elaboration based on Orbis data

The average values of fixed assets cannot be presented in a similar manner as employment, as values in local currencies were used here, what makes direct comparisons impossible.

The approach employed in this paper included only manufacturing MNEs as they are naturally engaged in GVC. However, the manufacturing parents may also control service unites providing crucial elements to the value chains. I am aware that I exclude the role of service subsidiaries, however the complexity of the issue requires a separate approach.

#### 4. Empirical models

The main objective is to investigate the impact of foreign operations of multinational firms on productive assets in home economies. It has been assumed that if a firm backshores some of the operations, the stock of productive assets in a home economy will grow, while that of abroad will be lower. Therefore the aim is to establish a link between employment and fixed assets abroad and in a home economy.

Additionally, I disentangle changes in offshoring behaviour of firms into nearshoring and farshoring. The EU is a unique setting for such an investigation and there is a clear trade-off for Western European enterprise between sourcing from distant, mostly Asian destinations and nearby locations in Europe. We could expect that for the sake of resilience and reducing transportation costs, the European firms may opt more vividly towards sourcing from European destinations offering cost arbitrage. The complete list of all dependent and independent variables with their specifications was presented in table 2.

**Table 2. Description of variables**

Variable	Variable description
emp_h	Employment in a company in a home economy (in persons)
emp_n	Employment in nearshoring units (in persons)
emp_f	Employment in farshoring units (in persons)
emp_n_lag1	1-year lag of employment in nearshoring units (in persons)
emp_f_lag1	1-year lag of employment in farshoring units (in persons)
assets_h	Fixed assets in a home economy (in million euros)
assets_n	Fixed assets of nearshoring units (in million euros)
assets_f	Fixed assets of farshoring units (in million euros)
assets_n_lag1	1-year lag of change in assets of nearshoring units (in million euros)
assets_f_lag1	1-year lag of change in assets of farshoring units (in million euros)

Source: Own elaboration

The baseline model relating to changes in the two production factors are as follows:

$$emp\_h_{it} = \beta_1 emp\_n_{it} + \beta_2 assets\_n_{it} + \alpha_i + \mu_{it} \quad (1)$$

where  $emp\_h_{it}$  relates to the number of employees of a company  $i$  in a home economy in the period  $t$ ,  $emp\_n_{it}$  relates to the number of employees of a company  $i$  in a nearshore unit in the period  $t$ ,  $assets\_n_{it}$  are assets of a company  $i$  in nearshore unit in the period  $t$ ,  $\alpha_i$  unknown intercept for each entity,  $\mu_{it}$  is the error term.

$$emp\_h_{it} = \beta_1 emp\_n_{it} + \beta_2 assets\_n_{it} + \beta_3 emp\_f_{it} + \beta_4 assets\_f_{it} + \alpha_i + \mu_{it} \quad (2)$$

where besides the elements of model (1),  $emp\_f_{it}$  relates to the number of employees of a company  $i$  in a farshore unit in the period  $t$ ,  $assets\_n_{it}$  are assets of a company  $i$  in farshore unit in the period  $t$ .

$$assets\_h_{it} = \beta_1 emp\_n_{it} + \beta_2 assets\_n_{it} + \alpha_i + \mu_{it} \quad (3)$$

where  $assets\_h_{it}$  is the value of fixed assets of a company  $i$  in a home economy in period  $t$ , the other notations are the same as in the baseline model (1).

$$assets\_h_{it} = \beta_1 emp\_n_{it} + \beta_2 assets\_n_{it} + \beta_3 emp\_f_{it} + \beta_4 assets\_f_{it} + \alpha_i + \mu_{it} \quad (4)$$

where  $assets\_h_{it}$  is the value of fixed assets of a company  $i$  in a home economy in period  $t$ , the other notations are the same as in the model (2).

Additionally, the interaction between employment and fixed assets was included in the following models:

$$emp_{hit} = \beta_1 emp_{nit} + \beta_2 assets_{nit} + \beta_3 emp_{nit} \# assets_{nit} + \alpha_i + \mu_{it} \quad (5)$$

and

$$assets_{hit} = \beta_1 emp_{nit} + \beta_2 assets_{nit} + \beta_3 emp_{nit} \# assets_{nit} + \alpha_i + \mu_{it} \quad (6)$$

where  $emp_{nit} \# assets_{nit}$  is the interaction term and other notations remain the same as in models (1) and (3). Farshore operations were not included in the models with interactions terms due to limited number of observations.

The models allow to estimate the impact of foreign employment on the local employment. However, the relationship may not be direct due to technological differences between home and foreign operations. When foreign operations are more labour-intensive than domestic activities, it is expected that the employment abroad is larger than the change in employment in home economy. When it comes to the value of fixed assets the relationship should be inverted. It means that a lower value of assets abroad can be translated into a larger value in a home economy due to a higher level of capital intensity in the home economy.

Naturally it is not possible to observe strategies of multinational firms regarding their internal organisation of production. Therefore all productive assets in home country, not particular units are taken into consideration. If the focus was on individual subsidiaries, the negative change in one domestic unit might have been offset by positive change in another domestic unit. Therefore changes are analysed for a pair of domestic productive resources versus production resources in foreign units.

Similar approach to firm-level analysis was applied by (Alfaro, Antràs, et al. 2019). This approach also pictures the difficulties to comprehend GVCs using firm level data. The issue is that we cannot trace the entire GVC and we lose information about the origin of inputs once they are transformed in the next stage.

## 5. Empirical results

The main objective of the analysis is to establish a link between productive assets in home economies and in foreign subsidiaries. The estimation was based on data of 2,369 European multinational firms active over the period of time 2012-2021. The applied technique was a fixed-effects model using panel data. The decision of selecting fixed-effects model over random-effect one was confirmed by statistically significant results of the Hausman test.

Two independent variables were employed in the models. First, the impact of foreign production factors on employment in home economies was estimated (model 1). In the other specification of the model (3) the outcome variable were fixed assets in home economies. In further steps, various specifications of the two models have been estimated.

Offshoring activities are very diversified, therefore it is important to disentangle between two key types: nearshoring and farshoring. The setting of the model using European firms operating in other European countries or on other continents allows for running the unique analysis.

In the baseline estimation (table 3, column 1) we can observe a statistically significant link between employment in home economy and headcount and fixed assets in nearshore destinations. The relationship between foreign productive assets on domestic operations is positive. It can be interpreted that rising foreign employment and assets increases the headcount in the domestic unit. I also included the lagged variables to control for the reverse causality. The values of coefficients were also held for 1-year lagged variables (table 3, column 2). However, the changes may be twofold. It may also mean that decreasing values of foreign assets are associated with a decrease in operations in a home economy.

Coefficients for farshoring assets were statistical significant and positive (table 3, column 3). The results for farshoring employment were insignificant. However, when the variables were lagged 1 year, all the coefficients were positive and highly statistically significant (table 3, column 4).

It is important to note that the estimations using nearshoring operations were conducted using much larger number of observations than in the case of farshoring. It is the results of asymmetry in nearshoring and farshoring operations – European firms are more active in operations in nearby destinations. However, the results both for larger and smaller number of observations keep their signs and significance.

The coefficients for the interaction term occurred significant as well, what confirms the simultaneous positive relationship between level of employment and fixed assets (table 3, column 5).

**Table 3. Impact of nearshoring and farshoring operations on employment in home economy**

Independent variable	Model (1)	Model (1) with lagged variables	Model (2)	Model (2) with lagged variables	Model (5)
emp_n	1.574 *** (.031)		1.585 *** (.079)		1.003 *** (.041)
emp_n_lag1		1.470 *** (.033)		1.344 *** (.083)	
emp_f			.012 (.025)		
emp_f_lag1				.061 *** (.012)	
assets_n	.056 *** (.004)		.048 *** (.011)		
assets_n_lag1		.081 *** (.005)		.054 *** (.026)	
assets_f			.004 *** (.000)		.037 *** (.005)
assets_f_lag1				.008 *** (.001)	
emp_n#assets_n					4.85e-07 *** (2.26e-08)
constant	327.478 (48.247)	388.601 (52.004)	433.517 (461.191)	761.465 485.926	900.325 (54.491)
observations	16,758	15,294	2,716	2,533	16,758
groups	2,274	2,271	437	429	2,274
R-squared (within)	0.151	0.132	0.196	0.190	0.177
Hausman test	.000	.000	.000	.000	.000

Notes: Standard error in parentheses, \*\*\* - significance at 0.01, \*\* - significance at 0.05, \* - significance at 0.1

Source: Own elaboration

When we turn our attention to fixed assets in a home economy, the results for nearshoring operations are highly significant in most specifications (table 4). The results indicated the positive relationship between the value of fixed assets in home economy and employment in nearshore units. In the case of statistically significant coefficients for lagged employment in farshore destination (table 4, column 4) the domestic assets when rising, when the employment was rising (and vice versa). There was a positive a positive relationship between the two variables.

However, we can observe negative relationship between the value of nearshore fixed assets and domestic assets. It means that less assets is located in proximate countries, the more assets in home activities. The value of coefficients for fixed assets in nearshore destinations was

significantly higher than the value of assets in farshoring destinations. The coefficients for farshore assets were positive and significant, however their magnitude was low.

The interaction term for joint impact of changes in nearshore fixed assets and employment occurred statistically significant and positive (table 4, column 6).

**Table 4. Impact of nearshoring and farshoring operations on fixed assets in home economy**

Independent variable	Model (3)	Model (3) with lagged variables	Model (4)	Model (4) with lagged variables	Model (6)
emp_n	.751 *** (.013)		.793 *** (.033)		.139 *** (.015)
emp_n_lag1		.879 *** (.012)		.916 *** (.030)	
emp_f			-.000 (.011)		
emp_f_lag1				.016 *** (.010)	
assets_n	-.034 *** (.002)		-.034 *** (.025)		-.054 *** (.002)
assets_n_lag1		-.028 *** (.002)		-.028 (.005)	
assets_f			.0003 *** (.0002)		
assets_f_lag1				.001 ** (.000)	
emp_n#assets_n					5.59e-07 *** (8.69e-09)
constant	54.232 (20.029)	-85.072 (19.169)	383.455 (194.571)	-257.441 175.716	653.457 (20.106)
observations	18,024	16,264	2,865	2,649	18,024
groups	2,279	2,275	443	433	2,279
R-squared (within)	0.208	0.303	0.234	0.351	0.373
Hausman test	.000	.000	.000	n.a.	.000

Notes: Standard error in parentheses, \*\*\* - significance at 0.01, \*\* - significance at 0.05, \* - significance at 0.1

Source: Own elaboration

## 6. Discussions

The results suggest several trends in international production networks of MNEs over the period of 2012-2021. First, there is a link between changes in productive assets abroad and operations of firms in home economies

in line with the results by De Backer et al. (2016). The changes were estimated from various perspectives. Especially important are results regarding changes in employment. Shifts in GVCs are expected to have an impact on employment both in home and host economies (Radi, Lamantia and Italo Bischi 2021). Negative developments abroad should lead to moving more production to domestic economies and the values of coefficients should be negative. However, we cannot observe a significant shift in employment between home and host economies. There is no trade-off between operations abroad and in home economy. This may be disturbing to those lobbying for moving production, which will bring more jobs to home economies (Clark, Kreps and Rao 2025).

The lack of positive changes in employment may be the result of the restrictions in the international markets. Businesses facing trade restriction may weaken their competitive position abroad, thus increased employment at home economy may not take place. This is also in line with evidence regarding American industries more exposed to tariff increase what resulted in largest employment decreases (Flaen and Pierce 2019). Similar findings were also reported regarding negative changes to the value of investments by American firms facing higher tariffs due to the trade war between China and the US (Amiti, Kong and Weinstein 2020). It has been argued that protectionist measures have not been enough for building long-term positive effects on manufacturing and employment in the USA (Gur and Dilek 2023).

The coefficients for employment variables were particularly significant for nearshoring (or intra-continental) operations. It means that firms have pan-European strategies and do not shift production solely to domestic economies. The nearshoring operations have not been subject to rising trade barriers. Even during the height of pandemic in Europe and restrictions to travel, goods were to lower extent affected by these events. Therefore the flows of goods between the units in Europe were quite smooth, not taking into consideration problems with deliveries of crucial components from the outside continent, especially from Asia. However, more important is the fact that we did not observe negative changes in farshoring due to negative changes in international environment and rising protectionism. This finding is opposite to the conclusions based on German manufacturing sector, where the preference for resilience in GVC led to more domestic and nearshore production (D'Angelo, Di Bernardino and Pernagallo 2025).

Less conclusive results were provided by the analysis of fixed assets. The relationship between fixed assets of foreign units was predominantly negative, what can be interpreted as inverse relationship between the value of assets in home economy and in foreign units. Additional factor that should be taken into consideration when concluding about the changes to productive networks is the survival rate of foreign subsidiaries depending on the sector characteristics (Salamaga 2023). Moreover, we discuss structures of

multinational corporations with multiple affiliates and shared fixed costs allow to achieve scale economies, thus firms are less responsive to changes in trade costs (Antràs, Fadeev, et al. 2022).

Limitation of the study is that it does not reveal the impact of changes in productive assets. The econometric models, which include only changes in employment and fixed assets, delivered low levels of explanatory power similarly to the study of (De Backer, Menon, et al. 2016). The approach employed in this paper is more sound from the econometric perspective.

### **Conclusions**

The article was aimed at explaining the relationship between employment and fixed assets within MNEs in home and foreign economies during a period of dynamic geopolitical shifts. Thanks to employing firm-based data, the article enriches the literature on the organization of multinational enterprises in the global economy. The evidence provided by the study suggests that it is not justified to treat operations of multinational firms in home and host economies as a kind of trade-off. Many multinational firms are highly integrated organizations, which do not transfer complete operations between countries. The engagement of firms into GVC should be treated as an innate element of MNCs' strategies.

The novelty of the article lays in focusing on productive assets within internationally integrated firms instead of trade in intermediates on various stages of GVC. The main issue with applying the trade data was a rigid assumption regarding proportions of absorption of intermediates in GVC. The approach based on trade in intermediates may take into consideration some short term changes to demand in particular groups of categories. The approach employed in this paper allows to detect long-term changes to international production networks.

From the micro perspective, the results suggest that that international organization of production is stable. It means that firms do not shift production from one location to another in response to short-term events. It can be explained by high fixed costs of establishing foreign operations. When the sunk costs have been already incurred, there is little incentive to move operations to another country. It also related to the fact that operations of MNEs are not only focused on producing goods in internationally organised networks, but rather run complex strategies of manufacturing and sales, and to some extent research and development. The power of MNEs lays in their arbitrage power, it means organising operation in the locations most favourable from the perspective of the entire organization.

The fact that we cannot observe large shifts in organization of MNEs, especially when it comes to farshoring, which became an important element of geopolitical discussion, may be also related to the fact that firms invested

heavily in moving the production to distant locations and the incentives to bring it closer to the home economy have not been sufficient. Therefore it should not be expected that MNEs will create many jobs in home economies due to changes in offshoring conditions.

From the macro perspective, this study provides particularly valuable insights in the current context of protectionist policies introduced in the global economy. During the analysed period of years 2012-2021 there have been multiple instances of events potentially invoking less offshoring and more local production. However, in spite of the dynamic geopolitical changes, there has been limited evidence of moving jobs and investment into home economies of MNEs.

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## ARTICLES

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### THE EVOLUTION OF LEGAL REGULATIONS IN THE FIELD OF FINANCING LOCAL GOVERNMENT UNITS IN POLAND IN THE YEARS 1990-2024

#### Abstract

The aim of the study is to present the evolution of the system of financing local government units (LGUs) in the years 1990-2024, in the context of both financial and systemic changes in Polish local governments.

The results of the analysis of the development of the Polish model of financing local government units indicate that since 1990 the legislator has repeatedly interfered in the construction of local taxes, shares of personal income tax (PIT) and shares of corporation tax (CIT). The effects of these changes were different for municipalities, districts and provincial authorities. Municipalities were the only ones equipped with their own local taxes to show the relatively highest level of resilience to fiscal changes. Districts remained the most susceptible to the effects of central tax changes. Provinces, on the other hand, functioned in a model depending on the economic cycle and CIT revenues.

The 2024 Act is characterised by a moderate level of normative effectiveness. Its key achievements include: a partial increase in the revenue stability of local governments units, a reduction in the direct impact of central

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tax changes on local government revenues, and the strengthening of redistributive mechanisms.

The main limitations, however, include: excessive complexity of calculation algorithms, limited transparency of calculation mechanisms, incomplete implementation of the principle of adequacy of revenues to public tasks, failure to fully strengthen the actual fiscal autonomy of local governments and the lack of a proper valuation of public services. Consequently, the 2024 Act constitutes a transitional solution, requiring further legislative amendments to achieve full compliance with the constitutional standard of financial independence of local government units.

**Keywords:** local government finances, local government units, stages of financing evolution, legislation, taxes, Poland.

**JEI classification:** E60, G28, H30, H79, H83, K34.

### **Introduction**

The restitution of local government in the Republic of Poland after the political breakthrough of 1989 required not only the proclamation of a new public law subjectivity, but above all the creation of a complementary system of financing capable of securing the implementation of decentralised tasks. The provisions of the Constitution of the Republic of Poland raise the financial independence of local government units to the rank of a constitutional principle. This was directly reflected in the normative construction of Article 167 of the Constitution of the Republic of Poland (Journal of Laws of 1997, No. 78, item 483, as amended), which enshrines the principle of adequacy of financial resources in relation to the competences of a given entity (Dębowska-Romanowska, 2010; Kosikowski, Ruśkowski, 2008). According to the well-established doctrine of public law, this independence is immanently linked to the tax power defined in Article 168 of the Constitution of the Republic of Poland (Stahl, Jaworska-Dębska, 2011).

However, the scope of this power remains limited by the will of the ordinary legislator, which in political practice generates constant tensions between the government administration and local structures. The thirty-five-year evolution of local government legislation in Poland illustrates the permanent dichotomy between the pursuit of fiscal sovereignty of local communities and the centralist tendencies of the state apparatus. Dogmatic analysis of successive normative acts allows us to distinguish several key legislative stages, each of which redefined the concept of income independence (Miemieć, 2005; Czarny [in:] Tuleja, 2023; Dolnicki, 2024).

The aim of the study is to present the evolution of the system of financing local governments in the years 1990-2024, in the context of both financial and systemic changes in Polish local governments. In assessing the changes

introduced in the 2024 Act, it was necessary to present a broader evolution of the system of financing local governments, through the prism of nearly 35 years of restitution of Polish local government. The subject of the analysis were the regulations of the Constitution of the Republic of Poland and the relevant acts on the financing of local governments.

### **1. Evolution of legislation on local government revenue in Poland after 1990**

The initial stage of the formation of the legal framework of local government finances was determined by the need to sanction the existence of restituted communes, which had so far been deprived of budgetary autonomy. This process originally materialized in the adoption of the Act on Municipal Revenues and the Principles of Subsidizing Them in 1991 (Journal of Laws of 1991 No. 89, item 518). This act, showing all the features of episodic legislation, outlined the first structure of diversification of sources of public-law revenues (Journal of Laws of 1991 No. 9, item 31). These regulations divided financial streams into own revenues, shares in taxes constituting state budget revenue and general subsidy (Journal of Laws of 1993 No. 129, item 600). At the same time, the tax sovereignty of the first level of local government was specified by the Act on Local Taxes and Fees (Journal of Laws of 1998 No. 150, item 983). This act, to this day, despite numerous amendments, is the core of the construction of property and income taxes of a local nature (Journal of Laws of 1994 No. 124, item 607).

A positive evolution of the system towards its relative stability was then brought about by the Act on Municipal Revenues. It replaced the existing provisional financial arrangements with fixed rates of participation in personal and corporate income taxes. This regulation created the foundations for rational long-term planning, minimizing the risk of arbitrary shaping of targeted subsidies by the minister responsible for public finance (Journal of Laws of 1994 No. 124, item 607; Journal of Laws of 2003 No. 203, item 1966, as amended; ref. no. K 13/11; Journal of Laws of 2009 No. 157, item 1240, as amended).

The implementation of the basic, three-level territorial division of the state as of 1 January 1999 forced a deep deconstruction of the existing mechanisms of capital flows in the public sector (ref. no. As of 30/04.)tag. The legislator responded to this challenge by passing the Act on the Income of Local Government Units in 1999 and 2000 (ref. no. K 1/03). The force of this regulation was subsequently extended many times by way of amendment, due to the lack of parliamentary consensus on the target fiscal model. The main task of the said act was to extend the algorithms of participation in income taxes to newly created public law corporations, such as counties and self-government voivodeships (ref. no. K 30/04; ref. no. K 1/03; Bitner, Sierak, 2022).

However, legal practice has shown that the newly established local government levels have been equipped with an insufficient volume of own revenues. This situation has made them entities structurally dependent on the general subsidy and targeted transfers from the central budget (Brzeziński, Olesińska, 2017). This state of affairs created significant dogmatic doubts in the context of the compatibility of national regulations with the principles expressed in the European Charter of Local Self-Government (Journal of Laws of 1994 No. 124, item 607). The imposition of further competences of a decentralised nature did not sufficiently correlate with the allocation of permanent, autonomous sources of funding (Kornberger-Sokołowska, 2012; Patrzalek, 2025).

The key instrument regulating the fiscal architecture of local government for over two decades has been the Act on the Income of Local Government Units (Journal of Laws of 2003 No. 203, item 1966, as amended). The new statutory structure consolidated and systematized the previously complicated subsidy mechanisms. It was based on the separation of individual parts of the general subsidy, including the educational, compensatory, balancing and regional parts (Patrzalek, 2022). Each of these parts was distributed on the basis of separate, multi-component algorithms of a mathematical and statistical nature. The long-term functioning of this act has caused numerous disputes before the bodies reviewing the constitutionality of law (Ruśkowski, 2010). This was reflected in the fundamental amendment of 2014, which was a direct enforcement of the judgment of the Constitutional Tribunal of 4 March 2014, ref. no. K 13/11. At that time, the Tribunal ruled that the provisions obliging voivodeships with high income potential to make corrective and compensatory payments violate the constitutional essence of financial independence (Bitner, et.al., 2017; Bintner, Sierak, 2022). This system, commonly referred to as the "Janosik system", did not sufficiently take into account the current expenditure situation of the payer itself (Chojna-Duch, 2017). The amendment forced by the ruling reconstructed prudential thresholds and introduced a guaranteed amount mechanism, protecting the richest individuals against excessive focalisation (Journal of Laws of 2014, item 1574).

**Table 1. Map of legislative evolution**

Lp.	Key changes in legislation
1.	Incidental Act – Provisional Income of Communes (1990). Adoption of the first Act on Commune Revenues for 1991. The beginning of fiscal decentralization.
2.	The first systemic act on the financing of local government units – the time of stabilization of the commune's finances (1993) - The Act on Municipal Revenues of 1993 introducing permanent financial rules for the first level of local government.
3.	Constitutional Foundation (1997) – Entry into force of the Constitution of the Republic of Poland. Articles 167 and 168 introduce the principles of adequacy and tax authority of local governments.
4.	Three-level division of local government units into communes, counties and self-governing voivodeships - 1998 - Act on local government revenues for the years 1999–2000. Adaptation of financial streams to the emergence of counties and voivodeships
5.	Construction for two decades (2003) – Act on the Income of Local Governments of 2003 A deep reconstruction of subsidies and shares in PIT/CIT, in force modified until the end of 2024.
6.	Intervention of the Tribunal (Janosikowe) 2014 – A key amendment to the 2003 Act forced by the Constitutional Tribunal's judgment (ref. no. K 41/12), reforming the system of corrective and compensatory payments.
7.	Changes to the Polish Deal 2021–2022 – A series of profound amendments to centralise the system by introducing a stabilisation rule and a development subsidy at the expense of own revenues.
8.	New Approach to the Tax Base (2024) – Adoption of a completely new law on the income of local government units (departing from tax share in favor of participation in residents' income), effective from 1 January 2025.

Source: Own study.

However, the following years brought a far-reaching depletion of financial autonomy, as a result of the amendments of 2021–2022 implementing the solutions of the package referred to as the Polish Deal (Journal of Laws of 2021, item 2105). Through systemic changes in the structure of personal income tax, manifested in an increase in the tax-free amount and a modification of tax thresholds, the legislator has reduced real PIT revenues going directly to local budgets (Hanusz, 2022). To amortize these losses, a stabilization rule and a new development part of the general subsidy were implemented (Journal of Laws of 2021, item 1927).

In the opinion of the representatives of the doctrine, this change constituted a regression in the process of decentralization, transforming tax shares into transfers of a quasi-subsidy nature. At the same time, budgetary discipline was determined by the provisions of the Public Finance Act. The introduced Article 243 of this Act linked the creditworthiness of entities directly to their operating surplus, which, in conjunction with the depletion of own revenues, intensified the crisis of financial liquidity of many local governments (Szołno-Koguc, 2021; Journal of Laws of 2009 No. 157, item 1240, as amended).

### **1.1. Period 1990–1993 – the restitution of fiscal independence of municipalities**

The first stage of the local government reform was initiated with the entry into force of the Act of 8 March 1990 on Municipal Self-Government (Journal of Laws of 2023, item 40, as amended) and the Act of 14 December 1990 on the Revenues of Municipalities and the Rules for Subsidising Them in 1991 (Journal of Laws of 1990, No. 89, item 518). The construction of these regulations was of a transitional nature and served to create a financial basis for the reactivated municipal self-government (Fundowicz, 2005).

The most important changes concerned real estate tax. The legislator departed from the model specific to the centrally planned economy and established a local property tax based on the territorial connection of the subject of taxation with the commune. This solution improved financial stability, as the property tax was characterized by low sensitivity to short-term economic fluctuations. However, changes concerning the non-uniform understanding of the concept of a building and frequent corrections to the rules of taxation of technical infrastructure did not work. They caused numerous interpretative disputes, which limited the predictability of budget revenues.

In the agricultural tax, the mechanism based on the average purchase price of rye has been maintained. This solution was flexible, but did not ensure the financial stability of agricultural municipalities. Fluctuations in market prices translated directly into income volatility. Similar reservations applied to the forest tax, the structure of which made revenues dependent on wood prices (Journal of Laws of 2020, item 333).

At this stage, there was not yet a stable system of shares in PIT and CIT. The revenues of municipalities therefore remained limited to local taxes and budget transfers. This system did not yet ensure real fiscal stability, but constituted a stage in the organisational formation of local government (Hanusz, 2022).

### **1.2. Period 1993-1998 – statutory stabilisation of commune revenues**

The Act of 10 December 1993 on the income of municipalities and the rules of their subsidy introduced the first systemic stabilization of the income structure.

In the personal income tax (PIT), a statutory definition of the shares of municipalities has been introduced. This change improved financial stability, as it linked local government revenues to local economic activity of residents. At the same time, this solution did not fully work, because the lack of a mechanism to compensate for the central changes in the PIT structure made local government revenues vulnerable to the decisions of the state legislator. The share of municipalities in corporate income tax (CIT)

is similarly determined. This solution improved the situation of industrialized units, but deepened spatial inequalities.

In real estate tax, successive indexations of maximum rates improved fiscal stability. They made it possible to compensate for inflation. Imprecise definitional changes concerning the building did not work. In the agricultural tax, the possibility of reducing the price of rye by commune councils has been introduced. This solution strengthened local tax authority, but increased the risk of political discretion. This period was the first stage of the actual strengthening of the fiscal independence of local government (Izdebski, 2021).

### **1.3. 1999-2003 – Three-stage reform**

The administrative reform of 1998 introduced by the Law of 26 November 1998 created a new revenue model. For municipalities, the existing local taxes and shares in PIT and CIT have been maintained. Financial stability was maintained. For counties, participation in PIT and CIT has been introduced as the main sources of tax revenue. This solution did not improve financial stability, because the counties did not obtain their own local taxes. The lack of local tax policy instruments meant full dependence on central decisions. Such a structural structure did not meet the standards of fiscal independence (Smoleń, 2020; Etel., et.al, 2006; Kosikowski, 2014).

CIT has become the main source for local government voivodeships. Initially, this solution was assessed positively, but in the end it did not provide lasting stability due to the cyclical nature of the revenues.

### **1.4. Period 2004-2015 – Systemic stabilisation model**

The Act of 13 November 2003 on the income of local government units (Journal of Laws of 2023, item 356, as amended) established a permanent structure valid until the end of 2023. This solution improved predictability (Kisilowska, 2018, pp. 95-115).

The changes introduced during this period included:

- adjustments to tax thresholds,
- extending family allowances,
- changes in tax-deductible costs,
- modifications to the rules of common taxation.

Some of these changes improved the situation of taxpayers. However, not all changes improved the stability of local governments.

With regard to CIT, the following were introduced:

- Rate changes
- investment reliefs,
- pro-development solutions.

These changes had a positive impact on economic activity. However, these changes had a negative impact on the predictability of voivodeship revenues.

In real estate tax, successive indexations of rates improved the stability of municipalities. However, extensions of statutory exemptions did not work. In the agricultural and forestry taxes, the changes were of a moderately stabilizing nature. E. Chojna-Duch (2017) indicates that this was the most predictable stage of the development of local government tax revenues.

### **1.5. Period 2016-2023 – intensive fiscal change (Polish Deal)**

The most significant changes concerned PIT, introduced in the following years:

- in 2019, a reduction in the PIT rate from 18% to 17%, an increase in tax-deductible costs and a relief for people up to 26 years of age;
- in 2021, an increase in the free amount;
- and in 2022 the reforms of the "Polish Deal".

These changes have definitely improved the situation of taxpayers, but moderately the situation of local government units.

In the field of CIT, the following have been introduced:

- in 2018, a reduction in the rate for small taxpayers;
- in 2021, the possibility of using the so-called Estonian CIT;
- in 2022, the extension of investment reliefs.

Some of these changes increased the competitiveness of the economy. It did not always improve the stability of voivodeship revenues. In the real estate tax, indexation was maintained, which was an important factor in protecting the stability of municipalities. Exemptions were extended in PCC and inheritance and gift tax.

## **2. Characteristics of the "new Act on Income of Local Governments of 2024"**

The Act on the Income of Local Governments of 2024 is an attempt to reconstruct the system of financing local governments after a period of significant fiscal turbulence related to changes in PIT and CIT and the crisis of income stability of local governments. This act redefines the structure of central transfers by departing from the current structure of the general subsidy in its classic form and introducing the category of "financial needs" as the basis for the redistribution of funds.

The act is part of a broader trend of parametric recentralisation – it increases the importance of algorithmic income determination, but at the same time limits the scope of autonomous influence of local governments

on the level of income. The new model is more technocratic and macro-fiscal than systemic.

From a constitutional perspective (Article 167 of the Constitution of the Republic of Poland), the Act aims to restore the adequacy of funds to tasks, but it does so in a centrally managed formula, and not by strengthening own revenues.

The proposer of the draft Act from Sejm Paper No. 622 (justification and effects of the regulation) indicated the main objectives of the proposed amendments to the Act of 2024:

Objective 1 – Strengthening and stabilizing the finances of local governments by increasing their own revenues, on which the ability to perform tasks and develop local governments depends. According to the solutions proposed in the draft, local governments will be financed mainly by tax revenues, while subsidies from the state budget will be only supplementary.

Objective 2 – Basing the financial supply of local government units on own income resulting from the local personal income tax and corporate income tax base, whereby – importantly – the income of local government units from participation in PIT and CIT will be stabilized and largely freed from the impact of tax changes.

Objective 3 – Objective and algorithmic calculation of financial resources for each local government unit. It is necessary to restore transparency, apoliticalness and adequacy of the criteria for the distribution of funds to the system of local government revenues. The system of local government revenues proposed in the draft will be based on objective parameters (measurable by means of statistical data and not susceptible to manipulation).

Objective 4 – Ensure better allocation of public funds. The system of revenues of local governments proposed in the draft will take into account the specificity of individual categories of local governments, covering not only the issue of income differentiation, but also the issue of expenditure needs of local governments resulting from the tasks performed, which is omitted in the current system.

Objective 5 – To make the system more flexible and to reduce the excessively extensive flow of funds between the state budget and local government units. In the current system of local government revenues, wealthy local governments make payments to the state budget (the so-called Janosik funds), and at the same time they are beneficiaries of these funds. The solutions proposed in the draft are aimed at limiting the flow of funds between local governments and the state budget, so that local governments do not make payments to the state budget.

Objective 6 – Increasing the influence of the local government on the distribution of funds for local governments. The draft provides for

the introduction of solutions to the local government revenue system that create the possibility of dividing – with the participation of the local government – financial resources depending on the conditions for the implementation of tasks in local government units that change from year to year (Sejm, Paper 622).

At the stage of discussion on the amendments to the Act on the Income of Local Governments of 2024, the scientific and local government communities pointed to the positive and negative effects of the proposed regulation. It should be mentioned that the process of adopting this act was preceded by a stormy discussion of many circles.

According to the author of the study, the positive changes include:

1. Systemic response to the local government income crisis – the act is a response to changes in the local finance sector after tax reforms and introduces a more predictable transfer model.
2. Sorting out the structure of transfers – a new revenue architecture:
  - simplifies the structure of redistributive instruments;
  - limits discretion in allocating funds,
  - The division is based on macroeconomic indicators.
3. Introduction of the category of "financial needs" – replacing the classic subsidy with the construction of financial needs theoretically allows for a better connection of funds with the actual costs of performing tasks and brings the system closer to the cost-based allocation model.
4. Increasing the importance of algorithmization - algorithms for the distribution of funds: they strengthen formal transparency and reduce the political arbitrariness of transfers, although this may lead to stratification of the wealth of local governments. And in the long run, to the pauperization of poor local governments and their systemic weakening, leading to the collapse of some of them.
5. An attempt to stabilize current income – stabilization mechanisms reduce income fluctuations resulting from the tax situation.

On the other hand, among the negative characteristics that require further work:

1. Parametric centralization of the system – The new act increases the dependence of local governments on mechanisms calculated centrally (in particular by the Ministry of Finance), which weakens real fiscal autonomy and widens the development differences of local governments.
2. Departing from the classic structure of the general subsidy – the subsidy as a guarantee instrument is replaced by the category of "financial needs", which is more administrative than systemic, it can be modified without changing the scope of tasks of local government units, it does not constitute a direct income guarantee.

3. Lack of strengthening of own revenues – the reform focuses on the redistribution of central funds, and not on increasing the share in taxes and their base or expanding the tax power of local governments.
4. Limited transparency of algorithms – although algorithms are formally public, their complexity, multiplicity of parameters, dependence on macroeconomic data make it difficult for local governments to be able to control them in real terms.
5. Vagueness of the definition of "financial needs" – the lack of an unambiguous, normative definition of reference costs raises the risk of underestimating tasks, discretionary shaping of parameters and interpretative discrepancies.
6. Poor participation of local governments in setting parameters – the procedure for determining revenues remains de facto one-sided – local governments do not have a real impact on the construction of indicators, being only a passive executor of statutory provisions.

### **3. Preliminary assessment of the adequacy and degree of effectiveness of the Act on Income of Local Governments of 2024 in relation to the adopted objectives**

A preliminary assessment of the adequacy and effectiveness of the Act of 1 October 2024 on the revenues of local government units leads to the conclusion that it constitutes an important stage in the evolution of the local government financing model, but the degree of achievement of the assumed objectives of the reform should be assessed as moderate and only partially satisfactory (Journal of Laws of 2024, item 1572). This assessment is reflected both in the scientific literature and in the official positions of organizations representing local government units.

In the academic community and among industry organizations of local government units, it was emphasized that the main objectives of the reform should be: increasing the income stability of local government units, ensuring the adequacy of revenues in relation to the scope of public tasks entrusted to them, increasing the predictability of budget planning, improving the transparency of transfer mechanisms, and actually strengthening the constitutional financial independence of local government units (Kobylski, Kosztowniak, 2024).

In addition, in the assessment of the academic community, only partial implementation of systemic functions is emphasized. The prevailing view in the literature on the subject is that the act implements the desired direction of decentralization reforms, but does not lead to the full removal of structural dysfunctions of the local government income system (Patrzalek, 2025; Dolnicki, 2024). It is pointed out that the reform limits the negative effects of the previous dependence of local government revenues on unilateral fiscal decisions of the state, but the algorithmic solutions used are excessively

complicated and weaken the ability of local government units to independently forecast revenues. A similar position is presented by the authors of expert studies prepared for the purposes of assessing the implementation of the reform, who emphasize that the mechanism for determining financial needs has increased the redistributive potential of the system, but at the same time reduced its transparency and made it more difficult to control the correctness of calculations by the local governments themselves (Chojna-Duch, et.al., 2025).

In the light of the concept of financial adequacy presented by A. Hanusz (2022), the reform should be assessed through the prism of the relationship between the scope of decentralized public tasks and the real income potential of individuals. Against this background, the 2024 Act has been assessed as an instrument to improve the income situation only partially, without definitively resolving the problem of the mismatch between revenues and the actual costs of performing tasks.

The position of the Association of Polish Cities is positive about the directional change in the financing of local governments, but negatively about its implementation. The Association of Polish Cities (2025) considered the adoption of the new act to be a necessary stage in the restoration of local government finances after their fiscal potential was weakened as a result of the tax changes of 2019–2023. At the same time, the organization pointed out that the practical implementation of the reform did not ensure full transparency and predictability of the system. In particular, reservations were raised concerning:

- limited access to source data for calculating financial needs,
- difficulties in verifying the correctness of calculations,
- incomplete compensation for the income losses of large cities.

In the opinion of the Association, this means only a partial implementation of the assumed goal of strengthening the financial independence of local governments (Position of the Association of Polish Cities, 2025, pp. 2–11).

The position of the Association of Rural Municipalities of the Republic of Poland indicates a moderately positive assessment of the distribution of income between individual local governments. The Association of Rural Municipalities of the Republic of Poland pointed out that the reform takes into account the needs of units with weaker fiscal potential to a greater extent than the previous model, which should be assessed positively from the perspective of the constitutional principle of equalizing income disparities. At the same time, the organization emphasized the need for further changes in the field of adapting algorithms to the specifics of rural municipalities, in particular infrastructure costs and distributed provision of public services (Position of the Association of Rural Municipalities of the Republic of Poland, 2025, pp. 4–13).

The position of the Union of Polish Metropolises indicates a critical assessment of compensatory effectiveness. The Union of Polish Metropolises presents the most critical position towards the effects of the reform. In the expert opinions prepared at the request of the UMP, it was indicated that the act did not provide full compensation for the lost revenues of the largest cities, and the redistributive model used does not sufficiently take into account the costs of performing metropolitan functions. As a consequence, according to the UMP, the act shows limited effectiveness in achieving the objective of income adequacy of the largest local government units (Report of the Union of Polish Metropolises, 2026).

The position of the Association of Polish Districts emphasizes the problem of maintaining income maladjustment. The Association of Polish Districts pointed out that the reform does not eliminate the systemic problem of underfunding of district tasks, especially in the field of secondary education, health care and public transport. The organization argued that improving financial liquidity cannot be equated with the full achievement of income adequacy (Position of the Association of Polish Districts, 2025, pp. 3–16).

It is worth noting that the assessment of individual organizations and industry associations is dictated by the individual needs of individual local governments, their wealth (budget and development situation).

### **Summary**

An analysis of the development of the Polish model of financing local government units indicates that since 1990 the legislator has repeatedly interfered in the construction of local taxes, PIT shares and CIT shares. The effects of these changes were different for communes, counties and self-governing voivodeships. Municipalities, as the only ones equipped with their own local taxes, showed relatively the highest level of resilience to fiscal destabilization. Districts remained the most susceptible to the effects of central tax changes. Voivodeships, on the other hand, functioned in a model depending on the economic situation and CIT revenues.

The 2024 Act improves the current financial stability of local governments, but does not restore their fiscal autonomy. Adequacy has been reduced to centrally managed redistribution, and not to the systemic right of local governments to their own, stable sources of income. The reform temporarily protects liquidity, but does not strengthen decentralization and, in the absence of an incentive system for local governments (concerning investment funds), may lead to the disappearance of investments, especially in poorer local governments.

The assessment of the adequacy and effectiveness of the Act on Income of Local Governments of 2024 leads to the conclusion that we are dealing with a reform that stabilizes in the short term, but is structurally insufficient. The act improves the current financial liquidity of local government units

by increasing the scale of central transfers and introducing an algorithmic model of "financial needs". At the same time, the reform does not restore the constitutional balance between the scope of tasks and own revenues. The burden of reform has shifted from fiscal decentralization to centrally managed redistribution.

As a consequence, the implementation of Article 167 of the Constitution of the Republic of Poland takes place mainly through compensation mechanisms, and not through strengthening the financial autonomy of local government units. Financial adequacy takes the form of a technocratic calculation of parameters, not a guarantee norm of a systemic nature.

A preliminary assessment of the adequacy and effectiveness of the Act of 1 October 2024 on the income of local government units indicates that this reform is a solution that partially implements the assumed systemic functions, but its implementation has revealed a number of normative and functional limitations. In the literature on the subject and the positions of industry organizations of local governments, it was emphasized that the main objectives of the 2024 reform should be: rebuilding the financial stability of local governments, increasing the predictability of budget planning, strengthening income adequacy in relation to the scope of public tasks performed, increasing the transparency of transfer mechanisms and actually strengthening the financial independence of local governments. The assessment of the degree of implementation of these postulates remains diverse.

In the assessment of the academic community, the partial adequacy of the reform is emphasized. The prevailing position in the doctrine of financial law and local government finance is that the new regulation is an important modernization step, but does not lead to a complete reconstruction of the income model of local government units, which has been postulated for many years by representatives of science

A comparison of the positions of doctrine and industry organizations leads to the conclusion that the 2024 Act is characterized by a moderate level of normative effectiveness. Its main achievements include: a partial increase in the income stability of local governments, a reduction in the direct impact of central tax changes on local government revenues, and the strengthening of redistributive mechanisms.

The main limitations include: excessive complexity of calculation algorithms, limited transparency of calculation mechanisms, incomplete implementation of the principle of adequacy of revenues to public tasks and lack of full strengthening of the actual fiscal autonomy of local governments. As a consequence, it should be assumed that the 2024 Act is a transitional solution, requiring further legislative corrections in order to achieve full compliance with the constitutional standard of financial independence of local government units.

## Conclusion

According to the author of the study, when attempting a preliminary assessment, after the 1.5-year period of validity of the 2024 Act, it is worth pointing out:

Positive changes:

1. Partial implementation of Article 167 of the Constitution of the Republic of Poland – The Act improves the predictability of current revenues, reduces rapid fluctuations in revenues after tax changes and introduces systemic stabilization mechanisms. This is a formal attempt to implement the constitutional principle of adequacy.
2. Improvement of the operational capacity of local government units – in the short term, the reform facilitates compliance with Articles 242–244 of the Public Finance Act, reduces the pressure to reduce current expenditure and stabilises debt ratios. For some local governments, this means a temporary improvement in creditworthiness and investment capacity.
3. Limiting the arbitrariness of transfers – algorithmisation of the distribution of funds leads to a reduction in political discretion and strengthens the formal transparency of the system.
4. Recognition of the state's responsibility for the effects of tax reforms – the legislator assumes that the state must react to the negative consequences of the changes, i.e. depletion in PIT/CIT for local governments, which is a change in the current approach to law-making.

Negative changes (requiring further changes) are:

1. Adequacy as an administrative, not a guarantee structure – the new model does not create a substantive right of local governments to a certain level of financing. "Financial needs" are not of a constitutional claim nature, they are determined centrally and can be modified without changing the scope of tasks. Adequacy ceases to be a protective norm and becomes a budgetary parameter.
2. A permanent paradigm shift (own revenues and transfer revenues) – the reform consolidates the model in which central funds are the basis for the functioning of local government units, and own revenues play a secondary role. This is a departure from the European standard of fiscal autonomy in favor of a model of redistributive dependence.
3. The education gap and the wage gap remain unresolved – the new system does not solve the fundamental problems of financing local government tasks. It does not introduce cost standards for public services, does not take into account the real costs of salaries and does not differentiate the quality and scope of services. As a result, the education gap has only been "covered" by transfers, remaining the biggest pain in the financing of local governments over the last three

decades, and the wage gap continues to burden the budgets of local governments.

4. Centralization of competences – the key parameters of the system are determined by the Ministry of Finance, with marginal influence of local governments. This means a reduction in decision-making autonomy, a weakening of the principle of subsidiarity and an increase in administrative discretion.
5. Risk of violation of the rule of law – with the complexity of algorithms and the lack of clarity in the definition of financial needs, they will hinder judicial review, limit the predictability of the application of the law and weaken the financial security of local government units, and in the future expose this system to negative assessments of the return to political discretion.
6. Lack of a systemic principle of compensation for losses – Compensation for the effects of tax changes is not automatic, depends on the decision of the legislator and does not create a permanent mechanism of state liability.

To sum up, it should be stated that the evolution of financial law in the area of local government after 1990 reflects the constant clash of centralist doctrines with the principle of subsidiarity. The transition from provisional acts from the 1990s to a reform based on a tax base proves that the preservation of local sovereignty requires constant adaptation of legal forms to the realities of the political system.

In further research directions, the author envisages an in-depth assessment of the effects of the 2024 Act regulations as well as the formulation of recommendations for changes for further work on changing the system of financing local governments. This results not only from the author's intentions, but above all from the legislator's obligation contained in Article 117 of the Act on Financing of Local Governments of 2024, which contains the provision "*The minister responsible for public finances shall, by 30 June 2026, submit information on the effects of the Act to the representation of local government units, along with possible proposals for changes*". Thus, the indicated obligation of the legislator is the best confirmation of the thesis about the evolutionary nature of the provisions of the Act for the finances of local government units.

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## ARTICLES

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### THE 2026 CMDI FRAMEWORK AND THE PERSISTENCE OF HOST-STATE ASYMMETRY: THE CASE OF POLAND

#### Abstract

The aim of this study is to review the regulatory provisions of the 2026 Crisis Management and Deposit Insurance (CMDI) framework, the conditions for its implementation in the Polish banking sector, and its potential effects.

In doing so, the following thesis is advanced: the 2026 CMDI framework harmonises the legal framework for crisis management across all Member States of the European Union, but it shifts the existing asymmetry between the Member State of the parent undertaking and the Member State of the subsidiary in cross-border banking groups from supervision to resolution and further entrenches it, raising the cost borne by a host Member State that remains outside the Banking Union (a non-participating Member State).

In the Polish banking sector, this asymmetry generates a regulatory and supervisory cost: Poland takes on the obligations of harmonisation without the reciprocal benefit, namely risk-sharing.

**Keywords:** banking groups, crisis management, deposit guarantee, CMDI, SRMR, BRRD, Banking Union, financial supervision.

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### **Introduction**

In 2026, the Polish banking sector finds itself in a situation in which six of the nine largest banks remain under the control of foreign banking groups from the European Union, predominantly from euro-area countries. After Austria's Erste Group completed its acquisition of a 49% stake in Santander Bank Polska in January 2026, this structure took on a new character: Austrian capital displaced Spanish capital as the dominant foreign investor. The other main foreign owners are ING Group (the Netherlands), Commerzbank (Germany), Banco Comercial Português (Portugal) and BNP Paribas (France). Each is a euro-area bank subject to consolidated supervision by the European Central Bank under the Single Supervisory Mechanism (SSM).

This ownership structure — present, with certain modifications, for more than a decade — now operates within a new regulatory context. The acts making up the Crisis Management and Deposit Insurance (CMDI) framework were adopted on 30 March 2026 and published in the Official Journal of the European Union on 20 April 2026. These are: Regulation (EU) 2026/808 amending Regulation (EU) No 806/2014 on the Single Resolution Mechanism (the Single Resolution Mechanism Regulation, SRMR; hereinafter the amending SRMR Regulation); Directive (EU) 2026/806 amending Directive 2014/59/EU on bank recovery and resolution (the Bank Recovery and Resolution Directive, BRRD; hereinafter the amending BRRD Directive); and Directive (EU) 2026/804 amending Directive 2014/49/EU on deposit guarantee schemes (the Deposit Guarantee Schemes Directive, DGSD; hereinafter the amending DGSD Directive). The acts entered into force on 10 May 2026; the deadline for transposing the directives and for the general application of the framework is 11 May 2028.

The aim of this study is to review the regulatory provisions of the 2026 CMDI framework, the conditions for its implementation in the Polish banking sector, and its potential effects. In doing so, the following thesis is advanced: the 2026 CMDI framework harmonises the legal framework for crisis management across all Member States of the European Union, but it shifts the existing asymmetry between the Member State of the parent undertaking and the Member State of the subsidiary in cross-border banking groups from supervision to resolution and further entrenches it, raising the cost borne by a host Member State that remains outside the Banking Union (a non-participating Member State). In the Polish banking sector, this asymmetry generates a regulatory and supervisory cost: Poland takes on the obligations of harmonisation without the reciprocal benefit, namely risk-sharing.

The method is a doctrinal analysis of the three CMDI acts and the Polish instruments transposing them, combined with an institutional analysis of the

home–host allocation of competences in supervision and resolution. Poland is taken as a case study: it is the largest host banking sector in the EU outside the Banking Union, and the Erste–Santander transaction of January 2026 makes the question immediate. As such, it illustrates the position of a non-participating host Member State, and the conclusions extend, with the appropriate qualifications, to comparable states such as the Czech Republic and Hungary. The contribution is to show that, whereas the existing literature located the home–host asymmetry at the level of supervision (Méró, Piroska, 2016; Véron, 2024a), the 2026 framework shifts it to the level of resolution.

### **1. The rationale for the CMDI reform and the diversity of banking sectors in the EU**

The reform of the crisis management and deposit insurance framework – adopted as a single package on 30 March 2026, comprising two directives amending the BRRD and DGSD and a regulation amending the SRMR – was the culmination of a years-long debate over the inconsistencies between EU law and national insolvency practice. These inconsistencies particularly affected small and medium-sized banks of a local character (BRRD; SRMR).

A key consideration was that, in many Member States, smaller institutions – such as the German Sparkassen and Landesbanken, Italian cooperative banks and Spanish *cajas* — were wound up under national law, bypassing the resolution tools provided for in the BRRD. This resulted in uneven levels of protection for depositors and creditors (BRRD; DGSD). In Germany, where the sector of local public and cooperative banks is particularly extensive, the authorities emphasised the need to preserve flexibility for their particular business models, while accepting greater predictability in crisis procedures (European Commission legislative proposal, document COM(2023) 226).

In Italy, burdened by a high level of non-performing loans and numerous interventions in regional banks, emphasis was placed on the use of sectoral funds and deposit guarantee schemes for orderly liquidation, to avoid disorderly bank failures and contagion in economically weaker regions (SRB Vision 2028 – a document of the Single Resolution Board, SRB).

Spain, with its experience of restructuring the *cajas* and of deep post-crisis consolidation of its banking sector, advocated greater use of resolution tools, including for smaller institutions, so as not to repeat the costly taxpayer-funded solutions of 2009–2012 (EBA/Op/2021/10 – a document of the European Banking Authority, EBA). The Nordic countries, with a highly concentrated banking sector and a strong presence of cross-border banking groups, emphasised the need for better coordination between national authorities and the Single Resolution Board, and for greater harmonisation of the public interest criterion (Schoenmaker, Véron, 2016).

In the countries of Central and Eastern Europe, including Poland, where the banking sector is strongly dominated by foreign groups,

a significant driver was the need to ensure that resolution decisions taken at group level would not lead to disorderly failures of local subsidiaries (Iwanicz-Drozdowska et al., 2016; Kosztowniak, 2022; 2023). At the EU-wide level it was stressed — as Hellwig (2014) and Goodhart and Avgouleas (2016) did in the literature on moral hazard and the rescue of banks with public funds — that an important driver was the desire to limit the loop of interdependence between banks and public finances (the so-called doom loop), that is, a situation in which bank rescues place an excessive burden on national budgets.

A further driver was a better link between deposit guarantee schemes and resolution processes, so that those schemes could fund the transfer of deposits and assets where this is cheaper than a conventional deposit payout. This followed from analyses by the European Banking Authority (EBA) and from empirical studies on the costs of intervention (DGSD; Hardy, Nieto, 2011; Hagendorff, Nieto, 2015). The lessons drawn from the regional banking crises in the United States and Europe after 2020 also played an important role. They showed that the speed and predictability of resolution authorities' action, together with clarity as to the scope of deposit protection, are key to maintaining depositor confidence.

The CMDI reform was also a response to calls from the academic community — including Lastra and Nieto (2015), Alexander (2015) and Schoenmaker (2017) — which urged clarifying EU law's relationship with national insolvency regimes, and for a better treatment of cross-border risks within the Banking Union.

## **2. The scope of the reform of the crisis management and deposit insurance (CMDI) framework**

The 2026 CMDI framework comprises a number of changes that can be grouped around three objectives. This section sets out their logic at the EU level; the details of their transposition into Polish law are discussed in Section 4.

The first objective is to streamline the resolution of small and medium-sized banks. The framework changes the definition and the practical application of the public interest criterion, so that resolution is more often regarded as the appropriate tool, including for institutions with a local reach whose failure could trigger contagion or serious disruption to access to financial services. A bank's limited systemic importance at the EU level does not, in itself, rule out a public interest, where the institution is critical to the financing of the local economy or performs a significant payment function in the region (BRRD; COM(2023) 226; SRB Vision 2028; EBA/Op/2021/10). This objective is also served by proportionate but genuine MREL requirements (the minimum requirement for own funds and eligible liabilities) for smaller banks; by the requirement to prepare recovery and resolution plans on a simplified basis; and by a strengthened role for the SRB

in coordinating action on smaller banks within the Banking Union (Nieto, 2015; Schoenmaker, Véron, 2016). The literature notes that these changes bring EU practice closer to long-standing recommendations that smaller institutions, too, be brought within the resolution regime where their failure may have significant local or regional effects (Hellwig, 2014; Goodhart, Avgouleas, 2016).

The second objective is to reduce the use of public funds. The framework reinforces the hierarchy of funding sources: losses are borne first by shareholders and creditors — through the write-down or conversion of liabilities — then sectoral resources are deployed (MREL, resolution funds, deposit guarantee schemes), while public funds remain a last resort (BRRD; SRMR). This loss-bearing sequence must be distinguished from the no-creditor-worse-off principle — a separate safeguard guaranteeing that no creditor bears, in resolution, a loss greater than it would have borne in normal insolvency proceedings. Exceptions to full write-down or conversion, justified by financial stability or the protection of critical functions, are to be applied only exceptionally and under the strict control of the European Commission. All forms of public support are subject to requirements of transparency, proportionality and time-limitation (SRMR; Alexander, 2015). This strengthened role for private investors and sectoral funds is intended to restore market discipline and forms part of the shift from the ‘too big to fail’ model to one of a bank’s orderly exit from the market (Hellwig, 2014; Goodhart, Avgouleas, 2016; Freixas, Rochet, 2008).

The third objective is to strengthen the protection of depositors. The framework expands and rationalises the operation of deposit guarantee schemes under the DGSD, in particular as regards the funding of preventive measures and participation in resolution. It also harmonises the target level of funds and the manner of their accumulation (risk-based contributions), to narrow the differences between Member States (DGSD; Hardy, Nieto, 2011; Hagendorff, Nieto, 2015). It also strengthens the information requirements placed on banks and the link between deposit guarantee schemes and resolution authorities, which is intended to facilitate swift and predictable action in a crisis (Freixas, Rochet, 2008). In countries with a strong tradition of local banking, such as Germany and Austria, it was important to ensure the full integration of institutional protection schemes (IPS) into the CMDI framework (COM(2023) 226). The specific form these arrangements take in Polish law – the scope of protection, temporary high balances, the client funds of financial institutions, and the role of institutional protection schemes – is discussed in Section 4. The literature emphasises that strengthening the role of deposit guarantee schemes in resolution processes is a precondition for the coherence of the Banking Union (Schoenmaker, 2017; Schoenmaker, Véron, 2016; Nieto, 2015).

The CMDI reform therefore does not create a new deposit protection system, but rather rationalises and strengthens mechanisms that already exist.

### **3. The 2026 CMDI framework as a source of supervisory–resolution asymmetry from the Polish perspective**

The analysis of the impact of the 2026 CMDI framework on Poland should be made in the context of ownership structure of the domestic banking sector described in the Introduction: six of the nine largest banks remain under the control of euro-area banking groups, and the acquisition of Santander Bank Polska by Erste Group (closed on 9 January 2026) has deepened that dependence, making Austrian capital the largest foreign investor. The number of banks does not, however, coincide with the share of assets: according to the Polish Financial Supervision Authority (KNF — Komisja Nadzoru Finansowego), by origin of capital (share in sector assets) the State Treasury controls 47.7% of the sector's assets, foreign capital 42.8% and domestic private capital 9.5% — the three categories together accounting for the whole of the sector (KNF, Dane miesięczne sektora bankowego, position as at 30 November 2025). The analysis that follows concerns only domestic banks held as subsidiaries of foreign groups; branches of credit institutions from other Member States fall outside its scope, since they are subject to a different allocation of competences in which supervision and resolution rest principally with the home Member State.

From this structure arises an asymmetry between the Member State of the parent undertaking and the Member State of the subsidiary, an asymmetry that the CMDI framework — contrary to its declared harmonisation — shifts from supervision to resolution and entrenches. Until now, it has shown itself mainly at the level of supervision: a euro-area parent undertaking is subject to consolidated supervision by the European Central Bank (ECB) under the Single Supervisory Mechanism, while its Polish subsidiary, being a domestic bank, remains under the supervision of the KNF. The Polish supervisor sits on the college of supervisors — a body bringing together the supervisory authorities of the states in which the group operates — but has no vote in the decision-making bodies of the ECB. The 2026 CMDI framework transfers this pattern of dependence from supervision to resolution.

This transfer operates in the following manner. Responsibility for the resolution of the parent undertaking lies with the EU Single Resolution Board, which is competent for groups from states participating in the Banking Union, while responsibility for the Polish subsidiary lies with the national Bank Guarantee Fund (BFG) acting as resolution authority. If, in the group resolution plan, the Single Resolution Board determines that the resolution of the parent undertaking is in the public interest, that determination will significantly affect the range of decisions available to the BFG in respect

of the Polish subsidiary. The Polish authorities take part only in a consultative capacity — through their participation in the resolution college — without a decisive vote (Véron, 2024a).

For Poland, this asymmetry translates into two kinds of cost. The first concerns decision-making authority and discretion and stems from the reformulation of the public interest assessment — the test that determines whether a failing bank is placed in resolution or in normal insolvency proceedings. This test refers to the resolution objectives laid down in EU law: maintaining the bank's critical functions, safeguarding financial stability, and protecting depositors and public funds. After the amendment, it becomes a two-stage test. The authority first establishes whether normal insolvency would jeopardise any of these objectives. If even one of them is threatened, the outcome can be negative only where insolvency would achieve those objectives more effectively than resolution (recital 14 of the preamble to the amending BRRD Directive; Asimakopoulos, Tröger, 2024). This lowers the threshold for resorting to resolution, which, for Poland, means widening the range of banks subject to it and deepening the subsidiary's dependence on group decisions.

The 'regional level' criterion is of particular importance: the authority may regard a bank's functions as critical even where the cessation of those functions would threaten financial stability only at the regional level (recital 11 of the preamble to the amending BRRD Directive). This raises two distinct questions. A substantive one — whether a Polish subsidiary, systemically important at the national level but marginal at group level, meets the critical-functions condition. And a jurisdictional one — whose assessment, national or group, will prove decisive. For the framework ties the scope of resolution planning for the subsidiary to its importance in the Member State in which it is established, and to the impact of its failure on the national deposit guarantee scheme (recital 4 of the preamble to the amending BRRD Directive); that importance is assessed in the context of the group, where the national interest is at times secondary.

The second cost is financial and relates to the scale of resources available for resolution. Access to the resolution fund requires the bank's owners and creditors to absorb losses of at least 8% of total liabilities including own funds (TLOF). Where a bank funded mainly through deposits does not have sufficient loss-absorbing capacity, a contribution from the deposit guarantee scheme may be counted towards that threshold (the topping-up mechanism). This mechanism will apply in Poland as well and is not reserved for the Banking Union; the difference lies in the scale of the fund. The orders of magnitude are telling: the Single Resolution Fund reached approximately EUR 80 billion at the end of 2024, meeting its target of 1% of covered deposits across the Banking Union, whereas the Polish resolution fund operated by the Bank Guarantee Fund is financed solely by domestic banks

and, depleted by the resolution of Getin Noble Bank in 2022 (which absorbed PLN 6.28 billion from it), stood at only 0.68% of covered deposits at the end of 2024, well below its statutory target. In the Banking Union, the contribution comes from a common fund financed by the banks of all participating states, whereas in Poland two separate funds operated by the Bank Guarantee Fund — the deposit guarantee fund and the resolution fund — are financed solely by domestic banks. Poland thus adopts the common rules without taking part in risk-sharing — the mechanism that spreads the cost of a bank's failure across the banking sectors of many states (Eurofi, 2025). The framework therefore does not abolish the asymmetry but entrenches it and raises its cost for a host Member State that remains outside the Banking Union. Yet for a host Member State outside the Banking Union this loop is not a peripheral concern but where the cost of the asymmetry actually falls: lacking a supranational backstop, such a state absorbs sovereign risk domestically and pays a measurable premium for it — several basis points per percentage point of debt, against roughly one for euro-area peripheries — so that the absence of risk-sharing diagnosed here on the resolution side has a direct counterpart on the sovereign-financing side (Toczyński, 2026).

#### **4. The scope and manner of implementing the 2026 CMDI framework in Polish law**

The framework is made up of three legal acts, but the Polish legislature transposes only two. The amending SRMR Regulation is directly applicable, and only in the states belonging to that mechanism; Poland, being outside the Banking Union, neither transposes it nor benefits from it. Two directives, by contrast, require transposition: the amending BRRD Directive (legal basis: Article 114 of the Treaty on the Functioning of the European Union, TFEU) and the amending DGSD Directive (basis: Article 53(1) of that Treaty). The deadline for transposing both expires on 11 May 2028. This division alone is an argument for the asymmetry thesis: Poland takes on the full set of harmonisation obligations while remaining outside the common mechanism and fund.

The changes will be transposed into domestic law mainly by the Act of 10 June 2016 on the Bank Guarantee Fund, the Deposit Guarantee Scheme and Resolution (Journal of Laws (Dz.U.) 2016, item 996, as amended; consolidated text Journal of Laws 2025, item 643), supplemented by targeted amendments to the Bankruptcy Law (Act of 28 February 2003). It is this Act that gives the Bank Guarantee Fund a dual function: that of the national resolution authority and that of the body operating the deposit guarantee scheme. Implementing the framework requires only targeted amendments.

The first area concerns the ranking of claims in a bank's insolvency proceedings and calls for correcting a widespread oversimplification: the framework does not introduce a 'uniform', single-tier depositor preference,

which was the European Commission's rejected original proposal. The harmonisation of the ranking to date had been only partial — the highest rank attached to covered deposits, that is, funds protected by the deposit guarantee scheme up to the equivalent of EUR 100,000 (recital 43 of the preamble to the amending BRRD Directive). The framework replaces this model with general depositor preference, extending priority to all deposits over ordinary unsecured creditors, while preserving the highest rank for covered deposits (Article 108 of the BRRD as amended by the amending BRRD Directive). This priority does not affect the position of secured creditors (creditors secured in rem), who are satisfied from the object of the security outside that ranking. Deposits used to meet MREL — a buffer intended to absorb the bank's losses in resolution — are, by contrast, excluded from the preference (recital 44 of the preamble to the amending BRRD Directive). The highest rank of covered deposits is confirmed by the amending DGSD Directive: when it makes a payout or contributes to resolution, the deposit guarantee scheme acquires against the bankruptcy estate a subrogated claim of the same rank (Article 9(2) of the DGSD as amended by the amending DGSD Directive).

Polish law already contains a depositor preference of its own: Article 440 of the Bankruptcy Law places covered deposits in the first category, and in the second category the claims of natural persons, micro-enterprises and small and medium-sized enterprises in respect of funds under guarantee protection other than covered deposits. The change brought by the framework is therefore an extension of an existing legal mechanism, not the creation of a new one.

The second area concerns the scope of deposit guarantee protection, which the amending DGSD Directive extends in three directions. First, it now covers the deposits of certain public-sector entities — local authorities and smaller public bodies and non-commercial institutions, such as schools or hospitals — previously excluded as professional depositors (Article 5(1)(j) of the DGSD as amended by the amending DGSD Directive; recital 7 of the preamble to the amending DGSD Directive). Second, the protection of so-called temporary high balances has been harmonised — that is, deposits temporarily inflated by life events, for example the sale of a flat. Protection covers at least EUR 500,000 above the standard EUR 100,000 guarantee for a harmonised period of six months, while for balances arising from transactions in residential property carried out by a natural person a ceiling of EUR 2,500,000 is set (Article 6(2) of the DGSD as amended by the amending DGSD Directive; recital 9 of the preamble to the amending DGSD Directive). Third, protection now extends to client funds entrusted to financial institutions, such as payment institutions, provided that those clients are identified (Article 8b of the DGSD as amended by the amending DGSD Directive).

The third area concerns the link between the deposit guarantee scheme and resolution, and the treatment of deposits for MREL purposes. The deposit guarantee scheme may finance the transfer of a bank's business to another institution instead of paying out funds to depositors, provided this is the cheaper option (the least cost test) and the total cost of the intervention remains below the amount of covered deposits (Article 11 of the DGSD as amended by the amending DGSD Directive; Gortsos, 2023). Deposits used to meet MREL are excluded from guarantee protection (Article 5(1)(l) of the DGSD as amended by the amending DGSD Directive, in conjunction with Article 45b of the BRRD); for deposits taken before 12 May 2028, acquired-rights protection is retained (grandfathering), expiring on 11 May 2029 (recital 30 of the preamble to the amending BRRD Directive).

The fourth area defines the scope of the Polish legislature's regulatory discretion. Both directives in the package bind Member States as to the result to be achieved, leaving them the choice of form and means of transposition (Article 288 TFEU), and in certain matters they provide for national options. Poland will decide, among other things, whether to allow the deposit guarantee scheme to finance preventive measures aimed at averting a bank's failure (Article 11(3) of the DGSD as amended by the amending DGSD Directive). It will also, on its own, define only the 'short period' that governs protection of balances from property transactions — an element distinct from the harmonised amounts and the harmonised protection period (Article 6(2) of the DGSD as amended by the amending DGSD Directive). A separate, narrow option is provided for cooperative banks: an institutional protection scheme recognised as a deposit guarantee scheme may temporarily support a member's liquidity and solvency to prevent that member's failure (recitals 22 and 38 of the preamble to the amending DGSD Directive; Article 113(7) of Regulation (EU) No 575/2013 — the Capital Requirements Regulation, CRR).

## **5. Discussion — the Structural Nature of Host-State Asymmetry**

The analysis in Sections 3 and 4 allows the question proper to this discussion to be posed: whether the asymmetry between the Member State of the parent undertaking and the Member State of the subsidiary is a transitional cost that will disappear as the Banking Union matures, or a structural feature of its design (Arnal, Lannoo, Lastra, 2024; Méré, Piroška, 2016). Two claims must be distinguished here. That the framework transfers the existing supervisory asymmetry onto the plane of resolution, without adding a layer of shared risk-bearing, follows directly from the analysis and is firmly established. That it deepens the asymmetry, by contrast, requires showing in what that deepening consists — the mere extension of it to a new area of decision-making does not in itself establish its structural character.

The strongest counterargument is advanced by Véron (2024a), with reference to the 2023 draft package: the asymmetry is not imposed by the package but is a price that the host Member State itself chooses by remaining outside the Banking Union; it is the national authorities that ‘ring-fence’ subsidiaries and keep them under control, and the source of the tension is banking nationalism, not the reform itself (Méró, Piroska, 2016). This argument is persuasive in part — remaining outside the Banking Union is Poland’s decision, and part of the cost stems from that decision, not from the package. The natural point of comparison is the counterfactual of accession through close cooperation under Article 7 of the SSM Regulation: in that scenario the asymmetry described here would largely dissolve, since a single resolution authority (the SRB) would decide for the group as a whole and the Polish subsidiary would draw on the common fund. The contrast between the two positions is precisely what reveals the nature of the cost — the loss of a decisive vote together with the absence of risk-sharing — and the thesis does not ignore that choice but shows that the 2026 framework raises the price of remaining outside. It does not, however, undermine the thesis. For the framework shifts the point of reference: it moves the decision on the subsidiary’s fate from the plane of supervision, where the national authority retained genuine powers, to the plane of resolution, where it now has only a consultative voice. The cost of the asymmetry therefore rises regardless of the original choice — and this is what its deepening consists in.

That the asymmetry is structural rather than transitional follows from three unresolved elements. First, the absence of a European Deposit Insurance Scheme (EDIS): as long as depositor protection rests on national funds, the host Member State bears harmonisation obligations without access to risk-sharing, and the dispute over the sharing of risk among states remains unresolved (Schoenmaker, 2017; Véron, 2024b). Second, the absence of a fiscal backstop for the Single Resolution Fund (SRF), and its restriction to states participating in the Banking Union, close this layer off to a state that remains outside it. Third, the incomplete harmonisation of national insolvency regimes means that a determination that is identical at EU level produces different effects in the subsidiary’s state than in the parent’s state. In the authors’ view, these elements are not incidental gaps but a missing layer of mutualisation: the asymmetry is structural for as long as that layer is absent — that is, as long as there is no EDIS and no fiscal backstop open to non-participating Member States — and it would recede if such a layer were added. This structural cost is also visible in the market. Comparative evidence across euro-area peripheries and non-euro CEE economies shows that states with a common monetary anchor pay much less per unit of debt, and suggests — though it does not prove — that such an anchor also weakens the bank–sovereign loop. The framework analysed here does not

touch this margin (Toczyński, 2026). Its source is therefore the architecture of the system, not a single transaction or transposition choice.

Finally, the potential for conflict between national authorities and the Single Resolution Board remains unresolved, where the host Member State's fiscal interest diverges from the resolution scenario that is optimal for the Banking Union (Nieto, 2015; Gortsos, 2023). Broader issues — the concentration of exposure to home sovereign debt, or the risks of the non-bank financial sector — remain outside the scope of the framework, governed by other acts, and affect the bank–sovereign loop only indirectly (Hellwig, 2014; Goodhart, Avgouleas, 2016). The conclusion of this discussion is therefore structural in nature: the framework transfers and entrenches an asymmetry that it does not offset with any layer of shared risk. Its consequences for the Polish legislature and authorities are developed in Section 6.

## **6. Summary and conclusions**

The aim of this article was to review the 2026 CMDI framework and the conditions for its implementation in the Polish banking sector. The analysis proceeded in four stages. Section 1 set the reform in the context of the diversity of the Union's banking sectors and the divergent positions of the Member States, whose common denominator was the need to bring smaller banks, too, within the resolution regime and to link deposit guarantee schemes more closely to resolution processes. Section 2 set out the content of the reform at EU level around three objectives: streamlining the resolution of small and medium-sized banks, reducing the use of public funds, and strengthening the protection of depositors. Sections 3 and 4 moved the analysis onto Polish ground — the former diagnosing the effect of the framework, the latter the technique of its implementation.

The analysis shows that Poland transposes two of the three parts of the framework — the amending BRRD Directive and the amending DGSD Directive — while remaining outside the directly applicable amending SRMR Regulation, which applies to the states of the Banking Union; the transposition deadline expires on 11 May 2028. The vehicle for the changes is the Act on the Bank Guarantee Fund, supplemented by targeted amendments to the Bankruptcy Law. The changes are largely extensions of existing legal mechanisms rather than the creation of new ones: Polish law already contains a depositor preference (Article 440 of the Bankruptcy Law), which the framework broadens, and the national deposit guarantee scheme already performs functions that extend beyond mere payout. The elements requiring national decisions, by contrast, are the extended scope of protection — public-sector entities, temporary high balances, the client funds of financial institutions — the treatment of deposits for MREL purposes, and the options left to the legislature.

The article's main analytical finding, developed in Sections 3 and 5, is that the framework — while harmonising the legal framework — transfers onto the plane of resolution a pre-existing asymmetry between the Member State of the parent undertaking and the Member State of the subsidiary, without offsetting it with a layer of shared risk-bearing. The practical conclusion, however, is not the passive acceptance of this state of affairs but the deliberate use of the margin of transposition. The legislature will decide, among other things, whether to allow the deposit guarantee scheme to finance preventive measures, and how to define the 'short period' for balances from property transactions, while the narrow option for cooperative banks allows pressure on the fund to be eased. In the absence of risk-sharing, the capacity of the national resolution fund also gains in importance, as does the active presence of the BFG and the KNF in the resolution college.

The 2026 CMDI framework therefore does not create a new crisis management system but rather rationalises and completes the existing one. For Poland, its significance lies not so much in the content of the harmonised rules as in the way they are fitted into the national regime, and in the position it assigns to a state that remains outside the Banking Union. A fuller assessment of the effects will be possible only after the first applications of the new provisions, and will depend on the further development of the Banking Union, including the possible establishment of a European deposit insurance scheme.

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## ARTICLES

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# HUMAN CAPITAL AND THE DIGITAL DETERMINANTS OF ARTIFICIAL INTELLIGENCE UPTAKE IN POLAND AGAINST THE BACKGROUND OF THE EUROPEAN UNION (2015-2024)

### Abstract

*This article examines whether, in the period 2015–2024, Poland was narrowing the gap separating it from the European Union in the areas of human capital, digitalisation, and the potential for artificial intelligence uptake. The empirical basis comprises ten indicators grouped into four domains - human capital, digital infrastructure and maturity, innovation potential, and economic outcomes - drawn from the World Bank Open Data API, OECD databases, and OECD.AI, each juxtaposing Poland with the Union aggregate. Descriptive statistics are employed: terminal values, the absolute gap, a catching-up index (the ratio of the national to the Union value), and the compound annual growth rate, deliberately forgoing econometric modelling. The results indicate pronounced yet heterogeneous convergence: Poland has steadily narrowed the gap in the domain of enabling conditions - research personnel, R&D expenditure, basic digital infrastructure and the digital maturity of enterprises, and labour productivity*

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*- while diverging in the adoption of frontier technologies, including the direct use of artificial intelligence in firms. The findings are interpreted in the light of the general-purpose technology concept and the absorptive capacity of the economy.*

**JEL classification codes:** J24, O33, O38, O52.

**Keywords:** human capital, digitalisation, artificial intelligence, convergence, Poland, European Union, digital maturity, labour productivity.

### **Introduction**

Artificial intelligence is now widely regarded as a general-purpose technology whose influence – by analogy with electricity or earlier information and communication technologies – is cross-cutting and extends to nearly every sector of the economy. Its productive use, however, depends not solely on the availability of the technology itself, but on the maturity of the conditions that precede it: the stock of human capital, the quality of digital infrastructure, the digital maturity of enterprises, and the innovation potential of the economy. In the policy of the European Union, articulated in the Digital Decade programme and in successive strategies concerning artificial intelligence, these areas have been recognised as a foundation of competitiveness and economic cohesion, and at the same time as a precondition for the effective absorption of frontier technologies.

Poland, as a catching-up economy of Central and Eastern Europe, has for two decades been narrowing its developmental gap relative to the core states of the European Union. A simplified picture is commonly assumed, in which this process unfolds evenly across all dimensions of modernisation. It is not obvious, however, whether the narrowing of enabling conditions – competences, infrastructure, and research-and-development expenditure – translates in parallel into the absorption of the frontier technology itself, including artificial intelligence. The research problem of this article therefore concerns establishing whether, and to what extent, Poland's gap relative to the European Union changed across the individual, qualitatively distinct areas of human capital, digitalisation, and the potential for artificial intelligence uptake, and in particular whether this process is homogeneous or, on the contrary, stratified – different for enabling conditions and for the most advanced technologies.

In view of the problem thus outlined, the following research question was formulated: did Poland, in the period 2015–2024, narrow the gap relative to the European Union in the domains of human capital, digitalisation, and the potential for artificial intelligence uptake? The aim of the article is to answer this question on the basis of ten indicators grouped into four areas – human capital, digital infrastructure and maturity, innovation

potential, and economic outcomes - juxtaposing Poland with the Union aggregate.

The perspective adopted in the article is that of convergence understood as relative catching-up, measured by the change in the ratio of the national to the Union value and by the difference in the compound annual growth rate. The article comprises three principal parts. The theoretical part organises the concepts and mechanisms linking human capital, digital maturity, innovation potential, and productivity outcomes, and situates artificial intelligence within the framework of the general-purpose technology concept. The empirical part carries out the comparative analysis of the indicators proper. The whole is closed by conclusions that answer the research question posed.

### **1. Human capital and the absorptive capacity of the economy**

The point of departure is the thesis that the capacity of an economy to absorb and productively employ advanced technologies follows not from mere access to them, but from the stock of human capital and complementary competences. In the literature on the catching-up economies of Central and Eastern Europe it is emphatically observed that innovative enterprises in these countries rely to a greater extent on internal sources of knowledge than on the transfer of technology from outside, which shifts the burden of the modernisation process onto the national competence and organisational base (Prokop, Stejskal, Klimova, & Zitek, 2021). The implication is significant for the case under study: where absorption depends on internal resources, the accumulation of research personnel and the prevalence of higher education become not a backdrop, but the proper precondition for closing the technological gap.

Artificial intelligence, moreover, transforms the structure of demand for competences. Analyses based on job-vacancy data show that the diffusion of AI – treated as a technology of broad, cross-cutting application – alters competence requirements not only in strictly technical occupations, but also in managerial and business roles (Acemoglu, Autor, Hazell, & Restrepo, 2022). In parallel, a dramatic rise in demand for AI specialists has been documented, together with a substantial wage premium for such competences – of the order of a dozen-odd per cent within the same firm – with demand concentrated in enterprises with higher research-and-development expenditure (Alekseeva, Azar, Giné, Samila, & Taska, 2021). It follows that talent associated with artificial intelligence is a scarce and unevenly distributed resource, and that its shortage may constitute a bottleneck for implementations even where infrastructure is favourable. For a catching-up economy this entails the risk that competition for limited personnel will be resolved to the disadvantage of peripheral countries, in which corporate demand and remuneration are lower.

## **2. Digital infrastructure and maturity as the environment for implementation**

The second link of the theoretical framework is the digital environment in which implementations take place. Research on the digitalisation of the European Union points to the co-occurrence of asymmetry and convergence: member states differ in their level of development of digital technologies, yet in many dimensions a gradual approximation is observed, described by means of beta- and sigma-convergence analysis (Kolupaieva & Tiesheva, 2023). Findings of this kind justify the manner of measuring the gap adopted in the empirical part, in terms of the ratio of the national to the Union value and its change over time.

At the enterprise level, digital maturity – understood as the capacity to absorb successive layers of technology – proves decisive. An analysis covering more than twelve thousand small and medium-sized enterprises in the Union demonstrated that it is precisely digital capabilities that are the principal driver of artificial intelligence adoption - especially in firms at a lower level of advancement, where complementary innovation capabilities act synergistically (Arroyabe, Arranz, Fernandez De Arroyabe, & Fernandez de Arroyabe, 2024). This mechanism is consistent with evidence at the productivity level: the employment of ICT specialists and the use of digital technologies, such as cloud computing and big-data analysis, are associated with a substantial increase in an enterprise's labour productivity (Cette, Nevoux, & Py, 2022). The theoretical conclusion is, however, conditional: infrastructure and basic digital tools are necessary but insufficient – their productive effect emerges only in combination with competences and organisational practices, which shifts the centre of gravity from equipment itself to the capacity for its use.

## **3. Innovation potential and the national innovation system**

The third link is innovation potential, conceived in terms of the national innovation system. With reference to Poland as a catching-up economy, it has been shown that interactions within the triple-helix configuration – science, enterprises, and public administration - shape innovation activity in a manner specific to a country closing a gap, in which these linkages are weaker and more dispersed than in core economies (Świadek, Dzikowski, Gorączkowska, & Tomaszewski, 2022). This institutional configuration sets the real limits on the pace at which rising research-and-development expenditure translates into measurable outcomes.

At the European level, the relationship between research-and-development expenditure and productivity proves, moreover, to be far from straightforward. It has been shown that both disembodied R&D and knowledge embodied in purchased machinery and equipment reduce the technological gap, yet the sign of their interaction is at times opposite – hence the metaphor of the “two disjointed faces” of R&D – which signals a lack

of complementarity and a possible deficit of policy coordination (Bruno, Douarin, Korosteleva, & Radosevic, 2022). In the same vein, it is documented that enterprises of southern and eastern Europe remain farther from the technological frontier, and that the Union's erstwhile role as a "convergence machine" has weakened amid the polarisation of the productive structures of the core and the periphery. Complementarily - returning to the specificity of Central and Eastern Europe - it is reliance on internal knowledge resources, rather than on foreign technologies, that proves a characteristic feature of those innovation systems (Prokop et al., 2021). From a theoretical standpoint, this warrants caution in interpreting measures of intellectual-property output, including patent applications, as a direct reflection of potential - their construction and filing channels remain systematically biased.

#### **4. Artificial intelligence as a general-purpose technology**

The fourth link is the theoretical conceptualisation of artificial intelligence itself. In the economic literature, AI is classified as a general-purpose technology - that is, a technology of cross-cutting application, capable of generating complementary innovations across many sectors simultaneously (Brynjolfsson, Rock, & Syverson, 2021). From this classification follows a consequence central to the present article - the concept of the productivity J-curve: the implementation of a general-purpose technology requires substantial yet poorly measured investment in intangible assets - new processes, business models, the reorganisation of work, and human capital - as a result of which measured productivity is initially understated, and only later, when those investments bear fruit, does it accelerate.

Empirical firm-level studies confirm a positive association between the use of artificial intelligence and productivity, while cautioning that these effects are stronger where firms apply AI broadly and possess many years of implementation experience (Czarnitzki, Fernández, & Rammer, 2023). Adoption is, moreover, highly uneven - contingent on the size and sector of the enterprise - and its principal driver remains digital capabilities, which again directs attention to complementary foundations rather than to the technology itself (Arroyabe et al., 2024). And since artificial intelligence, as a technology of broad application, alters the demand for labour throughout the economy, its diffusion is inextricably intertwined with the availability of appropriate competences (Acemoglu et al., 2022). The logic of the J-curve and the logic of absorptive capacity thus lead to a convergent theoretical conclusion: the productivity benefits of AI are deferred and conditional upon the accumulation of complementary assets, which technological leaders amass more rapidly.

## **5. Conceptual framework and assumptions**

The links set out above compose the heuristic conceptual chain adopted in this article: human capital conditions digital maturity, which together with innovation potential constitutes the capacity to absorb frontier technologies, the co-occurring outcome of which is labour productivity.

From the concept presented follows the assumption of directionality – for the core indicators a higher value is interpreted as a more favourable state, and the criterion of convergence is an increase in the ratio of the national to the Union value – together with the deliberate treatment as auxiliary of those measures whose interpretive direction is ambiguous. More importantly, the combination of the J-curve concept with the logic of absorptive capacity makes it possible to formulate a theoretically grounded research expectation, rather than mere description. Since the productive effects of a general-purpose technology are deferred and require the accumulation of complementary assets (Brynjolfsson et al., 2021), and technological leaders amass them more rapidly, deepening the polarisation of core and periphery (Bruno et al., 2022), an asymmetric pattern is to be expected: convergence in the domain of foundations – human capital, basic digital infrastructure, research-and-development expenditure, and productivity – alongside possible divergence at the technological frontier itself, that is, in the adoption of the most advanced applications of artificial intelligence. The mediating mechanism here is consistent: the productive effect of digital technologies emerges only in combination with complementary competences and organisational practices (Cette et al., 2022), the accumulation of which proceeds with a lag. The expectation thus formulated constitutes the theoretical bridge to the empirical part, whose findings - the narrowing of the gap in the foundations and its loss in frontier technologies – find in the above framework not merely description, but explanation.

## **6. Methodological assumptions**

The data for the empirical analysis were obtained from three complementary sources of a primary or near-primary character. Indicators 1–7 derive from the World Bank Open Data API in a uniform vintage of 8 April 2026, which ensures consistency of the data version within this group. The indicators concerning the use of ICT in enterprises and labour productivity were drawn from OECD databases (respectively, ICT Access and Usage by Businesses, updated in January 2026, and the Productivity Database), with the ICT data for EU member states based on the harmonised Eurostat methodology. The indicator of AI-competence migration derives from the OECD.AI Policy Observatory (LinkedIn Economic Graph data). Full documentation of sources, codes, and units is set out in Table 1.

The unit of comparison is Poland juxtaposed with the European Union aggregate. It should be emphasised that three operational definitions of the Union aggregate occur in the analysis, whose use follows from the availability of data from the respective providers and which – importantly for interpretive correctness - are not mutually identical. First, the World Bank “European Union” aggregate (code EUU), applied for indicators 1–3, 5, and 7. Second, the official “European Union (27)” aggregate of the OECD/Eurostat, applied for indicators 8–9. Third, the EU-27 aggregate reconstructed from country-level data (own calculations), applied where the provider does not publish a ready aggregate value: for the share of individuals using the Internet, a population-weighted mean was computed; for the number of patent applications, a sum over the 27 member states; and for AI-competence migration, an unweighted mean. These differences are deliberate and documented; they are not juxtaposed cross-wise in interpretation.

The time window of the analysis was defined flexibly. The years 2015–2024 remain the conceptual frame; however, the actual data coverage differs across indicators: some World Bank series end in 2023, the data on broadband lines and ICT imports in 2022, and the patent series in 2021, whereas the indicators of the adoption of the newest technologies (cloud, big data, IoT, AI) and of talent migration begin only around 2020–2021. Consequently, for each indicator the initial year (the earliest available year no earlier than 2015) and the final year (the most recent available) are reported explicitly, and all measures of change refer to such an individually defined window. This approach is a condition of fair comparison and has been reflected in the “Window” column in all tables.

**Table 1. Indicators, sources, and definitions of the EU aggregate used in the analysis**

Indicator	Code / measure	Source	Vintage	EU aggregate
R&D expenditure (% of GDP)	GB.XPD.RSDV.GD.ZS	World Bank API	2026-04-08	EUU (official WB)
Researchers in R&D / million	SP.POP.SCIE.RD.P6	World Bank API	2026-04-08	EUU (official WB)
Tertiary enrolment	SE.TER.ENRR	World Bank API	2026-04-08	EUU (official WB)
Internet (% of pop.)	IT.NET.USER.ZS	World Bank API	2026-04-08	EU-27 own calc. (pop.-weighted mean)
Fixed broadband	IT.NET.BBND.P2	World Bank API	2026-04-08	EUU (official WB)
Resident patent applications	IP.PAT.RESD	World Bank API	2026-04-08	EU-27 own calc. (sum of 24–27 states)
ICT goods imports	TM.VAL.ICTG.ZS.UN	World Bank API	2026-04-08	EUU (official WB)
ICT in firms (5 measures)	DSD_ICT_B (OECD)	OECD / Eurostat	2026-01-27	EU-27 (official OECD/Eurostat)
Productivity, GDP/hour	PDB – GDP per hour	OECD PDB	2026	EU-27 (official OECD)
OECD.AI – AI migration	AI skills migration	OECD.AI / LinkedIn	2021–2025	EU-27 own calc. (simple mean)

Source: Own elaboration based on the World Bank Open Data API (vintage 2026-04-08), OECD ICT Access and Usage by Businesses (upd. 2026-01-27), the OECD Productivity Database, and OECD.AI. “Own calc.” denotes own calculation of the EU-27 aggregate from country-level data

### 6.1. Analytical measures

To assess the gap and its evolution, four simple yet mutually complementary descriptive measures were employed. For each indicator let  $PL(t)$  denote the value for Poland and  $EU(t)$  the value of the Union aggregate in year  $t$ .

Absolute gap:  $G(t) = EU(t) - PL(t)$ . It measures the distance in the units of the given indicator; its decline ( $\Delta G < 0$ ) denotes a narrowing of the gap for variables in which a higher value is desirable.

Relative index (catching-up index):  $R(t) = PL(t) / EU(t) \times 100\%$ . A value below 100% indicates a position below the Union average; its increase ( $\Delta R > 0$ , expressed in percentage points) is the principal criterion of convergence adopted in this analysis.

Compound annual growth rate (CAGR):  $CAGR = (X(\text{end})/X(\text{start}))^{(1/n)} - 1$ , computed separately for Poland and the EU ( $n$  - the number of years in the window). The condition of genuine catching-up is  $CAGR(PL) > CAGR(EU)$ .

The assumption of directionality was adopted: for all core indicators a higher value is interpreted as a more favourable state, and the point of departure is Poland's position below the EU aggregate. Two indicators of an auxiliary character depart from this rule and are discussed with appropriate caution: ICT goods imports (an ambiguous interpretive direction – a high share may attest both to modernity and to technological dependence; moreover, Poland oscillates around the EU level) and AI-competence migration (a net-flow measure, taking negative values and variable over time). The IoT indicator is reported only for a two-year window (2020–2021), which precludes inference about a trend and requires that it be treated solely as indicative.

It is also necessary to distinguish convergence in relative terms (an increase in  $R$ ) from the narrowing of the gap in absolute terms (a decline in  $G$ ). The two measures usually point in the same direction, but not always: if both entities grow, yet the EU starts from a higher level, the absolute gap may widen despite an improvement in the percentage ratio. Such a case is signalled in the text where it occurs (inter alia, fixed broadband).

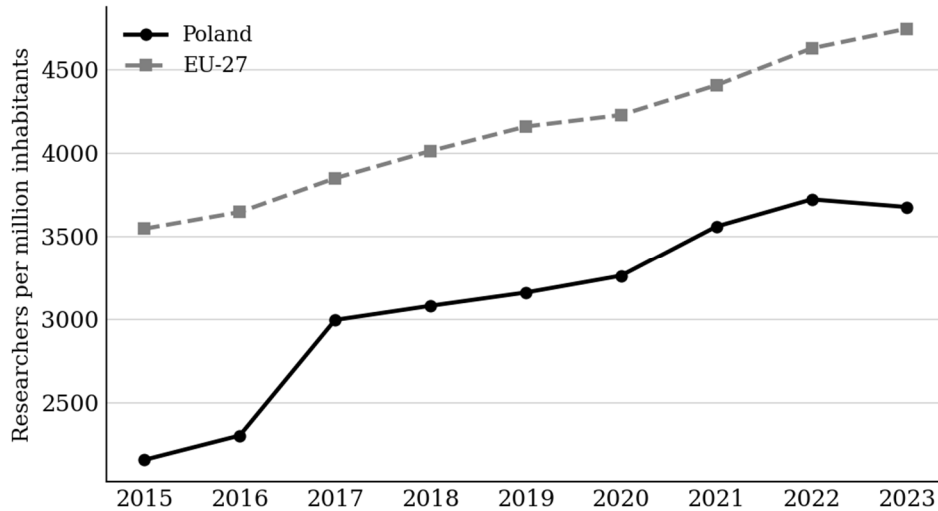
## 7. Human capital

The human-capital domain answers the question of whether Poland possesses a growing competence base conditioning the absorption of new technologies. Two core indicators were used - the number of researchers in R&D per million inhabitants and the gross tertiary enrolment ratio – supplemented auxiliarily by the AI-competence migration indicator from OECD.AI.

**Table 2. Human capital – terminal values and convergence measures**

Indicator	Window	Poland (start→end)	EU-27 (start→end)	PL/EU (start→end)	$\Delta$ (PL/EU) p.p.	CAGR PL / EU
Researchers in R&D / million	2015–2023	2,158 → 3,675	3,545 → 4,741	60.9% → 77.5%	+16.6	6.9% / 3.7%
Tertiary enrolment (% gross)	2015–2024	69.4 → 80.9	69.8 → 79.5	99.4% → 101.8%	+2.4	1.7% / 1.5%
OECD.AI – AI migration (net)*	2021–2025	0.54 → 0.49	0.66 → 0.53	81.6% → 92.1%	+10.5	n/a

Source: Own elaboration. \* Auxiliary indicator (net metric, EU aggregate as an unweighted mean) - indicative interpretation. Convergence/divergence is conveyed by the sign of  $\Delta$ (PL/EU).

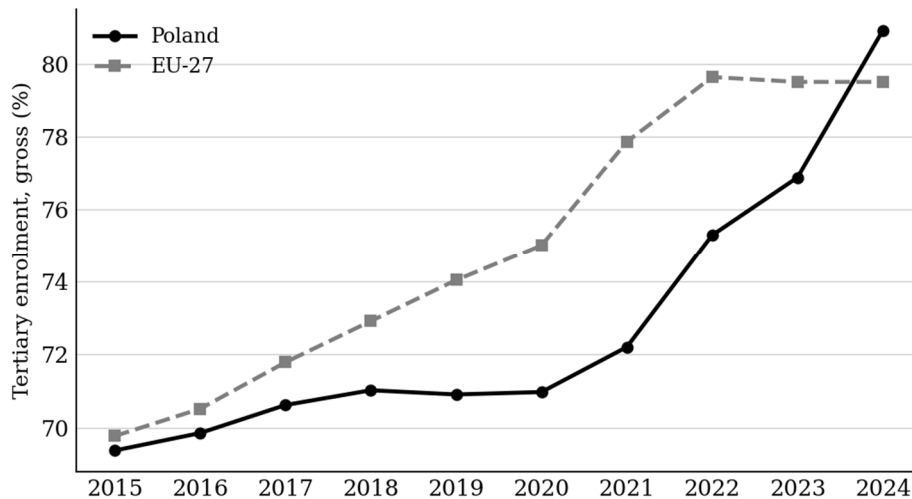


**Figure 1. Researchers in R&D per million inhabitants, Poland vs EU-27 (2015–2023).**

Source: own elaboration based on World Bank, code SP.POP.SCIE.RD.P6.

The picture of human capital is unequivocally positive. The number of researchers per million inhabitants rose in Poland from 2,158 in 2015 to 3,675 in 2023, while in the EU it grew from 3,545 to 4,741. The PL/EU ratio improved from 60.9% to 77.5%, that is, by 16.6 percentage points, and Poland's average annual rate of growth (6.9%) nearly doubled the Union rate (3.7%). Poland not only grows, but grows substantially faster than the reference point, which satisfies the strict condition of catching-up. It is worth noting the non-linearity of the trajectory - a marked jump occurs in 2016–2017 - which suggests the influence of institutional factors (inter alia, reforms

of the science system and an inflow of European funds), although under the descriptive convention adopted this question remains beyond the scope of inference.



**Figure 2. Gross tertiary enrolment ratio (%), Poland vs EU-27 (2015–2024)**

Source: own elaboration based on World Bank, code SE.TER.ENRR

The gross tertiary enrolment ratio reveals a different dynamic. At the beginning of the period Poland stood practically at the EU level (a ratio of 99.4% in 2015), after which - following a transitory decline in the first half of the decade, associated with demographic factors – it rebuilt its position, reaching 80.9% in 2024 against 79.5% in the EU, that is, a ratio of 101.8%. Poland's value on this indicator is therefore above the Union average. Caution in interpretation is nonetheless warranted: a high gross enrolment ratio describes the prevalence of higher education, not its quality or its field alignment with the needs of the digital economy; the indicator alone does not, therefore, settle the quality of human capital in areas critical for AI.

The AI-competence migration indicator (OECD.AI) was treated solely as auxiliary. In the 2021–2025 window the PL/EU ratio rises from 81.6% to 92.1%; however, the metric is of a net-flow character, takes values close to zero and negative (e.g., for the EU aggregate in 2024), and its year-on-year variability is high. For these reasons it can serve only as an illustration of the “emerging” picture of talent mobility, not as a basis for a conclusion about durable convergence of AI-competence resources.

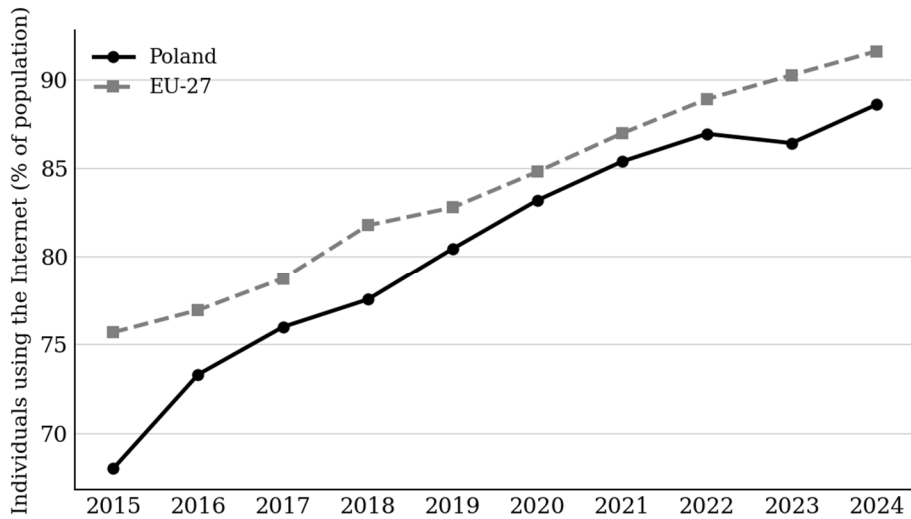
## 8. Digital infrastructure and maturity

This domain encompasses both basic access infrastructure (individuals using the Internet, fixed broadband lines) and the digital maturity of enterprises measured by five technologies (ERP, cloud, big data, IoT, artificial intelligence), as well as – auxilarily – the structure of ICT goods imports. It is precisely in this domain that the most important, heterogeneous pattern of the entire analysis comes to light.

**Table 3. Digital infrastructure and maturity – terminal values and convergence measures**

Indicator	Window	Poland (start→end)	EU-27 (start→end)	PL/EU (start→end)	$\Delta$ (PL/EU) p.p.	CAGR PL / EU
Internet (% of population)	2015–2024	68.0 → 88.6	75.7 → 91.6	89.8% → 96.7%	+6.9	3.0% / 2.1%
Fixed broadband / 100	2015–2022	19.0 → 23.8	31.5 → 38.7	60.4% → 61.6%	+1.3	3.3% / 3.0%
ICT firms: ERP (%)	2015–2025	20.9 → 39.1	38.5 → 46.4	54.2% → 84.2%	+30.0	6.5% / 1.9%
ICT firms: cloud (%)	2016–2025	8.2 → 54.7	18.9 → 52.7	43.2% → 103.7%	+60.5	23.5% / 12.1%
ICT firms: big data (%)	2015–2025	5.9 → 24.5	9.1 → 39.8	64.6% → 61.5%	-3.2	15.3% / 15.9%
ICT firms: IoT (%)†	2020–2021	16.6 → 18.6	18.2 → 28.7	90.8% → 65.0%	-25.7	n/a
ICT firms: AI (%)	2020–2025	4.1 → 8.4	6.0 → 19.9	69.3% → 41.9%	-27.4	15.1% / 27.3%
ICT goods imports (% of imp.)‡	2015–2022	9.8 → 6.3	8.0 → 6.8	122.0% → 93.9%	-28.1	-6.0% / -2.4%

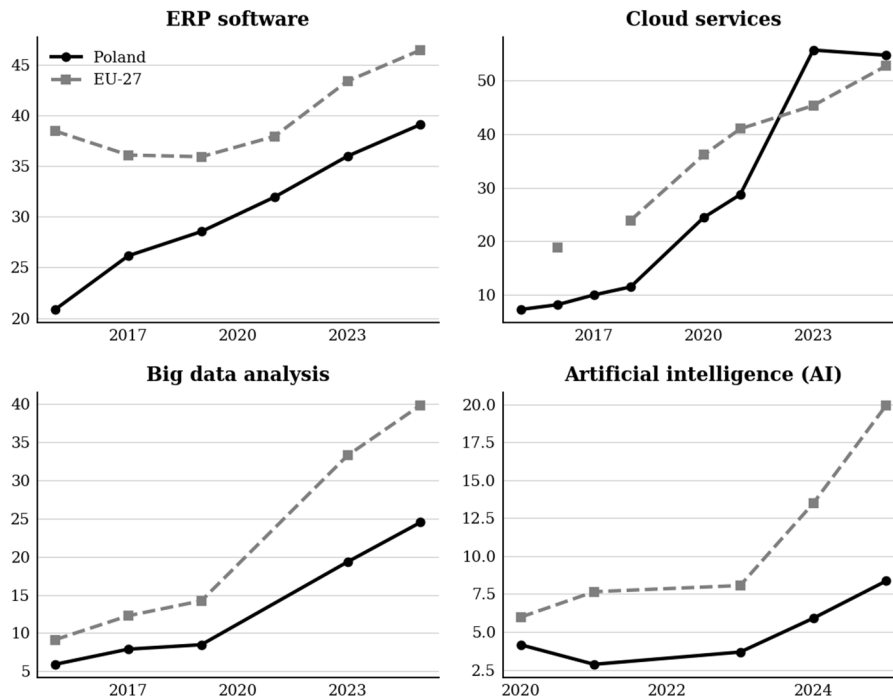
Source: Own elaboration. † Two-year window – inference about a trend is not possible. ‡ Auxiliary indicator with an ambiguous interpretive direction. Convergence/divergence is conveyed by the sign of  $\Delta$ (PL/EU).



**Figure 3. Individuals using the Internet (% of population), Poland vs EU-27 (2015–2024). The EU-27 aggregate as a population-weighted mean (own calculations)**

Source: Own elaboration based on World Bank, codes IT.NET.USER.ZS and SP.POP.TOTL

In the area of basic access infrastructure, moderate but distinct convergence is observed. The share of individuals using the Internet rose in Poland from 68.0% (2015) to 88.6% (2024), approaching the Union level (91.6%); the ratio improved from 89.8% to 96.7%. The gap in Internet access is therefore of a closing character and is today small. The situation of fixed broadband presents differently: the PL/EU ratio improved only marginally (from 60.4% to 61.6%), and – importantly – the absolute gap over the same period widened from 12.5 to 14.8 lines per 100 inhabitants. This is an instance of a case in which the relative and absolute framings diverge: Poland grows, but at a pace barely exceeding the EU, as a result of which – despite a formal, vestigial percentage convergence – the absolute infrastructural gap does not narrow.



**Figure 4. Use of selected ICT technologies in enterprises (% of firms employing 10+ persons), Poland vs EU-27**

Source: Own elaboration based on OECD ICT Access and Usage by Businesses (upd. 2026-01-27)

The richest in cognitive terms is the picture of the digital maturity of enterprises, where a dichotomy of key significance for the conclusions of the analysis comes to light. In the “mature” technologies that constitute the digital foundation of activity, Poland is distinctly catching up. The use of ERP systems rose from 20.9% to 39.1% of firms, with the ratio improving by as much as 30.0 percentage points (from 54.2% to 84.2%) and a rate of growth (6.5%) threefold higher than the Union’s (1.9%). An even stronger convergence - indeed, an overtaking - was recorded in cloud services: from a level of 8.2% in 2016 (43.2% of the EU value) Poland reached 54.7% in 2025, exceeding the Union average (52.7%) and raising the ratio by 60.5 percentage points. In both cases this is genuine, rapid catching-up.

The opposite direction is taken, however, by the adoption of the “frontier” technologies most closely associated with the use of artificial intelligence. The share of firms using AI rose in Poland from 4.1% (2020) to 8.4% (2025) – it formally doubled – but in the EU it grew over the same period from 6.0% to 19.9%, that is, more than threefold. As a result, the PL/EU ratio deteriorated

from 69.3% to 41.9% (by 27.4 percentage points), and Poland's rate of growth (15.1%) proved nearly half as high as the Union's (27.3%). An analogous, though weaker, pattern of divergence occurs in big-data analysis (the ratio falls from 64.6% to 61.5%, despite a similar, high rate of growth in both entities). The IoT indicator, available only for 2020–2021, signals an abrupt deterioration of the ratio; the two-year window does not, however, permit treating this as a trend.

The combined import of this part is as follows: Poland is effectively closing the gap in the layer of digital foundations (network access, ERP, cloud), but in the most advanced, directly “pro-AI” enterprise technologies the Union is pulling away faster than Poland manages to catch up. This is a finding stronger and more nuanced than a simple thesis of universal catching-up.

The ICT goods imports indicator (auxiliary) does not lend itself to interpretation in terms of catching-up. The share of these goods in Poland's imports fell from 9.8% to 6.3%, approaching the EU level (from which it started above - a ratio of 122% in 2015 against 93.9% in 2022). Since a high level of ICT imports may denote both intensive technology absorption and dependence on external supply, this indicator should not be interpreted as a measure of competence or of convergence; here it serves a contextual role for the picture of integration in digital trade.

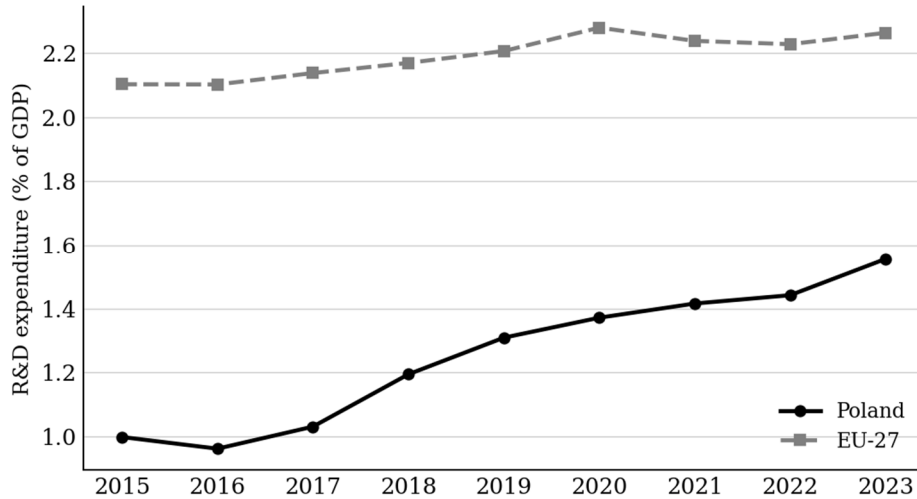
## 9. Innovation potential

Innovation potential was assessed by means of research-and-development expenditure relative to GDP and the number of resident patent applications; the previously discussed number of researchers was also treated as a bridging indicator.

**Table 4. Innovation potential - terminal values and convergence measures**

Indicator	Window	Poland (start→end)	EU-27 (start→end)	PL/EU (start→end)	Δ(PL/EU) p.p.	CAGR PL / EU
R&D expenditure (% of GDP)	2015–2023	1.00 → 1.56	2.10 → 2.26	47.5% → 68.7%	+21.3	5.7% / 0.9%
Patents – PL share in EU§	2015–2021	4,676 → 3,377	84,301 → 81,207	5.55% → 4.16%	-1.4	-5.3% / -0.6%

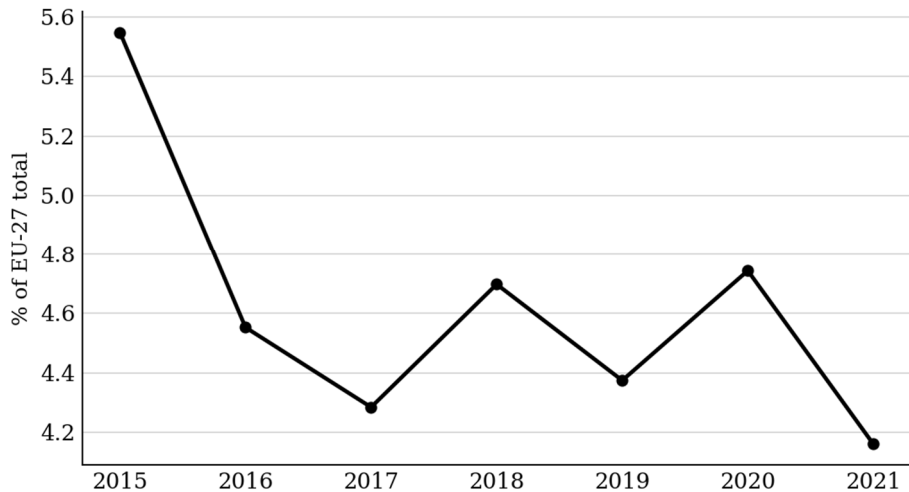
Source: Own elaboration. § For patents, PL/EU denotes Poland's share in the EU-27 total of applications (sum of 24–27 states, depending on coverage); the series ends in 2021. Convergence/divergence is conveyed by the sign of Δ(PL/EU).



**Figure 5. R&D expenditure (% of GDP), Poland vs EU-27 (2015–2023)**

Source: Own elaboration based on World Bank, code GB.XPD.RSDV.GD.ZS

R&D expenditure constitutes one of the most distinct manifestations of convergence in the entire set. R&D intensity rose in Poland from 1.00% of GDP (2015) to 1.56% (2023), while in the EU it remained relatively stable (from 2.10% to 2.26%). The PL/EU ratio improved from 47.5% to 68.7% (by 21.3 percentage points), and Poland's rate of growth (5.7% per year) many times exceeded the nearly flat Union path (0.9%). Poland is systematically increasing its research-and-development effort, although in level terms a substantial gap still separates it from the EU – expenditure amounts to two-thirds of the Union average.



**Figure 6. Poland's share in the EU-27 total of resident patent applications (%), 2015–2021**

Source: Own elaboration based on World Bank, code IP.PAT.RESD (the EU-27 aggregate as a sum of states, own calculations)

Resident patents, however, depict an opposite and cautionary picture. The absolute number of applications in Poland fell from 4,676 (2015) to 3,377 (2021), and Poland's share in the Union total declined from 5.55% to 4.16%. Although the number of applications was falling across the whole EU (an effect, *inter alia*, of the shift of activity to the European EPO route), in Poland the decline was faster (CAGR  $-5.3\%$  against  $-0.6\%$ ), which denotes relative divergence. This indicator is nonetheless burdened by a significant construction-related limitation: it counts resident applications at national patent offices, whereas a considerable part of patent activity in the EU proceeds through the EPO and the PCT route; summing national applications is therefore an incomplete approximation of actual inventive activity. For the purposes of the article the indicator should thus be treated as a signal of weakness in the creation of intellectual property, but with an explicit methodological reservation.

The juxtaposition of the two innovation indicators leads to a conclusion about an asymmetry of inputs and outputs: the rising research-and-development effort (R&D, personnel) is not accompanied by a proportional increase in measurable patent output. This discrepancy - though, in the light of the limitations of the patent data, calling for caution - is cognitively interesting and may serve as a point of departure for further discussion in the concluding part of the article.

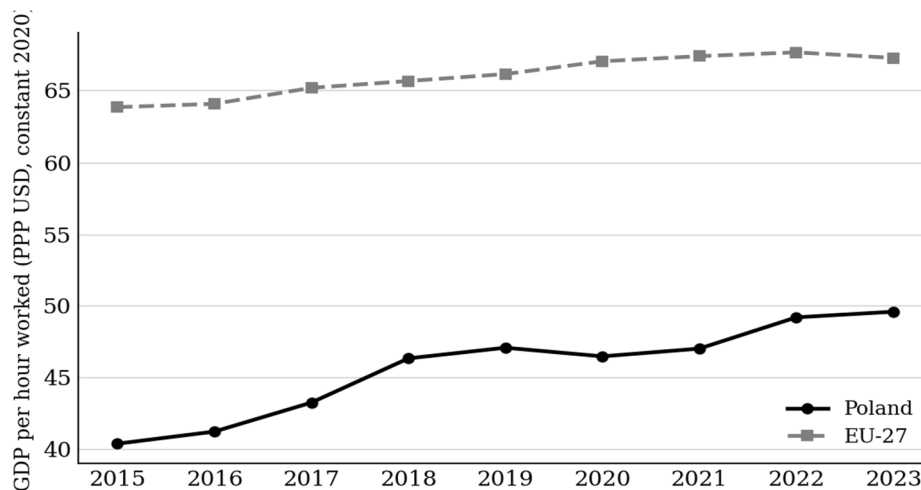
## 10. Economic outcomes

A synthetic reflection of the technological, organisational, and competence level of the economy is labour productivity, measured as GDP per hour worked (in USD at purchasing-power parity, constant 2020 prices). In accordance with the descriptive convention adopted, this indicator is treated as a co-occurring outcome of the conditions analysed in the preceding domains, and not as a variable whose causal relationships are demonstrated here.

**Table 5. Economic outcomes - labour productivity**

Indicator	Window	Poland (start→end)	EU-27 (start→end)	PL/EU (start→end)	Δ(PL/EU) p.p.	CAGR PL / EU
Productivity: GDP/hour (PPP USD)	2015– 2023	40.4 → 49.6	63.8 → 67.3	63.3% → 73.7%	+10.4	2.6% / 0.7%

Source: Own elaboration based on the OECD Productivity Database (GDP per hour worked, PPP USD, constant 2020 prices)



**Figure 7. Labour productivity: GDP per hour worked (PPP USD, constant 2020 prices), Poland vs EU-27 (2015–2023)**

Source: Own elaboration based on OECD PDB

Labour productivity in Poland rose from 40.4 USD/hour (2015) to 49.6 USD/hour (2023), against an increase from 63.8 to 67.3 USD/hour in the EU. The PL/EU ratio improved from 63.3% to 73.7% (by 10.4 percentage points), and Poland's rate of growth (2.6% per year) nearly quadrupled the Union rate (0.7%). Poland is consistently closing the gap in labour productivity, although – as in the case of R&D expenditure – it remains

considerable: national productivity currently amounts to just under three-quarters of the Union level. This trajectory is consistent with the picture of convergence observed in the human-capital and digital foundations, reinforcing the interpretation of productivity as a collective result of the gradual modernisation of the economy.

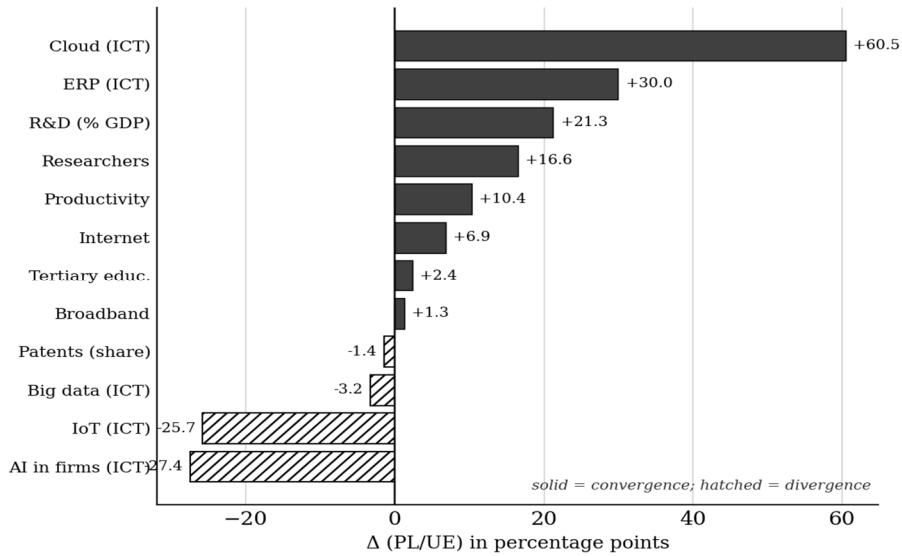
### 11. Empirical synthesis

The juxtaposition of all the indicators (Table 6, Figure 8) makes it possible to give a nuanced answer to the research question posed. In the overwhelming majority of domains Poland narrowed the gap relative to the European Union over the period analysed, with convergence strongest where it concerned the foundations: human capital (researchers: +16.6 p.p.), the research-and-development effort (R&D: +21.3 p.p.), basic enterprise digitalisation (ERP: +30.0 p.p.; cloud: +60.5 p.p.), and labour productivity (+10.4 p.p.). In all these cases Poland grew faster than the EU, satisfying the strict condition of catching-up.

**Table 6. Synthesis of convergence - all indicators (ordered by the change in the PL/EU ratio)**

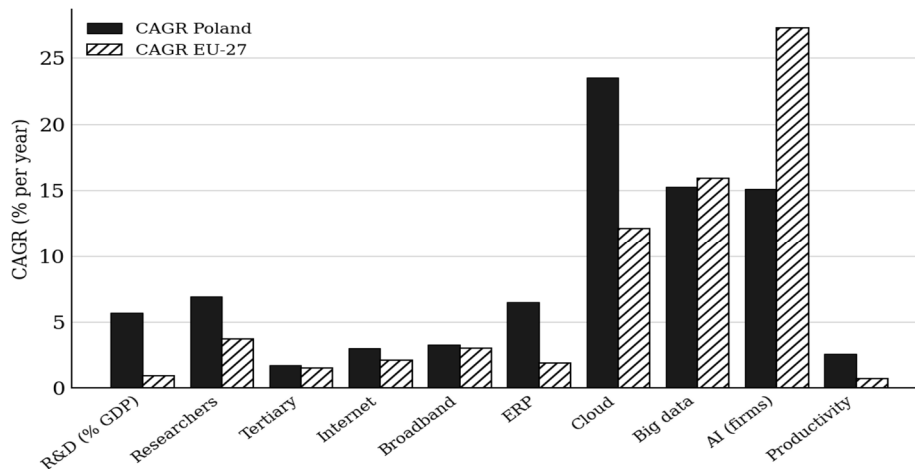
Indicator	Window	Poland	EU-27	PL/EU end	$\Delta(\text{PL/EU})$	CAGR PL/EU	Assessment
Cloud (ICT)	2016–25	8.2→54.7	18.9→52.7	103.7%	+60.5	23.5/12.1	convergence
ERP (ICT)	2015–25	20.9→39.1	38.5→46.4	84.2%	+30.0	6.5/1.9	convergence
R&D (% GDP)	2015–23	1.00→1.56	2.10→2.26	68.7%	+21.3	5.7/0.9	convergence
Researchers in R&D	2015–23	2,158→3,675	3,545→4,741	77.5%	+16.6	6.9/3.7	convergence
Productivity	2015–23	40.4→49.6	63.8→67.3	73.7%	+10.4	2.6/0.7	convergence
Internet	2015–24	68.0→88.6	75.7→91.6	96.7%	+6.9	3.0/2.1	convergence
Tertiary education	2015–24	69.4→80.9	69.8→79.5	101.8%	+2.4	1.7/1.5	convergence
Fixed broadband	2015–22	19.0→23.8	31.5→38.7	61.6%	+1.3	3.3/3.0	conv. (rel.)
Patents (share)	2015–21	4,676→3,377	84,301→81,207	4.16%	-1.4	-5.3/-0.6	divergence
Big data (ICT)	2015–25	5.9→24.5	9.1→39.8	61.5%	-3.2	15.3/15.9	divergence
IoT (ICT)†	2020–21	16.6→18.6	18.2→28.7	65.0%	-25.7	n/a	div. (short window)
AI in firms (ICT)	2020–25	4.1→8.4	6.0→19.9	41.9%	-27.4	15.1/27.3	divergence

Source: Own elaboration. † Two-year window. “CAGR PL/EU” in % per year. Auxiliary indicators (ICT imports, AI migration) are omitted from the core synthesis



**Figure 8. Change in the Poland/EU-27 ratio (in percentage points) between the initial and final year, by indicator**

Source: Own elaboration



**Figure 9. Compound annual growth rate (CAGR) of Poland and the EU-27, by indicator. A taller Poland bar signals satisfaction of the catching-up condition**

Source: Own elaboration

At the same time, the analysis reveals a consistent and significant exception to this optimistic picture. In the technologies most closely

associated with the use of artificial intelligence – the adoption of AI by enterprises (–27.4 p.p.), big-data analysis (–3.2 p.p.), and, indicatively, IoT – the direction is the reverse: the European Union is pulling away from Poland faster than Poland manages to catch up. Divergence was also recorded in patent output (Poland's share in the EU total fell by 1.4 p.p.), albeit with the reservation of the construction-related limitations of that indicator. This pattern is sufficiently distinct and internally consistent to warrant the formulation of the article's principal empirical thesis.

### **Conclusions**

The analysis conducted makes it possible to give an unequivocal, though nuanced, answer to the research question posed in the introduction. In the period 2015–2024 Poland narrowed the gap relative to the European Union, but this process was not homogeneous - on the contrary, it proved distinctly stratified. Convergence was decisive, and confirmed by the strict criterion of a faster rate of growth, in the domain of the enabling conditions for the use of advanced technologies: human capital, research-and-development expenditure, basic infrastructure and the digital maturity of enterprises, and labour productivity. At the same time, however, in the frontier technologies most closely associated with the use of artificial intelligence, divergence was observed - the European Union was pulling away from Poland faster than the national economy managed to close the gap. The principal empirical conclusion of the article therefore reduces to the statement that Poland is effectively building the foundations of digital and innovative modernisation, yet does not keep pace with the leaders at the technological frontier itself.

This finding is explained within the theoretical framework adopted. In accordance with the concept of the productivity J-curve, the benefits of a general-purpose technology are deferred and conditional upon the accumulation of poorly measurable complementary assets – new processes, organisational practices, and competences (Brynjolfsson et al., 2021) – and their pace of accumulation is higher among technological leaders, which deepens the polarisation of core and periphery. The pattern observed in the empirical part – the rapid closing of the gap in the foundations and its loss in the adoption of artificial intelligence – is consistent with the thesis that it is precisely digital capabilities and complementary competences, rather than the mere availability of technology, that determine the pace of its absorption (Arroyabe et al., 2024). Poland, possessing a growing but still catching-up competence base, confronts the newest technological wave at a moment when the core economies already command an accumulated advantage in intangible assets.

Particular attention is warranted by the observed asymmetry between the rising research-and-development effort and its measurable outcomes. Poland nearly doubled its R&D intensity and substantially expanded its stock

of research personnel, yet its share in the Union's patent output declined. Although the indicator of resident applications at national offices is burdened by construction and does not reflect the full extent of inventive activity, the direction of this discrepancy remains significant and corresponds with the lack of complementarity between different forms of R&D activity documented in the literature, as well as with a possible deficit of policy coordination in catching-up economies (Bruno et al., 2022). An increase in expenditure does not, therefore, translate automatically into an increase in measurable innovation outcomes – an observation of significant relevance for assessing the effectiveness of the national innovation system.

From these findings follow cautious implications of a cognitive character. First, the stratified picture of convergence suggests that further increases in expenditure on the enabling conditions, although needed, may not suffice to close the gap in the adoption of artificial intelligence itself, unless accompanied by the strengthening of the absorptive capacity of enterprises and of complementary competences. Second, the observed asymmetry of inputs and outputs indicates that the centre of gravity of assessment should shift from input measures towards outcome measures. Third, the early phase of the diffusion of artificial intelligence – in which the core economies have already attained a distinct advantage – renders the coming years a critical period for Poland's relative position. These implications are formulated solely in a descriptive register; the methodology adopted does not permit causal inference.

The present study has deliberate limitations. The comparative character of the Union aggregate is heterogeneous – three operational definitions of the EU aggregate were used, which were not juxtaposed cross-wise, but whose co-occurrence should be noted. The time windows of the individual indicators differ, and some of the series concerning frontier technologies are so short that they permit only indicative inference; this concerns especially the Internet of Things and AI-competence migration. The data on patent applications are burdened by a construction-related limitation. Finally, the use of descriptive statistics alone – a deliberate methodological choice ensuring transparency – does not permit a quantitative assessment of the strength and direction of the relationships between the variables analysed.

These limitations at the same time delineate the directions of further research. A natural extension is the move from description to modelling - beta- and sigma-convergence analysis for the full panel of member states, the study of the interdependence between digital maturity, human capital, and AI adoption by means of panel methods, and the deepening of the theme of the asymmetry of innovation inputs and outputs on the basis of harmonised patent data from the European route. A research programme so outlined would make it possible to verify – in the mode of causal inference – the hypotheses that the present descriptive analysis only adumbrates.

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