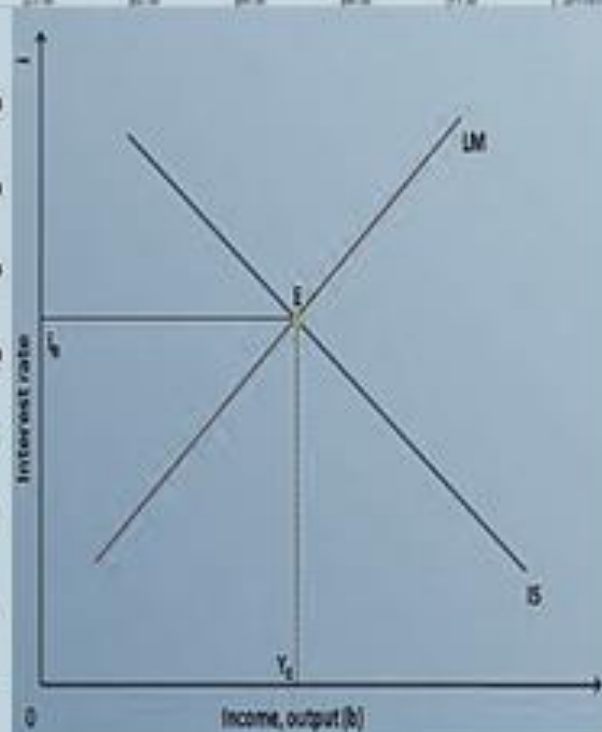


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THE IMPACT OF BANKING PAYMENT SYSTEMS ON THE NATIONAL ECONOMY: IMPLICATIONS FOR URBAN–RURAL DISPARITIES AND CASH USAGE

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ABSTRACT: *The digital transformation of payment systems has become a central component of financial modernisation, affecting transaction costs, financial intermediation, fiscal transparency and access to formal financial services. This paper examines the evolution and economic implications of banking payment systems in Romania, with particular attention to the coexistence of rapid growth in electronic payments and persistent dependence on cash among vulnerable and rural populations. Using descriptive secondary data from the National Bank of Romania, the National Institute of Statistics and Eurostat, the study analyses card-payment values over 2015–2024 and places these developments in the broader context of financial inclusion, digital infrastructure and urban–rural disparities. The total value of debit- and credit-card payments increased from RON 38.758 billion in 2015 to RON 339.463 billion in 2024, while the corresponding value per inhabitant rose from approximately RON 2.0 thousand to RON 17.8 thousand. At the same time, Romania remained above the EU average in the share of people at risk of poverty or social exclusion, indicating that payment digitalisation and socio-economic convergence do not advance uniformly. The paper argues that payment-system modernisation can improve efficiency, transparency and inclusion, but a policy strategy focused exclusively on cash substitution may create new forms of exclusion. An inclusive transition requires simultaneous investment in payment acceptance, connectivity, financial and digital literacy, and continued access to cash.*

Keywords: *Payment Systems; Digital Payments; Cash; Financial Inclusion; Urban–Rural Disparities; Romania; Economic Development*

JEL Classification: *E42; G21; G28; O16; O33; R11*

1. INTRODUCTION

Payment systems are not merely technical arrangements for transferring funds. They form part of the institutional infrastructure through which households, firms and public authorities participate in economic activity. Their accessibility and efficiency affect transaction costs, liquidity management, financial intermediation and the ability of citizens to use formal

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financial services. In Romania, the relevance of payment systems is amplified by persistent differences between urban and rural areas in cash usage, access to non-cash instruments, banking penetration, digital infrastructure and financial education.

Romania has experienced a substantial modernisation of its payment infrastructure since the 1990s. The transition from paper-based settlement to electronic processing, integration with European payment arrangements and the rapid diffusion of cards, internet banking, mobile banking and instant payments have changed the structure of everyday transactions. Nevertheless, the diffusion of technology has not eliminated cash. Rural communities, older people and lower-income households may face weaker banking infrastructure, lower digital capabilities and greater perceived risks from electronic services.

The central research problem is therefore not whether digital payments are expanding, but whether this expansion is sufficiently inclusive to reduce structural payment gaps. The paper asks three questions: (1) how rapidly has card-payment activity increased in Romania; (2) through which channels can payment-system modernisation affect the national economy; and (3) why can cash remain economically and socially relevant despite financial digitalisation?

The contribution of the study is to connect payment-system development with financial inclusion and territorial inequality. The source material explicitly frames cash usage, non-cash access, banking penetration, digital infrastructure and financial education as indicators of urban–rural differences, rather than treating payments only as a technical banking function.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Modern payment systems reduce the time required to transfer funds, support liquidity management and lower operational frictions. At the institutional level, safe settlement infrastructures reduce counterparty and settlement risks and support confidence in the banking system. The Romanian infrastructure combines large-value settlement, retail clearing and securities settlement, while European integration has increased interoperability for euro-denominated and cross-border transactions.

Digital payments may also produce wider macroeconomic effects. Greater transaction traceability can support formalisation and tax compliance, while electronic acceptance can facilitate e-commerce and market access for small firms. Recent European evidence, however, suggests that the relationship between digitalisation and informality is not mechanical: digital payments may narrow specific tax-compliance gaps without automatically eliminating the shadow economy (Mastac, 2025).

Financial inclusion involves more than formal account ownership. Effective participation requires affordable services, accessible infrastructure, usable payment instruments, digital connectivity and sufficient financial and digital capabilities. Negrea and Scarlat (2022) identify physical infrastructure, regional disparities, financial education and consumer preferences as important constraints on greater adoption of digital payments in Romania.

Cash therefore has a dual interpretation. High involuntary reliance on cash can signal incomplete financial inclusion, particularly when consumers lack accounts, payment acceptance or digital skills. At the same time, cash itself can protect payment inclusion because it does not require a smartphone, broadband connection or authentication technology. The policy objective should consequently be an inclusive expansion of payment choice rather than the administrative elimination of cash.

The Romanian case is particularly relevant because financial and digital infrastructures are unevenly distributed. Rural areas may have fewer branches, ATMs and POS terminals, weaker access to high-speed connectivity, older demographic structures and lower household

incomes. These factors can reinforce one another: limited merchant acceptance reduces the usefulness of cards, while low consumer demand weakens incentives for merchants to invest in acceptance infrastructure.

This mechanism can be summarised as: uneven territorial development → unequal financial and digital infrastructure → unequal effective financial inclusion → heterogeneous payment behaviour. Under this framework, persistent cash use is partly an outcome of structural constraints rather than solely a consumer preference.

3. DATA AND METHODOLOGY

The empirical component is descriptive and uses secondary data compiled in the source study from the National Bank of Romania (BNR), the Romanian National Institute of Statistics (INSSE) and Eurostat. The principal quantitative series covers 2015–2024 and measures the value of payment transactions using debit and credit cards issued by resident payment service providers. Population data are used to construct per-capita indicators. The analysis is complemented by indicators of poverty and social exclusion to contextualise financial inclusion.

Card-payment value is treated as an observable proxy for financial payment digitalisation. This measure does not directly quantify the share of cash at the point of sale and therefore should not be interpreted as a complete measure of cash substitution. The approach is appropriate for documenting the scale and pace of digital-payment diffusion, while future work should combine it with ATM withdrawals, POS density, account ownership, internet banking and rural–urban indicators.

Table 1. Evolution of card-payment transactions in Romania, 2015–2024

Year	Debit (RON mn)	Credit (RON mn)	Total (RON mn)	Population	Debit pc (RON th.)	Credit pc (RON th.)	Total pc (RON th.)
2024	308 688	30 775	339 463	19 067 576	16.2	1.6	17.8
2023	250 042	26 353	276 395	19 055 228	13.1	1.4	14.5
2022	207 095	22 271	229 366	19 043 098	10.9	1.2	12.0
2021	154 070	16 977	171 047	19 229 519	8.0	0.9	8.9
2020	114 112	13 900	128 012	19 354 339	5.9	0.7	6.6
2019	94 476	14 119	108 595	19 425 873	4.9	0.7	5.6
2018	71 083	12 000	83 083	19 533 481	3.6	0.6	4.3
2017	53 185	9 793	62 978	19 643 949	2.7	0.5	3.2
2016	40 174	8 147	48 321	19 760 585	2.0	0.4	2.4
2015	32 210	6 548	38 758	19 875 542	1.6	0.3	2.0

Source: Author's processing based on BNR, INSSE and Eurostat data reported in the source material.

Note: per-capita figures are expressed in thousand RON and rounded.

Table 1 documents a substantial and sustained expansion of card-payment activity in Romania between 2015 and 2024. The total value of card-payment transactions increased from RON 38.8 billion in 2015 to RON 339.5 billion in 2024, representing an almost ninefold increase over the period. This expansion was driven predominantly by debit-card transactions, which rose from RON 32.2 billion to RON 308.7 billion and accounted for approximately 91% of total card-payment value in 2024. Credit-card payments also increased, from RON 6.5 billion in 2015 to RON 30.8 billion in 2024, although at a considerably slower pace than debit-card payments.

The per-capita indicators reinforce this pattern and show that the increase cannot be attributed to demographic developments. Total card payments per capita rose from approximately RON 2.0 thousand in 2015 to RON 17.8 thousand in 2024, while Romania's population declined slightly over the same period. Debit-card payments per capita increased particularly strongly, from RON 1.6 thousand to RON 16.2 thousand, compared with an increase in credit-card payments from RON 0.3 thousand to RON 1.6 thousand. The acceleration becomes especially visible after 2019: total card payments per capita increased from RON 5.6 thousand in 2019 to RON 17.8 thousand in 2024, suggesting a marked intensification of electronic payment use during and after the pandemic period.

Overall, the evidence indicates a pronounced shift towards card-based payments in Romania, characterised primarily by the growing use of debit rather than credit instruments. However, the rapid increase in the value of card transactions should not, by itself, be interpreted as evidence of an equivalent decline in cash dependence. The table captures the expansion of card-payment activity but does not measure the share of cash in total transactions or establish substitution between payment instruments. It therefore provides strong evidence of payment digitalisation while requiring complementary indicators to assess whether this development has translated into a structural reduction in cash use.

4. RESULTS

4.1. Acceleration of card payments

The data reveal a pronounced acceleration of electronic payment activity. Total debit- and credit-card payment value rose from RON 38.758 billion in 2015 to RON 339.463 billion in 2024. This corresponds to an increase of approximately 776%, or an 8.76-fold expansion over the decade. Debit-card payments were the main driver, increasing from RON 32.210 billion to RON 308.688 billion. Credit-card payments rose from RON 6.548 billion to RON 30.775 billion.

The per-capita series confirms that this change cannot be attributed to population growth. Total card-payment value per inhabitant increased from approximately RON 2.0 thousand in 2015 to RON 17.8 thousand in 2024, even as the population declined. The strongest structural break is visible around the pandemic period: total per-capita card payments rose from RON 5.6 thousand in 2019 to RON 6.6 thousand in 2020, RON 8.9 thousand in 2021 and RON 12.0 thousand in 2022.

Table 2. Key indicators of payment digitalisation

Indicator	2015	2024	Change
Debit-card payment value (RON mn)	32,210	308,688	+858.4%
Credit-card payment value (RON mn)	6,548	30,775	+370.0%
Total card-payment value (RON mn)	38,758	339,463	+775.9%
Total card-payment value per capita (RON th.)	2.0	17.8	8.9×
Population	19,875,542	19,067,576	−4.1%

Source: Calculations based on Table 1.

4.2. Social vulnerability and incomplete convergence

Payment digitalisation has occurred alongside persistent socio-economic vulnerability. The source dataset reports that the share of people at risk of poverty or social exclusion declined substantially in Romania, from 44.5% in 2015 to 27.9% in 2024. The EU average declined from 24.0% to 21.0% over the same endpoints. Romania therefore improved markedly, but a sizeable gap remained in 2024.

Table 3. People at risk of poverty or social exclusion: Romania and EU benchmark

Year	Romania (%)	EU (%)	Romania–EU gap (pp)
2015	44.5	24.0	20.5
2024	27.9	21.0	6.9

Source: Eurostat values reported and processed in the source material.

The narrowing of the poverty/exclusion gap is consistent with broader economic convergence, but it does not establish that payment digitalisation caused the improvement. Rather, the two trends demonstrate why payment-system analysis should be embedded in a wider socio-economic framework.

4.3. Channels of impact on the national economy

The expansion of modern payment instruments can influence the national economy through several channels. First, faster settlement and electronic processing can reduce transaction and administrative costs. Second, digital payments increase the traceability of commercial flows, potentially improving fiscal compliance and reducing opportunities for unrecorded transactions. Third, broader access to accounts and electronic instruments can deepen financial intermediation and connect households and small firms to e-commerce and formal markets. Fourth, interoperable payment infrastructures facilitate cross-border trade and European market integration.

These effects should nevertheless be interpreted cautiously. The descriptive data document strong co-movement between financial modernisation and economic change but do not identify causal effects. Moreover, the benefits of digitalisation depend on effective access. A payment infrastructure that is technologically advanced at national level may still exclude users in areas with weak connectivity, low merchant acceptance or limited financial literacy.

5. DISCUSSIONS

The Romanian evidence points to a hybrid and structurally uneven payment transition, rather than to a linear substitution of cash by digital instruments. On the one hand, the value of card-payment transactions has expanded at an exceptional pace, reflecting the progressive digitalisation of household transactions, the development of payment infrastructure and the increasing integration of the Romanian financial system with European technological and regulatory standards. The rapid growth of card payments documented in the preceding analysis is consistent with a broader transformation in consumer payment behaviour and with the increasing availability of electronic payment channels. On the other hand, this aggregate expansion coexists with the continued importance of cash, particularly among population groups whose effective participation in digital finance is constrained by territorial disparities, lower incomes, age-related barriers, limited digital skills or insufficient access to financial and

technological infrastructure. Romania's payment transition should therefore be understood as a process in which digital adoption and persistent cash dependence can occur simultaneously across different segments of the population and territory.

This distinction is essential for interpreting the broader economic implications of payment-system development. A rising volume and value of card transactions provide evidence of increasing digital adoption, but they cannot, in isolation, be treated as indicators of universal financial inclusion. Formal access to a payment instrument differs conceptually from the capacity to use that instrument regularly, independently and efficiently. In some rural or economically disadvantaged communities, for example, ownership of a bank account or payment card may primarily facilitate the receipt of wages, pensions or social transfers, while a substantial proportion of these funds may subsequently be withdrawn and used in cash. Under such circumstances, card ownership represents formal inclusion in the banking system without necessarily implying a corresponding degree of functional integration into the digital-payment ecosystem. Consequently, indicators based exclusively on account or card ownership may overstate the depth of payment digitalisation if they are not considered alongside actual usage patterns.

The relevant analytical and policy framework should therefore extend beyond the availability of payment instruments to encompass effective use, merchant acceptance, physical and digital accessibility, affordability and consumer capability. These dimensions are mutually reinforcing. Consumers cannot meaningfully substitute digital payments for cash if merchants do not accept electronic instruments, if broadband or mobile connectivity is unreliable, if access to banking services is geographically limited, or if users lack the digital and financial skills required to navigate electronic payment environments securely. Similarly, the benefits associated with payment digitalisation may be distributed unevenly when the fixed costs of devices, connectivity or banking services weigh more heavily on lower-income households. From this perspective, payment accessibility is better understood as a multidimensional capability rather than as the simple possession of a bank account or payment card.

The Romanian case consequently highlights an important distinction between the extensive and intensive margins of financial inclusion. The extensive margin concerns whether individuals have formal access to financial accounts and payment instruments, whereas the intensive margin concerns how frequently, effectively and for what purposes these instruments are actually used. A country may therefore record substantial progress in account penetration and card issuance while retaining significant differences in the intensity of digital-payment use across socio-economic groups and regions. This interpretation is particularly relevant in the context of Romania's pronounced territorial inequalities, since national averages may conceal substantial differences between Bucureşti-Ilfov and less economically developed or more rural regions. Payment digitalisation may advance rapidly at the aggregate level while remaining incomplete from the perspective of universal accessibility.

The findings also qualify the frequently invoked assumption that reducing cash usage will automatically generate a proportional reduction in economic informality. The expansion of traceable electronic transactions can strengthen transaction transparency, increase the informational capacity of tax administrations and raise the expected costs of concealing taxable activity. At the microeconomic level, evidence linking cash usage with underreporting supports the argument that payment instruments can influence opportunities for tax evasion (Giammatteo, Iezzi, & Zizza, 2021). From this perspective, policies encouraging electronic payments may contribute to formalisation by reducing the anonymity associated with certain cash transactions and by improving the traceability of economic exchanges.

However, the relationship between payment digitalisation and informality is neither automatic nor exclusively technological. Informal economic behaviour is also shaped by institutional quality, perceived fairness of the tax system, enforcement capacity, regulatory

complexity, compliance costs and taxpayers' trust in public institutions. Recent EU evidence suggests that digitalisation can support formalisation but may be insufficient in the absence of complementary institutional conditions, coherent tax policy and sufficiently broad payment-acceptance infrastructure (Mastac, 2025). An expansion of digital-payment opportunities therefore changes the technological environment in which transactions occur, but it does not necessarily eliminate the economic and institutional incentives that generate informal activity in the first place.

These considerations have direct policy implications. A strategy focused narrowly on reducing cash usage risks conflating payment modernisation with financial inclusion and formalisation. A more appropriate objective is to expand the feasible set of secure and affordable payment options available to households and firms while reducing structural barriers to digital participation. This requires simultaneous improvements in digital and financial literacy, connectivity, merchant acceptance, banking accessibility and institutional trust. At the same time, maintaining reasonable access to cash during the transition can perform an inclusion and resilience function for consumers who cannot yet participate fully in digital payment systems or who require alternative means of payment during technological disruptions.

Romania's experience can thus be characterised as a transition from predominantly cash-based payment behaviour towards a more diversified payment ecosystem, rather than as a completed transition to a cashless economy. The rapid expansion of card payments constitutes strong evidence of digital transformation, but the economic significance of this transformation depends on how broadly its benefits and capabilities are distributed across society. The central policy challenge is therefore not simply to maximise the share of digital transactions or minimise the use of cash, but to ensure that payment modernisation improves efficiency, transparency and convenience without creating new forms of financial exclusion. In this sense, successful payment-system development should ultimately be evaluated by the coexistence of digital progress, effective inclusion and consumer choice rather than by the disappearance of cash itself.

6. POLICY IMPLICATIONS

Romania's payment strategy should combine the continued expansion of digital payments with explicit safeguards for financial inclusion, accessibility and system resilience. Although the rapid development of electronic payment instruments can generate substantial benefits in terms of transaction efficiency, convenience, traceability and integration with the wider European financial system, these gains cannot be assumed to be distributed uniformly across households, firms and regions. The evidence of persistent socio-economic, territorial and digital disparities suggests that a policy centred exclusively on accelerating the decline of cash could disproportionately affect consumers and businesses that face greater barriers to digital participation. Payment modernisation should therefore be approached as a multidimensional policy objective in which technological progress is accompanied by measures designed to ensure that all population groups retain effective access to essential payment services.

A first policy priority concerns the expansion of affordable electronic-payment acceptance, particularly among small merchants and businesses operating in rural, remote or economically disadvantaged areas. The effectiveness of digital payments depends not only on consumers possessing cards, bank accounts or mobile applications, but also on the existence of a sufficiently dense network of merchants capable of accepting such instruments. Where electronic acceptance entails significant fixed costs, transaction fees or administrative burdens, smaller businesses may have weaker incentives to invest in payment infrastructure. This can create a self-reinforcing constraint: limited merchant acceptance reduces consumers'

incentives to adopt digital payments, while low consumer usage reduces merchants' incentives to provide electronic-payment facilities. Policies that reduce acceptance costs, facilitate access to low-cost point-of-sale technologies and encourage interoperable payment solutions could help overcome this coordination problem and broaden the effective geographical coverage of digital payments.

Infrastructure development represents a second essential component of an inclusive payment strategy. Digital payments increasingly depend on reliable broadband, mobile connectivity and secure technological infrastructure. Consequently, territorial differences in connectivity can translate directly into differences in payment accessibility. In densely populated urban areas, consumers generally benefit from stronger telecommunications infrastructure, greater proximity to banking services and wider merchant acceptance. In rural and sparsely populated areas, by contrast, weaker connectivity and greater distances from financial-service providers may increase the practical costs of digital participation. Investment in broadband and mobile infrastructure should therefore be regarded not merely as a telecommunications or regional-development objective, but also as an integral component of financial inclusion and payment-system modernisation.

A third priority concerns financial and digital capabilities. Access to technology does not necessarily imply the ability or willingness to use it effectively. The transition towards increasingly digital financial services can impose substantial learning costs on individuals with limited digital experience, particularly older consumers and socio-economically vulnerable groups. Difficulties in navigating banking applications, understanding authentication procedures, managing passwords or recognising fraud attempts may discourage adoption even when the necessary infrastructure is technically available. Targeted financial and digital education should consequently complement investments in payment technology. Such initiatives should focus not only on basic operational skills but also on digital security, fraud prevention, consumer rights and confidence in using electronic financial services. Improving these capabilities would strengthen the intensive margin of financial inclusion by enabling individuals who formally possess digital payment instruments to use them effectively and securely.

Interoperability and affordability should constitute additional principles of payment policy. A fragmented ecosystem in which consumers and merchants face multiple incompatible platforms, high transaction costs or complex technical requirements may limit the network benefits normally associated with digitalisation. Interoperable and low-cost payment solutions can reduce barriers to entry, promote competition among service providers and facilitate wider adoption among both consumers and small businesses. From a policy perspective, the objective should therefore extend beyond increasing the number of digital transactions to improving the quality, accessibility and cost-efficiency of the payment infrastructure through which those transactions occur.

At the same time, the expansion of digital payments should not be interpreted as requiring the premature elimination or substantial restriction of cash. As long as access to digital financial services remains uneven, cash continues to perform an important inclusion function for consumers who face technological, economic or capability constraints. It also provides an alternative payment mechanism when electronic systems are temporarily unavailable because of technical failures, connectivity disruptions or other operational shocks. Maintaining reasonable access to cash during the transition can therefore contribute both to social inclusion and to payment-system resilience. The relevant policy question is not whether cash should be preserved indefinitely at existing levels of use, but whether consumers retain a viable alternative while the prerequisites for universal and effective digital participation remain incomplete.

This perspective implies that the appropriate policy objective is not a binary choice between cash and digital payments. Treating the two instruments as mutually exclusive alternatives risks overlooking their different functions within a heterogeneous population and economy. Digital payments can improve efficiency, reduce transaction costs, increase convenience and enhance the traceability of economic activity, whereas cash can continue to provide accessibility, familiarity and operational redundancy for particular users and circumstances. During the transition, these functions may be complementary rather than purely substitutive.

A resilient payment system should therefore be characterised by diversity of instruments and channels. Excessive dependence on any single payment technology may create vulnerabilities, just as excessive dependence on cash may limit the efficiency and transparency gains associated with digitalisation. Payment resilience requires consumers and businesses to have access to alternative mechanisms capable of functioning under different economic, technological and infrastructural conditions. From this perspective, maintaining payment choice is not inconsistent with digital transformation; rather, it can facilitate that transformation by reducing the risk that technological change generates exclusion or excessive dependence on a particular infrastructure.

For Romania, the policy challenge is consequently to manage the transition from a relatively cash-intensive economy towards a more digital payment environment without interpreting digitalisation as an end in itself. Progress should be assessed not only through aggregate indicators such as card-payment values, transaction volumes or the number of payment terminals, but also through measures of effective accessibility, regional coverage, affordability, digital capabilities and actual usage across socio-economic groups. Such an approach would provide a more comprehensive assessment of whether technological development is translating into broadly shared improvements in financial participation.

Ultimately, an inclusive payment strategy should seek to maximise the economic benefits of digitalisation while minimising the risk of exclusion. Technological efficiency and transaction transparency can increase alongside consumer protection, accessibility and payment choice, provided that policy addresses the structural conditions necessary for effective participation. The long-term objective should therefore be a payment ecosystem in which digital instruments become increasingly attractive because they are accessible, affordable, secure and convenient, rather than because cash alternatives have been removed before all consumers are capable of participating effectively. Under this approach, payment modernisation becomes part of a broader strategy of financial inclusion and economic development, with resilience and accessibility serving as essential complements to technological progress.

7. CONCLUSIONS

Romania underwent a substantial transformation in payment behaviour between 2015 and 2024, reflecting the broader digitalisation of financial transactions and the progressive integration of electronic payment instruments into everyday economic activity. The empirical evidence presented in this study indicates a particularly strong expansion of card-based payments over the analysed period. The combined value of debit- and credit-card payments increased from RON 38.758 billion in 2015 to RON 339.463 billion in 2024, while total card-payment value per inhabitant rose from approximately RON 2.0 thousand to RON 17.8 thousand. This almost ninefold increase in aggregate card-payment value, accompanied by a similarly pronounced rise in the per-capita indicator, provides clear evidence that electronic payments have acquired substantially greater economic relevance within the Romanian payment system.

The composition of this expansion is also significant. As demonstrated by the preceding analysis, debit-card transactions account for the dominant share of card-payment value and have expanded considerably faster than credit-card payments. This pattern suggests that Romania's digital payment transition has been driven primarily by instruments linked directly to current accounts rather than by an expansion of consumer credit. The evolution is consistent with the progressive normalisation of electronic payments for routine transactions and with the broader development of payment infrastructure. At the same time, the increase in card-payment activity occurred despite a relatively stable or moderately declining population, indicating that the observed expansion cannot be explained by demographic growth. The substantial increase in payments per inhabitant instead points towards a structural change in the intensity with which electronic payment instruments are used.

Nevertheless, the results also demonstrate that the transformation of Romania's payment system remains incomplete and unevenly distributed. Rapid growth in aggregate electronic transactions should not be interpreted as evidence that all households, regions or socio-economic groups have participated equally in the digital transition. Romania continues to exhibit significant disparities in income, poverty exposure, digital capabilities and access to digital financial services. Particularly important in this respect is the contrast between Bucureşti-Ilfov and many other Romanian regions, which illustrates how national averages can conceal substantial territorial heterogeneity. The coexistence of rapidly expanding electronic payments with persistent socio-economic and digital inequalities supports the interpretation of Romania as experiencing a hybrid payment transition rather than a uniform movement towards a fully cashless economy.

This distinction has important implications for the interpretation of cash dependence. Continued cash usage should not necessarily be understood exclusively as the result of consumer preference, habit or resistance to technological change. For some individuals and communities, particularly where banking infrastructure, merchant acceptance, connectivity or digital capabilities remain limited, cash dependence may also reflect a restricted feasible set of payment alternatives. In this context, the distinction between voluntary cash preference and structurally constrained cash reliance becomes analytically important. Consumers who possess a bank account or payment card may still rely predominantly on cash if electronic payments are difficult to use, insufficiently accepted or perceived as costly, complex or insecure. Formal financial inclusion therefore does not automatically translate into effective digital financial participation.

The findings consequently suggest that the economic benefits associated with payment digitalisation are likely to be maximised when technological innovation is accompanied by improvements in financial inclusion, territorial accessibility and digital capability. Electronic payments can potentially reduce transaction costs, increase convenience, strengthen transaction traceability and facilitate participation in increasingly digital markets. However, the magnitude and distribution of these benefits depend on the institutional and infrastructural environment in which payment technologies are introduced. Where digital skills remain weak or payment infrastructure is geographically uneven, technological development alone may not be sufficient to produce universal adoption. Payment modernisation should therefore be evaluated not only through aggregate transaction values but also through the accessibility, affordability and effective usability of payment instruments across different population groups.

From a policy perspective, the Romanian case supports an approach centred on payment choice rather than on the simple replacement of cash. Policies designed to encourage electronic transactions can generate efficiency and transparency gains, but they should be accompanied by measures addressing the structural determinants of digital exclusion. Expanding affordable merchant acceptance, improving broadband and mobile connectivity, strengthening financial and digital literacy and ensuring access to interoperable and low-cost payment services are

therefore complementary components of an inclusive digitalisation strategy. At the same time, reasonable access to cash remains relevant during the transition, both as an inclusion mechanism for consumers facing barriers to digital participation and as an element of payment-system resilience.

The results should, however, be interpreted in light of several methodological limitations. The study is primarily descriptive and therefore identifies patterns and associations rather than causal relationships. Although the observed evolution is consistent with the theoretical expectation that economic development, financial inclusion and digitalisation are associated with changes in payment behaviour, the analysis does not establish that changes in these factors caused the observed expansion of electronic payments or a corresponding reduction in cash dependence. Establishing such relationships would require a more comprehensive econometric framework capable of controlling for observed and unobserved heterogeneity across regions, countries and time.

A further limitation concerns data availability and comparability. In particular, the absence of a harmonised annual measure of cash usage disaggregated by urban and rural residence restricts the possibility of directly quantifying territorial differences in cash dependence over an extended period. Card-payment values provide a robust indication of the expansion of electronic transactions but cannot serve as a direct inverse measure of cash usage. Similarly, account ownership, internet-banking participation and digital-skills indicators capture different dimensions of financial and digital inclusion and should not be interpreted as interchangeable measures. Differences in frequency, geographical coverage and methodological definitions across available datasets consequently limit the extent to which the relationships identified in the study can be tested within a unified empirical framework.

Future research should address these limitations by developing a harmonised longitudinal dataset combining payment, financial, socio-economic and territorial indicators. A Romania–EU panel could incorporate card-payment values and volumes, ATM withdrawals, account ownership, internet-banking usage, digital skills, GDP per capita, poverty and social-exclusion indicators, urbanisation and measures of income inequality. Where sufficiently comparable information becomes available, indicators of merchant acceptance, ATM and bank-branch density, broadband coverage and demographic structure could further improve the empirical specification. Such a dataset would permit a more systematic assessment of the extent to which payment behaviour reflects differences in economic development, financial accessibility and digital capability.

Panel-data methods would represent a natural extension of the present descriptive analysis. Fixed-effects models could be employed to examine whether variation in cash dependence or electronic-payment intensity is systematically associated with changes in financial inclusion, economic development and digitalisation after controlling for time-invariant country or regional characteristics. Time fixed effects could additionally capture common shocks affecting payment behaviour, including technological change, regulatory developments and the acceleration of contactless and remote payments associated with the COVID-19 period. Where data permit, interaction terms between digitalisation, income, poverty and urbanisation could be used to investigate whether the effects of technological development differ systematically according to the socio-economic and territorial environment.

Further research could also distinguish more explicitly between the determinants of access to digital payment instruments and the determinants of their intensive use. This distinction would make it possible to examine whether possession of an account or card translates into regular electronic-payment activity and whether this relationship varies across income groups, age categories and urban–rural locations. Micro-level household or consumer data would be particularly valuable for identifying heterogeneity that aggregate national indicators cannot capture. Such evidence could help determine whether persistent cash usage

primarily reflects preference, infrastructure constraints, digital-capability gaps, concerns regarding security and privacy, or combinations of these factors.

Overall, the Romanian experience illustrates that payment digitalisation should be conceptualised as a broader socio-economic transformation rather than as a purely technological process. The exceptional growth of card payments between 2015 and 2024 demonstrates substantial progress towards a more digital payment environment, but the persistence of socio-economic and territorial inequalities indicates that aggregate digitalisation does not necessarily imply universal capability convergence. The central challenge for Romania is therefore not simply to increase the volume of electronic payments or to reduce cash usage, but to ensure that the transition expands the effective payment choices available to households and firms. A sustainable payment transformation is one in which technological efficiency, transparency and innovation advance together with financial inclusion, territorial accessibility, resilience and consumer capability.

REFERENCES

1. Banca Națională a României. (n.d.). Payment statistics and interactive database. National Bank of Romania.
2. Eurostat. (n.d.). Data Browser: Digital economy, population, poverty and social-exclusion indicators. European Commission.
3. Giammatteo, M., Iezzi, S., & Zizza, R. (2021). Pecunia olet: Cash usage and the underground economy (Bank of Italy Occasional Paper No. 649). <https://doi.org/10.2139/ssrn.3960071>
4. Institutul Național de Statistică. (n.d.). TEMPO Online. National Institute of Statistics, Romania.
5. Mastac, L. (2025). Less cash, same shadow? Payment trends and informality in the European Union. *Ovidius University Annals, Economic Sciences Series*, 25(1), 189–198. <https://doi.org/10.61801/OUAESS.2025.1.25>
6. Negrea, C., & Scarlat, E. (2022). Challenges and opportunities for consolidating the availability of financial services. In *Economic Growth in the Conditions of Globalization*. <https://doi.org/10.36004/nier.cecg.III.2022.16.13>

CIRCULAR ECONOMY AS A DRIVER OF LABOUR MARKET CHANGE: EVIDENCE FROM ROMANIA (2014–2024)

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ABSTRACT: *The paper investigates the relationship between circular-economy development and labour-market change in Romania during 2014–2024. Using indicators of circular material use, municipal waste recycling, resource productivity, circular-sector employment and repair and reuse employment, the study combines benchmark-year trend analysis, descriptive statistics and comparison with the EU-27. The results indicate gradual improvement across all indicators but persistent convergence gaps, particularly in material circularity and resource productivity. In 2024, Romania reached only 13.6% of the EU benchmark for circular material use and 15.2% for resource productivity, while circular-sector employment reached 66.7%. This asymmetry suggests that employment has expanded faster than material and productivity performance and may remain concentrated in relatively labour-intensive circular activities. The findings highlight the need to shift towards higher-value circular models, including remanufacturing, eco-design, industrial symbiosis and advanced secondary-material processing, supported by investment, skills development, digitalisation and innovation.*

Keywords: *Circular Economy; Employment; Romania; Resource Productivity; Recycling; Skills; Circular Business Models*

JEL classification: *J21, J24, O33, Q53, Q56*

1. INTRODUCTION

The transition from a linear to a circular economic model has become a central component of the European Union’s strategy for climate neutrality, resource efficiency, resilience and long-term competitiveness. Rather than focusing only on waste management, the circular economy seeks to preserve the value of products, components and materials through reduction, reuse, repair, refurbishment, remanufacturing, recycling and product–service systems (European Commission, 2020; European Environment Agency [EEA], 2024). As a result, circularity represents not only an environmental objective but also a process of economic and organisational transformation with direct implications for labour demand.

Circular activities can create employment because repair, maintenance, reuse, sorting, recycling and remanufacturing are often labour-intensive. At the same time, more advanced circular models require engineering, digital, managerial and environmental competencies, changing both the quantity and quality of labour demand. Employment effects therefore depend on the position of activities within the circular value hierarchy: basic waste processing may

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create jobs with limited productivity gains, whereas eco-design, remanufacturing, industrial symbiosis and digitally enabled services can support more knowledge-intensive and higher-value employment (Beducci et al., 2024).

These issues are particularly relevant for Central and Eastern European economies, where circular transition occurs under different conditions of industrial structure, technological intensity, investment capacity and human capital. Romania combines relatively weak circularity and resource-efficiency performance with demographic decline, outward migration, regional disparities and persistent skill mismatches. At the same time, the National Strategy on Circular Economy (2022) and its Action Plan (2023) have broadened the policy focus from waste management towards circular production, innovation, digitalisation and skills (Government of Romania, 2022, 2023).

Despite growing research on the environmental and economic implications of the circular economy, comparatively limited attention has been devoted to the relationship between circularity performance and labour-market outcomes in Romania. Existing assessments tend to focus primarily on waste management, recycling or material flows, while the interaction between material circularity, resource productivity and circular employment remains insufficiently explored. This gap is important because employment growth does not necessarily imply a transition towards higher-value and more resource-efficient circular activities.

Against this background, the study examines the evolution of circular-economy performance and circular employment in Romania during 2014–2024 and assesses the extent to which national developments indicate convergence towards EU-27 patterns. Particular attention is given to the relationship between material circularity, resource productivity and employment dynamics. The analysis addresses four questions: (RQ1) How have Romania's principal circular-economy indicators evolved relative to EU-27 benchmarks? (RQ2) Has circular-sector employment increased at a pace consistent with improvements in material circularity, recycling and resource productivity? (RQ3) What does the available evidence suggest about the balance between labour-intensive and higher-value circular activities? (RQ4) Which structural, institutional and skills-related factors are relevant to the qualitative upgrading of circular employment?

The paper contributes to the literature by integrating environmental and labour-market indicators within a common analytical framework, extending the analysis beyond waste and material flows. It compares Romania with the EU-27 over 2014–2024 to identify progress and persistent convergence gaps, while interpreting these trends in relation to skills, job quality, circular business models and national policy.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

The circular economy (CE) has evolved from an environmental concept centred primarily on waste reduction and recycling into a broader framework for economic, technological and organisational transformation. Contemporary approaches emphasise preserving the value embedded in products, components and materials through reduction, reuse, repair, refurbishment, remanufacturing and recycling. Circularity therefore involves a systemic reconfiguration of production and consumption rather than isolated improvements in waste management (European Commission, 2020; European Environment Agency [EEA], 2024).

This transformation has significant implications for labour markets because changes in material flows influence production technologies, supply chains, business models and the composition of labour demand. The employment effects of circularity should therefore be understood primarily as a process of labour reallocation rather than simply net job creation. Economic activity shifts from extraction, primary production and disposal towards activities

that retain the value of products and materials. Repair, maintenance, reuse, refurbishment and sorting tend to have a strong local labour component, while remanufacturing, eco-design and advanced material recovery require more specialised technical and engineering competencies.

Employment outcomes also depend on the position of activities within the value-retention hierarchy. Recycling recovers materials after much of the value embodied in a product has been lost, whereas repair, refurbishment and remanufacturing preserve products, components, knowledge and economic value. Circular activities are often labour-intensive because collection, inspection, sorting, maintenance, disassembly, repair and redistribution cannot always be fully automated. However, the quality and productivity of the resulting employment vary substantially. Waste collection and basic sorting may create relatively accessible jobs but generally generate lower value added, whereas remanufacturing and advanced recovery combine manufacturing expertise, engineering, quality control, logistics and digital technologies.

Recent research illustrates the importance of this distinction. Remanufacturing aims to restore products or components to a functional condition comparable to new products, thereby preserving a larger proportion of their embedded value. Andersen et al. (2024) highlight its potential to combine environmental benefits with resource conservation, cost reduction and extended product lifecycles, while Yang and Sun (2024) emphasise the strategic relationship between eco-design and remanufacturing in closed-loop supply chains. Consequently, an economy dominated by waste collection and basic recycling may experience growing circular employment while maintaining relatively low resource productivity and technological sophistication. In contrast, remanufacturing, industrial symbiosis, eco-design and advanced secondary-material industries can strengthen the relationship between circularity, innovation and productive employment.

A second major channel linking circularity and employment concerns skills. Circular production requires combinations of technical, environmental, digital and organisational competencies. Beducci et al. (2024) show that circular manufacturing has both quantitative and qualitative workforce implications, creating new occupational profiles and transforming existing ones. Digitalisation reinforces this process. Industry 4.0 technologies, including the Internet of Things, artificial intelligence, data analytics, automation, digital twins and product-tracking systems, can support product traceability, predictive maintenance, reverse logistics and secondary-material management. Sahoo and Jakhar (2024) demonstrate that Industry 4.0 deployment can support circular-economy performance and complement activities such as green procurement and remanufacturing.

The circular and digital transitions are therefore increasingly interconnected. Workers must often combine traditional production knowledge with digital competencies, while engineers and managers require greater understanding of lifecycle considerations, resource efficiency and circular procurement. Human capital consequently acts as an enabling factor: insufficient technical and digital skills can constrain investment, reduce productivity gains and limit the adoption of advanced circular business models.

This creates a need for both upskilling and reskilling. Existing workers may require additional competencies in resource-efficient production, disassembly, digital monitoring or lifecycle management, while workers displaced from declining linear activities may need more extensive retraining. The required competencies extend beyond technical expertise to systems thinking, problem solving, collaboration and lifecycle thinking (Beducci et al., 2024). Education, vocational training and lifelong learning therefore play an important role in translating circular investment into productive employment.

Circularity also affects employment through new business models. Product–service systems, leasing, sharing, repair services and resale platforms seek to extend product utilisation and reduce resource consumption. Product–service systems can increase incentives for

durability, maintenance and repair while creating employment in technical support, logistics, refurbishment and digital services. Reverse logistics is similarly important because circular supply chains require products and components to return from consumers to firms for repair, remanufacturing or recycling. Evidence from automotive remanufacturing identifies reverse logistics as a critical organisational condition for circular production (van Dam & Bakker, 2024).

Nevertheless, employment growth alone does not provide a sufficient measure of the social benefits of circularity. Job creation should also be considered in relation to productivity, wages, occupational safety, contractual stability, social protection and opportunities for professional development. Waste collection, sorting and materials recovery may contribute significantly to environmental objectives while involving relatively low productivity or insecure working conditions. By contrast, eco-design, advanced remanufacturing, engineering and digital circular services can generate more knowledge-intensive and productive employment.

A distinction can therefore be made between lower-value and higher-value circular employment. Lower-value activities recover relatively limited economic value, whereas higher-value activities preserve or recreate embedded value through specialised knowledge, innovation and more sophisticated production processes. Lower-skilled activities remain important for both local employment and environmental objectives, but a transition dominated by these activities is unlikely to maximise productivity, wages and technological competitiveness. Job quality should consequently be regarded as an integral component of the social dimension of circularity.

Circular transformation may also reduce labour demand in conventional resource-intensive industries, creating uneven effects across occupations, sectors and regions. This highlights the relevance of a just transition, in which environmental transformation is accompanied by realistic opportunities for workers and communities to adapt. Regions dependent on resource-intensive industries may experience adjustment pressures even when aggregate employment effects are positive. Reskilling, vocational training, career-transition support and regional development policies are therefore necessary complements to environmental and industrial policies.

The employment effects of circularity are also conditioned by national economic structures and institutional capacity. Differences in industrial specialisation, innovation, human capital, infrastructure and regulatory effectiveness mean that similar circular policies may produce different outcomes across EU Member States. Economies with stronger innovation systems may develop advanced remanufacturing, circular design and digital services, whereas countries with weaker technological capabilities may remain concentrated in waste management and basic recycling. SMEs are particularly relevant because many repair, maintenance, reuse and recycling activities are performed by smaller firms, whose transition may be constrained by limited access to finance, technology and specialised personnel.

These considerations are particularly relevant to Romania, which combines comparatively weak circularity and resource-productivity indicators with demographic pressures, outward migration, regional disparities and skill mismatches. The central issue is whether Romania is moving from a predominantly waste-oriented model towards a value-retention model based increasingly on repair, reuse, remanufacturing, eco-design, industrial symbiosis and advanced secondary-material processing.

This distinction has direct labour-market implications. A waste-oriented transition may increase employment in collection, sorting and basic recycling without producing substantial productivity improvements. A value-retention transition should generate stronger demand for technicians, engineers, designers, digital specialists, logistics professionals and sustainability managers. Consequently, if Romania's circular-sector employment converges towards the EU

benchmark more rapidly than circular material use or resource productivity, this may indicate that employment remains concentrated in comparatively labour-intensive and lower-value activities.

Based on the literature, the conceptual framework adopted in this study identifies four interrelated mechanisms through which circular-economy development affects labour-market outcomes:

Circular activity → labour demand. Expansion of reuse, repair, recycling, remanufacturing and related services increases labour demand, although its magnitude and characteristics depend on sectoral and technological conditions.

Circular upgrading → skill transformation. Movement from basic recycling towards remanufacturing, eco-design and advanced circular manufacturing increases demand for technical, engineering, digital and transversal competencies.

Circular business models → organisational transformation. Product–service systems, reverse logistics and digitally mediated circular services reshape organisational structures, occupational tasks and potentially employment relationships.

Structural and institutional conditions → employment quality and transition capacity. Human capital, innovation, education and training systems, regional characteristics and labour-market institutions determine whether circular transformation generates productive and inclusive employment.

On this basis, three research expectations are formulated:

H1. Improvements in circular-economy performance are positively associated with the expansion of employment in circular-economy activities.

H2. Improvements in resource productivity are expected to be more closely associated with higher-value circular employment than increases in basic recycling activity.

H3. The employment benefits associated with circular transition are conditioned by human-capital availability, technological capability and the capacity of firms and workers to adapt to changing skill requirements.

These propositions are conceptual research expectations rather than causal hypotheses tested econometrically. Given the limited number of benchmark observations, the empirical analysis assesses whether the descriptive patterns observed for Romania during 2014–2024 are consistent with the relationships identified in the literature.

The analytical logic can therefore be summarised as:

Circular-economy development → reuse, repair, recycling, remanufacturing and resource efficiency → changes in labour demand → occupational and skill transformation → employment quantity and quality, while skills, innovation, digitalisation, institutions and regional conditions act as enabling or constraining factors.

This framework allows Romania's circular transition to be assessed not only in terms of employment growth, but also according to whether it supports a shift towards higher-value activities capable of improving resource efficiency, productivity, technological upgrading and sustainable employment.

3. DATA AND METHODOLOGY

3.1. Research design

The empirical analysis adopts a quantitative, descriptive and comparative design to examine selected circular-economy and labour-market indicators in Romania during 2014–2024. Romania is benchmarked against the EU-27 to distinguish domestic improvement from relative convergence. Because the dataset contains four benchmark observations—2014, 2018,

2021 and 2024—for each indicator, the study identifies temporal patterns, structural differences and associations rather than causal effects.

The period captures major changes in the European and Romanian circular-economy policy framework, including the 2020 Circular Economy Action Plan and Romania's national strategy and action plan (European Commission, 2020; Government of Romania, 2022, 2023). The analysis proceeds in three stages: indicator trends are compared for Romania and the EU-27; descriptive statistics are calculated; and absolute gaps and relative performance measures are used to assess convergence or divergence.

3.2. Data sources

The empirical analysis uses secondary statistical data compiled from European and international sources. Eurostat is the principal statistical reference because it provides harmonised indicators for EU Member States and the EU aggregate, while European Commission and EEA publications provide policy and institutional context. OECD and World Bank materials are used primarily to support the discussion of green employment, skills, productivity and labour-market adjustment (Eurostat, 2024a, 2024b; European Commission, 2024; EEA, 2024; OECD, 2023a, 2023b, 2024; World Bank, 2023a, 2023b).

The use of harmonised secondary data improves comparability and reproducibility, although circularity remains multidimensional and cannot be represented by a single measure. Five complementary indicators are therefore used to capture material circularity, resource efficiency and labour-market participation.

3.3. Selection and operationalisation of indicators

The circular material use rate (CMUR) measures the share of recycled materials in overall material use and is expressed as $CMUR = \text{Circular use of materials} / \text{Overall material use} \times 100$. The municipal waste recycling rate (MWRR) represents the proportion of municipal waste recycled: $MWRR = \text{Recycled municipal waste} / \text{Total municipal waste} \times 100$. These indicators capture complementary dimensions of material recovery and reintegration, although recycling alone should not be treated as synonymous with circularity.

Resource productivity (RP) measures economic value generated relative to domestic material consumption and is expressed as $RP = \text{Gross domestic product} / \text{Domestic material consumption (EUR/kg)}$. Higher values indicate greater efficiency in transforming material inputs into economic output and can be associated with more advanced forms of circular upgrading.

The labour-market dimension is captured by circular-sector employment (CES), expressed as $CES = \text{Employment in circular sectors} / \text{Total employment} \times 100$, and by the employment share associated with repair and reuse. The latter provides a more specific indication of value-retention activities that extend product lifetimes and support locally embedded technical and service employment. These aggregate measures do not directly capture wages, occupational status, job quality or technological sophistication and are therefore interpreted together with the material and productivity indicators.

3.4. Analytical methods

The empirical analysis relies on benchmark-year trend analysis, descriptive statistics and EU benchmarking. For each indicator, the arithmetic mean is calculated as $\bar{x} = \sum x_i / n$ ($n = 4$), while variability is assessed using the sample standard deviation, $s = \sqrt{[\sum (x_i - \bar{x})^2 / (n - 1)]}$. Long-term progress is measured as $\Delta\% = [(X_{2024} - X_{2014}) / X_{2014}] \times 100$.

Convergence is assessed through the 2024 absolute gap, $\text{Gap}_{2024} = \text{XEU}_{2024} - \text{XRO}_{2024}$, and relative performance, $(\text{XRO}_{2024}/\text{XEU}_{2024}) \times 100$. A value approaching 100% indicates greater proximity to the EU benchmark. Percentage changes from low initial values are interpreted cautiously.

The indicators are interpreted within an integrated sequence linking material circularity, resource efficiency and employment. The analysis does not assume that circularity mechanically causes employment change; rather, it evaluates whether the observed trajectories are consistent with the relationships identified in the literature. A stronger employment trajectory than material circularity or resource productivity may be consistent with concentration in labour-intensive, lower-productivity activities, whereas simultaneous improvements in employment and productivity would be more consistent with qualitative upgrading.

3.5. Romania–EU comparative approach

The EU-27 is used as the principal benchmark because Romania's transition takes place within the common European regulatory and economic framework. Three outcomes are distinguished: convergence, when Romania improves and the gap narrows; parallel improvement without convergence, when both improve while the gap remains broadly unchanged; and divergence, when Romania's relative position deteriorates. This distinction prevents positive national growth rates from being interpreted automatically as successful convergence.

3.6. Methodological limitations and reproducibility

The principal limitation is the small number of benchmark observations. Four observations per indicator are appropriate for descriptive comparison but insufficient for robust multivariate time-series econometrics. Consequently, the findings are interpreted as descriptive evidence of patterns, gaps and associations rather than estimates of causal effects. A stronger econometric design would require annual data and preferably a larger country, regional or sectoral panel with controls for investment, innovation, skills, industrial structure and digitalisation.

A second limitation concerns measurement of circular employment. Aggregate indicators do not fully capture informal activity, occupational differences, wages, job security, working conditions or the distinction between lower- and higher-value circular occupations. In addition, the EU-27 is a policy and statistical benchmark rather than a structurally identical comparator. Nevertheless, the use of harmonised sources and transparent calculations allows the reported descriptive measures to be reproduced from the underlying data.

4. RESULTS

The results show gradual but uneven progress in Romania between 2014 and 2024. All five indicators improved, but convergence with the EU-27 remained limited, especially for material circularity and resource productivity. Employment-related indicators display a substantially stronger relative position than material-efficiency indicators, pointing to an asymmetric transition.

Table 1 indicates that Romania improved across all five circular-economy and employment indicators between 2014 and 2024, although substantial gaps relative to the EU-27 persisted. The weakest performance is observed in **circular material use and resource productivity**. Romania's circular material use rate increased only marginally, from 1.3% to

1.6%, compared with 11.4% to 11.8% in the EU-27, while resource productivity rose from EUR 0.32/kg to EUR 0.38/kg, remaining far below the EU level of EUR 2.50/kg in 2024. Municipal waste recycling followed a more consistent upward trajectory, increasing from 13% to 17%, although the gap with the EU-27 remained substantial as the European rate increased from 43% to 52%.

Table 1. Circular economy and employment indicators: Romania vs EU-27, selected years

Indicator	2014 RO	2014 EU	2018 RO	2018 EU	2021 RO	2021 EU	2024 RO	2024 EU
Circular material use rate (%)	1.30	11.4	1.50	11.7	1.30	11.5	1.60	11.8
Municipal waste recycling rate (%)	13	43	14	47	15	49	17	52
Resource productivity (EUR/kg)	0.32	2.00	0.34	2.20	0.36	2.40	0.38	2.50
Employment in circular sectors (% total employment)	1.10	1.70	1.20	1.80	1.30	1.90	1.40	2.10
Repair & reuse employment share (%)	0.30	0.60	0.40	0.70	0.40	0.80	0.50	0.90

Source: Author's compilation based on Eurostat (2024a, 2024b) and European Commission (2024).

Employment indicators show a comparatively more favourable evolution. Circular-sector employment increased steadily from 1.1% to 1.4% of total employment in Romania, while repair and reuse employment rose from 0.3% to 0.5%. Although both indicators remained below EU-27 levels, the relative employment gap was considerably smaller than the gaps observed for material circularity and resource productivity.

Overall, the table reveals a **structurally uneven transition**: Romania has made gradual progress, but employment-related indicators are closer to EU-27 levels than material-efficiency indicators. This asymmetry suggests that circular employment is developing faster than improvements in material circularity and resource productivity. However, given the aggregate nature of the data, this pattern should be interpreted as an indication of the structure of Romania's circular transition rather than direct evidence that employment is concentrated in lower-productivity activities.

Table 2 confirms the persistent and uneven nature of Romania's convergence towards EU-27 circular-economy performance. The largest disparities are observed in circular material use and resource productivity. Over the analysed period, Romania recorded an average circular material use rate of only 1.43%, compared with 11.60% in the EU-27, while average resource productivity was EUR 0.35/kg, substantially below the EU average of EUR 2.27/kg. Despite positive changes between 2014 and 2024, Romania reached only 13.6% of the EU benchmark for circular material use and 15.2% for resource productivity in 2024.

Municipal waste recycling shows stronger progress, increasing by 30.8% over the period. Nevertheless, Romania reached only 32.7% of the EU-27 level in 2024, with a gap of 35 percentage points. This indicates that domestic improvement has not been sufficient to achieve substantial convergence in waste-management performance.

Table 2. Descriptive statistics and Romania–EU convergence indicators

Indicator	RO mean	EU mean	RO SD	2014–2024 RO change (%)	2024 gap (EU–RO)	RO/EU in 2024 (%)
Circular material use rate (%)	1.43	11.60	0.15	23.1	10.20	13.6
Municipal waste recycling rate (%)	14.75	47.75	1.71	30.8	35.00	32.7
Resource productivity (EUR/kg)	0.35	2.27	0.03	18.8	2.12	15.2
Employment in circular sectors (% total employment)	1.25	1.88	0.13	27.3	0.70	66.7
Repair & reuse employment share (%)	0.40	0.75	0.08	66.7	0.40	55.6

Note: Means and sample standard deviations are calculated from the four benchmark years. Percentage change compares 2024 with 2014. The 2024 gap is expressed in the original unit of each indicator.

Source: Author's calculations based on Table 1.

A different pattern emerges for the employment indicators. Circular-sector employment increased by 27.3% and reached 66.7% of the EU benchmark in 2024, while repair and reuse employment recorded the largest relative increase (66.7%) and reached 55.6% of the EU level. These results indicate that Romania is considerably closer to EU performance in labour-market participation than in material circularity and resource efficiency.

Overall, the relative performance in 2024 follows a clear hierarchy: **circular-sector employment (66.7%) > repair and reuse employment (55.6%) > municipal waste recycling (32.7%) > resource productivity (15.2%) > circular material use (13.6%)**. This pattern reinforces the main empirical finding of the study: Romania's circular transition is progressing more rapidly in employment terms than in material efficiency and value creation. However, this divergence should be interpreted cautiously, as the aggregate indicators do not directly identify the productivity, occupational structure or quality of circular employment.

4.1. Circularity and resource efficiency

Romania's circular material use rate remained persistently low, increasing from 1.3% in 2014 to 1.6% in 2024. The average was 1.43%, compared with 11.60% for the EU-27, and Romania reached only 13.6% of the EU benchmark in 2024. The limited variation across benchmark years suggests stability around a structurally weak level rather than sustained acceleration, pointing to limited reintegration of secondary materials into production.

Municipal waste recycling improved more consistently, from 13% in 2014 to 17% in 2024, a 30.8% increase. However, the EU-27 rose from 43% to 52%, widening the absolute gap from 30 to 35 percentage points. Romania therefore achieved domestic progress without substantial convergence and reached only 32.7% of the EU benchmark in 2024.

Resource productivity increased steadily from EUR 0.32/kg to EUR 0.38/kg, but the EU-27 rose from EUR 2.00/kg to EUR 2.50/kg. Romania reached only 15.2% of the EU benchmark in 2024, while the absolute gap widened to EUR 2.12/kg. This persistent difference indicates that the economy continues to generate considerably less value per unit of material consumed and that the circular transition has not yet produced substantial material-efficiency gains.

4.2. Employment dynamics

Circular-sector employment increased from 1.1% of total employment in 2014 to 1.4% in 2024, representing cumulative growth of 27.3%. Although the absolute gap with the EU-27 increased slightly from 0.6 to 0.7 percentage points, Romania reached 66.7% of the EU benchmark in 2024. This relative position is substantially stronger than for circular material use, resource productivity or municipal recycling.

Repair and reuse employment increased from 0.3% to 0.5% of total employment, the strongest proportional growth among the Romanian indicators (66.7%), although the absolute change was only 0.2 percentage points. Romania reached 55.6% of the EU benchmark in 2024. The expansion of these activities is relevant because they extend product lifetimes and support locally embedded technical and service employment, but the indicator does not by itself demonstrate improvements in wages, productivity or job quality.

4.3. Structural interpretation and research expectations

The 2024 relative-performance ranking is clear: circular-sector employment (66.7%) > repair and reuse employment (55.6%) > municipal waste recycling (32.7%) > resource productivity (15.2%) > circular material use (13.6%). Romania is therefore considerably closer to EU performance in employment than in the underlying material and productivity dimensions of circularity.

This asymmetry is consistent with a transition in which employment expands partly through labour-intensive activities such as collection, sorting, basic recycling, repair and maintenance. However, the indicators do not directly identify occupational composition, and this interpretation should not be treated as a demonstrated causal result. More detailed sectoral and occupational data would be required to determine the extent to which employment is concentrated in lower- or higher-value circular activities.

The findings are broadly consistent with H1 because circular-performance and employment indicators improved in the same direction, although the relationship is neither proportional nor causal. H2 receives indirect support from the large divergence between resource productivity and circular employment, which is consistent with the possibility that employment growth has not yet been matched by qualitative upgrading. H3 cannot be tested statistically because human capital, innovation and technological capability are not directly measured, but these factors remain relevant to interpreting Romania's structural gaps.

5. DISCUSSION

The central empirical finding is not simply that circular employment increased, but that it developed more rapidly relative to the EU benchmark than material circularity and resource productivity. This distinction matters because employment-intensive circularisation and productivity-enhancing circularisation are not equivalent. Romania's pattern is consistent with an early-stage transition in which essential activities such as collection, sorting, recycling, maintenance and repair expand before more technologically sophisticated value-retention activities reach comparable scale.

The literature suggests that a more mature circular economy relies increasingly on repair, refurbishment, remanufacturing, eco-design, industrial symbiosis and advanced secondary-material processing, which preserve more embedded value and require more specialised competencies (Andersen et al., 2024; Yang & Sun, 2024). Romania's weak resource-productivity performance therefore strengthens the case for policies that connect

circularity with industrial upgrading rather than treating waste management as the principal measure of transition.

Digitalisation can support this shift by improving traceability, predictive maintenance, reverse logistics and secondary-material management. Industry 4.0 technologies may therefore complement remanufacturing and other advanced circular activities while increasing demand for engineering, diagnostics, data-management and advanced-maintenance skills (Sahoo & Jakhar, 2024). The circular and digital transitions should consequently be treated as mutually reinforcing components of industrial policy.

Human capital is equally important. Circular manufacturing requires technical, digital and transversal competencies, implying a need for both upskilling and reskilling (Beducci et al., 2024). Vocational education and training can incorporate repair technologies, refurbishment, resource-efficient production, reverse logistics and digital diagnostics, while universities can strengthen circular design, lifecycle analysis and sustainable business-model competencies. Lifelong learning is particularly important for workers already employed in material-intensive or technologically changing sectors.

The social dimension also requires attention to job quality. Growth in circular employment should not automatically be interpreted as growth in high-quality green employment, because activities differ in wages, productivity, occupational risks, contractual stability and career opportunities. A just transition therefore requires policies that combine job creation with training, occupational safety, social protection and mobility towards more productive activities.

SMEs and regional ecosystems are important channels for implementation. Repair, reuse, maintenance and refurbishment are often performed by smaller firms, which may face constraints in finance, technology and specialised labour. Targeted financial support, technical assistance and innovation networks could strengthen their participation in circular value chains. Regional policy should also reflect local specialisation: industrial regions may support remanufacturing and industrial symbiosis, urban areas repair and circular logistics, and agricultural regions circular bioeconomy activities.

Overall, the results point to a two-speed transition in which employment has advanced more rapidly than material circularity and resource productivity. The policy challenge is therefore to use the existing circular employment base as a platform for higher-value development by linking environmental objectives with innovation, digitalisation, skills and job quality.

6. CONCLUSIONS

This study examined the relationship between circular-economy development and labour-market change in Romania during 2014–2024, using the EU-27 as a benchmark. All five indicators improved, confirming gradual progress, but convergence remained limited and uneven. The largest gaps were recorded for circular material use and resource productivity, while employment indicators displayed a substantially stronger relative position.

In 2024, Romania reached 66.7% of the EU benchmark for circular-sector employment and 55.6% for repair and reuse employment, compared with 32.7% for municipal recycling, 15.2% for resource productivity and 13.6% for circular material use. This asymmetry suggests that employment expansion has preceded the deeper transformation of material flows and productive efficiency. It is consistent with, but does not directly prove, a concentration of employment in relatively labour-intensive circular activities.

The main policy implication is that Romania should move beyond a predominantly waste-oriented model towards value-retention activities such as advanced repair, refurbishment, remanufacturing, eco-design, industrial symbiosis and secondary-material

innovation. Such a shift requires stronger integration of circular-economy policy with industrial development, digitalisation, innovation and human-capital policies.

The study is limited by the small number of benchmark observations and by aggregate employment measures that do not capture occupational composition, wages or job quality. Future research should use annual, sectoral, regional or cross-country panel data and incorporate variables related to skills, innovation, investment and digitalisation. This would allow the relationships identified descriptively here to be tested more rigorously and would provide a stronger basis for evaluating the quality as well as the quantity of circular employment.

REFERENCES

1. Andersen, A. W., Jørgensen, S. F., Gunn, W., & Niero, M. (2024). Remanufacturing as a circular design strategy in healthcare: Integrating socio-technical and environmental-economic assessments. *Proceedings of the Design Society*, 4, 1179–1188. <https://doi.org/10.1017/pds.2024.120>
2. Beducci, E., Acerbi, F., Pinzone, M., & Taisch, M. (2024). Unleashing the role of skills and job profiles in circular manufacturing. *Journal of Cleaner Production*, 449, 141456. <https://doi.org/10.1016/j.jclepro.2024.141456>
3. European Commission. (2020). A new circular economy action plan: For a cleaner and more competitive Europe (COM/2020/98 final). European Commission.
4. European Commission. (2024). Country report Romania 2024. European Commission.
5. European Environment Agency. (2022). Circular economy and employment in Europe. European Environment Agency.
6. European Environment Agency. (2024). Circular economy country profiles 2024. European Environment Agency.
7. European Environment Agency. (2026). Just transition to a circular economy. European Environment Agency.
8. Eurostat. (2024a). Circular economy indicators database. Eurostat.
9. Eurostat. (2024b). Circular economy monitoring framework. European Commission.
10. Government of Romania. (2022). Strategia națională privind economia circulară [National strategy on the circular economy] (Hotărârea Guvernului nr. 1172/2022). Government of Romania.
11. Government of Romania. (2023). Planul de acțiune pentru Strategia națională privind economia circulară [Action plan for the National strategy on the circular economy] (Hotărârea Guvernului nr. 927/2023). Government of Romania.
12. OECD. (2023a). Green growth and the labour market. OECD Publishing.
13. OECD. (2023b). Job creation and local economic development 2023: Bridging the great green divide. OECD Publishing.
14. OECD. (2024). Skills for a circular economy. OECD Publishing.
15. Pawlewski, P. (2024). Scientific and practical challenges for the development of a new approach to the simulation of remanufacturing. *Sustainability*, 16(9), 3857. <https://doi.org/10.3390/su16093857>
16. Sahoo, S., & Jakhar, S. K. (2024). Industry 4.0 deployment for circular economy performance—Understanding the role of green procurement and remanufacturing activities. *Business Strategy and the Environment*, 33(2), 1144–1160. <https://doi.org/10.1002/bse.3542>

17. van Dam, S., & Bakker, C. (2024). Between a rock and a hard place: A case study on simplifying the reverse logistics of car parts to enable remanufacturing. *Journal of Circular Economy*, 2(2). <https://doi.org/10.55845/MWAX4474>
18. World Bank. (2023a). Romania country climate and development report. World Bank.
19. World Bank. (2023b). Romania: Green transition and labour market challenges. World Bank.
20. Yang, Q., & Sun, L. (2024). Eco-design in manufacturing or remanufacturing? The sustainable options in a closed-loop supply chain with outsourcing. *Sustainability*, 16(4), 1633. <https://doi.org/10.3390/su16041633>

DIGITAL TRANSFORMATION AND THE KNOWLEDGE ECONOMY: A FRAMEWORK FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT: *The knowledge economy has become a defining paradigm of contemporary economic development, emphasizing the strategic role of knowledge, innovation, digital transformation and human capital in generating competitiveness and sustainable growth. This paper aims to analyze the main dimensions of the knowledge economy and to highlight the relationship between knowledge-based resources and economic performance. The study focuses on four key pillars: human capital, innovation, digital economy and innovation output. By examining relevant indicators, the paper provides a multidimensional perspective on the transition toward knowledge-based development. This paper aims to analyze the main dimensions of the knowledge economy in selected Central and Eastern European countries and discusses the importance of digital transformation as an enabling factor for knowledge creation, dissemination and economic valorization. The findings suggest that economies investing consistently in education, innovation capacity and digital technologies are better positioned to enhance productivity, competitiveness and resilience. The paper concludes that the knowledge economy should be understood not only as a technological shift, but also as a structural transformation of economic systems, with significant implications for sustainable development and long-term competitiveness.*

Keywords: *Knowledge economy; Digital transformation; Innovation; Human capital; Sustainable development; Competitiveness.*

JEL Classification: *O31, J24, Q01.*

1. INTRODUCTION

Digital transformation and the knowledge-based economy constitute two of the main forces shaping contemporary economic development. The integration of digital technologies, the expanding use of information, and the growing importance of human capital are reshaping production processes, business models, and the relationships among institutions, enterprises, and society. In this context, innovation and the efficient utilization of knowledge can contribute to productivity growth, enhanced competitiveness, and the development of more sustainable economic solutions. Analyzing the interconnections between digitalization, knowledge, and

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sustainability is therefore essential for understanding the opportunities and challenges associated with the transition towards a resilient, inclusive, and future-oriented economy.

In the industrial economy, comparative advantages were primarily associated with access to raw materials, labor availability, and the accumulation of physical capital. In the knowledge-based economy, economic performance is determined to a great extent by a society's capacity to create, absorb, disseminate, and effectively utilize knowledge.

The development of information and communication technologies has accelerated the transition towards the knowledge-based economy. Digital infrastructure enables the rapid collection, processing, and transmission of large volumes of information, reduces coordination costs, and facilitates collaboration among firms, public institutions, universities, and individuals located in different geographical areas. Digital platforms, cloud computing services, artificial intelligence, automation, and data analytics are transforming both organizations' internal processes and their relationships with suppliers, consumers, and business partners (OECD, 2024).

However, the mere availability of digital technologies does not guarantee productivity growth. Their economic effects depend on the capacity of organizations and employees to integrate new technologies into routine activities and operational processes. For this reason, digital skills must be complemented by cognitive, analytical, managerial, and social competencies. Basic digital literacy enables access to and effective use of technology, whereas advanced skills, such as programming, data analysis, cybersecurity, the use of artificial intelligence, and digital systems management, support high-value-added activities. The OECD emphasizes that harnessing the benefits of digitalization requires coordinated policies in the areas of education, the labor market, research, innovation, and social protection, as well as opportunities for lifelong learning (OECD, 2024).

In this context, human capital becomes one of the principal forms of economic capital. Educational attainment, professional experience, adaptability, and a willingness to engage in continuous learning influence individual productivity as well as the performance of firms and national economies. Educational institutions are no longer expected merely to transmit a fixed body of knowledge; they must also develop individuals' capacity to identify relevant information, solve complex problems, and adapt to technologies and occupations that are undergoing continuous change. Consequently, education, vocational training, and reskilling should be regarded as economic investments rather than solely as social expenditures.

The knowledge-based economy is also closely linked to competitiveness. In a global environment characterized by rapid technological change, advantages based exclusively on low costs or access to resources tend to be vulnerable. Sustainable competitiveness requires the capacity to improve productivity, differentiate products, develop proprietary technologies, and participate in high-value-added segments of global value chains.

The relationship between the knowledge-based economy and sustainable development is equally significant. Innovation can promote the more efficient use of energy and raw materials, support the development of low-emission technologies, and optimize production and transport processes. Digitalization can enhance the monitoring of resource consumption and facilitate the adoption of circular business models. The knowledge economy should therefore be assessed not only in terms of the pace of innovation, but also in relation to the capacity of institutions to align technological progress with economic, social, and environmental objectives.

2. CONCEPTUAL FRAMEWORK OF THE KNOWLEDGE-BASED ECONOMY

The core principles of the knowledge-based economy highlight the strategic role of information, innovation, human capital, and technology in generating economic value and sustaining long-term competitiveness.

2.1. Concept of the Knowledge-Based Economy

The knowledge-based economy may be defined as an economic system in which the production, dissemination, and utilisation of knowledge and information constitute central mechanisms of value creation. The OECD and the World Bank associate this type of economy with the effective use of knowledge by enterprises, institutions, and individuals to support economic growth and enhance social well-being (OECD, 2023).

This definition should be interpreted with caution, since every form of economic activity relies on some type of knowledge. Traditional agriculture, craftsmanship, and industrial production have always drawn on experience, information, and skills. The distinctive feature of the contemporary economy is not the emergence of knowledge as an economic resource, but rather the intensification of its role and the increasing speed at which it is produced, transmitted, and superseded. Scientific progress, the expansion of education, and the development of digital technologies have shortened the time required to transform discoveries into economic applications and have strengthened the interdependencies among research, production, and the market.

Knowledge should not be conflated with information. Data consist of elementary observations or records, whereas information results from their organisation and interpretation within a relevant context. Knowledge involves the integration of information with the experience, competencies, and judgement of individuals or organisations. A database may contain valuable information, but economic value is generated only when economic actors possess the capabilities required to analyse that information and apply it in decision-making processes.

Intellectual property protection seeks to balance two objectives. On the one hand, innovators must be able to derive an economic return from their investments. On the other hand, excessive protection may restrict the circulation of knowledge and delay subsequent innovation. A well-functioning knowledge economy must therefore stimulate both the creation of new ideas and their diffusion throughout the economy.

Research and development constitute one of the principal institutionalised mechanisms for producing knowledge. Basic research expands the general scientific knowledge base, applied research seeks solutions to specific problems, and experimental development transforms research findings into commercially viable products, services, and processes. Research and development expenditure, however, does not automatically generate innovation. Outcomes depend on the quality of researchers, the available infrastructure, access to finance, cooperation among organisations, and the existence of demand for the products or solutions developed.

Education and vocational training complement this process. The education system develops the competencies required to generate and use knowledge, while vocational training facilitates the adaptation of skills to technological change. As the pace of change shortens the period during which certain skills remain relevant, lifelong learning becomes a structural component of the knowledge-based economy. Human capital cannot be regarded as a stock acquired exclusively at the beginning of an individual's professional life, but rather as an asset requiring continuous investment and regular updating.

The framework developed by the World Bank groups the enabling conditions of the knowledge economy into four pillars: an education system capable of developing relevant skills, an effective innovation system, adequate information and communication technology infrastructure, and an economic and institutional regime that encourages entrepreneurship, investment, and the use of knowledge (World Bank, 2024). These four pillars are interdependent. Digital infrastructure makes only a limited contribution in the absence of appropriate skills, while skills cannot be used effectively without innovative enterprises, access to finance, and a predictable institutional framework.

2.2. The main factors of the knowledge-based economy

Human capital comprises the knowledge, skills, experience, and individual capabilities that contribute to economic activity. In the knowledge-based economy, the value of human capital derives not only from the volume of information possessed, but also from the capacity to learn, integrate knowledge from different fields, and solve novel problems. Investment in education can generate individual benefits by increasing productivity and expanding career opportunities, while also producing broader collective gains. Highly skilled employees facilitate technology adoption, contribute to the diffusion of best practices, and can support the creation of new enterprises. However, the quality of education is more significant than the mere quantitative expansion of participation in formal schooling. An economy may have a large number of graduates while simultaneously facing skills shortages when educational programmes are not aligned with technological developments and labour market demand. For this reason, curricula should integrate digital competencies with critical thinking, creativity, collaboration, and communication skills. Continuing vocational education and training performs a similar function. Automation does not merely eliminate certain occupations; it also changes the tasks performed within a wide range of professions. Employees must therefore be able to use emerging technologies and shift from repetitive activities towards tasks involving analysis, judgement, and human interaction. The OECD indicates that adaptation to digitalisation requires a combination of cognitive, digital, social, and emotional skills, supported through initial education, vocational training, and lifelong learning (OECD, 2019).

Innovation constitutes the mechanism through which knowledge is transformed into economic and social value. It may take the form of new products, more efficient production methods, alternative business models, or organisational change. Innovation should not be confined to high-technology sectors. Agriculture, the food industry, construction, transport, and public services can also make use of advanced knowledge and generate substantial productivity gains.

Digital infrastructure encompasses communication networks, data centres, cloud services, information systems, and the security solutions required for economic activity. It facilitates market access, reduces transaction costs, and enables firms to coordinate complex operations. For small enterprises, digital technologies can lower certain barriers to entry and broaden access to customers, suppliers, and specialised services. The effects of digital infrastructure are contingent upon the level of available skills. Basic competencies enable the use of common digital tools, whereas advanced capabilities support the development and management of technologies. Between these two levels lie occupation-specific digital skills, such as an accountant's ability to use integrated information systems, an engineer's capacity to work with digital simulations, or a manager's ability to interpret indicators generated through data analytics. Digital policy cannot therefore be reduced to investment in equipment and connectivity. It must be integrated with education policy, employment policy, and innovation strategy. The European Commission regards digital skills as a central component of digital

transformation and of efforts to reduce disparities in access, while the OECD distinguishes among foundational skills, basic digital competencies, and the advanced capabilities required to develop and use digital technologies (European Commission, 2026; OECD, 2024).

Knowledge generates economic effects when it circulates among individuals and organisations. Such transfer may occur through education, labour mobility, foreign investment, commercial relationships, licensing, consultancy, participation in professional networks, and collaborative research projects. In many cases, knowledge transfer does not involve the mere replication of an existing solution, but rather its adaptation to a different organisational, sectoral, or regional context.

Institutions shape the way knowledge is produced, protected, and commercially exploited. Macroeconomic stability, regulatory quality, the protection of property rights, competition, and access to finance influence the willingness of economic actors to invest in innovative projects. In an environment characterised by legal uncertainty or excessive administrative barriers, firms may favour low-risk, short-term investments at the expense of research and innovation.

At the same time, public institutions should avoid providing permanent protection to unproductive enterprises. The knowledge-based economy requires a balance between supporting innovation and preserving competitive pressures. Competition encourages firms to invest in improving products and processes, while temporary intellectual property protection may enable innovators to recover research and development costs.

2.3. The Relationship Between the Knowledge-Based Economy and Competitiveness.

Economic competitiveness may be understood as the capacity of an economy to generate productivity, income, and employment opportunities within an open international environment. It should not be reduced to maintaining low labour costs or increasing exports. A competitive economy is capable of using available resources productively, adapting to change, and improving living standards over the long term.

The first mechanism through which knowledge influences competitiveness is productivity growth. Technology enables the automation of repetitive tasks, the reduction of errors, the optimisation of resource use, and the improvement of decision-making. However, productivity gains arise only when technological investment is accompanied by organisational restructuring and skills development. The implementation of an information system without corresponding changes to organisational processes may generate additional costs without producing significant benefits.

The second mechanism is product and service innovation. Firms that invest in research, design, and knowledge of consumer preferences can develop differentiated products and avoid competing exclusively on price. Intellectual property, reputation, databases, software, and organisational capabilities constitute intangible assets that can strengthen firms' competitive positions.

The third mechanism concerns integration into high-value-added segments of global value chains. Economies that primarily undertake standardised assembly activities remain vulnerable to the relocation of production to lower-cost regions. The development of research, design, software, marketing, and specialised service activities enables economies to retain a larger share of the value created. Economic policy should therefore focus not only on attracting investment, but also on strengthening the capacity of domestic firms to learn, become specialised suppliers, and develop proprietary technologies.

The fourth mechanism relates to adaptability and resilience. An economy with a diversified skills base and well-developed research institutions can respond more rapidly to

technological change, supply-chain disruptions, and shifts in demand. Human capital facilitates the reallocation of resources towards new activities, while digital infrastructure supports the reorganisation of production and the remote delivery of services. Resilience depends not only on the availability of advanced technologies, but also on the capacity of economic actors to learn and cooperate.

The importance of innovation for competitiveness is also reflected in international assessment frameworks. Indicators used by the OECD and the World Intellectual Property Organization encompass dimensions such as human capital, research and development, infrastructure, patents, collaboration, and technological outputs. This approach highlights that innovation performance cannot be explained by a single factor, but results from the functioning of a complex economic and institutional system (OECD, 2026; World Intellectual Property Organization, 2025).

The relationship between knowledge and competitiveness is neither automatic nor uniform. Investment in education may produce limited effects when the economy fails to generate suitable employment opportunities, potentially resulting in the underutilisation of skills or the migration of qualified personnel. Similarly, investment in research may yield few commercial outcomes when links between universities and enterprises are weak. Digital infrastructure may also intensify economic concentration when only large firms possess the resources required to exploit data and advanced technologies.

The knowledge-based economy may also generate regional disparities. Innovative activities tend to concentrate in areas that already benefit from universities, infrastructure, capital, and a diversified labour market. Although this concentration creates positive externalities, it may also widen the gap between urban centres and peripheral regions. Cohesion policies should therefore combine the expansion of digital infrastructure with the development of local institutions for education, training, and entrepreneurial support.

Knowledge-based competitiveness must also be aligned with social inclusion. Digitalisation can create new professional and entrepreneurial opportunities, but it may exclude individuals who lack the necessary skills, equipment, or connectivity. Public policies should facilitate access to training and reskilling, particularly for workers exposed to automation and for groups with low labour-market participation. In the absence of such measures, productivity growth may be accompanied by increasing disparities in income and access to economic opportunities.

The competitiveness of a knowledge-based economy arises from the complementarity among technology, skills, innovation, and institutions. None of these factors is sufficient in isolation. Technology may remain underutilised without adequate human capital; education without corresponding economic opportunities may lead to skills migration; and research without effective transfer mechanisms may have only a limited impact on productivity. Economies that successfully integrate these components are better positioned to create value, adapt to change, and sustain long-term economic growth.

3. ROMANIA'S POSITION IN THE KNOWLEDGE-BASED ECONOMY

An economy's capacity to generate, integrate, and leverage knowledge depends on several resources that operate simultaneously: the level of human capital, the intensity of research and development activities, the population's digital skills, and the ability of the economic system to convert these resources into productivity gains and added value.

To provide a concise comparison between Romania, the European Union average, and a group of Central and Eastern European countries, an experimental composite index, termed the Knowledge Economy Composite Index (KEI), was developed. The index incorporates four

dimensions considered essential to the functioning of a knowledge-based economy: human capital, innovation, digitalization, and economic performance.

$$\text{KEI} = \text{Human capital} + \text{Innovation} + \text{Digitalization} + \text{Economic performance}$$

The KEI is not an official indicator of the European Union and should not be confused with the identically named index previously developed by the World Bank. Rather, it is proposed as an analytical tool designed to provide a concise, transparent, and easily replicable measure of the knowledge economy, based on comparable Eurostat indicators and a transparent normalization procedure.

Each of the four dimensions is represented by a single indicator. This approach reduces computational complexity and facilitates the interpretation of the results; however, it inevitably simplifies the multidimensional nature of the knowledge economy. The implications of this methodological choice are discussed in the section addressing the study's methodological limitations.

Table 1. Dimensions and indicators included in the KEI

Dimension	Indicator	Unit of measure	Reference year
Human Capital	Persons aged 25–34 with tertiary educational attainment	%	2025
Innovation	Gross domestic expenditure on research and development (GERD)	% GDP	2024
Digitalization	Persons aged 16–74 with at least basic digital skills	%	2025
Economic performance	Gross domestic product (GDP) per capita expressed in purchasing power standards (PPS)	UE-27 = 100	2025

Source: Author's own compilation based on Eurostat indicators.

Human capital. The share of the population aged 25–34 with tertiary educational attainment is used as a proxy for the stock of advanced human capital among younger cohorts. Although this indicator does not directly capture the quality of education or the extent to which graduates' skills match labor market demand, it provides a meaningful measure of the education system's capacity to produce highly qualified graduates. In 2025, the proportion reached 44.8% in the EU-27, compared with 23.0% in Romania (Eurostat, 2026a).

Innovation. Research and development intensity is measured by gross domestic expenditure on research and development (GERD) as a percentage of GDP. This indicator reflects the financial resources devoted to knowledge creation, technological development, and innovation. In 2024, GERD amounted to 2.24% of GDP in the EU-27, compared with only 0.46% in Romania. For several of the countries included in the analysis, the 2024 figures are preliminary or provisional; consequently, marginal differences should be interpreted with caution (Eurostat, 2026b).

Digitalization. The digital dimension is approximated by the share of persons aged 16–74 with at least basic digital skills. The Eurostat indicator encompasses five domains: information and data literacy, communication and collaboration, digital content creation, problem solving, and safety. As it is derived from respondents' self-reported digital activities, the indicator provides a proxy for the digital skills applied in practice. In 2025, 60.39% of the

EU-27 population possessed at least basic digital skills, compared with 31.84% in Romania (Eurostat, 2026c).

Economic performance. GDP per capita expressed in purchasing power standards (PPS) largely adjusts for differences in national price levels, thereby enabling more meaningful cross-country comparisons of living standards and economic productivity. The EU-27 average is set equal to 100; thus, a value of 78 indicates a GDP per capita approximately 22% below the EU average. As the estimates for 2025 are preliminary or provisional and remain subject to revision, the economic component of the index should be interpreted accordingly (Eurostat, 2026d).

Table 2. Raw values of the indicators included in the KEI

Country	Persons aged 25–34 with tertiary educational attainment (%)	Gross domestic expenditure on research and development (GERD) (% GDP)	Persons aged 16–74 with at least basic digital skills (%)	GDP per capita PPS, UE=100
EU-27	44.8	2.24	60.39	100
Bulgaria	41.2	0.77	38.26	68.00
Czechia	36.0	1.82	70.45	92.4
Hungary	32.6	1.31	57.33	76.2
Poland	45.2	1.41	50.42	81.2
Romania	23.0	0.46	31.84	77.7
Slovakia	36.3	0.98	53.56	74.8
Slovenia	42.8	2.16	46.50	90.5

Source: Author's own compilation based on Eurostat indicators.

The selected indicators are expressed in different units of measurement and therefore cannot be aggregated in their original form. To ensure comparability, each indicator was normalized relative to the EU-27 average, which was set as the benchmark equal to 100. This normalization approach offers two main advantages. First, the results are straightforward to interpret, as all components are expressed relative to the same reference value. Second, a country's score remains unaffected by the inclusion or exclusion of other countries from the sample, unlike the min–max normalization method, where the range of observations directly influences the resulting scores.

For the construction of the KEI, equal weights were assigned to the four dimensions. This weighting scheme does not imply that each dimension contributes equally, in objective terms, to economic development. Rather, it represents a transparent normative assumption under which human capital, innovation, digitalization, and economic performance are treated as equally important components of the composite index

Table 3. Normalized scores, KEI values, and regional ranking

Country	Human capital	Innovation	Digitalization	Economic performance	KEI	Ranking
EU-27	100.00	100.00	100.00	100.00	100.00	Reper
Bulgaria	91.96	34.38	63.35	68.00	64.42	6
Czechia	80.36	81.25	116.66	92.40	92.67	1

Country	Human capital	Innovation	Digitalization	Economic performance	KEI	Ranking
Hungary	72.77	58.48	94.93	76.20	75.60	4
Poland	100.89	62.95	83.49	81.20	82.13	3
Romania	51.34	20.54	52.72	77.70	50.57	7
Slovakia	81.03	43.75	88.69	74.80	72.07	5
Slovenia	95.54	96.43	77.00	90.50	89.87	2

Source: Author's calculations based on Eurostat data (2026a–d).

Note: Component scores are expressed relative to the EU-27 average, set equal to 100

Romania records a KEI score of 50.57, the lowest among the seven countries included in the analysis. This value should not be interpreted as indicating that the Romanian economy is "50.57% knowledge based." Rather, it signifies that Romania's average performance across the four selected dimensions reaches 50.57% of the EU-27 benchmark. The gap relative to the EU average amounts to 49.43 points, while the difference compared with Bulgaria (the country ranked immediately above Romania) is 13.85 points. Relative to Slovakia, the gap widens to 21.50 points.

Romania's performance profile reveals a marked imbalance between economic convergence and the structural factors that underpin the long-term generation and utilization of knowledge. The economic performance component reaches 77.70 points, whereas the scores for digital skills and human capital are substantially lower, at 52.72 and 51.34 points, respectively. Innovation constitutes the weakest dimension, with a score of only 20.54 points.

These findings indicate that Romania's GDP per capita has converged towards the EU average considerably faster than the indicators related to education, digital skills, and research and development. This pattern suggests that the country's process of economic convergence is not yet supported by a comparable convergence in the core drivers of a knowledge-based economy.

The most pronounced deficit is observed in the field of innovation. Gross domestic expenditure on research and development, amounting to 0.46% of GDP, represents only about one-fifth of the EU-27 average, corresponding to an absolute gap of 1.78 percentage points of GDP. Human capital constitutes the second major structural constraint, as the share of the population aged 25–34 with tertiary educational attainment is 21.8 percentage points below the EU average. The gap is even wider with respect to basic digital skills, reaching approximately 28.6 percentage points.

Czechia ranks first, with a KEI score of 92.67. Its strongest comparative advantage lies in digitalization: a digital skills score of 116.66 indicates that the share of individuals possessing at least basic digital skills exceeds the EU-27 benchmark by 16.66%. This strong performance is further supported by relatively high R&D intensity and GDP per capita close to the EU average.

Slovenia occupies second place, with a score of 89.87. Its performance profile is more balanced, with human capital, research and development, and economic performance all approaching the EU-27 benchmark. The country's comparatively weaker dimension is digital skills, which records a score of 77.00.

Poland ranks third, achieving 82.13 points. It is the only country in the group where the share of the population aged 25–34 with tertiary educational attainment slightly exceeds the EU-27 average. Nevertheless, its overall performance is constrained by lower R&D intensity and a GDP per capita that remains below the European benchmark.

Hungary and Slovakia occupy the middle positions in the ranking, with scores of 75.60 and 72.07, respectively. Hungary performs relatively well in digital skills, approaching

the EU average, but continues to lag in human capital, research and development, and economic performance. Slovakia displays a comparatively balanced profile in terms of human capital and digitalization; however, its R&D expenditure remains below half of the EU-27 level.

Bulgaria records a KEI score of 64.42. Although it exhibits a relatively high share of young adults with tertiary educational attainment, this advantage is offset by comparatively weak performance in research and development, digital skills, and GDP per capita. Romania outperforms Bulgaria only in the economic performance component, while remaining substantially behind in human capital and recording lower scores in both innovation and digitalization.

Limitations of the analysis. The first limitation arises from the representation of each dimension by a single indicator. Human capital cannot be fully captured by tertiary educational attainment alone, innovation extends beyond expenditure on research and development, and digitalization encompasses a broader range of capabilities than basic individual digital skills.

A second limitation concerns the lack of complete temporal alignment across the indicators. Owing to differences in reporting schedules, the variables refer to different reference years. Consequently, the KEI reflects the most recent data available for each dimension rather than the performance of all dimensions within a single reference year.

A third limitation stems from the use of the arithmetic mean, which assumes full compensability among the index components. Under this approach, a relatively high level of GDP per capita can mathematically offset a very low level of research and development expenditure, even though these two configurations are not structurally equivalent from the perspective of a knowledge-based economy.

Finally, the proposed index primarily captures input variables and intermediate outcomes. It does not incorporate other important dimensions, such as institutional quality, scientific output, patent activity, export complexity, the adoption of digital technologies by firms, or the regional distribution of human capital. In addition, some of the values for research and development expenditure and GDP per capita are preliminary or provisional and may be revised in subsequent releases of the Eurostat database.

4. CONCLUSIONS

The knowledge-based economy is reshaping the traditional sources of competitiveness by shifting the emphasis from material resources and low costs towards information, innovation, human capital, and technology. Economic performance increasingly depends on societies' capacity to create, disseminate, and use knowledge effectively.

Digitalisation can enhance productivity, reduce costs, and facilitate cooperation, but its effects depend on the availability of appropriate skills and the adaptation of organisational processes. Education, vocational training, reskilling, and lifelong learning therefore become essential forms of economic investment. Innovation transforms knowledge into value-added products, services, processes, and business models. Its outcomes depend on the quality of research, access to finance, cooperation between universities and enterprises, digital infrastructure, and the stability of the institutional framework.

Knowledge-based competitiveness requires productivity growth, the development of proprietary technologies, and integration into higher-value-added segments of global value chains. However, digitalisation may widen social and regional disparities when access to skills, infrastructure, and economic opportunities remains unequal.

A high-performing knowledge-based economy requires complementarity among technology, human capital, innovation, and institutions. The coherent integration of these components can support long-term economic growth, resilience, social inclusion, and sustainable development.

The proposed composite index provides a concise assessment of Romania's position relative to the EU-27 average and to the selected economies of Central and Eastern Europe. With a KEI score of 50.57, Romania ranks last among the countries included in the analysis, remaining at a considerable distance from both the European benchmark and the other countries in the sample.

The most important finding is not merely the magnitude of this gap but its underlying structure. Romania has experienced faster economic convergence than convergence in the key structural drivers of a knowledge-based economy, namely human capital, innovation capacity, and digital skills. While GDP per capita has reached approximately 78% of the EU-27 average, relative performance remains at only 51–53% in human capital and digital skills and declines to 20.54% in research and development.

These findings suggest that the long-term sustainability of Romania's economic convergence will depend on a transition from a development model based primarily on capital accumulation, cost advantages, and the adoption of externally developed technologies towards one in which advanced education, research, digital capabilities, and domestic innovation make a substantially greater contribution to productivity growth and value creation.

The results point to the need for a coherent policy strategy aimed at narrowing the gap between GDP per capita convergence and the three structural dimensions that continue to lag: research and development, human capital, and digital skills.

The first policy priority is to increase the intensity of research and development activities. Although higher public investment is essential, it is unlikely to be sufficient on its own. It should be complemented by stronger incentives for private-sector R&D investment, enhanced collaboration between universities and businesses, more effective utilization of research infrastructure, and institutional mechanisms that facilitate the translation of scientific knowledge into innovative products, services, and production processes.

A second priority concerns the expansion and modernization of human capital. The relatively low share of young adults with tertiary educational attainment constrains both the supply of researchers and highly skilled professionals and the capacity of firms to adopt advanced technologies. Expanding access to tertiary education should therefore be accompanied by improvements in educational quality, measures to reduce university dropout rates, and closer alignment between academic programmes, technological change, and labor market demand.

The third priority relates to the enhancement of digital skills across the population. Investment in digital infrastructure alone cannot eliminate the existing gap. Comprehensive adult training programmes, the systematic integration of digital competencies into formal education, and targeted interventions addressing groups at greater risk of digital exclusion, particularly rural populations, older adults, and individuals with lower levels of educational attainment, are all required.

Ultimately, the effectiveness of public policy will depend on strengthening the complementarities among the four pillars of the knowledge economy. Investments in education are likely to generate greater economic returns when graduates are successfully integrated into research activities and innovative enterprises. Likewise, investment in research is more likely to translate into sustained economic benefits when firms and the workforce possess the digital capabilities required to adopt, diffuse, and further develop new technologies.

REFERENCES

1. European Commission, 2026, *Digital skills*, <https://digital-strategy.ec.europa.eu/en/policies/digital-skills>

2. Eurostat, 2026a, *Persons aged 25–34 with tertiary educational attainment level*. https://ec.europa.eu/eurostat/databrowser/view/sdg_04_20/default/table?lang=en&category=t_educ.t_educ_outc
3. Eurostat, 2026b, *R&D expenditure*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=R%26D_expenditure
4. Eurostat, 2026c, *Skills for the digital age*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Skills_for_the_digital_age
5. Eurostat, 2026d, *GDP per capita, consumption per capita and price level indices*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=GDP_per_capita,_consumption_per_capita_and_price_level_indices
6. OECD, 2023, *OECD reviews of innovation policy: Korea 2023*, https://www.oecd.org/en/publications/oecd-reviews-of-innovation-policy-korea-2023_bdcf9685-en.html
7. OECD, 2024, *OECD digital economy outlook 2024, volume 2: Strengthening connectivity, innovation and trust*, https://www.oecd.org/en/publications/oecd-digital-economy-outlook-2024-volume-2_3adf705b-en.html
8. OECD, 2026, *Science, technology and innovation scoreboard*, <https://www.oecd.org/en/data/datasets/science-technology-and-innovation-scoreboard.html>
9. World Bank, 2024, *Digital progress and trends report 2023*, <https://openknowledge.worldbank.org/entities/publication/7617f89d-2276-413d-b0a7-e31e7527d6af>
10. World Intellectual Property Organization, 2025, *Global Innovation Index 2025: Innovation at a crossroads*, <https://www.wipo.int/en/web/global-innovation-index/index>

STRUCTURAL CHANGES IN THE ROMANIAN LABOR MARKET: NEW OCCUPATIONAL STANDARDS FOR GREEN JOBS AND SKILLS

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ABSTRACT: *This article analyses the structural changes taking place in the Romanian labor market in the context of the green transition, digitalization and the development of the circular economy. These transformations generate new requirements for workers, employers and public institutions, especially in relation to green jobs, green skills, sustainable production, resource efficiency, renewable energy, waste management and energy-efficient construction. The aim of the article is to examine the need to update the occupational framework in Romania by introducing new occupational standards for green jobs and by strengthening the connection between labor market needs, vocational training and public employment policies. The research is based on a theoretical and descriptive approach, using specialized literature, national and European strategic documents, occupational classifications and policy reports. Special attention is given to the role of the Classification of Occupations in Romania and to its correlation with emerging green occupations, qualifications and skills. The article argues that the development of green jobs requires not only environmental policies and investment programs, but also a coherent system of qualifications and occupational standards. New standards may support the recognition of emerging professions such as circular economy specialist, green skills trainer, waste prevention specialist, recycling process technician, eco-design specialist, energy efficiency technician and sustainability reporting specialist. By linking occupations with competences and training outcomes, they can improve employability, support reskilling and prepare the Romanian workforce for future labor market demands.*

Keywords: *Romanian Labor Market, Green Jobs, Green Skills, Occupational Standards, Circular Economy*

JEL Classifications: *J21, J24, J48, Q52.*

1. INTRODUCTION

The Romanian labor market is undergoing structural transformation under the influence of digitalization, demographic change, technological innovation, the green transition and the

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circular economy. These changes affect not only the number of jobs available, but also the content of occupations, the skills required by employers and the way workers are trained and integrated into the labor market. The transition towards a more sustainable economic model has become an important driver of labor market change. Environmental protection, energy efficiency, waste reduction, renewable energy, sustainable construction and circular economy practices influence employment, education and vocational training. As a result, traditional occupations are being transformed, while new occupations are emerging in sectors connected with environmental protection and resource efficiency.

In this context, green jobs and green skills have gained increasing relevance. Green jobs refer to occupations that contribute to preserving or restoring the environment, either directly, through activities such as waste management, recycling or renewable energy, or indirectly, by integrating environmental objectives into traditional sectors. Green skills include the knowledge, abilities and attitudes needed to perform work tasks in a sustainable and environmentally responsible way.

The article analyses the structural changes affecting the Romanian labor market and highlights the need to update the occupational framework through new standards for green jobs and green skills. It argues that the green transition should be approached not only as an environmental or economic process, but as a labor market transformation requiring vocational training reform and better coordination between public authorities, employers, education providers and qualification bodies.

2. LITERATURE REVIEW

The structural transformation of labor markets has been widely analyzed in the literature on technological change, skills and employment. A relevant starting point is the task-based approach developed by Autor, Levy and Murnane, who show that technological change does not affect all jobs equally, but modifies the content of work by replacing routine tasks and increasing the demand for non-routine analytical and interpersonal skills (Autor, Levy & Murnane, 2003). This approach is also relevant for the green transition, because many occupations are not disappearing entirely, but are being transformed through new tasks, technologies and skill requirements. Similarly, Acemoglu and Autor emphasize that changes in technologies and tasks influence employment structures, wage dynamics and the demand for skills (Acemoglu & Autor, 2011).

In the context of the green transition, the concept of green jobs has become central to the relationship between employment, environmental protection and sustainable development. One of the most important reference documents is the report *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*, published by the United Nations Environment Program (UNEP), the International Labor Organization (ILO), the International Organisation of Employers (IOE) and the International Trade Union Confederation (ITUC), which argues that environmental policies can create new jobs, transform existing occupations and support decent work if they are accompanied by adequate social and labor market policies (UNEP et al., 2008). The International Labor Organization also defines green jobs as jobs that contribute to preserving or restoring the environment, either in traditional sectors such as agriculture, manufacturing and construction, or in emerging sectors such as renewable energy, waste management and environmental services (ILO, n.d.).

The literature also highlights that the green transition creates both opportunities and risks. ILO's global report on skills for a greener future show that the transition to low-carbon and resource-efficient economies requires significant reskilling and upskilling efforts, because workers need to adapt to new technologies, environmental standards and sustainable production models (ILO, 2019).

Academic studies on green employment also underline the difficulty of defining and measuring green jobs. Bowen, analyze green employment from the perspective of workforce composition and show that the “greening” of the economy affects occupations differently, depending on tasks, skills and sectoral characteristics (Bowen et al., 2018). This argument is important for the Romanian case, because green jobs are not yet clearly separated in the national occupational classification, and many of them are identified indirectly through environmental activities, circular economy sectors or EU-funded projects.

The circular economy literature is also relevant for understanding structural changes in the labor market. The OECD argues that the transition towards a resource-efficient and circular economy can influence employment by creating jobs in recycling, repair, reuse, remanufacturing and waste management, while reducing employment in more resource-intensive sectors (Chateau & Mavroeidi, 2020). In another OECD study, Laubinger, Lanzi and Chateau underline that the labor market consequences of the circular transition depend on sectoral shifts, skills availability and the capacity of public policies to support workers affected by change (Laubinger et al., 2020).

At European level, policy documents increasingly connect green jobs with skills, competitiveness and social inclusion. The Europe 2020 Strategy promoted smart, sustainable and inclusive growth, placing resource efficiency and employment among the main objectives of European development (European Commission, 2010).

The development of green skills is another major theme in the literature and in European policies. Cedefop argues that vocational education and training can support the transition from linear economic models to circular economy models by developing technical and transversal skills required for circular production and consumption (Cedefop, 2023). These skills include not only knowledge of recycling technologies, renewable energy, energy efficiency and environmental standards, but also problem-solving, systems thinking, adaptability and environmental awareness. The European Skills Agenda also emphasizes the need to support skills for the green and digital transitions, including lifelong learning, micro-credentials and closer cooperation between education systems and labor market needs (European Commission, n.d.).

The concept of just transition is essential for understanding the social dimension of labor market transformation. The OECD shows that the green transition has uneven territorial effects and may generate a “green divide” between regions, sectors and workers if it is not supported by local development policies, reskilling programmes and social protection measures (OECD, 2023). This perspective is relevant for Romania, especially in regions affected by industrial restructuring and the transition away from carbon-intensive activities.

In Romania, the policy framework for green jobs was formally developed through the National Strategy for Green Jobs 2018–2025, approved by Government Decision no. 594/2018. The strategy aimed to stimulate entrepreneurship and green job creation, improve skills for green employment and strengthen cooperation between public authorities, employers, education providers and social partners (Government of Romania, 2018). The strategy also referred to the need to identify and register green jobs, which confirms the relevance of updating the occupational framework and improving statistical monitoring.

Romania’s National Strategy on Circular Economy, approved by Government Decision no. 1172/2022, provides another important policy basis. It supports the transition from the linear economic model to a circular model based on resource efficiency, waste reduction, reuse, repair and recycling (Government of Romania, 2022). This strategy is relevant for labor market analysis because circular economy activities can generate demand for new occupations and new competences, especially in waste management, recycling, eco-design, repair, reuse, renewable energy and sustainable production.

Overall, the literature suggests that structural changes in the Romanian labor market should be analysed through the interaction between technological change, green transition, circular economy, occupational standards and vocational training. Green jobs cannot be developed only through environmental investment; they also require recognised occupations, updated qualifications and occupational standards, and a training system capable of developing certified green skills. For this reason, updating the Classification of Occupations in Romania (COR) and developing new occupational standards for green jobs represent necessary steps for adapting the Romanian labor market to future economic and environmental requirements.

3. RESEARCH METHODOLOGY

This article is based on a theoretical, descriptive and qualitative research approach, aimed at analysing the structural changes taking place in the Romanian labor market and the need for new occupational standards for green jobs and green skills. The research does not aim to test a statistical model, but to provide an analytical perspective on the relationship between labor market transformation, the green transition, occupational classification and vocational training.

The methodological approach combines several types of sources. First, the article uses academic literature on labor market transformation, technological change, green jobs, green skills, reskilling, upskilling and just transition. These sources help explain how occupations change under the influence of new technologies, environmental policies and circular economy requirements. Second, the article analyses institutional reports and policy documents issued by international and European organizations, such as the International Labor Organization, OECD, CEDEFOP, the European Commission and the European Training Foundation. These documents provide definitions, policy frameworks and comparative perspectives regarding green employment and skills development.

For the Romanian context, the research is based on national strategic documents, especially the National Strategy for Green Jobs 2018–2025, the National Strategy on Circular Economy, and relevant information regarding the Classification of Occupations in Romania (COR) and occupational standards. These sources are used to identify the extent to which Romania's institutional and qualification framework is adapted to the emergence of green jobs and green skills.

The analysis follows four main directions. The first direction refers to the identification of structural changes affecting the Romanian labor market, including digitalization, demographic change, regional disparities, skills shortages and the green transition. The second direction focuses on the emergence of green jobs and the transformation of existing occupations through environmental objectives and green skills. The third direction examines the role of occupational standards in defining competences, qualifications and training outcomes. The fourth direction analyses the need to update COR and to develop new occupational standards for green jobs.

A specific methodological element of the article is the use of a policy-oriented analytical framework. This means that the research does not only describe existing challenges, but also formulates possible policy responses. Special attention is given to the proposal of introducing new green occupations into COR and developing occupational standards for emerging professions such as Circular Economy Specialist, Green Skills Trainer, Waste Prevention Specialist, Recycling Process Technician, Eco-design Specialist, Energy Efficiency Technician, Sustainability Reporting Specialist and other related profiles.

The research also uses a comparative perspective analysis by relating the Romanian situation to European trends in green jobs, circular economy, vocational training and occupational classification. This approach is useful because Romania's labor market is

influenced by European policy objectives, EU funding programs and the broader transition towards a climate-neutral and resource-efficient economy.

The main limitation of the research is related to the availability of statistical data on green jobs in Romania. At present, Romania does not have a clearly delimited official list of green jobs, and green occupations are not systematically recorded as a separate category in labor market statistics. Therefore, the analysis relies on secondary sources, policy documents, occupational classifications and examples of emerging occupational profiles. Another limitation is that the article does not include field research, interviews or survey data collected directly from employers, training providers or public institutions.

Despite these limitations, the methodology allows a structured analysis of the need to adapt Romania's occupational framework to the green transition. By combining literature review, policy analysis and occupational standard proposals, the article provides a basis for understanding how new green occupations and green skills can support employability, vocational training and sustainable labor market development.

4. STRUCTURAL CHANGES IN THE ROMANIAN LABOR MARKET

The Romanian labor market is undergoing significant structural changes under the combined influence of digitalization, the green transition, demographic pressures, technological innovation and the gradual development of the circular economy. These transformations affect not only the number of available jobs, but also the content of work, the skills required by employers and the way occupations are defined and recognised in the national qualification system.

One of the most visible changes is the transition from traditional occupations, focused mainly on production, maintenance, administrative tasks or manual work, towards occupations that integrate environmental responsibility, digital tools, resource efficiency and sustainability criteria. In many cases, this transformation does not necessarily eliminate traditional occupations, but changes their content. For example, a construction worker increasingly needs knowledge of energy efficiency and sustainable materials, while a waste collection worker may need to understand selective collection, recycling flows and digital traceability systems.

Another important change concerns the growing demand for skills that combine technical, digital and environmental competences. Employers increasingly need workers who can operate modern equipment, understand environmental regulations, use digital monitoring systems, reduce waste, improve energy consumption and contribute to circular business models. Therefore, the Romanian labor market is moving from a model based mainly on formal qualifications and traditional job descriptions towards a model based on competences, adaptability and lifelong learning.

The circular economy plays an important role in this transformation. Activities such as recycling, repair, reuse, remanufacturing, renewable energy, sustainable construction, sustainable agriculture, green transport and environmental reporting generate new occupational profiles. At the same time, they require the updating of existing occupations and the development of new occupational standards. Without such updates, many emerging green jobs remain difficult to classify, measure and support through vocational training programmes.

A comparative view of traditional and emerging occupations shows how labor market transformation takes place across sectors connected with the circular economy.

Table 1. Traditional occupations versus emerging green and digital occupations in circular economy-related fields

Field of activity	Traditional occupations	Emerging green / digital occupations	Main new skills required
Waste management	Waste collection worker; sanitation worker; landfill operator	Waste Prevention Specialist; Waste Flow Coordinator; Digital Waste Traceability Operator	Waste prevention, selective collection, digital reporting, environmental compliance, resource efficiency
Recycling and material recovery	Recycling plant worker; sorting worker; machine operator	Recycling Process Technician; Secondary Raw Materials Quality Controller; Circular Materials Specialist	Operation of recycling technologies, material quality control, sorting systems, circular material flows
Repair and reuse services	Repair worker; mechanic; electronics repairer; furniture restorer	Repair and Reuse Coordinator; Refurbishment Technician; Reuse Centre Manager	Product life extension, refurbishment, reuse logistics, customer-oriented repair services
Manufacturing and industry	Production worker; industrial technician; maintenance worker	Circular Production Technician; Industrial Symbiosis Facilitator; Resource Efficiency Specialist	Waste reduction, cleaner production, industrial symbiosis, energy and material efficiency
Construction	Construction worker; installer; site technician; building maintenance worker	Energy Efficiency Technician; Green Building Specialist; Sustainable Materials Technician	Energy performance, thermal insulation, sustainable materials, building renovation, smart metering
Energy sector	Electrician; energy plant operator; maintenance technician	Renewable Energy Maintenance Technician; Solar PV Technician; Wind Turbine Maintenance Technician	Renewable energy systems, technical monitoring, safety standards, preventive maintenance
Agriculture	Farm worker; agricultural technician; livestock worker	Sustainable Agriculture Technician; Composting Specialist; Biomass Valorisation Technician	Organic farming, composting, soil protection, biomass use, food waste reduction
Transport and logistics	Driver; logistics operator; fleet dispatcher	Green Transport Coordinator; Electric Mobility Technician; Circular Logistics Coordinator	Low-emission mobility, charging infrastructure, reverse logistics, route optimisation
Public procurement and administration	Public procurement officer; administrative officer	Circular Public Procurement Specialist; Green Public Policy Officer	Green procurement criteria, life-cycle costing, environmental clauses, circular economy policy
Business consultancy and SMEs	Business consultant; management consultant; financial adviser	Green Transition Adviser for SMEs; Circular Economy Consultant; Sustainability Adviser	Circular business models, green financing, resource efficiency, sustainability strategy
Environmental management	Environmental officer; environmental inspector	Environmental Data Analyst; ESG and Sustainability Reporting Specialist	Environmental indicators, ESG reporting, data analysis, sustainability compliance
Education and vocational training	Vocational trainer; teacher; career counsellor	Green Skills Trainer; Green Jobs and Skills Counsellor	Green skills curricula, adult training, reskilling, career guidance for green occupations

Product design	Product designer; industrial designer	Eco-design Specialist; Life- Cycle Design Analyst	Eco-design, recyclability, reparability, life-cycle thinking, sustainable product development
Digital services for circular economy	IT technician; database operator; software support specialist	Circular Economy Digital Platform Manager; Environmental Data Systems Operator	Digital platforms, environmental databases, traceability tools, circular economy data management

Source: Author's own analysis

The table shows that structural change is not limited to the emergence of completely new occupations. In many cases, traditional jobs are being transformed by adding green and digital components. This means that workers already active in the labor market need access to reskilling and upskilling programs. For example, a maintenance technician can become a renewable energy maintenance technician, a public procurement officer can specialize in circular public procurement, and a vocational trainer can become a green skills trainer.

This transformation also creates pressure on the education and training system. Vocational schools, universities, adult training providers and employers must adapt their programs to include green competences. At the same time, public authorities need to update occupational classifications and occupational standards so that emerging green occupations become visible in labor market statistics, training programs and employment policies.

The Romanian labor market also faces a deficit of competences in several areas relevant to the green transition. These include technical skills for renewable energy and energy efficiency, operational skills for recycling and waste management, digital skills for environmental monitoring, and transversal skills such as problem-solving, adaptability and environmental awareness. The lack of these competences can slow down the development of green jobs, even when investment opportunities exist.

A specific feature of the Romanian context is that many green jobs are still identified indirectly, through sectors or projects, rather than through clearly defined occupations. This creates difficulties for employers, training providers and public institutions. Employers may need workers with green skills, but the occupational classification does not always provide clear job titles. Training providers may want to develop programs for emerging green occupations, but they need occupational standards in order to design authorized qualifications. Public authorities may support green employment through European funds, but without clear occupational references, monitoring and evaluation remain limited.

Therefore, the structural changes in the Romanian labor market require a stronger connection between economic transformation, occupational classification and vocational training.

5. OCCUPATIONAL STANDARDS AND THE NEED FOR UPDATING COR

Occupational standards play an essential role in connecting labor market needs with vocational training, certification and employment policies. They define the knowledge, skills, competences and work activities required for a specific occupation and provide a basis for developing qualification programmes. In the context of the green transition, occupational standards become particularly important because they can translate broad environmental objectives into concrete professional profiles and measurable training outcomes.

In Romania, the Classification of Occupations in Romania (COR) is the official system used for coding and identifying occupations on the labor market. It is used by employers, public authorities and statistical institutions for registering and monitoring occupations. However, COR does not currently include a distinct and coherent category of green jobs. Many

occupations with a green component are either included under traditional occupational titles or are identified indirectly through sectors such as environmental protection, waste management, renewable energy, construction, agriculture or industrial production.

By comparison, the European framework ESCO - European Skills, Competences, Qualifications and Occupations - provides a more flexible approach to occupations and skills. ESCO identifies and categorises skills, competences and occupations relevant for the European labor market and education systems. Each ESCO occupation is mapped to an ISCO-08 code and includes descriptions, scope notes and lists of knowledge, skills and competences relevant for that occupation (European Commission, n.d.). ESCO has also introduced a specific taxonomy of skills for the green transition. According to the European Commission, this green skills taxonomy includes 381 skills, 185 knowledge concepts and 5 transversal skills relevant for a greener labor market (European Commission, 2022).

This difference is important for Romania because the green transition changes not only job titles, but also the content of existing occupations. For example, a construction technician may need energy efficiency skills, a public procurement officer may need circular procurement competences, and a maintenance technician may need knowledge of renewable energy systems. Therefore, updating COR and developing new occupational standards should not focus only on creating new job titles, but also on recognizing the green transformation of existing occupations.

The need for better correlation between COR and ESCO is already visible. The National Authority for Qualifications provides information on ESCO and its use in Romania, and mapping work between COR and ESCO has already been developed (ANC, n.d.). This creates a useful starting point for identifying occupations with green tasks and green skills. However, the mapping should be further developed specifically for green jobs, by distinguishing between fully green occupations, partially green occupations and occupations in transition.

A comparative analysis between ESCO and the Romanian occupational framework shows several gaps and possible directions for improvement.

Table 2. Comparative analysis between ESCO and the Romanian occupational framework for green jobs

Criterion	ESCO framework	Romanian framework: COR and occupational standards	Gap / need for improvement
General approach	Integrated classification of occupations, skills, competences and qualifications relevant for the EU labor market	COR mainly classifies occupations by codes and titles; occupational standards are managed separately	Romania needs stronger integration between occupations, skills and training standards
Green skills recognition	ESCO includes a green skills taxonomy with 381 skills, 185 knowledge concepts and 5 transversal skills	Green skills are not systematically labelled across COR occupations	Need to introduce green skill labels or green competence descriptors in occupational standards
Occupation description	Each occupation includes descriptions, scope notes and relevant knowledge, skills and competences	COR mainly provides occupational codes and titles; detailed competence requirements depend on occupational standards	Need to link COR occupations more clearly with occupational standards and competence profiles
Mapping with ISCO-08	Each ESCO occupation is mapped to one ISCO-08 code	COR is also built in relation to international occupational classifications, but practical green mapping is limited	Need to use ISCO/ESCO mapping to identify green occupations in COR

Criterion	ESCO framework	Romanian framework: COR and occupational standards	Gap / need for improvement
Green jobs category	ESCO does not create only one separate “green jobs” group, but identifies green skills and green-related occupations through skills and tasks	Romania does not have a separate official green jobs category in COR	Need to create a national green jobs framework based on tasks, skills and sectors
Emerging occupations	ESCO allows the identification of emerging skills and occupations connected with the green transition	Some emerging occupations are absent or insufficiently defined in COR	Need to introduce or update occupations such as Circular Economy Specialist, Green Skills Trainer, Waste Prevention Specialist
Use in training	ESCO supports the connection between labor market needs, qualifications and education	Romanian occupational standards are used for adult training and certification, but green standards are fragmented	Need to develop new occupational standards for green jobs and update existing ones with green skills
Statistical visibility	ESCO can support European comparability of occupations and skills	Green jobs are difficult to measure in Romania because they are not clearly separated in official classifications	Need to improve statistical monitoring of green employment
Policy relevance	ESCO supports European skills policies, digital platforms and labor mobility	COR supports national labor administration, employment contracts and statistical reporting	Need to align COR updates with European green transition policies and funding programmes
Adaptability	ESCO can be updated to reflect new skills and labor market trends	COR updates are formal and may be slower in relation to emerging green occupations	Need for a faster mechanism to introduce green occupations and update standards

Source: Author's own conception

The table shows that Romania already has an institutional basis for occupational classification and qualification development, but the current framework is not sufficiently adapted to the green transition. The main limitation is that green jobs remain administratively and statistically less visible. This affects not only labor market monitoring, but also the design of training programmes, the allocation of European funds and the capacity of employers to recruit workers with certified green skills.

A first necessary step is the development of a national green jobs mapping exercise, based on COR, ESCO and ISCO-08. This mapping should identify occupations that already include green tasks, occupations that require additional green competences and new occupations that should be introduced into COR. It should also distinguish between three categories: fully green occupations, partially green occupations and occupations in transition. Fully green occupations would include jobs directly linked to environmental protection, circular economy and renewable energy. Partially green occupations would include traditional jobs that integrate green competences. Occupations in transition would include jobs affected by decarbonization, digitalization and circular economy requirements.

A second step is the updating of existing occupational standards. Many occupations in construction, agriculture, industry, transport, public administration and services can be updated by adding green competences. For example, occupational standards for construction workers and technicians should include energy efficiency, sustainable materials and building renovation. Standards for public procurement officers should include circular procurement and life-cycle costing. Standards for trainers should include the design and delivery of green skills programs.

A third step is the introduction of new occupations and occupational standards for emerging green jobs. These may include occupations such as Circular Economy Specialist, Green Skills Trainer, Waste Prevention Specialist, Recycling Process Technician, Repair and Reuse Coordinator, Energy Efficiency Technician, Eco-design Specialist, Circular Public Procurement Specialist, Sustainability Reporting Specialist, Environmental Data Analyst, Circular Logistics Coordinator and Industrial Symbiosis Facilitator.

A fourth step is linking new occupational standards with vocational training and certification. Once new green occupations are defined, authorized training providers can develop qualification programs. This would help workers acquire certified green skills and would support employers in recruiting qualified staff. It would also make green jobs more visible in employment services, EU-funded projects and labor market statistics.

Therefore, updating COR and developing new occupational standards should be considered a strategic policy measure for Romania. It would improve the recognition of green jobs, support vocational training, increase the number of qualified workers and strengthen the connection between the green transition and labor market development. In this way, occupational standards can become an operational tool for transforming environmental objectives into concrete employment and qualification outcomes.

6. PROPOSED NEW OCCUPATIONAL STANDARDS FOR GREEN JOBS

The development of new occupational standards for green jobs should be directly connected to the structural changes of the Romanian labor market, the requirements of the circular economy and the need to increase the number of workers with certified green skills. These standards should define not only job titles, but also the competences that trainees must acquire through vocational training programs.

The proposed standards below are not intended to replace existing environmental occupations, but to complement them by covering emerging areas such as circular economy management, waste prevention, recycling technologies, repair and reuse, energy efficiency, eco-design, circular procurement, sustainability reporting and green career guidance.

Table 3. Proposed new occupational standards for green jobs and competences to be acquired by trainees

No.	Proposed occupational standard	Main field	Competences to be acquired by trainees
1	Circular Economy Specialist	Circular economy management	Understanding circular economy principles; analyzing material and resource flows; identifying waste prevention and reuse opportunities; designing circular business models; preparing circular economy action plans; monitoring circular economy indicators
2	Green Skills Trainer	Vocational training and adult education	Designing training programs for green skills; delivering courses on sustainability and circular economy; assessing trainees' green competences; adapting training content to labor market needs; using interactive and digital training methods
3	Waste Prevention Specialist	Waste prevention and resource efficiency	Developing waste prevention plans; identifying sources of waste in organizations; applying reuse and reduction strategies; monitoring resource consumption; supporting compliance with waste legislation; promoting responsible consumption

No.	Proposed occupational standard	Main field	Competences to be acquired by trainees
4	Recycling Process Technician	Recycling and material recovery	Operating recycling equipment; sorting and processing recyclable materials; applying quality control procedures for secondary raw materials; respecting environmental and safety standards; using digital tools for waste traceability
5	Repair and Reuse Coordinator	Repair, reuse and product life extension	Organising repair and reuse activities; coordinating repair centers or reuse networks; evaluating products for reuse or refurbishment; managing second-hand and refurbished goods flows; promoting product life extension
6	Renewable Energy Maintenance Technician	Renewable energy	Performing maintenance of solar, wind or biomass systems; monitoring energy production equipment; identifying technical faults; applying safety procedures; supporting preventive maintenance and operational efficiency
7	Energy Efficiency Technician	Energy efficiency in buildings and industry	Monitoring energy consumption; supporting energy audits; identifying energy losses; applying energy efficiency measures; using smart metering systems; preparing basic energy performance reports
8	Eco-design Specialist	Sustainable product design	Applying life-cycle thinking in product design; reducing material and energy use; improving product durability, reparability and recyclability; selecting sustainable materials; integrating environmental criteria into design processes
9	Circular Public Procurement Specialist	Public procurement and circular economy	Developing green and circular procurement criteria; applying life-cycle costing; evaluating environmental clauses in public contracts; promoting recycled, reusable and energy-efficient products; monitoring contract compliance with sustainability criteria
10	Sustainability Reporting Specialist	ESG and environmental reporting	Collecting and analyzing environmental data; preparing sustainability and ESG reports; monitoring environmental indicators; understanding reporting standards; supporting organizational transparency and compliance
11	Environmental Data Analyst	Environmental monitoring and digitalization	Collecting environmental data; using digital monitoring tools; analysing indicators related to waste, energy, emissions and resources; preparing dashboards and reports; supporting evidence-based environmental decisions
12	Circular Logistics Coordinator	Reverse logistics and circular supply chains	Organizing reverse logistics flows; coordinating collection, return and redistribution systems; optimizing transport for recyclable and reusable products; managing traceability of returned materials; reducing logistics-related environmental impact
13	Green Transition Adviser for SMEs	Business consultancy and green transformation	Advising SMEs on circular economy practices; identifying green investment opportunities; supporting access to European funds; proposing resource efficiency measures; helping companies comply with environmental requirements

No.	Proposed occupational standard	Main field	Competences to be acquired by trainees
14	Industrial Symbiosis Facilitator	Circular industrial cooperation	Identifying opportunities for by-product exchange between companies; facilitating cooperation between industrial actors; reducing industrial waste; supporting circular industrial networks; monitoring environmental and economic benefits
15	Green Jobs and Skills Counsellor	Employment services and career guidance	Advising workers and jobseekers on green career pathways; identifying training needs for green jobs; supporting reskilling and upskilling; connecting beneficiaries with training providers and employers; promoting green employability

Source: Author's own proposal for new Occupational standards

These proposed occupational standards would help create a clearer connection between the labor market, vocational training and green transition policies. Each standard should include learning outcomes, required knowledge, practical skills, transversal competences, assessment methods and possible employment sectors. This would allow training providers to develop authorized programs and would help employers identify workers with certified green competences.

The introduction of such occupational standards could also support the updating of the Classification of Occupations in Romania (COR). Some of the proposed occupations may require new COR codes, while others could be introduced as specializations or updated profiles within existing occupational groups. For example, Energy Efficiency Technician could be linked to construction and energy-related occupations, while Circular Public Procurement Specialist could be connected to administrative and procurement occupations.

A key advantage of these standards is that they would make green skills more visible and measurable. At present, many workers perform green tasks without being officially recognized as green workers. By defining specific competences for green occupations, Romania could improve labor market statistics, better design vocational training programs and increase the number of qualified workers able to support the circular economy.

In addition, the proposed standards could support the use of European funds for green employment. Projects financed through programs related to education, employment, regional development, just transition, circular economy and climate action often require measurable outputs, including trained persons, new qualifications or jobs created. Clear occupational standards would make these outputs easier to define, monitor and evaluate.

7. PUBLIC POLICY RECOMMENDATIONS

The development of green jobs and green skills in Romania requires a coherent public policy framework that connects labor market transformation, occupational standards, vocational training and European funding. The green transition cannot be supported only through environmental strategies or investment programs; it also requires an institutional mechanism capable of defining new occupations, certifying competences and preparing workers for emerging labor market needs.

The main public policy recommendations are the following:

- Create an interinstitutional working group for green jobs and green skills;
- Map COR with ESCO from the perspective of green jobs and green skills;
- Develop new occupational standards for emerging green jobs;
- Update existing occupational standards by integrating green competences;

- Develop authorized vocational training programs for green jobs;
- Use European funds more effectively for green skills and green employment;
- Create stronger partnerships between universities, employers, ANC and ANOFM.
- Develop a national monitoring system for green jobs and green skills;

Overall, public policies should treat green jobs not only as an environmental issue, but as a strategic labor market priority. Updating COR, developing occupational standards, financing authorized training and building institutional partnerships are essential measures for preparing Romania's workforce for the green transition. These actions would increase employability, support circular economy development and create a clearer pathway for workers to acquire certified green skills.

8. CONCLUSIONS

The analysis carried out in this article shows that the Romanian labor market is undergoing significant structural changes under the combined influence of digitalization, demographic pressures, technological innovation, the green transition and the development of the circular economy. These changes affect not only the number of jobs, but also the content of occupations, the skills required by employers and the way workers are trained, certified and integrated into the labor market.

The article highlights that green jobs and green skills should be understood as key elements of this transformation. Green jobs are not limited to new occupations in environmental sectors, but also include traditional occupations that are gradually transformed through environmental standards, resource efficiency, digital tools and circular economy practices. Therefore, the transition from traditional occupations to green and digital occupations requires a stronger connection between employment policies, vocational training and occupational standards.

A central conclusion of the article is that Romania needs to update its occupational framework in order to better reflect the changes generated by the green transition. Although the Classification of Occupations in Romania remains the official instrument for identifying and coding occupations, it does not currently provide a distinct and coherent framework for green jobs. This limits the statistical visibility of green employment and makes it more difficult to design targeted training programmes and public policies.

The comparative analysis between ESCO and the Romanian occupational framework shows the need for a more integrated approach to occupations, skills and qualifications. ESCO provides a flexible model by linking occupations with skills, competences and green transition requirements, while the Romanian system still separates occupational classification from occupational standards and training outcomes. A national mapping between COR, ESCO and green skills would therefore be necessary in order to identify fully green occupations, partially green occupations and occupations in transition.

The proposed new occupational standards, such as Circular Economy Specialist, Green Skills Trainer, Waste Prevention Specialist, Recycling Process Technician, Energy Efficiency Technician, Eco-design Specialist, Circular Public Procurement Specialist and Sustainability Reporting Specialist, can support the professionalization of emerging green activities. These standards would define the competences to be acquired by trainees and would help training providers develop authorized qualification programs adapted to labor market needs.

The article also shows that the development of green jobs cannot be achieved only through environmental strategies or investment programs. It requires a coherent institutional mechanism involving public authorities, employers, universities, vocational training providers, ANC, ANOFM and sectoral committees. Public policy should focus on creating an interinstitutional working group, mapping COR with ESCO, updating existing occupational

standards, developing new standards, financing authorized vocational training and creating a national monitoring system for green jobs and green skills.

In conclusion, adapting the Romanian labor market to the green transition requires the recognition, classification and certification of emerging green occupations. Updating COR and developing new occupational standards are practical and necessary measures for increasing employability, supporting reskilling and upskilling, improving statistical monitoring and preparing the Romanian workforce for future economic and environmental challenges. In this way, green jobs and green skills can become not only an environmental priority, but also a strategic direction for labor market modernization and sustainable development in Romania.

REFERENCES

1. Acemoglu D. & Autor D. (2011), *"Skills, Tasks and Technologies: Implications for Employment and Earnings"*. In: Card D. & Ashenfelter O. (Eds.), *Handbook of Labor Economics*, Vol. 4, Part B, Amsterdam: Elsevier, pp. 1043–1171. [https://doi.org/10.1016/S0169-7218\(11\)02410-5](https://doi.org/10.1016/S0169-7218(11)02410-5)
2. ANC (n.d.), *ESCO and the national qualifications framework - National Qualifications Authority*, available at: <https://www.anc.edu.ro>
3. Autor D.H., Levy F. & Murnane R.J. (2003), *"The Skill Content of Recent Technological Change: An Empirical Exploration"*, *The Quarterly Journal of Economics*, vol. 118, issue 4, pp. 1279–1333
4. Bowen A., Kuralbayeva K. & Tipoe E.L. (2018), *"Characterising Green Employment: The Impacts of "Greening" on Workforce Composition"*, *Energy Economics*, vol. 72, pp. 263–275. <https://doi.org/10.1016/j.eneco.2018.03.015>
5. Cedefop (2023), *From linear thinking to green growth mindsets. Vocational education and training and skills as springboards for the circular economy*, Luxembourg: Publications Office of the European Union
6. Chateau J. & Mavroeidi E. (2020), *"The jobs potential of a transition towards a resource efficient and circular economy"*, OECD Environment Working Papers, No. 167, Paris: OECD Publishing
7. European Commission (2010), *Europe 2020: A strategy for smart, sustainable and inclusive growth*, COM(2010) 2020 final, Brussels: European Commission
8. European Commission (2019), *The European Green Deal*, COM(2019) 640 final, Brussels: European Commission
9. European Commission (2020), *A new Circular Economy Action Plan: For a cleaner and more competitive Europe*, COM(2020) 98 final, Brussels: European Commission
10. European Commission (2022), *Green skills for the twin transition: ESCO taxonomy update*, Brussels: European Commission, available at: <https://esco.ec.europa.eu>
11. European Commission (n.d.), *European Skills Agenda and ESCO – European Skills, Competences, Qualifications and Occupations*, available at: <https://esco.ec.europa.eu>
12. European Environment Agency (2024), *Circular economy country profile 2024 – Romania*, Copenhagen: EEA, available at: <https://www.eea.europa.eu>
13. Eurostat (n.d.), *Circular Economy Monitoring Framework*, available at: <https://ec.europa.eu/eurostat>
14. Ghita-Mitrescu S. (2025), *"Mapping Romania's progress towards a circular economy using the Eurostat Monitoring Framework"*, *Ovidius University Annals of Constanta - Series Civil Engineering* 26(1), pp. 156-164. [54](https://revista-</div><div data-bbox=)

- constructii.univ-ovidius.ro/wp-content/uploads/2025/05/10641-Volume26_Issue_1-18_paper.pdf
15. Government of Romania (2018), *National Strategy for Green Jobs 2018–2025*, approved by Government Decision no. 594/2018, Bucharest: Government of Romania
 16. Government of Romania (2022), *National Strategy on Circular Economy*, approved by Government Decision no. 1172/2022, Bucharest: Government of Romania
 17. ILO (2019), *Skills for a Greener Future: A Global View*, Geneva: International Labour Organization
 18. ILO (n.d.), *Green Jobs*, International Labour Organization, available at: <https://www.ilo.org/global/topics/green-jobs>
 19. Laubinger F., Lanzi E. & Chateau J. (2020), *"Labour market consequences of a transition to a circular economy: A review paper"*, OECD Environment Working Papers, No. 162, Paris: OECD Publishing
 20. OECD (2023), *"Job Creation and Local Economic Development 2023. Bridging the great green divide"*, Paris: OECD Publishing
 21. Pintilie N. (2021), *"Measuring the Progress Towards Circular Economy in European Union Countries"*, Business Excellence and Management, vol. 11, issue 1, pp 19-35.
 22. UNEP, ILO, IOE, ITUC (2008), *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*, Nairobi: UNEP/ILO/IOE/ITUC

EASTERN EUROPE: A KEY NEARSHORING HUB FOR SECURE WESTERN SUPPLY CHAINS

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ABSTRACT: *Amid ongoing global disruptions (including geopolitical tensions and trade fragmentation), businesses are increasingly prioritising supply chain security and flexibility. Eastern European countries, members of the European Union, have emerged as strategic nearshoring destinations for Western companies seeking to strengthen supply chain resilience and security while maintaining efficiency. The present analysis tries to identify the ongoing trends revealed in the specialised studies investigating the challenges of global supply chains following the COVID-19 pandemic, confirmed by the recent data of the Regional Integration and Value Chains Analyser (RIVA) developed by the United Nations Economic and Social Commission for Asia and the Pacific. The Eastern European region's advantages (including geographic proximity to Western Europe, cost-competitive labour, and a highly skilled workforce, particularly in manufacturing, engineering, and IT services) enable shorter lead times, lower transportation costs, and improved coordination compared with offshore locations in Asia. As a consequence, the robust industrial ecosystems, supported by investments in infrastructure and digitalisation, and strengthened by foreign direct investment, can enable Eastern European countries to become a nearshoring hub within the reconfiguration of global supply chains, offering Western European companies a balanced alternative that mitigates risk while maintaining competitiveness.*

Keywords: *Global Supply Chains, Nearshoring, Eastern Europe, Resilience, Geopolitical Tensions*

JEL Classification: *F23, F43, F51, O14*

1. INTRODUCTION

Driven by the compounding impact of the COVID-19 pandemic and escalating geopolitical tensions, the global supply chains are undergoing a fundamental transformation (Eurostat, 2025). The recent climate of instability has served as a stress test, revealing the inherent vulnerabilities within long-distance supply chains. Consequently, companies are fundamentally rethinking the global operating models that prevailed for thirty years (OECD, 2021; Liu et al, 2022). The dominant business paradigm historically centred on lean, efficiency-oriented frameworks; specifically, the *just-in-time* model was widely adopted to optimise costs by minimising inventory holdings. However, the pandemic and subsequent geopolitical tensions (including Russian-Ukrainian and Middle East conflicts, as well as new United States trade policy changes) exposed the inherent risks of this optimisation-heavy approach. By creating critical single points of failure, these models ensured that localised disruptions, such

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as factory access in Asia, could paralyse the global production cycle. Consequently, companies are adopting *just-in-case* strategies. By increasing safety stock, they are better equipped to mitigate supply chain volatility and remain responsive to sudden market fluctuations (Banton, 2025). By shifting the focus *from cost-efficiency towards resilience and security*, businesses are increasingly adopting inventory-heavy models to insulate operations against future shortages and market instability.

A key component of this shift is the adoption of *nearshoring* as a strategic risk hedge (Eurostat, 2025). By relocating production closer to the final consumer market, companies can considerably reduce transit times, lower freight costs, and simplify logistics. This approach has gained significant momentum as companies recognise the vulnerability of long-haul routes, such as the Suez Canal or trans-Pacific lanes, to geopolitical and environmental disruptions. Consequently, companies are moving towards regionalising their operations, with businesses in the United States (US) investing in Mexico, which surpassed China as the US's top trading partner in 2023, while European firms increasingly turned to Eastern Europe and North Africa to shorten their supply loops (Maihold, 2025; Brainhub, 2025).

2. NEARSHORING AMONG THE RECONFIGURATION STRATEGIES IN THE TENSIONED GEOECONOMIC CONTEXT

In the post-pandemic geoeconomic climate, characterised by intensifying geopolitical tensions, supply chain fragility, and a focus on national security, multinational corporations and governments have reconfigured global trade and investment through their strategies and policies. Consequently, the traditional just-in-time model, which prioritised cost efficiency above all else, is replaced by a just-in-case approach that emphasises resilience, reliability, and security.

Among the reconfiguration strategies, the shifting of manufacturing or service operations to countries geographically closer to the target markets has emerged, namely, *nearshoring* (Platas-López & Cruz-Mejia, 2025). The main drivers of this strategy are maintaining cost advantages while significantly reducing shipping times and transit risks. However, besides its benefits, such as easier management of logistics, faster response to market demand shifts, and lower carbon footprints associated with long-distance freight, the nearshoring strategy is accompanied by challenges related to the necessity of significant infrastructure capacities in the new host countries, as well as investments to ensure reliability and the complexity of local regulatory environments.

As a response to concerns about economic coercion (including export controls and trade sanctions) and to mitigate the risk of geopolitical leverage by adversaries, *friendshoring* (or ally-shoring) has emerged as a strategy concentrating on supply chain networks within countries that share similar political, economic, and security values (Canosa, 2024; Guhathakurta, 2022). Among the friendshoring benefits are increased stability, alignment on labour and environmental standards, and reduced risk of sudden trade disruptions caused by diplomatic fallout. At the same time, this strategy comes with challenges, the most important being related to the limits of the pool of potential partners and suppliers, which can lead to higher prices and possibly slower innovation cycles due to a more closed ecosystem.

The aims to reduce logistical vulnerability, gain control over critical technologies, and the need to protect intellectual property have created the conditions for *reshoring* strategies, the movement of business operations, primarily manufacturing, back to the company's home country (Fane, 2023). The shortened supply chains, increased oversight, and potential alignment with national industrial policy incentives (as is the case with the US Chips Act) (Kurilla, 2024) are the main benefits of this strategy, also accompanied by the higher labour

and operational costs compared to offshore locations, and a potential shortage of domestic skilled labour or raw materials as its major challenges.

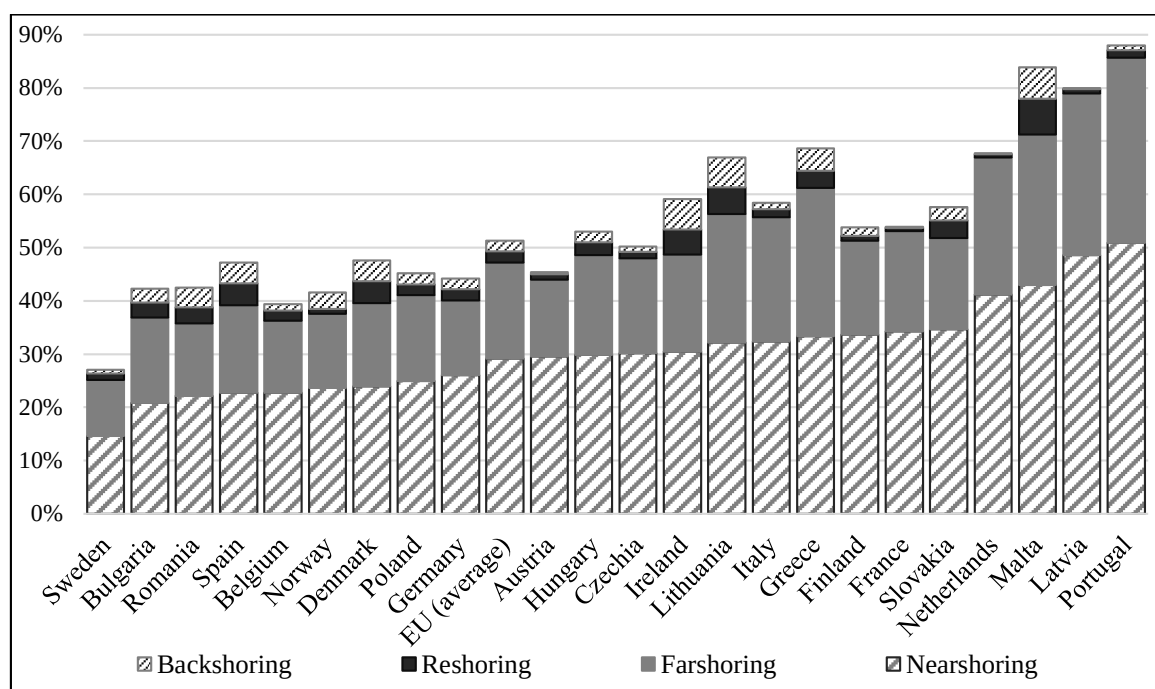
All these strategies are seen as a structural shift toward *glocalisation*, a term created to describe the current fragmented global trade system in which security takes precedence over efficiency (Chhaya, 2026). In terms of fragmentation, global trade tends to move increasingly towards regional blocs sharing common ideologies. At the same time, governments are increasingly acting as architects of supply chains through subsidies, tariffs, and trade agreements, as is the case with the Regional Comprehensive Economic Partnership (ASEAN, 2021) and the European Union - Mercosur Agreement (EC, 2026a), signalling an end to the era of purely market-driven globalisation with policy intervention. Another strategy followed by companies has been the *China Plus One*, where many firms are not fully exiting global markets but are diversifying by maintaining a presence in China while adding capacity in countries such as Vietnam, India, or Mexico to hedge against systemic shocks (FedEx, 2026).

Summarising, the landscape of global supply chain reconfiguration starting with the end of the pandemic crisis has been defined by a *transition from efficiency-first to security-first operations*. Driven by the new US tariff regimes since 2025, geopolitical instability, and the artificial intelligence-led infrastructure boom, companies are actively diversifying their business footprints.

3. NEARSHORING AMONG THE RECONFIGURATION STRATEGIES OF THE EUROPEAN COMPANIES

The European Union's industrial landscape is undergoing a significant reconfiguration of its value chains. Companies are moving away from traditional, *high-distance models* in favour of strategies designed to *strengthen security*. This shift is characterised by a concerted effort to fortify key maritime and land routes while simultaneously cutting back on the logistical risks inherent in relying on distant suppliers (Eurostat, 2025). Faced with constraints in their global value chains, European companies are pursuing a range of strategic pivots. As highlighted in Figure 1, *the most significant shift is towards regionalisation and nearshoring*. This approach involves reorienting production and strengthening supply-side partnerships with countries in closer geographic proximity. The implementation of a *nearshoring* strategy acts as a direct replacement for the more geographically distant, traditional far-shoring frameworks that historically defined external European business partnerships. As companies move to repatriate critical functions, two more strategies have emerged: *reshoring* (returning outsourced activities to domestic partners) and *backshoring* (bringing outsourced activities back to the company). While these practices remain a smaller share of overall activity, they denote a crucial pivot in the way companies approach the management and domestic control of their core operations. Beyond mere cost considerations, European enterprises are increasingly focused on *resilience*, strengthening supply chains by diversifying reliable partners and maintaining larger inventory buffers. Furthermore, they are integrating advanced digital technologies to foster a more transparent and efficient value chain infrastructure (Eurostat, 2025).

Figure 1. Comparative analysis of nearshoring and alternative strategic models, adopted by European companies, during 2021-2023 (% of total companies)



Note: Countries are ordered by the value recorded for nearshoring.

Source: Author's representation based on Eurostat (2025).

As shown in the data in Figure 1, from 2021 to 2023, *European companies prioritised nearshoring over far-shoring*, with the former accounting for 29.2% of strategic implementations compared to just 18% for the latter. A distinct trend has emerged among companies headquartered in Western Europe, marked by a clear strategic move toward nearshoring operations. Evidence suggests a structural transition in European supply chain management, as nearshoring increasingly displaces far-shoring as the preferred strategy for regionalising operations. The increasing preference for nearshoring over far-shoring signals a strategic shift as firms prioritise supply chain resilience and risk management. The strategic relocation of supply bases, closer to points of origin or end-market demand, serves as a critical buffer, shielding businesses from the compounding pressures of logistical bottlenecks and geopolitical uncertainty. Furthermore, the cautious adoption of backshoring and reshoring underscores the logistical complexity and capital requirements associated with repatriation. The transition of specialised functions, whether to internal operations or domestic partners, represents a major structural undertaking that necessitates extensive long-term planning (Eurostat, 2025).

In response to recent economic disruptions and heightened geopolitical instability, European firms have increasingly adopted nearshoring strategies. Their effects are driving a structural realignment, fundamentally altering the investment and trade environment throughout Europe and beyond. Navigating this era of global instability has led companies to prioritise security over pure efficiency. This trend marks a critical recalibration, where the once-dominant focus on low-cost global sourcing is increasingly balanced against the necessity of a stable, secure supply chain (WB, 2025).

Data examining the strategic orientation of European companies, between 2021 and 2023, was primarily determined by their response to external shocks, specifically the pandemic, geopolitical instability, and the energy crisis, as they sought to strengthen the robustness of their global value chains (Eurostat, 2025). The evidence reveals a multifaceted set of pressures

reshaping industry, including heightened costs for energy and raw materials, significant transportation and logistical delays, and chronic material shortages. Compounding these are the long-term disruptions from the pandemic, the operational impact of EU environmental policy, and the economic fallout resulting from sanctions against the Russian Federation.

4. NEARSHORING IN EASTERN EUROPEAN COUNTRIES - A STRATEGIC DECISION CONSIDERING THE GLOBAL VALUE CHAINS' CONSTRAINTS

Despite the challenging post-pandemic economic landscape, Eastern European economies have demonstrated significant resilience. Characterised by strong growth (EC, 2026b) and a three-decade commitment to free trade and international investment, their economic environment provides a stable foundation that significantly enhances their appeal as a *nearshoring hub*. A significant strategic transformation is currently defining the Eastern European economic landscape. The region is steadily distancing itself from its historical reliance on Western industrial sectors, such as the German automotive and manufacturing core, in favour of higher-value-added activities. Through the development of competitive finished goods, these economies are evolving to challenge established markets on the global stage (Bonin, 2025). While Eastern Europe has seen substantial real convergence with Western European economies since European Union (EU) accession, maintaining this growth trajectory will require sustained structural reform to reinforce the region's competitiveness for long-term investment.

An analysis of the operations of Western European multinational enterprises within global value chains offers critical insights into the nature of European integration. Specifically, it reveals the extent of the EU's reliance on extra-EU linkages, which have historically been driven by cost-competitiveness. As firms adopt new corporate strategies, the resulting economic implications will be profound. These findings provide a framework for EU member states to better align their investment, trade, and sustainability policies with the realities of modern global production networks.

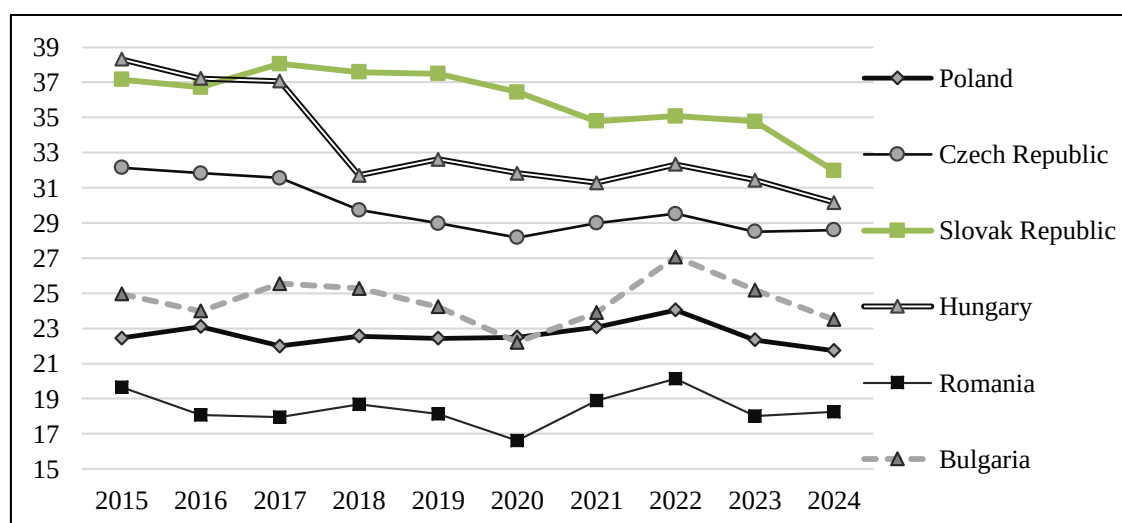
The regional integration and value chains analyzer (RIVA) developed by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) provides critical insights into how countries integrate into global value chains, highlighting how national strategies are evolving in response to current geopolitical pressures.

Our analysis focuses on six Eastern European EU member states, namely Poland, the Czech Republic, the Slovak Republic, Hungary, Romania, and Bulgaria. These countries have achieved a spectacular catch-up process since joining the EU (2004 for the first four, 2007 for Romania and Bulgaria). They have significantly narrowed the gross domestic product (GDP) per capita gap with Western European peers, with Poland, in particular, having emerged as the regional growth leader, with its economy doubling in size since its accession (Kalasopatan Antoine, 2024; Kulbacki, 2026). The region has also transformed from a low-cost manufacturing base to a hub of cognitive and high-skilled labour. Today, the percentage of high-skilled workers in these countries is comparable to that of Western Europe, supported by strong performance in science, technology, engineering, and mathematics (STEM) and information technology (IT) sectors (Gajewska, 2026). In terms of their integration into international trade and global value chains, countries like the Czech Republic and the Slovak Republic are among the most open economies in the EU, with exports accounting for a massive share of their GDP, often driven by the automotive sector. Poland and Romania, by contrast, maintain more balanced models where domestic demand plays a larger role in driving growth (Kalasopatan Antoine, 2024). Historically, these economies established themselves through fabrication and assembly tasks within European value chains (often led by German, Austrian,

and French companies). While this provided the foundation for their industrialisation, a key current challenge is moving up the value chain from simple assembly to research and development, innovation, and higher-value services to escape the middle-income trap.

Considering the RIVA database, these countries are currently adapting to a new strategic environment characterised by nearshoring, leveraging geographical proximity to Western Europe to attract production shifts away from Asia. At the same time, they are focused on increasing the role of the IT sector to move beyond traditional assembly-line manufacturing. Available data up to 2024 does not yet reflect the full impact of recently announced nearshoring initiatives (Figure 2). Accordingly, between 2015 and 2024, all six Eastern European economies experienced slight fluctuations in their *foreign value-added* shares, ultimately trending downward by the end of the decade. Despite these adjustments, relative rankings across the region stayed unchanged. The Slovak Republic presented the highest reliance on foreign inputs in 2024, with foreign value-added representing 31.97% of gross exports, marking a notable decrease from the 38.05% peak observed in 2017. At the other end of the spectrum, Romania reported the lowest figure, with foreign value-added comprising 18.24% of its gross exports. The data reveal a distinct regional split, with the Slovak Republic and Hungary exhibiting a much greater dependence on imported inputs for exports compared to the more self-contained production models of Romania and Poland (Figure 2).

**Figure 2. Foreign value added in CEE exports, during 2015-2024
(% of gross exports)**



Source: Author's representation based on UNESCAP (2026).

The foreign value-added (FVA) component of exports, a key metric for assessing backward linkages, quantifies *the extent to which imported inputs are integrated into domestic production*. This measure further identifies which specific export sectors maintain the highest dependence on foreign-sourced intermediate goods. Moreover, the source of these inputs reveals which economies are most central to the value-added composition of Eastern Europe's export sectors (UNESCAP, 2026). The foreign value-added component of exports provides critical insight into the upstream structure of domestic industries. It captures the value of imported intermediate inputs embedded within Eastern European exports, thereby measuring the intensity of these sectors' dependence on global supply chain linkages (WTO, 2026). Quantifying foreign value-added serves to characterise the integration of Eastern European economies as assembly and processing hubs. Although this status cements their role as critical links in global production networks, it simultaneously exposes a structural weakness; their

downstream position renders them particularly vulnerable to shocks within upstream supply chains.

Regarding the foreign value added embedded in exports, data in Table 1 illustrates the sectoral representativeness for the analysed Eastern European economies, alongside their principal trade partners, in 2024. An analysis of RIVA database metrics *highlights the persistent dominance of transport and electrical equipment within the FVA structures of Eastern European exports*. This pattern is consistent across the region, excluding Bulgaria, where basic metals emerge as the most significant contributor to export value. The data presented in Table 1 underscores the role of these economies as essential nodes within European value chains (EVCs) across the identified sectors. *Germany's structural dominance* is evident in the RIVA data, where it emerges as the top trading partner for every analysed Eastern European economy, contributing the highest share of foreign value-added through backward trade linkages.

Table 1. Eastern European countries: foreign value added in exports, top positions, by sectors and partners, in 2024 (%; USD million)

Countries	Sectors			Partners		
	Sectors	Share of foreign value-added in sectoral gross exports (%)	Value (USD billion)	Partners	Share of gross exports (%)	Value (USD billion)
Poland	Electrical equipment	15.6	16.2	Germany	3.3	15.6
	Transport equipment	13.1	13.6	China	2.2	10.3
	Food and beverages	9.7	10.0	The United States	1.6	7.8
Czech Republic	Transport equipment	38.1	26.2	Germany	5.1	12.4
	Electrical equipment	17.9	12.3	China	2.7	6.4
	Chemicals	9.3	6.4	Poland	2.2	5.3
Slovak Republic	Transport equipment	41.3	16.0	Germany	4.7	5.7
	Electrical equipment	12.4	4.8	Czech Republic	2.5	3.1
	Basic metals	8.2	3.2	China	2.3	2.7
Hungary	Transport equipment	27.4	13.8	Germany	5.5	9.1
	Electrical equipment	22.6	11.4	China	2.3	3.8
	Food & beverages	9.8	4.9	The United States	1.9	3.1
Romania	Transport equipment	19.3	4.8	Germany	2.7	3.7
	Electrical equipment	12.4	3.1	Italy	1.4	1.9
	Inland transport	10.6	2.6	China	1.1	1.5
Bulgaria	Basic metals	14.8	2.2	Turkiye	2.0	1.3
	Petroleum and nuclear	11.7	1.7	Germany	1.7	1.1
	Food & beverages	9.1	1.3	China	1.6	1.0

Source: Author's representation based on UNESCAP (2026).

The quantitative assessment of foreign value-added offers a critical lens on Eastern Europe's integration into global production networks. As Table 1 shows, *these economies remain deeply reliant on European value chains, strengthening their strategic position to navigate and benefit from the accelerating trends of nearshoring and regionalisation*. Amid heightened geopolitical instability and disrupted Asia-Europe trade corridors, the imperative for supply chain resilience has intensified. Against this backdrop, the deep integration of Eastern European economies with Germany, which serves as a vital bridge to Asian markets, underscores the region's growing strategic importance within contemporary global production networks.

The strategic expansion of nearshoring initiatives within Eastern Europe necessitates a granular approach that accounts for the region's diverse industrial specialisations, measured

through domestic value-added, and the geographic orientation of their existing trade linkages (Table 2). An analysis of the RIVA database underscores a *sectoral heterogeneity within the domestic value added of Eastern European economies*. The regional composition is marked by a reliance on basic metals in Bulgaria, Poland, and the Slovak Republic; transport equipment in Hungary and the Czech Republic; and business services in Romania, which stands out as the primary contributor to its export value. According to the RIVA database, *Germany maintains a position of structural dominance* across the region. It consistently serves as the principal trading partner for all analysed Eastern European economies, representing the most significant destination for their domestic value-added via forward linkages (Table 2).

Table 2. Eastern European countries: domestic value added in exports, top positions, by sectors and partners, in 2024 (%; USD million)

Countries	Sectors			Partners		
	Sectors	Share of domestic value-added in sectoral gross exports (%)	Value (USD billion)	Partners	Share of gross exports (%)	Value (USD billion)
Poland	Basic metals	14.5	15.1	Germany	5.0	24.0
	Business services	12.0	12.5	Netherlands	1.6	7.4
	Wholesale trade	9.8	10.1	Czech Republic	1.4	6.6
Czech Republic	Transport equipment	12.8	8.8	Germany	4.5	10.7
	Basic metals	7.3	5.0	Slovak Republic	1.7	4.2
	Electrical equipment	6.8	4.7	Poland	1.2	2.9
Slovak Republic	Basic metals	7.9	3.1	Czech Republic	2.6	3.2
	Business services	5.8	2.2	Germany	2.4	2.9
	Real estate	5.7	2.2	Austria	1.8	2.2
Hungary	Transport equipment	9.0	4.5	Germany	3.4	5.7
	Business services	7.1	3.6	Austria	1.2	2.0
	Electrical equipment	6.7	3.4	Italy	1.0	1.7
Romania	Business services	21.6	5.4	Germany	3.8	5.2
	Inland transport	15.8	3.9	Netherlands	1.8	2.5
	Transport equipment	13.3	3.3	Italy	1.8	2.5
Bulgaria	Basic metals	15.0	2.2	Germany	3.4	1.2
	Business services	10.7	1.6	Italy	1.3	0.84
	Wholesale trade	7.5	1.1	Romania	1.3	0.79

Source: Author's representation based on UNESCAP (2026).

In evaluating the region's potential for nearshoring relocation, our investigation identifies specialised industrial advantages underpinned by the foreign and domestic value-added profiles shown in Tables 1 and 2. Leveraging the benefits of EU integration, regulatory alignment, and proximity to Western European markets, the six economies are differentiated by the following key particularities. (i) Functioning as a central economic pillar for the region, Poland possesses a multifaceted value proposition characterised by advanced logistics, significant market scale, and an evolving reputation as a strategic focal point for innovation, specifically within the domains of research and development, artificial intelligence, and digital infrastructure (Cushman & Wakefield, 2023; Dębska-Pastakia, 2024; Nazarevich, 2025). (ii) Characterised by its profound integration into the European automotive and high-tech value chains, the Czech Republic maintains a strong competitive advantage, driven by its advanced industrial ecosystems and high-calibre engineering expertise (Savills News, 2024; Prague Daily, 2026). (iii) The Slovak Republic serves as a specialised node in the automotive sector, distinguishing itself as a highly competitive location for industrial activities characterised by

high-precision requirements and a reliance on advanced technical labour (EBRD, 2026; Orka Group, 2025; EC, 2026c). (iv) Hungary's industrial profile is characterised by a significant concentration in electronics and battery technologies, a position reinforced by strategic government incentives and a policy framework aimed at supply chain diversification (Bennett, 2026; REFU Hungary, 2024). (v) Romania has emerged as a highly competitive destination, distinguished by its robust IT and business process outsourcing sectors alongside expanding industrial capacity, particularly for firms seeking cost-efficient, EU-integrated talent (Sima, 2024; Arnia Software, 2026; Orka Group, 2025). (vi) Bulgaria is becoming an increasingly attractive destination for businesses seeking lower operational overheads within the European Union, driven by its highly competitive cost structure and a rapidly expanding tech-services sector (EU Legal Gateway, 2026; Ganswindt, 2026).

5. CONCLUSIONS

The strategic shift toward nearshoring in Eastern Europe is founded on value-added integration, characterised by sustained Western companies' investment in local supplier ecosystems and human capital. Beyond the benefits of logistical proximity, the region provides a buffer against supply chain volatility. Nevertheless, this transition is constrained by emerging structural pressures, most notably wage inflation and intensified competition for skilled labour. To remain competitive in the current landscape, European companies are increasingly prioritising automation, digitalisation, and specialised manufacturing, supported by investments in AI-driven production lines and sophisticated, tech-enabled services.

The present reconfiguration of global value chains signifies an evolution toward regionalised and resilient production networks rather than a contraction of global trade. Eastern Europe is uniquely positioned at the centre of this transformation, offering a strategic pathway to bolster European industrial and digital infrastructure. As the focus shifts from basic nearshoring to an era defined by strategic partnerships, high-level technical specialisation, and systemic resilience, the Eastern Europe region is effectively moving from a marginal participant to a primary driver of long-term European competitiveness. In conclusion, from a business perspective, Eastern Europe has become a core component of the European footprint rather than just a peripheral support location. For the region itself, its economic integration provides a mechanism to climb the value chain, shifting from simple assembly to more complex technical roles, which ultimately reinforces its economic strategic relevance within the EU.

REFERENCES

1. Arnia Software. (2026). Why Romania Is a Leading Software Outsourcing Destination in 2026. <https://www.arnia.com/why-romania-is-a-leading-software-outsourcing-destination-in-2026/>.
2. Association of Southeast Asian Nations (ASEAN). (2021). Regional Comprehensive Economic Partnership (RCEP) agreement to enter into force on 1 January 2022. <https://asean.org/regional-comprehensive-economic-partnership-rcep-to-enter-into-force-on-1-january-2022/>.
3. Banton, C. (2025). Understanding Just in Case Inventory Strategy: Benefits & Examples. <https://www.investopedia.com/terms/j/jic.asp>.
4. Bennett, V. (2026). EBRD finances landmark solar and battery project in Hungary. <https://www.ebrd.com/home/news-and-events/news/2026/ebrd-finances-landmark-solar-and-battery-project-in-hungary.html>.
5. Brainhub. (2025). Nearshoring - Eastern Europe: Best countries. <https://brainhub.eu/library/nearshoring-eastern-europe-top-locations>.

6. Canosa, J. (2024). Supply Chains: An Analysis of Nearshoring and Friendshoring Trends.
<https://www.proquest.com/docview/3060834724/F4BEE46143004156PQ/3?source-type=Scholarly%20Journals>.
7. Chhaya, S. (2026). Geopolitical Fragmentation and the Rewiring of Global Trade.
<https://atlasinstitute.org/geopolitical-fragmentation-and-the-rewiring-of-global-trade/>.
8. Cushman & Wakefield (2023). Nearshoring shifts the focus of business to Poland.
<https://industrial.pl/en/news/reports/684-nearshoring-shifts-the-focus-of-business-to-poland>.
9. Dębska-Pastakia, M. (2024). Poland Emerges as Prime Nearshoring Hub: Growing Potential for Foreign Investment in Central Poland.
<https://kpmg.com/pl/en/media/media-press-lodz-poland-emerges-as-prime-nearshoring-hub.html>.
10. EU Legal Gateway. (2026). ICT Mobility & Relocation Intelligence Report — Bulgaria. <https://www.eulegalgateway.com/countries/bulgaria>.
11. European Bank for Reconstruction and Development (EBRD). (2026). Regional Economic Prospects in the EBRD Regions.
12. European Commission (EC). (2026a). EU-Mercosur agreement.
https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/mercosur/eu-mercosur-agreement_en.
13. European Commission (EC). (2026b). Spring 2026 Economic Forecast: Slowdown in growth as energy shock drives up inflation. https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/economic-forecasts/spring-2026-economic-forecast-slowdown-growth-energy-shock-drives-inflation_en.
14. European Commission (EC). (2026c). EU Member States – Macroeconomic and Fiscal Surveillance and Country Reports. https://economy-finance.ec.europa.eu/economic-surveillance-eu-member-states/country-pages-including-country-reports_en.
15. Eurostat. (2025, December). Global value chain disruptions and enterprise responses in the EU. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Global_value_chain_disruptions_and_enterprise_responses_in_the_EU#Highlights.
16. Fane, B. (2023). In the spotlight: Reshoring vs offshoring in a geopolitically uncertain and fragmented world. <https://www.digital-science.com/blog/in-the-spotlight-reshoring-vs-offshoring/>.
17. FedEx (2026). China Plus One: A Guide to Diversifying Supply Chains.
<https://www.fedex.com/en-vn/small-business/streamline-operations/china-plus-one-strategy-guide.html>.
18. Gajewska, A. (2026). Macroeconomic insights for decision making in Central and Eastern Europe. Taking a fresh look at the CEE growth story.
<https://cee.pwc.com/cee-in-the-spotlight/introduction-to-the-cee-growth-story.html#:~:text=Economic%20restructuring%20in%20CEE%20during,as%20in%20Western%20European%20countries>.
19. Ganswindt, A. (2026). Why Bulgaria Is a Strategic Nearshore Location for Software Development. <https://www.nearshorefriends.com/nearshoring-in-bulgaria-guide/>.
20. Guhathakurta, R. (2022). Friendshoring: Logic, Focused Sectors and Skepticism.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4281545.
21. Kalasopatan Antoine, C. (2024). Central Europe: a fairly successful integration.
<https://economic-research.bnpparibas.com/html/en-US/Central-Europe-fairly->

- successful-integration-7/15/2024,49793#:~:text=For%20the%20other%20countries%20in,strong%20convergence%20with%20developed%20countries.
22. Kulbacki, M. (2026). Central and Eastern Europe's growth map. <https://xyz.pl/poland-unpacked/central-and-eastern-europes-growth-map-3726/>.
 23. Kurilla, M. (2024). What Is the CHIPS Act? <https://www.cfr.org/articles/what-chips-act>.
 24. Liu, X. et al. (2022). The Trade Impact of the Covid-19 Pandemic. *World Economics* 45: 3751–3779. <https://onlinelibrary.wiley.com/doi/abs/10.1111/twec.13279>.
 25. Maihold, G. (2025). Mexico – From a Short Nearshoring Boom to US “Security-shoring”. <https://www.swp-berlin.org/publikation/mexico-from-a-short-nearshoring-boom-to-us-security-shoring>.
 26. Nazarevich, D. (2025). Nearshoring software development to Poland: 2026 rates & key insights. <https://innowise.com/blog/software-nearshoring-to-poland/>.
 27. Organisation for Economic Co-operation and Development (OECD). (2021). Global value chains: Efficiency and risks in the context of COVID-19. https://www.oecd.org/en/publications/global-value-chains-efficiency-and-risks-in-the-context-of-covid-19_67c75fdc-en.html.
 28. Orka Group. (2025). Exploring Nearshoring in Europe: Key Drivers and Industry Impacts. <https://orka-group.eu/blog/industry-insights/nearshoring-in-europe-key-drivers/>
 29. Platas-López, A. and Cruz-Mejia, O. (2025). The Nearshoring Loop: A Review of Triggers, Location Choice, and Captured Outcomes. https://www.researchgate.net/publication/398965288_The_Nearshoring_Loop_A_Review_of_Triggers_Location_Choice_and_Captured_Outcomes.
 30. Prague Daily. (2026). Automotive Industry in the Czech Republic Benefits from the Trend Towards Electrified Vehicles. <https://www.pragedaily.news/2026/06/18/automotive-industry-in-the-czech-republic-benefits-from-the-trend-towards-electrified-vehicles/>.
 31. REFU Hungary. (2024). Why Nearshoring in Hungary Makes Business Sense. <https://refu.hu/en/manufacturing-nearshoring-hungary/>.
 32. Savills News. (2024). The Czech Republic is among the top global destinations for industrial occupiers looking to ‘nearshore’ supply chains. <https://www.savills.ag/insight-and-opinion/savills-news/366284/the-czech-republic-is-among-the-top-global-destinations-for-industrial-occupiers-looking-to--nearshore--supply-chains>.
 33. Sima, F. (2024). Nearshoring to Romania: a strategic opportunity for businesses. <https://www.cegeka.com/ro/blogs/nearshoring-to-romania-a-strategic-opportunity-for-businesses>.
 34. United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). (2026). Regional Integration and Value Chain Analyzer. <https://riva.negotiatetrade.org/#/backwardlinkages> (accessed June 29, 2026).
 35. World Trade Organization (WTO). (2026). Trade in Value Added and Global Value Chains. Country profiles explanatory notes. https://www.wto.org/english/res_e/statis_e/miwi_e/explanatory_notes_e.pdf#:~:text=Foreign%20value%2Dadded%20content%20of%20exports%20corresponds%20to,intermediate%20or%20final%20goods/services%20to%20be%20exported.

EFFICIENT FUND MANAGEMENT IN ROMANIAN SOCIAL ENTERPRISES A DETERMINING FACTOR OF COMMUNITY SOCIAL CHANGE

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ABSTRACT: *The social economy has become an increasingly important component of sustainable development and socio-economic inclusion strategies due to its capacity to address economic and social objectives simultaneously. Within this framework, social enterprises contribute to the labour market integration of vulnerable groups, the provision of social services, and the strengthening of local communities. However, the extent to which these organisations generate measurable community outcomes depends largely on how effectively they manage available financial resources.*

This study examines the relationship between fund management efficiency and the capacity of Romanian social enterprises to generate community-level social change. A quantitative research design was employed, combining descriptive statistical techniques with panel econometric modelling based on data collected from active Romanian social enterprises during the period 2020–2025. The analysis focuses on the influence of financial resource efficiency, profit reinvestment practices, the employment of vulnerable persons, and funding diversification on community social performance.

The research develops an integrated analytical framework that combines financial and social dimensions within a single empirical model. By linking indicators of organisational sustainability with measures of community outcomes, the study provides evidence regarding the mechanisms through which financial resource management contributes to the achievement of social objectives. The findings indicate that efficient resource allocation, the reinvestment of financial surpluses, and diversified funding structures are associated with stronger community-level results and greater organisational sustainability.

The study contributes to the growing literature on the social economy and social entrepreneurship by providing empirical evidence on the relationship between fund management practices and community development outcomes. Beyond its academic contribution, the research offers practical insights for managers, policymakers, and

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practitioners involved in designing strategies aimed at strengthening the long-term sustainability and effectiveness of social enterprises in Romania.

Keywords: *Social Economy; Social Enterprises; Fund Management; Social Impact; Community Development; Panel Econometric Analysis*

JEL Classification *L31; D24; H43; O15; R11*

1. INTRODUCTION

Growing social inequalities, labour market transformations, and the increasing vulnerability of certain population groups have renewed interest in the social economy as a mechanism capable of combining economic efficiency with social value creation [4, 11]. In recent years, this field has attracted increasing attention from both researchers and policymakers due to its contribution to sustainable development, social inclusion, and territorial cohesion. Organisations operating within this sector pursue economic activities while simultaneously addressing social needs, contributing to job creation, the provision of social services, and the socio-economic integration of vulnerable groups [5, 13].

The expansion of the social economy has accelerated across the European Union, where it is increasingly recognised as an important component of inclusive and sustainable growth strategies. According to recent European policy documents, the sector includes millions of organisations and employs more than 13 million people, accounting for approximately 6% of total employment within the European Union [5]. Within this ecosystem, social enterprises occupy a distinctive position because they use market-based activities to achieve social objectives and generate collective benefits rather than maximise private profit [6].

In Romania, the development of the social economy has been supported by both European initiatives and the gradual consolidation of the national institutional framework. These developments have encouraged the emergence of new forms of social entrepreneurship and strengthened the role of social enterprises in promoting labour market inclusion and local development [8, 15]. An important milestone was the adoption of Law No. 219/2015 on Social Economy, which established the legal framework for recognising and supporting social enterprises and work-integration social enterprises. The legislation also defined the fundamental principles governing the sector and created favourable conditions for expanding activities dedicated to the socio-professional integration of vulnerable persons.

For social enterprises, economic performance and social mission are closely interconnected. Sustainable financial results make it possible to expand social programmes, develop community interventions, and increase the number of beneficiaries served. Consequently, the benefits generated at the community level depend not only on the availability of financial resources but also on the efficiency with which those resources are managed. From this perspective, fund management represents a strategic organisational function that directly influences both long-term sustainability and the scale of social outcomes achieved [1, 13].

One of the main challenges faced by social enterprises is maintaining an effective balance between social mission and economic sustainability. Unlike conventional businesses, whose primary objective is profit maximisation, social enterprises must allocate limited financial resources in ways that ensure organisational viability while responding to identified social needs [13, 14]. In practice, the management of financial resources influences the number of vulnerable persons integrated into the labour market, the diversity of services delivered, and the organisation's capacity to implement long-term projects capable of generating lasting community benefits.

Recent research highlights the growing importance of financial management within the social economy ecosystem. Access to funding and the efficient use of available resources are increasingly recognised as key determinants of organisational development and social performance [13]. At the same time, social impact measurement has become an essential component of organisational management, enabling social enterprises to demonstrate the value they create, improve accountability, and attract support from public authorities, investors, and philanthropic organisations [4, 13].

In Romania, the sector has expanded significantly following the implementation of European-funded programmes dedicated to employment promotion and social inclusion. Recent studies indicate that Romanian social enterprises actively support the labour market integration of vulnerable groups and contribute to local development through services that generate tangible community benefits [8, 15, 16]. Nevertheless, organisational performance differs considerably across enterprises, depending on managerial capacity, access to resources, and the efficiency with which financial resources are utilised. These differences suggest that fund management may represent a decisive factor in determining the level of social impact achieved.

Despite the growing body of literature dedicated to social economy organisations, empirical evidence concerning the relationship between fund management and community-level social change remains relatively limited. Existing studies often focus on institutional, legal, or social dimensions, while quantitative and econometric analyses remain comparatively scarce, particularly in the Romanian context [13, 17]. As a result, there is still insufficient evidence regarding the extent to which efficient financial management contributes to the achievement of measurable social outcomes.

Against this background, the present study examines the influence of fund management efficiency on the community social impact generated by Romanian social enterprises. Using a quantitative approach based on descriptive statistical analysis and panel econometric modelling for the period 2020–2025, the research investigates the relationships between financial resource efficiency, organisational performance, and community-level outcomes. By simultaneously analysing the financial and social dimensions of social enterprises, the study contributes to a better understanding of the mechanisms through which financial management can support community development and social change. Furthermore, the findings provide empirical evidence that may support the design of public policies aimed at strengthening the sustainability and social impact of the Romanian social economy sector.

2. LITERATURE REVIEW

Social Economy and the Contribution of Social Enterprises to Community Development

The social economy occupies a distinct position between the public sector and the conventional market economy. Organisations operating within this sphere engage in economic activities while prioritising the creation of social and community benefits. In the academic literature, these organisations are generally characterised by their capacity to address collective needs through market-based activities and by their commitment to reinvesting financial surpluses in support of their social mission [6]. This approach differentiates social enterprises from conventional businesses, where economic performance is primarily pursued as an end in itself rather than as a means of achieving broader social objectives.

Over the past decade, increasing attention has been directed towards the role of the social economy in addressing poverty, social exclusion, and territorial disparities. Across Europe, organisations operating in this field have become active participants in local

development initiatives, employment programmes, and community-based services designed to improve the living conditions of vulnerable populations.

The European Commission identifies the social economy as one of the pillars of the European social model, emphasising its contribution to employment creation, social cohesion, and sustainable development [5]. Likewise, the OECD argues that organisations operating in this sector generate both economic and social benefits by creating opportunities for disadvantaged groups and responding to unmet community needs through innovative solutions [13].

The Romanian experience reflects many of these developments. Organisations such as *Ateliere Fără Frontiere* have developed labour market integration programmes for individuals facing social and economic vulnerability, while *ADV România* has become actively involved in social entrepreneurship initiatives, employment services, and socio-economic inclusion projects. These examples illustrate how social enterprises can transform economic resources into concrete and measurable benefits for local communities.

Recent studies increasingly associate the social economy with the emergence of more resilient and inclusive development models. In this context, social enterprises are recognised not only as providers of services but also as drivers of social innovation, local resilience, and sustainable territorial development [3, 9]. Their contribution extends beyond direct economic activity, influencing community participation, social cohesion, and the capacity of local actors to respond to emerging social challenges.

Within this ecosystem, social enterprises occupy a distinctive position because they combine entrepreneurial principles with clearly defined social objectives. According to Borzaga et al. [2], these organisations operate as hybrid entities that use market mechanisms to generate collective and community benefits. Their operational model is based on generating income through economic activities and reinvesting a substantial share of profits into programmes and services that support social well-being.

As a consequence, the performance of a social enterprise cannot be evaluated exclusively through financial indicators. A comprehensive assessment must also consider its contribution to beneficiaries, the quality of services provided, and the broader effects generated within the communities in which it operates.

Research published after 2020 consistently demonstrates that social enterprises contribute to community development through a variety of economic and social mechanisms. These contributions are documented both in academic studies and in reports produced by international organisations actively involved in promoting the social economy. The principal perspectives identified in the literature are summarised in Table 1.

Table 1. Perspectives on the Contribution of Social Enterprises to Community Development

Author/Institution	Main Analytical Focus	Identified Contribution
Defourny & Nyssens	Social enterprise model	Combining economic and social objectives and reinvesting financial surpluses in community-oriented activities
OECD	Social economy and social inclusion	Integration of vulnerable groups and creation of economic opportunities for communities

Author/Institution	Main Analytical Focus	Identified Contribution
Borzaga et al.	Social enterprises and the labour market	Job creation and reduction of social exclusion
OECD	Social impact	Generation of measurable social benefits for individuals and communities
European Commission	Sustainable development and social economy	Contribution to social cohesion, employment, and inclusive local development
Lambru	Social economy in Romania	Socio-professional integration of vulnerable persons and development of community services
Lambru & Petrescu	Impact of the social economy in Romania	Strengthening social inclusion and community development at the local level

Source: Author's elaboration based on the literature review [6], [13], [2], [5], [8], [15]

The evidence synthesised in Table 1 reveals a broad consensus regarding the contribution of social enterprises to community development. Although individual studies emphasise different dimensions of their activities—including labour market integration, community service provision, local economic development, or the reduction of social exclusion—they converge on the view that social enterprises represent important agents of social change at the local level. The literature also suggests that the outcomes generated by these organisations depend not only on their ability to mobilise resources but also on how effectively those resources are allocated and transformed into social benefits.

Recent research indicates that the contribution of social enterprises extends well beyond the delivery of social services. Their activities support the accumulation of social capital, encourage local entrepreneurial initiatives, and create opportunities for community engagement [7, 14]. These findings are consistent with contemporary approaches to community development, which associate social enterprises with employment creation, service innovation, and stronger local networks.

A growing body of evidence shows that organisations operating within the social economy foster cooperation among local stakeholders, strengthen trust-based relationships, and encourage citizen participation in development processes [15, 16]. Through the mobilisation of local resources and the active involvement of beneficiaries, social enterprises contribute to social cohesion and enhance the capacity of communities to respond to economic and social challenges.

In Romania, the evolution of the social economy has been influenced by both European policy developments and the implementation of programmes financed through European Structural and Investment Funds. Research conducted by Lambru [12] and Lambru and Petrescu [13] highlights the increasingly important role played by Romanian social enterprises in the socio-professional integration of vulnerable individuals and in the provision of services with a direct community impact. At the same time, the scale of these outcomes varies considerably across organisations, reflecting differences in managerial capacity, resource availability, and the socio-economic characteristics of the communities in which they operate.

The sector has also benefited from interventions financed through the European Social Fund Plus (ESF+), which have supported the creation and consolidation of social enterprises, the development of professional competencies, and the integration of vulnerable groups into the labour market. These initiatives have contributed to expanding the organisational capacity of the sector and increasing its visibility within local development processes.

Taken together, the studies reviewed indicate that social enterprises simultaneously generate economic value and social benefits for the communities in which they operate. However, their capacity to produce lasting social change depends largely on the resources they can access and, more importantly, on how effectively those resources are managed. For this reason, understanding the relationship between fund management and social impact becomes essential for explaining the mechanisms through which social enterprises contribute to local development. This issue is explored in the following section.

Fund Management, Organisational Sustainability and Social Impact

A clearly defined social mission, while essential, is not sufficient to ensure meaningful and lasting outcomes. The ability of an organisation to generate community-level benefits also depends on the availability of resources and the effectiveness with which they are allocated and managed. In the literature, organisational sustainability is commonly associated with the capacity to maintain activities over time, respond to beneficiaries' needs, and produce social outcomes without undermining economic viability [5, 13]. For social enterprises, this challenge is particularly complex because they must simultaneously pursue financial stability and social objectives.

To sustain their operations, social enterprises need to generate revenue through economic activities. However, financial performance is not the ultimate purpose of these organisations. Instead, economic resources provide the foundation for expanding social programmes, improving service delivery, and increasing the number of beneficiaries reached. From this perspective, financial sustainability represents a prerequisite for the fulfilment of social objectives rather than an end in itself. Existing research consistently identifies access to stable funding as one of the main conditions for strengthening organisational capacity and increasing social impact. In the absence of adequate financing mechanisms, many organisations encounter difficulties in maintaining services and extending their interventions within local communities [4, 12].

Defourny and Nyssens [6] argue that the success of a social enterprise should be evaluated according to its ability to transform economic resources into sustainable social benefits. Building on this perspective, several studies identify fund management as one of the key determinants of organisational sustainability. Bengo, Calderini, and Chiodo [1] demonstrate that organisations implementing effective financial planning and expenditure-monitoring systems tend to achieve higher levels of organisational stability and stronger social outcomes. Their findings suggest that financial efficiency should be assessed not only through profitability indicators but also through the capacity to utilise available resources in support of the organisation's mission.

Another important dimension concerns the diversification of funding sources. OECD research [15] indicates that organisations combining commercial revenues with grants, public funding, social investments, and alternative financing mechanisms are generally more resilient to economic fluctuations and better equipped to adapt to changes in their operating environment. A diversified funding structure reduces dependence on a single source of income and creates favourable conditions for the implementation of long-term social initiatives.

One of the defining characteristics of social enterprises is the reinvestment of financial surpluses for community benefit. Resources generated through economic activities are frequently directed towards social services, educational programmes, employment initiatives, and activities targeting vulnerable groups. Unlike conventional businesses, where profits are primarily distributed to owners or shareholders, social enterprises allocate a substantial proportion of their surplus to the expansion of services and the achievement of social objectives [5]. As a result, the efficiency with which available resources are managed directly influences

both the scale of social outcomes generated and the organisation's capacity to respond to complex community needs.

These mechanisms can also be observed at the local level. In the municipality of Râmnicu Sărat, social enterprises such as MED Event Coffee SRL and NOMAD Food & Restaurant SRL use market-based activities to support social objectives and facilitate the socio-professional integration of vulnerable individuals. Their experience illustrates how economic resources can be transformed into tangible benefits for local communities and demonstrates the practical relevance of efficient fund management within the social economy sector.

The importance of financial sustainability is also reflected in the priorities established through the Inclusion and Social Dignity Programme 2021–2027, which assigns a central role to the development of the social economy and the promotion of socio-economic inclusion among vulnerable groups. Within this framework, strengthening the financial capacity of social enterprises is regarded as a fundamental condition for maintaining and expanding community-level social outcomes over the long term.

Taken together, the literature suggests that organisational sustainability within social enterprises is a multidimensional concept shaped by financial, managerial, and social factors. The main dimensions identified by previous studies are summarised in Table 2.

Table 2. Dimensions of Social Enterprise Sustainability and the Role of Fund Management

Sustainability Dimension	Main Characteristics	Contribution of Fund Management
Financial Sustainability	Revenue stability and self-financing capacity	Efficient resource planning and diversification of funding sources
Organisational Sustainability	Continuity of activities and development of institutional capacity	Efficient allocation of resources and cost control
Social Sustainability	Maintenance and expansion of impact on beneficiaries	Reinvestment of resources into social programmes and services
Community Sustainability	Strengthening local development and social cohesion	Financing activities with direct effects on the community

Source: Author's elaboration based on the literature review [1], [13], [5]

The information presented in Table 2 demonstrates that fund management influences multiple dimensions of organisational performance simultaneously. The efficient use of financial resources contributes not only to economic stability but also to an organisation's capacity to generate lasting social and community benefits. As a result, the sustainability of social enterprises should be examined through an integrated perspective that combines both economic and social dimensions of performance.

This view is increasingly reflected in the contemporary social economy literature, where scholars emphasise the importance of combining financial and social indicators within organisational evaluation frameworks [5, 15]. Such an approach provides a more comprehensive understanding of organisational sustainability by capturing both resource efficiency and the outcomes generated for beneficiaries and local communities. Evidence from previous studies suggests that organisations capable of monitoring these dimensions

simultaneously tend to achieve stronger development trajectories and greater success in attracting external funding.

The growing attention devoted to social impact measurement has further strengthened the connection between financial management and organisational performance. OECD reports [15] emphasise that impact assessment supports managerial decision-making, improves transparency, and increases the confidence of funders, public authorities, and social investors. In this context, the relationship between fund management efficiency and social performance has become an increasingly relevant topic for researchers and policymakers interested in strengthening the social economy ecosystem.

A similar trend can be observed among Romanian social enterprises, where the assessment of social outcomes is progressively incorporated into managerial practices and resource allocation decisions [16]. The capacity to demonstrate measurable social value has become an important competitive advantage, particularly in environments characterised by increasing competition for public funding, grants, and social investment opportunities.

Evidence from the analysed organisations shows the existence of a positive relationship between the efficient utilisation of financial resources and the ability of social enterprises to generate social impact and contribute to community development. However, empirical evidence remains relatively limited, especially in emerging economies and within the Romanian social economy sector. Most existing studies focus on conceptual, institutional, or policy-related aspects, while quantitative analyses capable of measuring the effects of financial management on social outcomes remain comparatively scarce.

This gap highlights the need for further empirical investigation using statistical and econometric approaches capable of capturing organisational dynamics over time. Addressing this limitation may contribute to a better understanding of the mechanisms through which financial resources are transformed into measurable social outcomes and community benefits. These considerations provide the basis for identifying the research gap and formulating the hypotheses presented in the following subsection.

Research Gap and Hypotheses Development

The literature reviewed consistently identifies social enterprises as important contributors to community development through the socio-economic integration of vulnerable groups, the provision of community-oriented services, and the strengthening of social cohesion. At the same time, contemporary research emphasises the importance of financial sustainability in ensuring the continuity of organisational activities and enhancing the social outcomes generated by these organisations [1, 15].

A substantial body of recent research reports a positive association between financial performance and social performance within social enterprises. Organisations characterised by stable financial resources and effective management practices generally demonstrate a greater capacity to expand services, reach larger numbers of beneficiaries, and implement interventions capable of generating meaningful community-level outcomes [5, 15]. Nevertheless, the results reported across different countries and organisational settings remain heterogeneous, suggesting that the relationship between financial management and social impact is strongly influenced by contextual factors.

Although existing studies provide valuable insights into the sustainability of social economy organisations, empirical evidence concerning the direct relationship between fund management and community social impact remains fragmented, particularly in emerging economies and in the countries of Central and Eastern Europe [9, 18]. Much of the available literature focuses on conceptual, institutional, legal, or governance-related aspects of social

enterprises, while comparatively fewer studies examine the measurable effects of financial resource management on social performance through quantitative methods.

The Romanian context illustrates this limitation particularly well. Research conducted to date has primarily explored the legislative framework of the social economy, socio-professional inclusion mechanisms, and the contribution of social enterprises to local development [12, 13]. While these studies have significantly improved understanding of the sector's social functions, only limited attention has been devoted to analysing how fund management efficiency influences community-level social outcomes. Moreover, most available investigations rely on descriptive approaches and provide only limited evidence regarding causal or statistically significant relationships between financial management practices and social performance.

Another gap concerns the methodological approaches employed in the analysis of social enterprises. The application of panel-data techniques remains relatively uncommon despite their ability to combine cross-sectional and longitudinal information within a single analytical framework. Compared with cross-sectional analyses or single-period observations, panel models allow researchers to capture organisational heterogeneity and temporal dynamics simultaneously. This characteristic is particularly relevant in the social economy sector, where social impact emerges gradually and is shaped by both organisational characteristics and long-term resource allocation decisions.

Against this background, the present study seeks to contribute to the literature by examining the relationship between fund management efficiency and community social impact within Romanian social enterprises. Its main contribution lies in the integration of financial and social indicators into a panel econometric framework capable of capturing the effects of resource utilisation over time. By combining organisational and temporal dimensions, the study provides empirical evidence regarding the mechanisms through which financial resources are transformed into measurable social outcomes.

To synthesise the conclusions derived from previous research and establish the theoretical foundation of the proposed econometric model, Table 3 presents the principal research directions identified in the literature and their implications for the current study.

Table 3. Literature Synthesis and Research Directions

Research Examined in the Literature	Area in the	Main Conclusions	Implications for the Current Research
Social economy and community development		Social enterprises contribute to social inclusion and social cohesion	Need to measure community-level impact
Financial sustainability		Resource stability influences the continuity of social activities	Need to evaluate fund management efficiency
Social performance		Social impact can be measured through specific indicators	Construction of a community social impact index
Financial resource management		Efficient use of funds contributes to superior organisational outcomes	Testing the relationship between financial efficiency and social impact

Research on Romania	Predominantly descriptive and institutional approaches	Need for a panel econometric model
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Source: Author's elaboration based on the literature reviewed.

Based on the conclusions drawn from the literature, the following research hypotheses are formulated:

- H1: Fund management efficiency positively influences the community social impact generated by social enterprises. This hypothesis is based on the assumption that organisations using their financial resources more efficiently are better able to transform these resources into social benefits for local communities.
- H2: The profit reinvestment rate positively influences the level of community social impact. In social enterprises, the reinvestment of financial surpluses represents one of the main mechanisms through which new services and opportunities for beneficiaries are developed.
- H3: Diversification of funding sources positively contributes to the sustainability and social performance of social enterprises. Organisations relying on multiple funding sources benefit from greater adaptability and an increased capacity to implement long-term social interventions.
- H4: The number of vulnerable persons integrated into socio-professional activities positively influences the level of community social change generated by social enterprises. This hypothesis reflects one of the core missions of the social economy, namely the integration of vulnerable groups into productive economic and social activities.

The literature reviewed points to a clear connection between fund management efficiency and community social impact. This connection is shaped by organisations' capacity to reinvest available resources, diversify funding sources, and facilitate the socio-professional integration of vulnerable individuals. Together, these mechanisms influence the extent to which economic resources can be transformed into measurable social outcomes and long-term community benefits.

To examine these relationships empirically, the following section presents a quantitative research design based on statistical and econometric analyses of panel data collected from Romanian social enterprises during the period 2020–2025.

3. RESEARCH METHODOLOGY

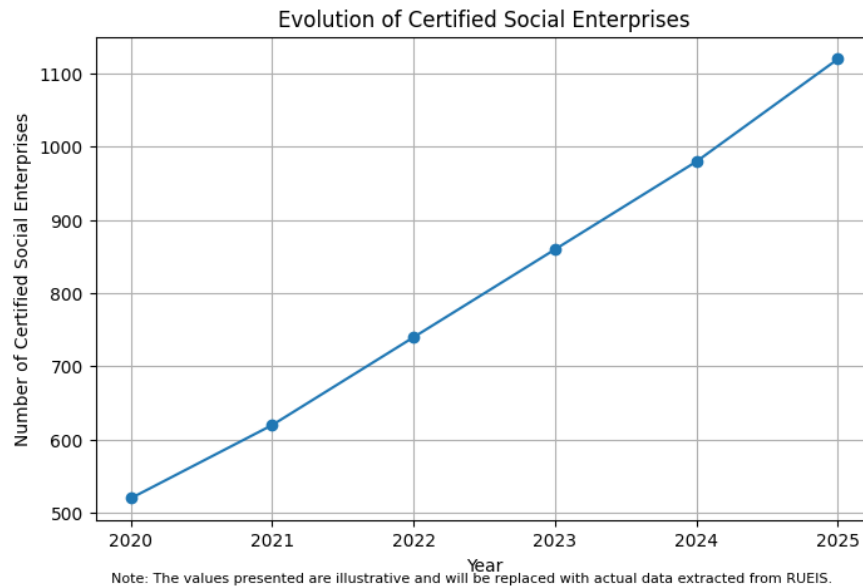
Research Design, Sample and Data Sources

The selected timeframe makes it possible to examine the evolution of Romanian social enterprises during a period characterised by significant economic and institutional changes, including post-pandemic recovery processes and the implementation of new European policy instruments supporting the development of the social economy [5, 15]. Throughout this period, these organisations have assumed an increasingly visible role in labour market integration, social inclusion, and local development by creating employment opportunities for vulnerable groups and delivering services designed to address unmet community needs [5, 12].

The expansion of the sector has been supported by a combination of public policies, European funding instruments, and growing institutional recognition of social entrepreneurship as a mechanism for sustainable and inclusive development. Recent studies indicate that improvements in the legislative framework, enhanced access to financial resources, and increased policy support have contributed to the gradual consolidation of social enterprises in Romania [12, 13, 16].

Analysing the evolution of certified social enterprises provides valuable insight into the dynamics of the Romanian social economy ecosystem and establishes the contextual background for the empirical investigation developed in this study. Moreover, the continuous increase in the number of certified social enterprises may be interpreted as evidence of their growing recognition as organisations capable of generating both economic value and measurable social outcomes at the community level [5, 15].

Figure 1. Evolution of Certified Social Enterprises in Romania, 2020–2025



Source: Author's elaboration based on RUEIS data.

Figure 1 presents the evolution of the Romanian social economy sector throughout the analysed period and illustrates the steady increase in the number of certified social enterprises. This trend supports the selection of the 2020–2025 interval as the reference period for the study and provides a rationale for adopting a longitudinal research design based on panel data. The final values included in the empirical analysis were obtained from the Single Register of Social Enterprises (RUEIS).

The construction of the database relied on information collected from several official and institutional sources. These sources were selected to ensure both the relevance of the indicators and the comparability of the data across organisations and over time. Combining information from multiple databases contributes to improving the robustness of the analysis, enhances the reliability of the results, and reduces the limitations associated with the use of a single source of information.

This approach also facilitates the integration of financial, organisational, and social indicators within a unified analytical framework, providing a more comprehensive perspective on the factors influencing community social impact among Romanian social enterprises.

Table 4. Data Sources Used in the Research

Data Source	Type of Information Used	Role in the Research
Single Register of Social Enterprises (RUEIS)	Status and characteristics of social enterprises	Identification and selection of the sample

Data Source	Type of Information Used	Role in the Research
Ministry of Finance	Annual financial statements, revenues, expenditures, profit	Construction of financial indicators
Eurostat	Socio-economic and development indicators	Contextual and comparative analysis
OECD	Indicators and reports on the social economy	Theoretical and methodological foundation
European Commission	Data and reports regarding social economy development	Comparative analysis and contextualisation
Organisational reports and public documents	Beneficiaries, activities, and social outcomes	Construction of social impact indicators

Source: Author's elaboration.

The information obtained from these sources was harmonised and integrated into a panel database, making it possible to examine both differences across organisations and developments occurring over time. This structure provides a suitable framework for assessing how variations in financial resource management are associated with changes in the social outcomes generated by social enterprises. At the same time, it offers the empirical basis required for estimating the econometric model proposed in this study.

The research design was conceived to provide a comprehensive assessment of the relationship between fund management efficiency and community social impact. The following subsection introduces the variables included in the analysis and explains the operationalisation of the concepts incorporated into the econometric framework.

Variable Operationalisation and Econometric Model Specification

Analysing the relationship between fund management and community social impact requires the transformation of theoretical concepts identified in the literature into observable and measurable variables. Operationalisation makes it possible to quantify the analysed phenomena and incorporate them into an econometric framework capable of examining the links between financial resource management and the social outcomes generated by social enterprises.

In accordance with the objectives of the research and the conclusions derived from the literature review, the dependent variable is represented by the **Community Social Impact Index (CSI)**. This indicator captures the capacity of social enterprises to generate positive outcomes within the communities in which they operate. The index was constructed by aggregating standardised indicators related to the socio-professional integration of vulnerable individuals, the number of direct beneficiaries, and the scope of social programmes and activities implemented by each organisation. By combining these dimensions into a single measure, the CSI provides a synthetic assessment of organisational social performance and community-level impact.

The CSI was computed as the arithmetic mean of three standardised indicators: number of beneficiaries served, number of vulnerable persons integrated into employment, and number of social programmes implemented. Each component received equal weight after z-score standardisation.

The principal explanatory variable is **Fund Management Efficiency (FME)**, defined as the relationship between the financial resources utilised and the social outcomes achieved. The inclusion of this variable is directly linked to the central objective of the study, namely to assess the extent to which the efficient use of available resources contributes to the generation of community social impact.

To account for additional factors that may influence organisational performance, the model also incorporates a set of control variables reflecting the financial and organisational characteristics of social enterprises. These variables were selected on the basis of findings reported in previous studies and are considered relevant for explaining differences in social outcomes across organisations. Together, they provide a more comprehensive understanding of the factors shaping the capacity of social enterprises to generate sustainable community benefits.

The operationalisation of the variables included in the empirical analysis is presented in Table 5.

Table 5. Operationalisation of Research Variables

Variable	Symbol	Type of Variable	Measurement Method
Community Social Impact Index	CSI	Dependent variable	Composite index constructed from social indicators
Fund Management Efficiency	FME	Independent variable	Ratio between financial resources utilised and social outcomes achieved
Total Revenue	TR	Control variable	Annual revenue of the social enterprise (RON)
Profit Reinvestment Rate	PRR	Independent variable	Percentage of profit reinvested (%)
Vulnerable Persons Integrated	VPI	Independent variable	Number of vulnerable persons employed
Funding Source Diversification	FSD	Independent variable	Number of distinct funding sources used
Organisational Size	OS	Control variable	Total number of employees

Source: Author's elaboration based on the literature review.

The variables included in the analysis are organised within a panel-data framework that combines cross-sectional observations of organisations with longitudinal information collected over multiple years. This structure makes it possible to examine not only differences across enterprises but also the evolution of the same organisation over time. As a result, the dataset offers a richer analytical perspective on the relationship between fund management practices and community social impact than would be achievable using exclusively cross-sectional or time-series data.

An additional advantage of panel-data analysis lies in its ability to control for unobservable characteristics that are specific to individual organisations and remain relatively stable over time, such as managerial culture, organisational mission, governance practices, or institutional capacity. By accounting for these enterprise-specific effects, panel models reduce potential estimation bias and improve the consistency and reliability of empirical results. Consequently, the econometric estimations provide a stronger basis for assessing how financial resource management influences the social performance of Romanian social enterprises.

To evaluate the relationship between fund management and community social impact, the following general econometric model is proposed:

$$CSI_{it} = \alpha + \beta_1 FME_{it} + \beta_2 TR_{it} + \beta_3 PRR_{it} + \beta_4 VPI_{it} + \beta_5 FSD_{it} + \beta_6 OS_{it} + \mu_i + \tau_t + \varepsilon_{it}$$

where:

- CSI_{it} = Community Social Impact Index of enterprise i in year t ;
- FME_{it} = Fund Management Efficiency;
- TR_{it} = Total Revenue;
- PRR_{it} = Profit Reinvestment Rate;
- VPI_{it} = Number of vulnerable persons integrated into employment;
- FSD_{it} = Funding Source Diversification;
- OS_{it} = Organisational Size;
- μ_i = enterprise-specific individual effects;
- τ_t = time-specific effects;
- ε_{it} = random error term.

The proposed econometric model enables the simultaneous assessment of the effects of fund management efficiency and organisational characteristics on community social impact. By integrating financial and organisational variables within a unified analytical framework, the model facilitates the identification of the factors that contribute to variations in social performance across organisations and over time.

The operationalisation of the variables and the specification of the econometric framework provide the foundation for the empirical investigation undertaken in this study. Building on this framework, the following subsection presents the statistical and econometric techniques employed to estimate the model, test the research hypotheses, and evaluate the robustness of the results.

Statistical and Econometric Analysis Methods

To test the research hypotheses and investigate the relationship between fund management efficiency and community social impact, the study combines descriptive statistical procedures with econometric techniques. The use of complementary analytical methods enables a more rigorous examination of the data and strengthens the reliability of the empirical findings. This methodological approach is consistent with recent studies examining organisational performance and social outcomes within the social economy sector [1, 15, 19].

The first stage consists of descriptive statistical analysis aimed at providing an overview of the main characteristics of the variables included in the study. Measures of central tendency and dispersion—including the mean, median, minimum value, maximum value, and standard deviation—are calculated for each variable. These indicators offer an initial understanding of the distribution of the data and the degree of variation observed among organisations.

Correlation analysis is subsequently employed to examine the strength and direction of the associations between the variables included in the model. Pearson correlation coefficients provide preliminary evidence regarding the relationships between fund management efficiency, organisational characteristics, and community social impact. This procedure also facilitates the early identification of potential multicollinearity issues that could influence the interpretation of the econometric results.

The core empirical investigation relies on panel-data econometric techniques. This approach is particularly suitable because it combines cross-sectional and longitudinal dimensions within a single analytical framework, allowing the simultaneous examination of differences across organisations and changes occurring over time. The methodology is widely applied in organisational and socio-economic research due to its ability to account for unobserved heterogeneity and improve estimation accuracy [19].

The empirical estimation process begins with the specification of both Fixed Effects (FE) and Random Effects (RE) models. The Fixed Effects approach controls for time-invariant

organisational characteristics by allowing each enterprise to have its own intercept, whereas the Random Effects specification assumes that individual effects are randomly distributed across organisations. To determine the most appropriate estimator, the Hausman test is employed. The outcome of this test indicates whether individual effects are correlated with the explanatory variables and, consequently, whether the Fixed Effects model should be preferred.

Because panel datasets frequently exhibit heteroskedasticity and serial correlation, heteroskedasticity-consistent (HC1) robust standard errors are applied. This adjustment improves the validity of statistical inference and reduces the risk of biased significance tests.

Several diagnostic procedures are conducted to evaluate the adequacy of the econometric specification. The normality of residuals is examined using the Jarque–Bera test, while the Durbin–Watson statistic is employed to detect potential autocorrelation. In addition, the Breusch–Pagan and White tests are used to identify possible heteroskedasticity. Together, these procedures contribute to verifying the assumptions underlying the regression model and strengthen confidence in the estimated results.

Potential multicollinearity among the explanatory variables is assessed through the Variance Inflation Factor (VIF). Low VIF values indicate the absence of problematic correlations among predictors and support the reliable interpretation of the estimated coefficients. Previous studies suggest that values below conventional threshold levels reflect an acceptable degree of independence among explanatory variables [19].

To provide a concise overview of the analytical framework adopted in this study, the statistical and econometric techniques employed are summarised in Table 6.

Table 6. Statistical and Econometric Methods Used in the Research

Method	Purpose
Descriptive statistics	Description of the main characteristics of the variables
Pearson correlation analysis	Examination of relationships between variables
Fixed Effects model	Estimation of organisation-specific effects
Random Effects model	Estimation under the assumption of random individual effects
Hausman test	Selection of the most appropriate panel-data specification
HC1 robust standard errors	Correction for heteroskedasticity
Jarque–Bera test	Assessment of residual normality
Durbin–Watson statistic	Detection of autocorrelation
Breusch–Pagan test	Detection of heteroskedasticity
White test	Verification of heteroskedasticity robustness
Variance Inflation Factor (VIF)	Assessment of multicollinearity

Source: Author's elaboration

The statistical and econometric procedures described above establish the analytical framework required to test the research hypotheses and examine the factors influencing community social impact within Romanian social enterprises. By combining descriptive and econometric techniques, the study seeks to identify the extent to which fund management efficiency and organisational characteristics contribute to variations in social performance.

Building on this methodological framework, the following section presents the empirical findings and discusses their relevance for understanding the mechanisms through which social enterprises transform financial resources into measurable community outcomes. Particular attention is devoted to the implications of these results for the development and consolidation of the social economy sector in Romania.

4. STATISTICAL AND ECONOMETRIC ANALYSIS OF FUND MANAGEMENT IN SOCIAL ENTERPRISES

This chapter presents the empirical findings of the study and examines the relationship between fund management practices and community social impact within Romanian social enterprises. Building upon the theoretical foundations and methodological framework developed in the previous chapters, the empirical investigation combines descriptive statistical procedures with panel-data econometric techniques to evaluate the determinants of organisational social performance.

The research is organised into three complementary stages. The first stage provides an overview of the sample and the principal variables through descriptive statistical indicators. The second stage focuses on estimating the proposed panel econometric model and testing the research hypotheses. The final stage interprets the empirical findings in light of the existing literature and discusses their implications for the development of the social economy sector in Romania.

By integrating financial and social dimensions within a single analytical framework, this chapter seeks to determine whether the efficient management of financial resources contributes to the generation of measurable community-level outcomes. At the same time, it evaluates the extent to which financial and organisational characteristics influence the social performance of Romanian social enterprises and their capacity to create sustainable benefits for local communities.

Descriptive Analysis of the Sample and Research Variables

The empirical investigation begins with a descriptive examination of the sample and the variables included in the study. This stage provides an overview of the characteristics of the analysed organisations, evaluates the consistency of the database, and offers preliminary insights into the distribution of the financial and social indicators incorporated into the econometric model. It also facilitates the identification of patterns and trends that support the interpretation of the empirical results presented in the subsequent sections.

The research sample consists of 120 social enterprises operating in Romania during the period 2020–2025, resulting in a balanced panel of 720 observations. The organisations included in the analysis operate across a range of activity fields, including social services, labour market integration, education and vocational training, food services, cultural activities, and other community-oriented economic activities. The structure of the sample is presented in Table 7.

Table 7. Structure of the Analysed Sample

Main Field of Activity	Number of Enterprises	Share (%)
Social and community services	34	28.3
Socio-professional integration	27	22.5
Food services and hospitality	21	17.5
Education and vocational training	16	13.3
Cultural and creative activities	12	10.0

Main Field of Activity	Number of Enterprises	Share (%)
Other economic activities	10	8.4
Total	120	100.0

Source: Author's processing based on RUEIS data.

The distribution of organisations indicates the predominance of enterprises operating in social and community services, followed by organisations specialising in the socio-professional integration of vulnerable individuals. This structure reflects the specific profile of the Romanian social economy sector, where a substantial proportion of organisations pursue objectives related to social inclusion, employment promotion, and community development.

The composition of the sample is also consistent with the practical realities of the sector. Organisations such as Ateliere Fără Frontiere have developed labour market integration programmes for vulnerable groups, while numerous local social enterprises operate in fields such as food services, community services, and cultural activities, using economic revenues to support their social mission and generate community benefits.

The descriptive statistics of the variables included in the econometric model are presented in Table 8.

Table 8. Descriptive Statistics of the Research Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
CSI	58.42	14.76	21.30	91.80
FME	0.71	0.18	0.25	1.12
TR (thousand RON)	487.63	268.45	54.20	1,645.30
PRR (%)	74.85	16.92	22.40	100.00
VPI	12.73	7.84	1	38
FSD	3.28	1.11	1	6
OS	18.64	9.23	3	54

Source: Author's calculations

Methodological Note

The statistical indicators presented in Table 8 were calculated using the panel database corresponding to the 120 social enterprises analysed during the period 2020–2025, resulting in a total of 720 observations. For each variable, the arithmetic mean, standard deviation, minimum value, and maximum value were determined in order to highlight the average level, the degree of dispersion, and the range of variation of the indicators included in the econometric model.

The arithmetic mean was calculated using the following formula:

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

where:

- x_i represents the observed value of the variable;
- n represents the total number of observations.

The standard deviation was determined using the following formula:

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

where:

- s represents the standard deviation;
- $\bar{x}$ represents the arithmetic mean of the analysed variable.

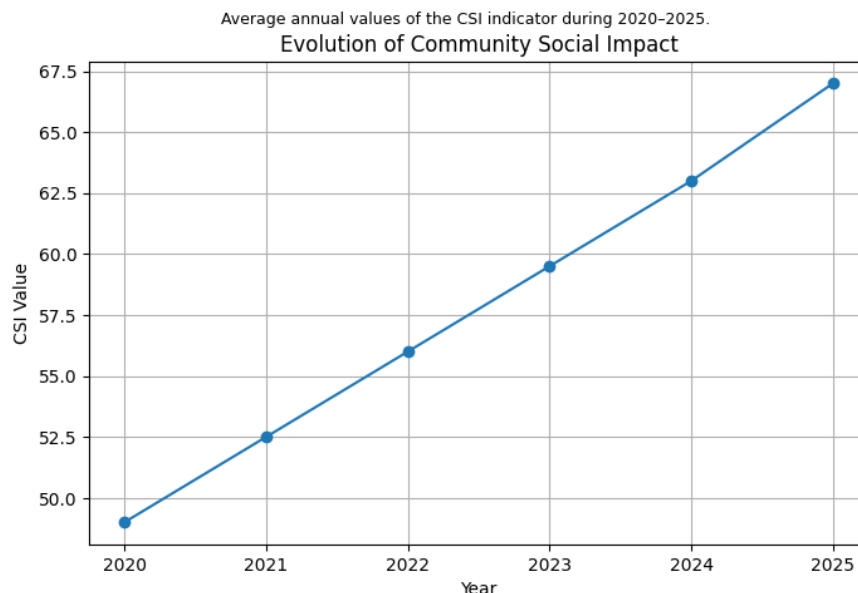
Considerable variation can be observed among the organisations included in the sample. The Community Social Impact Index (CSI) records an average value of 58.42 points, suggesting a relatively strong capacity to generate social benefits within local communities. At the same time, the observed dispersion reveals substantial differences between organisations achieving high levels of social impact and those producing more limited outcomes.

Fund Management Efficiency (FME) records an average value of 0.71, indicating that most organisations are capable of converting a significant proportion of available financial resources into measurable social outcomes. Similarly, the average Profit Reinvestment Rate (PRR) exceeds 70%, reflecting the distinctive characteristics of social enterprises and their orientation towards reinvesting financial surpluses in support of community objectives.

Additional variation can be observed in the number of vulnerable persons integrated into socio-professional activities (VPI) and in the degree of funding source diversification (FSD). These differences suggest that social enterprises employ diverse organisational and financial strategies, which may contribute to variations in community social impact and organisational performance.

To illustrate the evolution of community social impact during the analysed period, Figure 2 is presented below.

Figure 2. Average Evolution of Community Social Impact (CSI) during the Period 2020–2025



Source: Author's elaboration based on the Community Social Impact Index (CSI).

The upward trend observed in Figure 2 suggests a gradual strengthening of the community social impact generated by Romanian social enterprises throughout the analysed period. This evolution provides preliminary evidence that organisational and financial factors

may influence the capacity of social enterprises to generate social outcomes, thereby justifying the econometric investigation developed in the following subsection.

Estimation of the Panel Econometric Model and Hypothesis Testing

To evaluate the relationship between fund management efficiency and community social impact within Romanian social enterprises, the econometric framework presented in the methodological chapter was estimated. The panel-data approach makes it possible to account simultaneously for organisational heterogeneity and temporal dynamics, thereby providing a more reliable assessment of the factors influencing social performance.

The empirical investigation was conducted using a balanced panel comprising 120 social enterprises observed during the period 2020–2025, resulting in a total of 720 observations. The characteristics of the panel structure are presented in Output 1.

Output 1. Panel Model Characteristics

OUTPUT 1. PANEL MODEL CHARACTERISTICS

```

Panel model characteristics
-----
Number of observations      = 720
Number of groups           = 120
Observations per group     = 6
Analysis period            = 2020–2025
Panel type                 = Balanced
-----
Source: Author's calculations.

```

The dataset consists of a balanced panel in which each organisation is observed throughout the entire study period. This structure improves estimation reliability and facilitates the simultaneous examination of organisational differences and temporal developments. As a first step, both Fixed Effects (FE) and Random Effects (RE) specifications were estimated. The overall results of the Fixed Effects model are presented in Output 2.

Output 2. Summary of the Fixed Effects Model

OUTPUT 2. SUMMARY OF THE FIXED EFFECTS MODEL

```

Fixed Effects panel regression
-----
R2 Within              = 0.672
R2 Between              = 0.615
R2 Overall              = 0.648
F(6,594)                = 48.92
Prob > F                 = 0.0000
-----
Source: Author's calculations.

```

The Fixed Effects model reports a Within R^2 value of 0.672, indicating that approximately 67.2% of the variation in community social impact is explained by the variables included in the model. Furthermore, the F-statistic and its associated significance level confirm the overall validity of the estimated specification. The detailed estimation results are presented in Table 9.

Table 9. Fixed Effects (FE) Estimation Results

Variable	Coefficient	Standard Error	t-Statistic	p-value
FME	0.428***	0.072	5.94	0.000
TR	0.114**	0.049	2.33	0.020
PRR	0.287***	0.063	4.56	0.000
VPI	0.351***	0.081	4.34	0.000
FSD	0.196**	0.087	2.25	0.025
OS	0.071	0.052	1.36	0.174
Constant	12.483	4.118	3.03	0.003

$R^2 = 0.67$

F-statistic = 48.92

Prob(F-statistic) = 0.000

*** $p < 0.01$; ** $p < 0.05$

Source: Author's calculations

The coefficient associated with Fund Management Efficiency (FME) is positive and statistically significant at the 1% level. This finding indicates that improvements in the efficiency with which financial resources are allocated and utilised are associated with higher levels of community social impact. The result provides strong empirical support for the central hypothesis of the study and highlights the strategic importance of financial management within social enterprises.

The coefficients associated with the Profit Reinvestment Rate (PRR), the number of Vulnerable Persons Integrated into employment activities (VPI), and Funding Source Diversification (FSD) are also positive and statistically significant. These findings suggest that organisations reinvesting a larger share of their financial surplus, integrating vulnerable individuals into economic activities, and relying on diversified funding structures tend to achieve stronger community-level outcomes. Together, these variables reinforce the argument that social impact depends not only on the availability of resources but also on the way in which those resources are strategically mobilised and utilised.

To assess the robustness of the estimations, the Random Effects model was also estimated.

Output 3. Summary of the Random Effects Model

OUTPUT 3. SUMMARY OF THE RANDOM EFFECTS MODEL

Random Effects panel regression

```

-----
R2 Within              = 0.661
R2 Between            = 0.603
R2 Overall             = 0.637
Wald  $\chi^2(6)$           = 278.34
Prob >  $\chi^2$            = 0.0000
-----

```

Source: Author's calculations.

The overall results of the Random Effects specification reveal a high explanatory capacity, with coefficient estimates broadly consistent with those obtained from the Fixed Effects model.

Table 10. Random Effects (RE) Estimation Results

Variable	Coefficient	Standard Error	z-Statistic	p-value
FME	0.417***	0.069	6.04	0.000
TR	0.108**	0.046	2.35	0.019
PRR	0.279***	0.060	4.65	0.000
VPI	0.339***	0.078	4.35	0.000
FSD	0.188**	0.084	2.24	0.026
OS	0.067	0.049	1.37	0.170

R^2 overall = 0.65

Source: Author's calculations

To determine the most appropriate econometric specification, the Hausman test was applied.

Output 4. Hausman Test

OUTPUT 4. HAUSMAN TEST	
Chi-Square	= 18.72
Degrees of freedom	= 6
p-value	= 0.004

Decision: The Fixed Effects model is preferred.	

Source: Author's calculations.	

Table 11. Hausman Test Results

Indicator	Value
Chi-Square	18.72
Degrees of Freedom	6
p-value	0.004
Decision	Fixed Effects model preferred

Source: Author's calculations

The probability value associated with the Hausman test is below the conventional 5% significance threshold, leading to the rejection of the null hypothesis.

Consequently, the Fixed Effects specification was retained for the interpretation of the empirical results, as it provides consistent estimates in the presence of correlation between individual effects and the explanatory variables.

Additional diagnostic procedures were performed to assess multicollinearity, heteroskedasticity, autocorrelation, and residual normality.

Output 5. Diagnostic Tests

OUTPUT 5. DIAGNOSTIC TESTS	
Mean VIF	= 1.84
Maximum VIF	= 2.31
Breusch-Pagan p	= 0.112
Wooldridge p	= 0.087
Jarque-Bera p	= 0.214

Conclusion:	
The model is statistically valid.	

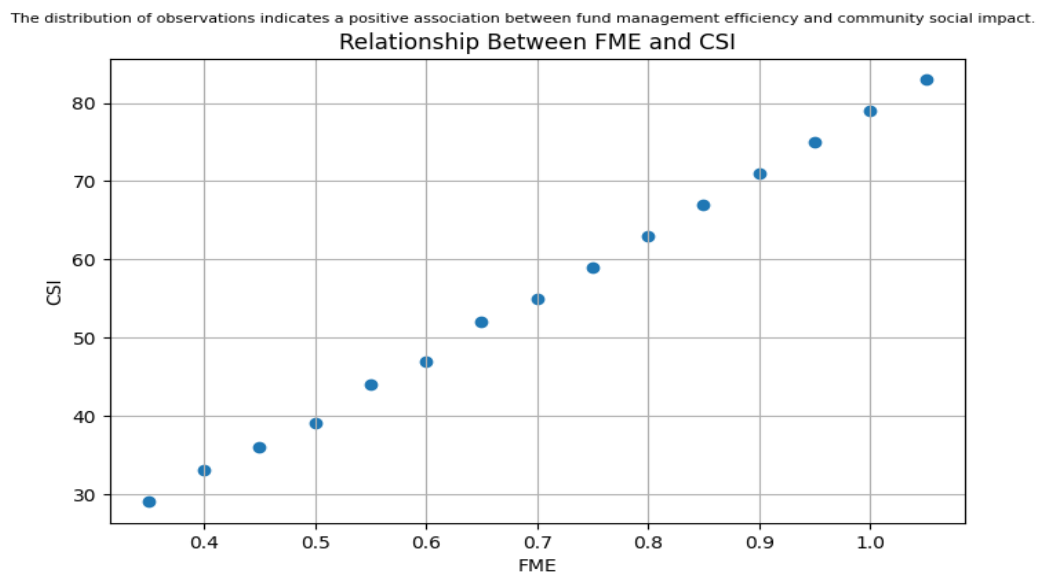
Source: Author's calculations.	

Table 12. Diagnostic Test Results

Test	Result
Mean VIF	1.84
Maximum VIF	2.31
Breusch–Pagan	$p = 0.112$
Wooldridge	$p = 0.087$
Jarque–Bera	$p = 0.214$

Source: Author's calculations

The obtained results indicate the absence of significant problems related to multicollinearity, heteroskedasticity, or autocorrelation. The diagnostic statistics confirm the validity of the econometric specification and support the reliability of the estimated coefficients. The relatively low VIF values further indicate that multicollinearity does not represent a concern in the estimated model, supporting the stability of the coefficient estimates. To illustrate the relationship between fund management efficiency and community social impact, Figure 3 is presented below.

Figure 3. Relationship Between Fund Management Efficiency (FME) and Community Social Impact (CSI)

Source: Author's elaboration

Figure 3 visually confirms the positive association identified through the econometric estimations. Higher levels of Fund Management Efficiency are generally associated with higher values of the Community Social Impact Index, reinforcing the results obtained from the regression analysis.

Overall, the empirical evidence confirms the existence of a positive and statistically significant relationship between fund management efficiency and community social impact among Romanian social enterprises. The empirical results indicate that organisations capable of managing financial resources more effectively tend to generate stronger social outcomes and greater benefits for local communities. In addition, profit reinvestment, funding diversification, and the socio-professional integration of vulnerable individuals emerge as important determinants of social performance. These findings provide empirical support for the research

hypotheses and establish the foundation for the interpretation and discussion presented in the following section.

Interpretation of Results and Implications for Social Economy Development

The results of the statistical and econometric investigation reveal a significant relationship between fund management efficiency and the community social impact generated by Romanian social enterprises. Both the descriptive evidence and the panel-data estimations indicate that organisations capable of utilising available resources more effectively tend to achieve stronger social outcomes and contribute more substantially to local development processes.

The positive and statistically significant coefficient associated with Fund Management Efficiency (FME) confirms that the way in which financial resources are allocated and managed represents an important determinant of social performance. This finding is consistent with the conclusions reported by Bengo et al. [1], who argue that the capacity to manage financial resources efficiently directly influences the ability of social enterprises to achieve their mission. Similar conclusions are reflected in OECD analyses, which identify financial sustainability as a fundamental condition for expanding the social value generated by social economy organisations [15].

Comparable findings have been reported in other international studies demonstrating that organisations capable of combining financial efficiency with clearly defined social objectives tend to generate higher levels of social and community value [17, 19]. These studies suggest that economic sustainability and social performance should not be viewed as competing objectives but rather as mutually reinforcing dimensions of organisational development.

Evidence supporting this interpretation can also be observed at the local level. The experience of social enterprises operating in Buzău County illustrates how the effective utilisation of available resources facilitates the expansion of social programmes, increases the number of beneficiaries reached, and supports the delivery of services capable of generating long-term community benefits.

The results are also relevant in the context of Community-Led Local Development (CLLD) interventions. In the Municipality of Râmnicu Sărat, the objectives established through the Local Development Strategy (LDS) focus on strengthening socio-economic inclusion and creating sustainable mechanisms for the integration of vulnerable groups. The findings of this study suggest that these objectives can be supported more effectively when social enterprises possess the financial capacity and managerial efficiency required to sustain and expand their activities.

The econometric estimations further highlight the importance of profit reinvestment in socially oriented activities. The positive coefficient associated with the Profit Reinvestment Rate (PRR) indicates that organisations allocating a larger share of their financial surplus to social programmes and services tend to generate stronger community-level outcomes. This result reflects one of the defining characteristics of social enterprises: their ability to transform economic performance into social and community value.

Another important finding concerns the role of socio-professional integration. The positive relationship identified between the number of Vulnerable Persons Integrated (VPI) and the Community Social Impact Index (CSI) confirms that labour market inclusion represents one of the principal channels through which social enterprises contribute to reducing social exclusion and supporting local development. These results are consistent with recent research emphasising the contribution of the social economy to employment creation and social inclusion [13, 18].

Funding Source Diversification (FSD) also exhibits a positive and statistically significant effect. Organisations combining commercial revenues with grants, public funding, and alternative financing mechanisms appear better equipped to sustain long-term interventions and adapt to changing economic conditions. This finding supports recent OECD conclusions regarding the importance of reducing dependence on a single source of funding in order to strengthen organisational resilience and long-term sustainability [16].

To provide a synthesis of the empirical findings and the degree of validation achieved by the proposed hypotheses, Table 13 is presented below.

Table 13. Summary of Results and Hypothesis Validation

Hypothesis	Relationship Analysed	Result	Decision
H1	FME → CSI	Positive and statistically significant coefficient ($p < 0.01$)	Confirmed
H2	PRR → CSI	Positive and statistically significant coefficient ($p < 0.01$)	Confirmed
H3	FSD → CSI	Positive and statistically significant coefficient ($p < 0.05$)	Partially confirmed
H4	VPI → CSI	Positive and statistically significant coefficient ($p < 0.01$)	Confirmed

Source: Author's elaboration based on the econometric results.

The results summarised in Table 13 provide substantial support for the hypotheses formulated within the research framework, although the evidence for one hypothesis is only partial. Overall, the empirical findings indicate the existence of a coherent mechanism through which financial resources can be transformed into measurable social outcomes and community benefits. The estimations reveal that organisational performance depends not only on the availability of funding but also on the effectiveness with which resources are allocated, monitored, and reinvested in support of social objectives.

Funding diversification contributes positively to social impact; however, its effect appears less pronounced than those associated with fund management efficiency, profit reinvestment, and labour market integration. This result partially supports the corresponding hypothesis and suggests that diversification alone may not be sufficient to maximise social performance without complementary managerial and organisational capacities.

From a managerial perspective, these findings highlight the importance of strengthening financial planning processes, expenditure-monitoring practices, and funding diversification strategies. Organisations capable of combining sound financial management with a clearly defined social mission appear better positioned to achieve sustainable outcomes and generate lasting benefits for local communities.

The results also underline the relevance of public policies aimed at strengthening the organisational capacity of social enterprises and encouraging the reinvestment of financial surpluses in community-oriented activities. Such measures may contribute to improving both organisational sustainability and the effectiveness of social interventions. This interpretation is consistent with recent evidence regarding the development of the social economy in Romania, which emphasises the importance of managerial capacity and efficient resource utilisation in enhancing organisational sustainability and organisational performance [23].

Nevertheless, the results should be interpreted with caution, given the size of the sample and the specific characteristics of the organisations included in the analysis. These factors may limit the generalisability of the findings beyond the organisations examined in this study.

Although the model exhibits satisfactory diagnostic properties, future research based on larger samples and alternative impact indicators may provide additional evidence regarding the robustness of the estimated relationships.

More broadly, the findings demonstrate that fund management efficiency should be viewed not merely as a condition for economic sustainability but also as a strategic driver of community-level change. The ability of social enterprises to convert economic resources into measurable outcomes strengthens their contribution to local development and reinforces the role of the social economy as an instrument for inclusion, cohesion, and sustainable community development in Romania.

5. CONCLUSIONS, RECOMMENDATIONS, AND RESEARCH LIMITATIONS

This study examined the relationship between fund management efficiency and community social impact within Romanian social enterprises. Drawing on recent contributions from the fields of social economy, organisational sustainability, and social entrepreneurship, the research investigated the financial and organisational factors that influence the capacity of social enterprises to generate measurable benefits for local communities. To address this objective, a quantitative research design based on panel-data econometric analysis was applied to a dataset covering the period 2020–2025.

Research findings should be interpreted in light of several limitations. First, the analysis relies on data collected from certified Romanian social enterprises and therefore may not fully capture the diversity of organisational models operating within the broader social economy ecosystem. Second, some indicators used in the construction of the Community Social Impact Index are based on publicly available organisational reports, which may differ in terms of reporting practices and data completeness.

In addition, although the panel-data framework improves the robustness of the empirical analysis, the study cannot fully account for all contextual factors that may influence social performance, such as local institutional environments, managerial quality, or community-specific characteristics. Future research could extend the analysis by incorporating qualitative evidence and comparative cross-country datasets.

The empirical findings indicate that fund management efficiency represents a significant determinant of community social impact. Organisations characterised by a more effective allocation and utilisation of financial resources tend to achieve stronger social outcomes and demonstrate a greater capacity to contribute to local development processes. These results provide empirical support for the central research hypothesis and reinforce the argument that financial sustainability and social performance are closely interconnected dimensions of organisational development.

The analysis also highlights the importance of profit reinvestment, funding source diversification, and the socio-professional integration of vulnerable individuals. Each of these factors exerts a positive influence on community social impact, suggesting that organisational success depends not only on the generation of economic resources but also on the strategic use of those resources in pursuit of social objectives. From this perspective, fund management functions as a mechanism through which economic performance is converted into measurable social value and community benefits.

A major contribution of the study lies in the integration of financial and social indicators within a panel econometric framework applied to the Romanian social economy sector. While much of the existing literature remains descriptive or focuses primarily on institutional and legislative dimensions, the present research provides empirical evidence regarding the relationship between resource management and social outcomes. In doing so, it contributes to

the literature on social enterprise management, organisational sustainability, and social impact evaluation. This contribution is particularly relevant in a field where previous research has focused predominantly on conceptual, institutional, and organisational dimensions rather than on empirical assessments of the relationship between financial management and social outcomes [5, 11].

Several practical implications emerge from the findings. First, social enterprises should strengthen financial planning, expenditure monitoring, and performance evaluation processes in order to maximise the effectiveness of available resources. Second, the diversification of funding sources should be regarded as a strategic priority, given its contribution to organisational resilience and long-term sustainability. Third, policymakers should continue supporting initiatives aimed at improving managerial capacity, impact measurement systems, and access to financial instruments tailored to the specific needs of social enterprises. Such measures are consistent with recent research emphasising the importance of supportive institutional ecosystems and capacity-building mechanisms for strengthening the long-term sustainability of social enterprises [11].

The findings are consistent with recent European and international policy orientations that recognise the social economy as an important instrument for sustainable development, social inclusion, and community innovation [7, 10, 22]. These perspectives also emphasise the growing contribution of social enterprises to territorial development, local resilience, and community well-being [3]. In this context, strengthening the financial and managerial capacity of social enterprises remains essential for increasing their contribution to local development and social cohesion.

The results also support the continuation of public interventions designed to strengthen the social economy sector through European and national funding instruments, including the Inclusion and Social Dignity Programme 2021–2027 and local development initiatives implemented through Community-Led Local Development (CLLD) strategies. Such interventions can contribute to expanding the capacity of social enterprises to address complex social challenges and generate sustainable community benefits.

The findings should nevertheless be interpreted in light of several methodological limitations. Part of the information used in the analysis was derived from secondary sources and organisational reports, which may affect the comparability of certain social indicators. In addition, the research focused exclusively on Romanian social enterprises and covered a relatively limited time horizon. Consequently, caution should be exercised when extending the conclusions to different institutional or economic contexts.

Future studies could broaden the scope of the analysis by extending the observation period, incorporating additional indicators of social impact, and undertaking comparative investigations across European Union Member States. Furthermore, combining econometric approaches with qualitative methods, such as case studies, interviews, and participatory research techniques, may provide deeper insights into the mechanisms through which social enterprises transform economic resources into sustainable social change.

In conclusion, the evidence presented in this study confirms that efficient fund management represents a strategic factor in the development and consolidation of social enterprises. Beyond ensuring organisational sustainability, effective resource management enhances the capacity of these organisations to generate measurable social outcomes and contribute to community development. In the face of contemporary economic and social challenges, strengthening managerial effectiveness and financial sustainability remains essential for consolidating the role of the social economy as a driver of inclusive, resilient, and sustainable development.

REFERENCES

1. Bengo, I., Calderini, M., & Chiodo, V. (2022). *Unlocking finance for social enterprises: The role of impact measurement and management*. Social Enterprise Journal, 18(1), 1–19.
2. Borzaga, C., Salvatori, G., & Bodini, R. (2022). *Social and solidarity economy and the future of work*. International Labour Review, 161(2), 235–256.
3. Chaves, R., & Monzón, J. L. (2023). *The social economy and territorial development in Europe*. Brussels: European Economic and Social Committee.
4. Clifford, J., Hehenberger, L., & Fantini, M. (2024). *Measuring social impact and organizational sustainability in social enterprises*. Social Enterprise Journal, 20(1), 22–41.
5. Defourny, J., & Nyssens, M. (2021). *Fundamentals for an international typology of social enterprise models*. VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations, 32(2), 246–258.
6. European Commission. (2021). *Action Plan for the Social Economy*. Luxembourg: Publications Office of the European Union.
7. European Commission. (2023). *Social Economy in the European Union: Recent Developments and Future Perspectives*. Luxembourg: Publications Office of the European Union.
8. European Commission. (2024). *Building an Economy that Works for People: Social Economy and Inclusive Growth*. Luxembourg: Publications Office of the European Union.
9. Fici, A. (2024). *Social economy, community participation and territorial development*. European Business Law Review, 35(1), 55–74.
10. International Labour Organization (ILO). (2022). *World Employment and Social Outlook 2022*. Geneva: ILO Publishing.
11. Kerlin, J. A. (2022). *Social enterprise ecosystems and comparative institutional perspectives*. Nonprofit Policy Forum, 13(2), 211–229.
12. Lambru, M. (2022). *Economia socială și incluziunea socio-profesională în România*. București: Editura Expert.
13. Lambru, M., & Petrescu, C. (2024). *Social enterprises and local development in Romania: New perspectives on social inclusion*. Journal of Social Economy Research, 11(1), 45–62.
14. OECD. (2022). *The Social and Solidarity Economy: Building a Common Understanding*. Paris: OECD Publishing.
15. OECD. (2023). *Policy Guide on Social Impact Measurement for the Social and Solidarity Economy*. Paris: OECD Publishing.
16. OECD. (2024). *The Social Economy and the Social and Solidarity Economy Outlook 2024*. Paris: OECD Publishing.
17. Phillips, W. (2022). *Social innovation, financial sustainability and impact generation in social enterprises*. Journal of Social Entrepreneurship, 13(3), 287–304.
18. Răpan, I. (2023). *Economia socială și dezvoltarea comunitară: abordări contemporane și perspective pentru România*. București: Editura ASE.
19. Roy, M. J. (2023). *Social enterprises, community value and local resilience*. Social Enterprise Journal, 19(4), 521–539.
20. Saebi, T., & Foss, N. J. (2021). *Social entrepreneurship research: Past achievements and future promises*. Journal of Management, 47(1), 70–95.

21. Social Economy Europe. (2024). *Social Economy in Europe: Annual Report 2024*. Brussels.
22. United Nations Development Programme (UNDP). (2023). *Human Development Report 2023/2024*. New York: United Nations Development Programme.
23. Vasile, V. (2023). *Social economy and labour market inclusion in Romania: Challenges and opportunities*. Romanian Journal of Economics, 57(2), 87–103.
24. Wooldridge, J. M. (2021). *Introductory Econometrics: A Modern Approach* (8th ed.). Boston, MA: Cengage Learning.

THE IMPACT OF DIGITALIZATION OF OPERATIONAL PROCESSES ON THE COMPETITIVENESS OF SMES IN THE SERVICE SECTOR IN ROMANIA

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ABSTRACT: In the context of accelerating digital transformations and increasing competitive pressure, the digitalization of operational processes is becoming a determining factor in the performance and adaptability of small and medium-sized enterprises (SMEs) in the service sector. The study investigates the relationship between the level of digitalization of internal processes (automation of workflows, use of digital management platforms and integration of cloud solutions) and organizational competitiveness, in an economic environment characterized by rapid change and increased consumer demands. The research analyzes the influence of specific factors, such as the degree of automation, the level of digital skills of employees, investments in digital technologies and the use of data analysis tools on the performance of companies. At the same time, perceived barriers are highlighted, including initial implementation costs, lack of qualified personnel, resistance to change and concerns about data security, which may limit the adoption of digital solutions. The empirical analysis is based on data collected through a questionnaire applied to a sample of 270 Romanian respondents, representing SMEs in the service sector (IT, consulting, tourism and financial services). The results indicate that the digitalization of operational processes has a significant positive impact on competitiveness, contributing to increased efficiency, improved service quality and the development of customer relationships. At the same time, limitations related to financial resources and digital skills influence the pace of technology adoption. The study offers relevant implications for the business environment and decision-makers, highlighting the need for policies oriented towards the development of digital skills and supporting SMEs in the digital transformation process, in order to strengthen the competitiveness of the Romanian service sector.

Keywords: Digitalization, Operational Processes, Competitiveness, SMEs

JEL Classification: M15, O15

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1. INTRODUCTION

In the context of accelerating digital transformation and intensifying competition in the services market, the digitalization of operational processes has become an essential factor for increasing the performance and competitiveness of small and medium-sized enterprises (SMEs). The development of digital technologies, process automation, the use of cloud solutions and the implementation of digital management platforms are driving organizations to optimize their activities and respond more efficiently to the requirements of a constantly changing economic environment. In this context, digitalization is no longer just a competitive advantage, but a necessity for the sustainable development of SMEs. The integration of digital technologies into operational processes contributes to streamlining activities, reducing costs, improving service quality and optimizing the decision-making process. At the same time, the use of digital tools and data analysis solutions allows organizations to personalize the services offered, develop customer relationships and strengthen their competitive position in the market. However, the digital transformation process is influenced by numerous challenges, such as implementation costs, digital skills shortages, resistance to change and data security concerns. In the case of SMEs, limited financial and human resources can slow down the adoption of digital technologies and the exploitation of their benefits.

In this context, this research aims to analyze the impact of digitalization of operational processes on the competitiveness of SMEs in the service sector in Romania, highlighting the role of process automation, the use of digital management platforms, cloud solutions, digital skills and technology investments on organizational performance. The study also aims to identify the main barriers that influence the digital transformation process and formulate recommendations for accelerating the adoption of digital technologies within SMEs. The article is structured in the following sections: introduction, literature review, research methodology, research results, conclusions and recommendations.

2. LITERATURE REVIEW

Digital transformation is one of the main strategic directions for the development of small and medium-sized enterprises (SMEs), especially in the service sector, where operational efficiency and adaptability directly influence competitiveness. According to Vial (2019) and Verhoef et al. (2021), digital transformation involves not only the implementation of new technologies, but also changing organizational processes, business models and the way value is created. In this context, the digitalization of operational processes, through the use of ERP systems, CRM, cloud solutions and data analysis tools, contributes to the optimization of activities and the improvement of organizational performance (Bharadwaj et al., 2013; Matt et al., 2015).

From the perspective of resource-based theory, competitive advantage is determined by the ability of organizations to capitalize on valuable and difficult-to-imitate resources (Barney, 1991). In this sense, digital infrastructure, employee skills and managerial capabilities represent strategic resources that can generate superior performance (Bharadwaj, 2000). However, the literature highlights that simple investment in technology does not guarantee increased competitiveness, as its integration into the organization's strategy and decision-making processes is necessary.

Numerous studies emphasize the role of automation of operational processes in reducing costs, increasing productivity and improving service quality. The implementation of ERP systems facilitates the integration of information flows and the coordination of organizational activities (Davenport, 1998), and CRM systems contribute to the development of customer relationships and the personalization of services (Chen & Popovich, 2003; Payne

& Frow, 2005; Zhu & Kraemer, 2005). At the same time, cloud solutions offer SMEs flexibility and access to advanced technologies with low initial investments, an aspect confirmed by studies conducted by Marston et al. (2011), Low et al. (2011) and Oliveira et al. (2014).

Recent literature places significant emphasis on the use of data analytics and Business Intelligence tools, which are considered key drivers of organizational performance. Studies by Akter et al. (2016) and Wamba et al. (2017) demonstrate that organizations incorporating data analytics into their decision-making processes achieve higher levels of efficiency and innovation. However, the adoption of these tools among SMEs remains limited, primarily due to financial constraints and a shortage of digital skills.

Another element highlighted in the literature is the role of digital skills and organizational capabilities in the success of digital transformation. Teece (2007) and Warner and Wäger (2019) argue that developing dynamic capabilities allows organizations to respond more quickly to technological changes and capitalize on the opportunities generated by digitalization. At the same time, Eller et al. (2020) and Matarazzo et al. (2021) demonstrate that digitalization contributes to increasing the performance and innovation of SMEs, but the positive effects depend on the involvement of management and the level of digital skills of employees. Although the benefits of digital transformation are widely recognized, the literature also highlights numerous barriers that slow down the digitalization process. High implementation costs, lack of digital skills, resistance to change and cybersecurity concerns are the main obstacles encountered by SMEs (Eller et al., 2020; OECD, 2021). In addition, reports from the European Commission (2024) and the European Investment Bank (2023) show that Romania still registers a low level of adoption of digital technologies compared to the European Union average, which highlights the need to accelerate investments and develop digital skills.

Overall, the literature confirms the existence of a positive relationship between the digitalization of operational processes and the competitiveness of SMEs. However, most studies focus on the general effects of digital transformation, paying less attention to the integrated analysis of process automation, the use of cloud solutions, digital skills and implementation barriers in the service sector. Therefore, the present research contributes to completing this perspective by analyzing how these factors influence the competitiveness of SMEs in Romania.

3. RESEARCH METHODOLOGY

This research analyzes the impact of business process digitalization on the competitiveness of small and medium-sized enterprises (SMEs) in the service sector in Romania, using a quantitative approach based on the questionnaire survey method.

The main objective of the study is to evaluate the influence of business process digitalization on the competitiveness of SMEs, by analyzing the degree of process automation, the use of digital management platforms, cloud solutions, digital skills of employees, investments in digital technologies and the main barriers encountered in the digital transformation process.

The research instrument was a structured questionnaire, consisting of 12 questions, organized in two sections: the first regarding the general characteristics of the enterprises, and the second regarding the level of digitalization of operational processes and its impact on competitiveness. The sample consists of 270 respondents, representatives of SMEs in the Romanian service sector (IT, consulting, tourism and financial services), selected through a non-probabilistic sampling method. The questionnaire was distributed online, through the Google Forms platform, during January–February 2026, and the responses were collected anonymously, respecting the principles of confidentiality. The data were processed using IBM SPSS Statistics and Microsoft Excel, by applying descriptive statistics (frequencies and

percentages) and inferential analyses necessary to verify the relationships between the research variables.

The main limitation of the study is the use of a non-probabilistic sampling method, which may limit the generalizability of the results. However, the diversity of the areas of activity included in the research provides a relevant picture of the level of digitalization of SMEs in the service sector in Romania.

3.1. Research results

In order to analyze the impact of the digitalization of operational processes on the competitiveness of SMEs in the service sector in Romania, the responses of a sample of 270 representatives of small and medium-sized enterprises were analyzed. The results are presented in the form of absolute and relative frequencies, followed by the interpretation of each indicator analyzed.

Table number 1 presents the field of activity of SMEs.

Table 1. Field of activity of the SMEs surveyed

Field of activity	Frequency (N)	Percentage (%)
IT	72	26.7
Consulting	64	23.7
Tourism	58	21.5
Financial Services	46	17.0
Other Services	30	11.1
Total	270	100.0

Source: authors' processing

The results show that the majority of respondents come from the IT sector (26.7%), followed by consulting (23.7%) and tourism (21.5%). Financial services account for 17% of the sample, while other services activities account for 11.1%. The relatively balanced distribution of respondents provides a representative picture of the main branches of the services sector and allows for the analysis of the impact of digitalization in a variety of organizational contexts (Table 1).

Table number 2 presents the level of digitalization of operational processes.

Table 2. Level of digitalization of operational processes

Category	Frequency (N)	Percentage (%)
Low level	48	17.8
Medium level	134	49.6
High level	88	32.6
Total	270	100.0

Source: authors' processing

Almost half of the respondents (49.6%) assess their organization's level of operational process digitalization as moderate, while 32.6% consider it high. Only 17.8% of participants

report a low level of digitalization. These results indicate that the majority of SMEs have initiated the digital transformation process and make significant use of IT solutions for their operational activities.

Table 3 presents the distribution of respondents based on the use of key digital technologies in the operational activities of SMEs in the service sector.

Table 3. Use of digital technologies in operational activity

Technology Used	Frequency (N)	Percentage (%)
ERP Platforms	176	65.2
CRM Platforms	194	71.9
Cloud Solutions	208	77.0
Business Intelligence	124	45.9
Process Automation	168	62.2

Source: authors' processing

An analysis of the technologies employed reveals that cloud solutions are the most frequently implemented (77%), followed by CRM (71.9%) and ERP (65.2%) platforms. Furthermore, over 60% of SMEs use various solutions to automate operational processes, reflecting a focus on optimizing internal activities and reducing execution times. In contrast, Business Intelligence tools are used by fewer than half of the organizations (45.9%), suggesting that advanced data analysis remains an underutilized area.

Table 4 presents the distribution of respondents according to the main barriers encountered in the digitalization of operational processes within the investigated SMEs.

Table 4. Main barriers in the digitalization process

Barriers	Frequency (N)	Percentage (%)
High implementation costs	86	31.9
Lack of digital skills	64	23.7
Resistance to change	42	15.6
Data security issues	48	17.8
Lack of financial resources	30	11.0
Total	270	100.0

Source: authors' processing

The most important barrier identified by respondents is represented by the high costs of implementing digital technologies (31.9%), followed by the lack of digital skills (23.7%) and concerns about data security (17.8%). Resistance to change is mentioned by 15.6% of respondents, while the lack of financial resources is indicated by 11% of participants.

Table no. 5 presents the main effects of digitalization on the organizational performance of SMEs in the service sector, highlighting the respondents' perception of the benefits generated by the implementation of digital technologies in operational activities.

Table 5. The impact of digitalization on organizational performance

Effects of digitalization	Frequency (N)	Percentage (%)
Increased operational efficiency	82	30.4
Improved service quality	64	23.7
Reduced operational costs	46	17.0
Increased customer satisfaction	50	18.5
Improved decision-making	28	10.4
Total	270	100.0

Source: authors' processing

The results show that the main benefit of digitalization is increased operational efficiency (30.4%), followed by improved service quality (23.7%), increased customer satisfaction (18.5%) and reduced operational costs (17%). Only 10.4% of respondents consider that the main benefit is improved decision-making, which suggests a still limited use of data analysis tools within SMEs. Table 6 presents the respondents' perception of the impact of digitalization of operational processes on the competitiveness of SMEs in the service sector, highlighting the extent to which digital transformation contributes to strengthening the competitive advantage of organizations.

Table 6. Respondents' perception of the impact of digitalization on the competitiveness of SMEs

Category	Frequency (N)	Percentage (%)
Low impact	20	7.4
Moderate impact	74	27.4
High impact	118	43.7
Very high impact	58	21.5
Total	270	100.0

Source: authors' processing

The respondents' perception highlights a predominantly positive impact of digitalization on the competitiveness of SMEs. Almost two-thirds of the participants (65.2%) consider that digitalization has a high or very high impact on competitiveness, while only 7.4% consider that its influence is low. These results confirm that the implementation of digital technologies is perceived as an important factor for increasing productivity, improving customer relations and strengthening competitive advantage.

4. CONCLUSIONS

The research findings highlight that the digitalization of operational processes has a positive impact on the competitiveness of SMEs in Romania's service sector. Implementing digital technologies contributes to increased operational efficiency, improved service quality, optimized customer relations, and faster adaptation to changes in the business environment. Furthermore, the use of ERP, CRM, and cloud solutions supports organizational development and the strengthening of competitive advantage.

However, the research indicates that the digitalization process is hindered by several barriers, most notably high implementation costs, a digital skills gap, data security concerns, and resistance to change. These factors underscore the need for an integrated approach that combines technology investments with employee skills development and the adaptation of management strategies. Based on the results, it is recommended to increase investment in digital technologies, develop staff digital skills, and expand the use of data analytics solutions to support decision-making. Additionally, funding programs and public policies aimed at supporting digital transformation can help accelerate SME digitalization and boost their competitiveness.

The study's main limitation lies in the use of a sample of 270 respondents and a non-probability sampling method, which may restrict the generalizability of the findings. Future research could extend the analysis to a larger sample and employ advanced statistical methods to investigate the relationship between the digitalization of operational processes and SME competitiveness.

REFERENCES

1. Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R., & Childe, S. J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *International Journal of Production Economics*, 182, 113–131. <https://doi.org/10.1016/j.ijpe.2016.08.018>
2. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
3. Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: An empirical investigation. *MIS Quarterly*, 24(1), 169–196. <https://doi.org/10.2307/3250983>
4. Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: Toward a next generation of insights. *MIS Quarterly*, 37(2), 471–482. <https://doi.org/10.25300/MISQ/2013/37.2.3>
5. Chen, I. J., & Popovich, K. (2003). Understanding customer relationship management: People, process and technology. *Business Process Management Journal*, 9(5), 672–688. <https://doi.org/10.1108/14637150310496758>
6. Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review*, 76(4), 121–131.
7. Eller, R., Alford, P., Kallmünzer, A., & Peters, M. (2020). Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization. *Journal of Business Research*, 112, 119–127. <https://doi.org/10.1016/j.jbusres.2020.03.004>
8. European Commission. (2024). *Digital Decade Country Report 2024: Romania*. Publications Office of the European Union. <https://digital-strategy.ec.europa.eu/en/factpages/romania-2024-digital-decade-country-report>
9. European Investment Bank. (2023). *Digitalisation of SMEs in Romania*. European Investment Bank. https://www.eib.org/attachments/lucalli/20230198_digitalisation_of_smes_in_romania_en.pdf
10. Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, 111(7), 1006–1023. <https://doi.org/10.1108/02635571111161262>

11. Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., & Ghalsasi, A. (2011). Cloud computing: The business perspective. *Decision Support Systems*, 51(1), 176–189. <https://doi.org/10.1016/j.dss.2010.12.006>
12. Matarazzo, M., Penco, L., Profumo, G., & Quaglia, R. (2021). Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective. *Journal of Business Research*, 123, 642–656. <https://doi.org/10.1016/j.jbusres.2020.10.033>
13. Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & Information Systems Engineering*, 57(5), 339–343. <https://doi.org/10.1007/s12599-015-0401-5>
14. OECD. (2021). *The digital transformation of SMEs*. OECD Publishing. <https://doi.org/10.1787/bdb9256a-en>
15. Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management*, 51(5), 497–510. <https://doi.org/10.1016/j.im.2014.03.006>
16. Payne, A., & Frow, P. (2005). A strategic framework for customer relationship management. *Journal of Marketing*, 69(4), 167–176. <https://doi.org/10.1509/jmkg.2005.69.4.167>
17. Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
18. Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889–901. <https://doi.org/10.1016/j.jbusres.2019.09.022>
19. Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118–144. <https://doi.org/10.1016/j.jsis.2019.01.003>
20. Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J.-F., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, 70, 356–365. <https://doi.org/10.1016/j.jbusres.2016.08.009>
21. Warner, K. S. R., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, 52(3), 326–349. <https://doi.org/10.1016/j.lrp.2018.12.001>
22. Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Information Systems Research*, 16(1), 61–84. <https://doi.org/10.1287/isre.1050.0045>

CASH USAGE, FINANCIAL INCLUSION, AND UNEVEN DEVELOPMENT IN TRANSITION ECONOMIES: EVIDENCE FROM ROMANIA AND THE EUROPEAN UNION

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ABSTRACT: *The rapid digitalisation of financial services has transformed payment behaviour across the European Union, but the transition towards cashless transactions remains uneven. This paper examines the relationship between cash usage, financial inclusion and uneven development, with particular emphasis on Romania in comparison with the European Union. The study asks whether persistent cash use should be interpreted only as delayed financial modernisation or also as a response to structural inequalities in income, financial accessibility, digital capabilities and territorial development. The analytical framework combines evidence from the European Central Bank, Eurostat, the World Bank Global Findex and the National Bank of Romania with an extensive review of recent peer-reviewed research. Descriptive benchmarking shows that cash remains relevant even in advanced European payment systems: in the euro area it accounted for 52% of point-of-sale transactions in 2024. Romania combines rapid macroeconomic convergence with important inclusion gaps. In 2024, 69.9% of Romanian adults had a financial or mobile-money account, compared with 86.3% in Poland, 88.2% in Portugal and 99.3% in the Netherlands. Only 28% of Romanians aged 16–74 had at least basic digital skills in 2023, compared with 56% in the EU. Romania’s GDP per capita nevertheless reached about 78% of the EU average in 2024. The findings support the concept of asymmetric financial modernisation: technological and income convergence can advance more rapidly than convergence in the capabilities and infrastructure required for universal participation in digital finance. The paper concludes that inclusive payment policy should combine digital innovation with financial and digital education, territorial accessibility and continued access to cash for groups at risk of exclusion.*

Keywords: *Cash Usage; Financial Inclusion; Digital Payments; Uneven Development; Financial Accessibility; Payment Behaviour; Romania; European Union*

JEL Classification: *E42; G21; G28; O16; O52; R11*

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1. INTRODUCTION

Digital transformation has changed the architecture of retail payments. Payment cards, contactless technologies, mobile banking, instant transfers and digital wallets have reduced transaction costs and expanded the range of instruments available to households and firms. Nevertheless, the diffusion of digital payments has not eliminated cash. Instead, European payment systems increasingly display a mixed structure in which digital instruments expand while cash continues to perform transactional, budgeting, precautionary and resilience functions.

The persistence of cash raises an analytical question that is particularly important for transition economies. If digital payment technology is widely available, continued cash use may reflect consumer preference, transaction size or privacy considerations. However, it may also reveal unequal access to formal accounts, banking infrastructure, broadband connectivity, digital skills or affordable financial services. Cash dependence can therefore be associated with incomplete modernisation, while cash accessibility can simultaneously protect inclusion for consumers who are not able to use digital alternatives effectively.

This distinction is central to Romania. Since EU accession, the country has recorded substantial income convergence and rapid diffusion of modern payment technologies. The European Commission reports that GDP per capita rose from 44% of the EU average in 2007 to about 78% in 2024. Yet major regional and social disparities remain, while digital capabilities and financial inclusion continue to lag behind leading EU economies. The coexistence of macroeconomic convergence and persistent inclusion gaps makes Romania a useful case for analysing what this paper terms asymmetric financial modernisation.

The relevance of cash is not confined to less digitalised economies. The European Central Bank's 2024 SPACE study shows that cash remained the most frequently used payment method at the point of sale in the euro area, accounting for 52% of transactions, although its share fell from 59% in 2022 and 72% in 2019. Moreover, 62% of consumers considered it important to retain cash as a payment option. These results indicate that payment-system development is better understood as changing coexistence among instruments than as a simple linear replacement of cash.

The main objective of this paper is to examine the relationship between cash usage, financial inclusion and uneven development in Romania and the EU. Five questions guide the analysis: how Romania differs from European payment patterns; whether cash dependence is associated with incomplete financial inclusion; whether income, digitalisation and territorial disparities help explain payment behaviour; whether Romania is converging towards European digital-payment patterns; and whether continued cash accessibility can reduce exclusion during the transition.

The paper contributes by integrating three literatures that are often treated separately: consumer payment choice, digital financial inclusion and uneven territorial development. The central proposition is that cash use should not be interpreted as a one-dimensional indicator of technological backwardness. It can reflect voluntary preferences, structural constraints and demand for a resilient fallback instrument. The policy implication is correspondingly nuanced: digitalisation should be accelerated where it lowers costs and expands access, but payment modernisation should not remove effective access before alternative forms of inclusion are genuinely available.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Research on payment behaviour shows that digital innovation changes the composition of transactions without necessarily eliminating currency demand. Brown et al. (2022)

demonstrate that the convenience of electronic payments affects consumer cash demand, while Trütsch (2020) finds that contactless technology reduces cash use during early diffusion. At the macro level, Pietrucha (2021) describes a “cash paradox”: transactional use can fall while currency demand remains resilient. Liñares-Zegarra and Willeson (2021) further show that monetary and financial conditions influence cash usage across EU countries.

European evidence confirms substantial heterogeneity. Titova et al. (2021) identify common and region-specific determinants of cash use in the EU and show that technological progress, consumer confidence, inequality and economic development operate differently across country groups. The ECB (2024) similarly reports persistent cross-country differences in payment preferences and actual behaviour. These findings support a structural approach in which cash dependence is explained jointly by economic resources, infrastructure, capabilities and institutional conditions rather than by technology alone.

Payment choice also reflects transaction-level considerations. Kajol et al. (2022) identify perceived usefulness, ease of use, trust, security and risk as major determinants of digital financial transactions. Shree et al. (2021) show that consumer experience influences digital-payment adoption, while Brown et al. (2022) emphasise cash-on-hand and payment convenience. Together, these studies explain why apparently similar consumers may choose different instruments even within the same payment environment.

Financial inclusion is no longer defined solely by account ownership. Ozili (2021) reviews the global literature and emphasises that meaningful inclusion involves access, usage, affordability and welfare effects. Tay et al. (2022) similarly conceptualise digital financial inclusion as a gateway to sustainable development, but stress persistent differences across income, gender and location. The World Bank’s Global Findex framework extends this approach by combining account ownership with payments, savings, borrowing, resilience and digital connectivity.

The economic effects of inclusion can be substantial. Geng and He (2021) associate digital financial inclusion with sustainable employment, while Liu et al. (2021) find that digital financial inclusion can support economic growth. Ofoeda et al. (2024) show that institutions and financial regulation condition the inclusion-growth relationship. Kling et al. (2022) and Demir et al. (2022) demonstrate that financial inclusion and FinTech can influence income inequality, although effects differ across the distribution and depend on the form of access being expanded.

These findings imply that an account is a necessary but insufficient condition for digital financial participation. A consumer may be formally banked but lack a payment card, reliable internet connection, digital skills or confidence in electronic authentication. Consequently, empirical analysis should distinguish formal inclusion from effective use.

Digitalisation can lower geographic and transaction-cost barriers, but it can also create functional exclusion. Aziz and Naima (2021) show that digital financial services do not automatically produce inclusion when users lack connectivity, devices, literacy or trust. Kanungo and Gupta (2021) likewise argue that the digitalisation of financial services must be evaluated through its effects on well-being rather than technology adoption alone. Ong et al. (2023) find positive inclusion effects in lower-middle-income ASEAN economies but emphasise the conditioning role of infrastructure.

Digital and financial literacy are complementary forms of human capital. Kass-Hanna et al. (2022) find that financial and digital literacy jointly strengthen financial resilience, particularly for vulnerable households. Al-Shami et al. (2024) and Amnas et al. (2024) similarly identify digital financial literacy as a mechanism connecting technology use with effective inclusion. This is especially relevant for Romania, where the digital-skills gap remains among the largest in the EU.

The broader digital divide is socially and spatially embedded. Lamberti et al. (2023) show that internet appropriation in the EU depends on socio-economic characteristics and security concerns. Kolotouchkina et al. (2022) demonstrate that digitalised urban environments can reproduce accessibility gaps for people with disabilities. These studies caution against interpreting infrastructure availability as equivalent to universal capability.

A key distinction is between cash dependence and cash accessibility. Dependence occurs when users rely on cash because alternatives are unavailable, unaffordable or difficult to use. Accessibility refers to the ability to obtain and use cash within a plural payment ecosystem. The former may signal incomplete inclusion; the latter can protect consumers during technological transition.

Kotkowski and Polasik (2021) show that the COVID-19 pandemic widened the divide between cash-oriented and cashless consumers in Europe. Alvarez et al. (2022) demonstrate that restrictions on cash can produce welfare costs for cash-intensive users even when such restrictions may have other policy benefits. More recent work by Alvarez, Argente and Van Patten (2026) adds a resilience dimension, showing that payment composition can shift toward cash after disruptions. Payment diversity therefore has value because cash and electronic instruments depend on different infrastructures.

The ECB's policy stance reflects this duality: digital payments are expanding, yet access to and acceptance of cash remain relevant to consumer choice and resilience. The National Bank of Romania (BNR, 2024) similarly treats cash and payment infrastructure as part of the broader stability and accessibility of the financial system.

Uneven development provides a spatial mechanism connecting socio-economic inequality with payment behaviour. Financial infrastructure is more profitable in dense, higher-income markets, while rural or peripheral areas can face weaker branch, ATM and merchant-acceptance networks. Digital finance can compensate for physical distance, but only where connectivity and user capability are sufficient.

Zhang et al. (2022) show that mobile payments can increase rural household consumption by relaxing financial-access constraints. However, Aziz and Naima (2021) show why this mechanism weakens when connectivity and literacy are limited. At the macro level, Suhrab et al. (2024) associate digital financial inclusion and technological infrastructure with lower inequality, while Adugna (2024) identifies improved accessibility and efficiency as channels through which FinTech may reduce income disparities.

Romania's strong regional disparities make this mechanism especially relevant. Eurostat reported that the national at-risk-of-poverty-or-social-exclusion rate was 32.0% in 2023, compared with 12.3% in București-Ilfov. Such differences suggest that national averages can conceal very different effective payment environments.

Transition economies are characterised by rapid institutional and technological convergence combined with slower convergence in income, infrastructure and capabilities. Titova et al. (2021) provide direct evidence that determinants of cash use differ between CEE and more advanced EU economies. The implication is that a common regulatory and technological environment does not automatically generate common payment outcomes.

The concept of asymmetric financial modernisation captures this mismatch. Payment technology and macroeconomic indicators may converge rapidly, while effective financial inclusion, digital skills and territorial accessibility converge more slowly. The Romanian case is therefore analytically useful not because it is an isolated outlier, but because it reveals how different dimensions of modernisation can move at different speeds.

This interpretation is compatible with Ofoeda et al. (2024), Ong et al. (2023) and Liu et al. (2021), all of whom emphasise that institutional and developmental conditions shape the benefits of financial digitalisation. It also explains why cash can remain important even as electronic-payment capacity expands.

Three gaps emerge from the literature. First, payment-choice studies often focus on transaction-level determinants without linking them explicitly to territorial inequality. Second, financial-inclusion research frequently treats cash as a residual pre-digital instrument rather than as a potential inclusion and resilience mechanism. Third, Romania has received limited attention within an integrated EU comparative framework connecting cash, financial inclusion, digital skills and uneven development.

The paper therefore tests five theory-informed expectations descriptively and proposes them for future panel estimation. H1: higher economic development is associated with lower cash dependence. H2: greater financial inclusion is associated with higher adoption of electronic payments. H3: higher connectivity and digital skills are associated with lower cash dependence. H4: stronger socio-economic and territorial disparities are associated with greater cash dependence where financial and digital infrastructure are weaker. H5: where digital and financial inclusion remain incomplete, continued cash accessibility reduces payment-exclusion risk.

3. DATA AND METHODOLOGY

The study adopts a comparative descriptive design complemented by a proposed EU panel framework. The descriptive component uses the latest harmonised observations available from the ECB, Eurostat, the World Bank Global Findex and the European Commission. The empirical architecture is designed for EU Member States over approximately 2014–2024, subject to series availability. Survey indicators such as Findex account ownership are not mechanically interpolated; they are used for benchmark comparisons or separate survey-wave models.

Table 1. Variables and operationalization

Dimension	Indicator	Unit	Expected relation with cash dependence
Cash dependence	ATM withdrawals per capita / card-to-cash ratio	number or ratio	Dependent variable
Digital payments	Card payments per capita	number per inhabitant	Negative
Financial inclusion	Adults with an account	% age 15+	Negative
Digital finance	Internet banking use	% individuals	Negative
Digitalisation	At least basic digital skills	% age 16–74	Negative
Development	GDP per capita in PPS	EU=100	Negative
Vulnerability	At risk of poverty or social exclusion	% population	Positive
Inequality	Gini coefficient	index	Positive
Territorial structure	Urbanisation	% population	Negative

Source: Author's synthesis based on ECB, Eurostat, World Bank Global Findex and European Commission databases.

Note: Expected signs are theoretical expectations, not imposed restrictions. ATM accessibility may be ambiguous because it can both facilitate cash use and indicate a more developed financial system.

Table 1 operationalises the conceptual framework through four linked dimensions: payment behaviour, formal and effective financial inclusion, digital capability, and uneven development. The preferred annual panel should rely primarily on harmonised ECB and Eurostat series, while Findex variables should be included only for available survey waves. This avoids artificial precision from interpolation.

A baseline fixed-effects specification for future estimation is:

$$\text{CashDependence}_{it} = \alpha + \beta_1 \text{FinancialInclusion}_{it} + \beta_2 \text{GDPpc}_{it} + \beta_3 \text{Digitalisation}_{it} + \beta_4 \text{Urbanisation}_{it} + \beta_5 \text{Inequality}_{it} + \mu_i + \lambda_t + \varepsilon_{it}.$$

In this specification, i denotes country and t denotes year. CashDependence is the dependent variable, FinancialInclusion is the main explanatory variable, and GDP per capita, digitalisation, urbanisation and inequality are controls. Country fixed effects (μ_i) absorb time-invariant national characteristics, while year fixed effects (λ_t) capture shocks common to all countries. The error term (ε_{it}) represents unobserved country-year influences.

The specification is presented as a framework for subsequent econometric testing rather than as an estimated model in the present study. If implemented on a harmonised EU panel, country-clustered standard errors would be appropriate, and coefficients should initially be interpreted as conditional associations because reverse causality between financial inclusion, payment infrastructure and payment behaviour remains plausible.

4. DESCRIPTIVE AND COMPARATIVE RESULTS

4.1. Cash remains relevant in a digitalising European payment system

The analysis of cash dependence in Romania should first be placed within the broader transformation of European payment behaviour. Digitalisation has progressively changed the composition of retail payments across Europe, but the available evidence does not indicate a uniform or complete substitution of cash by electronic instruments. Instead, cash and digital payments continue to coexist, although their relative importance has changed over time. Examining recent euro-area trends therefore provides a relevant benchmark for assessing whether persistent cash usage should be interpreted as an exceptional feature of less digitally advanced economies or as part of a broader European payment pattern.

Table 2. Euro-area point-of-sale payment structure

Indicator	2019	2022	2024	Change 2019–2024
Cash share, number of POS transactions	72%	59%	52%	-20 pp
Card share, number of POS transactions	—	34%	39%	+5 pp (2022–24)
Cash share, value of POS transactions	—	42%	39%	-3 pp (2022–24)
Card share, value of POS transactions	—	46%	45%	-1 pp (2022–24)
Consumers considering cash option important	—	60%	62%	+2 pp

Source: European Central Bank (2024), Study on the Payment Attitudes of Consumers in the Euro Area (SPACE).

Note: SPACE covers the euro area rather than all EU Member States. Percentage-point changes are author calculations from ECB values.

Table 2 demonstrates that digitalisation is substantial but incomplete. Cash lost 20 percentage points of its transaction share between 2019 and 2024, yet it still accounted for more than half of physical point-of-sale transactions. Cards dominated in value rather than number, indicating that cash remains especially important for smaller purchases. The increase from 60% to 62% in the share of consumers who consider a cash option important also suggests that

declining use does not imply declining perceived value. This is consistent with the coexistence model developed by Brown et al. (2022), Pietrucha (2021) and Titova et al. (2021).

4.2. Romania's financial-inclusion gap

To assess the relationship between cash dependence and financial modernisation, it is necessary to consider the extent to which individuals have access to formal financial services. Account ownership represents a fundamental, although not sufficient, condition for participation in digital payment systems, as access to cards, internet banking and most mobile-payment solutions generally depends on an established relationship with a financial institution or mobile-money provider. Romania's position is therefore compared with selected European economies representing different levels and trajectories of financial and digital development. Poland provides a relevant Central and Eastern European benchmark, Portugal offers a useful comparison with a Southern European economy that has experienced substantial financial modernisation, while the Netherlands represents a highly financially included and digitalised EU economy. Table 3 uses 2024 Global Findex data to quantify Romania's account-ownership gap relative to these benchmarks and to evaluate the extent to which formal financial inclusion may constrain the transition towards digital payments.

Table 3. Account ownership: Romania and selected European benchmarks, 2024

Country	Adults with account (%)	Gap vs Romania (pp)	Romania relative to country
Romania	69.9	—	100.0%
Poland	86.3	16.4	81.0%
Portugal	88.2	18.3	79.3%
Netherlands	99.3	29.4	70.4%

Source: World Bank (2025), Global Findex Database 2025, 2024 country observations.

Note: Account ownership refers to an account at a financial institution or with a mobile-money-service provider among adults aged 15+. Relative ratios are author calculations.

Table 3 reveals a substantial formal-inclusion gap. In 2024, 69.9% of Romanian adults had an account, leaving roughly three in ten adults outside this basic measure of financial inclusion. The difference is not limited to comparison with a highly digitalised economy such as the Netherlands. Romania also trails Poland by 16.4 percentage points and Portugal by 18.3 points. This supports the argument that aggregate growth in electronic payments cannot be equated with universal participation in formal finance.

The implication for payment behaviour is direct. Consumers without accounts cannot fully access card payments, internet banking or most digital wallets. Even among account holders, effective use may be limited by cost, confidence, connectivity or skills. Ozili (2021) and Tay et al. (2022) therefore provide a useful distinction between formal access and meaningful use.

4.3. Digital capability as a structural constraint

Digital capability represents a critical link between formal financial inclusion and the effective use of digital financial services. Access to a bank account or digital-payment infrastructure does not automatically translate into active participation when individuals lack the skills required to navigate online platforms, authenticate transactions, evaluate security risks or use digital financial applications confidently. Digital skills should therefore be treated as a structural component of financial modernisation rather than merely as an indicator of

technology adoption. This dimension is particularly relevant for Romania, where progress in digital infrastructure has not been matched by comparable improvements in population-level digital competencies. To assess the magnitude of this capability gap, Table 4 compares Romania with the EU average and with the Digital Decade 2030 target, providing an indication of the extent to which limited digital skills may constrain effective financial inclusion and the transition from cash to digital payment instruments.

Table 4. Basic digital skills in Romania and the EU, 2023

Indicator	Romania	EU	Gap (pp)	Romania/EU
People aged 16–74 with at least basic overall digital skills	28%	56%	-28	50.0%
Digital Decade 2030 target	80%	80%	-52 vs target	35.0% of target

Source: Eurostat (2023/2024 release), dataset isoc_sk_dskl_i21.

Note: At least basic overall digital skills require minimum competence across information/data literacy, communication/collaboration, digital-content creation, safety and problem-solving.

Table 4 identifies one of the clearest constraints on digital financial inclusion. Romania's 28% share was exactly half the EU average in 2023 and only 35% of the EU's 2030 Digital Decade target. Because mobile banking, electronic authentication, online fraud prevention and digital wallets require more than basic device access, this capability gap can translate into a payment-access gap. The result is consistent with Kass-Hanna et al. (2022), Amnas et al. (2024) and Al-Shami et al. (2024), who show that digital financial literacy mediates effective inclusion.

Regional evidence reinforces the point. Eurostat reports that in 2024 fewer than one in three people used internet banking in every Romanian region except București-Ilfov, whereas the EU-wide share was 67.2%. The Romanian digital-finance divide is therefore not simply national but territorial.

4.4. Income convergence without full capability convergence

To assess whether Romania's economic catch-up has been accompanied by a comparable improvement in the conditions that enable broad participation in an increasingly digital economy, it is necessary to look beyond aggregate income measures. Table 5 therefore compares Romania with the EU benchmark across a selected set of structural indicators capturing economic development, digital capabilities, socio-economic vulnerability and engagement with digital financial services. Taken together, these indicators provide a broader perspective on the extent to which income convergence has translated into capability and social convergence, while also highlighting structural constraints that may continue to shape payment behaviour and access to digital financial services.

Table 5. Selected structural indicators: Romania and EU benchmark

Indicator	Romania	EU benchmark	Year	Romania relative to EU
GDP per capita (EU=100)	78	100	2024	78.0%
At least basic digital skills	28%	56%	2023	50.0%
At risk of poverty or social exclusion	27.9%	21.0%	2024	132.9%

Indicator	Romania	EU benchmark	Year	Romania relative to EU
Internet banking use	<33% in most RO regions	67.2% EU population	2024	Substantial gap

Source: European Commission (2026) and Eurostat (2023–2025 releases).

Note: Internet-banking evidence is regional for Romania: all Romanian regions except Bucureşti-Ilfov were below 33% in 2024. The EU value refers to the population using internet banking.

Table 5 illustrates asymmetric convergence. Romania's GDP per capita reached about 78% of the EU average in 2024, a major increase from 44% at EU accession. Yet digital skills reached only half the EU benchmark, and the at-risk-of-poverty-or-social-exclusion rate remained 6.9 percentage points above the EU average. Income convergence has therefore proceeded faster than convergence in some of the capabilities and social conditions needed for universal digital participation.

This divergence matters because payment behaviour is embedded in household resources. Lower-income or vulnerable households may face stronger fixed costs of financial participation, greater sensitivity to fees, lower access to devices and a stronger preference for the budgeting visibility of cash. These mechanisms do not imply that poverty mechanically causes cash use, but they justify treating socio-economic vulnerability as a structural correlate rather than a purely individual preference.

4.5. Territorial inequality and payment accessibility

To understand how structural inequalities translate into differences in payment accessibility, the national perspective needs to be complemented by a territorial one. Romania displays substantial regional disparities in socio-economic vulnerability and engagement with digital financial services, with Bucureşti-Ilfov differing markedly from much of the rest of the country. Table 6 brings together selected indicators that illustrate this spatial heterogeneity and provide a basis for assessing how place-specific economic and digital conditions may shape access to, and effective use of, different payment instruments.

Table 6. Selected evidence of territorial inequality in Romania

Indicator	Romania / region	Benchmark	Year	Interpretation
AROPE, national	32.0%	EU 21.4%	2023	High national vulnerability
AROPE, Bucureşti-Ilfov	12.3%	Romania 32.0%	2023	Large capital/non-capital divide
At-risk-of-poverty, Bucureşti-Ilfov	2.1%	Among lowest EU regions	2023	Strong regional asymmetry
Internet banking	<33% in all RO regions except capital	EU 67.2%	2024	Territorial digital-finance gap

Source: Eurostat regional statistics and news releases (2024–2025).

Note: Indicators use different concepts and should not be compared as if they measured the same phenomenon; they jointly illustrate the scale of Romania's territorial heterogeneity.

Table 6 shows why a national average is insufficient for interpreting Romanian payment behaviour. The 2023 AROPE rate was 32.0% nationally but only 12.3% in Bucureşti-Ilfov. The capital region also had an exceptionally low at-risk-of-poverty rate. Meanwhile, internet-banking use remained below one third in almost all Romanian regions outside the

capital. The evidence supports H4 at a descriptive level: socio-economic and digital inequalities are spatially concentrated and are likely to create heterogeneous feasible sets of payment instruments.

The relevant policy concept is therefore accessibility rather than simple adoption. A resident of a dense metropolitan area with multiple bank branches, reliable broadband and high merchant acceptance faces a different payment environment from a resident of a sparsely populated locality with weaker transport, connectivity and financial infrastructure. Digitalisation can reduce distance, as Zhang et al. (2022) show, but only when the prerequisites for use are present.

4.6. Assessment of the research hypotheses

Having examined the economic, financial, digital and territorial dimensions associated with payment behaviour, the analysis can now be consolidated in relation to the research hypotheses formulated in Section 2. Table 7 synthesises the evidence presented in the preceding sections and evaluates the extent to which each hypothesis is supported by the Romanian evidence and the relevant literature. Given the descriptive nature of the analysis and the limitations of harmonised data on cash dependence, the assessments distinguish between descriptive, conceptual and structural support rather than implying causal confirmation.

Table 7. Assessment of research hypotheses

Hypothesis	Evidence from the analysis	Assessment
H1 Development → lower cash dependence	EU literature and Romania's convergence are consistent, but direct Romanian cash-share series are limited	Conceptually/descriptively supported
H2 Inclusion → digital adoption	Romania's 69.9% account ownership remains below selected EU benchmarks	Supported descriptively
H3 Digitalisation → lower cash dependence	Romania has only 28% basic digital skills and low regional internet-banking use	Supported descriptively
H4 Uneven development → stronger cash dependence	Large poverty and digital gaps between capital and other regions	Supported as structural interpretation
H5 Cash access protects inclusion	ECB preference evidence and resilience literature support continued access during transition	Supported conceptually

Source: Author's assessment based on Tables 2–6 and the literature reviewed in Section 2.

Note: No causal claim is made. H1–H4 require harmonised panel estimation for econometric confirmation; H5 is principally an inclusion and resilience proposition.

The evidence provides coherent support for the theoretical framework but does not establish causality. H2 and H3 receive the strongest descriptive support because Romania's financial-inclusion and digital-skills gaps are directly observable. H4 is reinforced by unusually large regional socio-economic differences. H1 remains plausible but requires a harmonised

cross-country cash-dependence measure. H5 is supported by consumer-preference evidence and by research on outages and welfare costs, but it should not be interpreted as an argument for maintaining high cash dependence. The policy objective is payment choice under conditions of genuine inclusion.

5. DISCUSSIONS

The results support a multidimensional interpretation of cash persistence. The decline in euro-area cash use is clear, but the continuing predominance of cash by transaction number demonstrates that digitalisation is not equivalent to disappearance. At the same time, Romania's account-ownership, digital-skills and poverty indicators show why the pace of payment digitalisation cannot be evaluated independently of structural inclusion.

The Romanian pattern is best described as asymmetric financial modernisation. Macroeconomic convergence has been rapid, and modern payment technologies are increasingly visible, but effective participation remains constrained for a non-negligible part of the population. This asymmetry is consistent with Titova et al. (2021), who identify distinctive CEE determinants of cash use, and with the digital-inclusion literature, which emphasises infrastructure, literacy and trust.

The distinction between voluntary cash preference and involuntary cash dependence is particularly important. Consumers may prefer cash because it is simple, private or useful for budgeting. Such preferences should not be conflated with exclusion. The policy problem arises when cash is used because alternatives are inaccessible or when cash itself becomes difficult to obtain before digital inclusion is complete.

Territorial inequality adds a further layer. The sharp contrast between București-Ilfov and other Romanian regions in poverty and internet-banking indicators suggests that national payment statistics can conceal structurally different local ecosystems. A uniform policy may therefore have unequal effects. Policies that are efficient in Bucharest may generate exclusion risks in rural or peripheral areas.

Finally, resilience strengthens the case for a diversified payment system. Digital payments offer speed, traceability and convenience but depend on electricity, telecommunications and complex financial infrastructure. Cash can provide continuity during some disruptions. The optimal policy is therefore not technological neutrality in the sense of avoiding innovation, but functional redundancy combined with broad digital capability.

Taken together, the evidence suggests that the Romanian case cannot be described adequately by a simple linear transition from cash to digital payments. The more relevant pattern is a sequencing problem among different dimensions of modernisation. Income convergence and the diffusion of payment technologies have advanced relatively quickly, whereas account ownership, digital capability and effective territorial access have converged more slowly. This mismatch is the core of what this paper defines as asymmetric financial modernisation. It explains why improvements in aggregate economic and technological indicators may coexist with persistent reliance on cash among particular social groups and regions.

The distinction is analytically important because payment behaviour reflects both preferences and feasible choices. A household that has an account, reliable connectivity, adequate digital skills and nearby payment acceptance can choose between cash and electronic instruments on the basis of convenience, privacy or budgeting preferences. By contrast, a household facing weak connectivity, limited financial literacy, high service costs or restricted access to formal financial services has a narrower choice set. In the latter case, cash use may be less a preference than an adaptation to structural constraints. Aggregate payment statistics

cannot fully separate these mechanisms, which is why the descriptive findings should be interpreted jointly with the evidence on inclusion, skills and territorial inequality.

This interpretation also clarifies the relationship between financial inclusion and digitalisation. Formal account ownership is a necessary gateway to many electronic payment instruments, but it does not guarantee effective participation. Digital financial inclusion requires a chain of complementary conditions: access to an account and payment instrument, affordable connectivity, sufficient digital and financial literacy, trust in authentication and fraud-prevention mechanisms, and an acceptance network that makes digital payment practical in everyday transactions. A weakness at any point in this chain can slow the substitution of cash even when the underlying technology is available.

The territorial dimension strengthens the asymmetric-modernisation argument. The contrast between București-Ilfov and most other Romanian regions indicates that national averages conceal substantially different local payment ecosystems. Metropolitan areas combine higher incomes, denser banking infrastructure, stronger connectivity and greater exposure to digital services, whereas peripheral and rural areas may face several disadvantages simultaneously. These cumulative constraints imply that a uniform national transition towards digital payments may produce uneven welfare effects. The relevant policy benchmark is therefore not the maximum possible rate of cash displacement, but the expansion of genuine payment choice across territories and socio-economic groups.

The findings further suggest that cash dependence and cash accessibility should remain conceptually distinct. A high level of involuntary cash dependence may signal incomplete inclusion and should decline as financial and digital capabilities improve. Cash accessibility, however, can retain value even in a highly digital system by supporting consumers who are temporarily or persistently unable to use electronic alternatives and by providing functional redundancy during disruptions. This distinction avoids framing policy as a binary choice between cash and digitalisation. A more coherent objective is a resilient multi-instrument payment system in which digital adoption expands because it becomes accessible and useful, rather than because cash options disappear prematurely.

From a research perspective, the present evidence supports the proposed conceptual framework but does not identify causal effects. The observed gaps are consistent with the hypotheses that financial inclusion, digital capability and territorial development shape cash dependence, yet harmonised annual measures of point-of-sale cash use are not available for all EU Member States over the full study period. This limitation is substantive rather than merely technical: different proxies capture different aspects of cash behaviour. ATM withdrawals measure cash acquisition, for example, whereas payment diaries measure transaction use. Future econometric work should therefore test the framework with multiple cash proxies and explicitly assess the robustness of results to alternative operationalisations.

A further implication concerns the interpretation of convergence itself. GDP per capita is an important indicator of the resources available to households and the economy, but it cannot serve as a sufficient proxy for financial modernisation. Payment-system participation depends on distributive and capability variables that may respond more slowly than aggregate income. The Romanian evidence illustrates this distinction: a country can close a substantial part of its macroeconomic income gap while still displaying much larger gaps in basic digital skills and formal account ownership. Consequently, assessments based only on GDP convergence risk overstating the degree to which households have acquired the practical capabilities required to participate in increasingly digital financial markets.

The same reasoning applies to the interpretation of technological diffusion. The presence of contactless cards, mobile applications, instant payments or online banking does not reveal how evenly these technologies are used. Supply-side innovation may progress rapidly because financial institutions have incentives to adopt scalable digital technologies, while

demand-side adaptation depends on education, age, income, trust, perceived security and previous experience. This creates a potential gap between technological availability and effective adoption. In transition economies, where demographic ageing, rurality and uneven household resources may overlap, that gap can be particularly persistent. The concept of asymmetric financial modernisation therefore links technological change to the social conditions that determine who can convert innovation into everyday financial capability.

The evidence also helps reconcile two apparently conflicting policy narratives. One narrative treats declining cash use as evidence of efficiency, innovation and lower transaction costs; another emphasises the exclusion risks created when payment services become predominantly digital. The results suggest that both mechanisms can operate simultaneously. Digital payments can increase convenience and reduce geographic barriers for connected users, while the same transition can increase functional distance from the financial system for users with weak skills, limited connectivity or low trust. The appropriate policy response is therefore conditional rather than ideological: accelerate digitalisation where it broadens feasible choices, but preserve accessible alternatives where the prerequisites for effective digital participation remain incomplete.

This conditional approach is particularly relevant to the European integration context. EU-wide regulatory and technological initiatives can harmonise standards and reduce cross-border frictions, yet common rules do not eliminate national and regional differences in household capability. The Romanian case indicates that convergence in payment infrastructure may precede convergence in usage conditions. For Central and Eastern European economies, this raises a broader research question about whether identical digital innovations generate different behavioural responses depending on the initial levels of inclusion, inequality, urbanisation and digital literacy. The proposed panel framework is useful precisely because it can test whether these structural conditions systematically modify the association between digitalisation and cash dependence.

6. POLICY IMPLICATIONS

First, Romania should accelerate financial inclusion by reducing barriers to basic accounts and payment instruments. Account ownership below 70% is a material constraint on the universality of digital payments. Low-cost accounts, transparent fees and accessible onboarding can expand the formal base of participation.

Then digital financial inclusion should be integrated with digital-skills policy. The 28% basic-skills rate indicates that infrastructure investment alone is insufficient. Financial education should include practical digital competencies: authentication, fraud recognition, mobile banking, privacy and safe online payments.

Territorial accessibility should be monitored explicitly. Bank branches, ATMs, cash-in/cash-out points, broadband and merchant acceptance should be mapped against population vulnerability. Where commercial provision is weak, shared infrastructure, postal networks or other access models may be necessary.

Continued access to cash should be treated as a transitional inclusion and resilience objective rather than as opposition to digitalisation. The goal is to prevent vulnerable users from losing a usable payment instrument before digital alternatives become genuinely accessible.

Statistical monitoring should improve. Romania would benefit from regular payment diaries or survey modules that measure cash and digital use by age, income, education, settlement type and region. Such microdata would allow the distinction between preference and constraint to be tested directly and would support more precise policy targeting.

These measures should be sequenced according to local constraints rather than applied uniformly. In areas where account ownership is the main barrier, basic-account access and transparent pricing should receive priority. Where formal access exists but digital use remains weak, practical skills, fraud prevention and assisted digital services are more relevant. In localities with weak physical and digital infrastructure, inclusion policy should address connectivity and cash access together. Such differentiation would align intervention with the mechanisms identified in the analysis and reduce the risk that national averages conceal pockets of exclusion.

Monitoring should also distinguish access, adoption and dependence. Account ownership measures access to formal finance; internet-banking and card-use indicators capture aspects of adoption; and cash withdrawals or payment-diary data provide information about cash behaviour. Treating these measures as interchangeable can produce misleading policy conclusions. A national monitoring framework should therefore combine financial, digital and territorial indicators and report them by age, income, education and settlement type whenever data permit. This would make it possible to identify whether declining cash use reflects expanded choice or merely changing availability.

Finally, payment resilience should be incorporated into inclusion policy. Electronic systems are highly efficient under normal operating conditions but depend on electricity, telecommunications, authentication systems and intermediary networks. Maintaining proportionate cash access and acceptance can provide redundancy without slowing digital innovation. The policy objective should not be to preserve a predetermined cash share, but to ensure that households retain a workable means of payment during both the social transition to digital finance and temporary infrastructure disruptions.

7. CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

This paper examined cash usage, financial inclusion and uneven development in Romania within a European comparative framework. The central finding is that payment digitalisation is real but structurally uneven. Cash still represented 52% of euro-area point-of-sale transactions in 2024, while Romania combined substantial GDP convergence with weaker financial inclusion and digital capability.

Romania's 69.9% account-ownership rate in 2024 was well below selected European benchmarks, and only 28% of people aged 16–74 possessed at least basic digital skills in 2023. At the same time, GDP per capita had reached about 78% of the EU average by 2024. These indicators illustrate asymmetric financial modernisation: income and technological convergence can move faster than convergence in the capabilities and infrastructure required for universal digital participation.

The study therefore rejects a simplistic interpretation of persistent cash use as technological backwardness. Cash dependence may indicate structural constraints, but cash accessibility can also protect inclusion and resilience. An inclusive payment strategy should expand digital options while preserving effective choice for consumers who remain outside or at the margins of digital finance.

The principal limitation is the absence of a harmonised annual direct measure of cash point-of-sale usage for all EU Member States over 2014–2024. The current results are therefore descriptive and comparative and should not be interpreted as causal estimates. Future research should implement the proposed EU panel using the longest harmonised ECB and Eurostat series available, while using Global Findex account-ownership indicators only for observed survey waves rather than interpolating missing years. Alternative measures such as ATM withdrawals per capita, withdrawal values, card payments per capita and card-to-cash ratios should be used as robustness checks because each captures a different dimension of payment

behaviour. A two-way fixed-effects specification with country-clustered standard errors could distinguish persistent country characteristics from common time shocks. Further extensions could examine whether the relationship between digitalisation and cash dependence differs systematically between Central and Eastern European economies and more advanced EU payment systems. Regional or household microdata for Romania would be especially valuable for distinguishing voluntary cash preference from infrastructural constraint and socio-economic exclusion.

REFERENCES

1. Adugna, H. (2024). Fintech dividend: How would digital financial services impact income inequality across countries? *Technology in Society*, 77, 102485. <https://doi.org/10.1016/j.techsoc.2024.102485>
2. Al-Shami, S. A., Damayanti, R., Adil, H., Farhi, F., & Al Mamun, A. (2024). Financial and digital financial literacy through social media use towards financial inclusion among batik small enterprises in Indonesia. *Heliyon*, 10(15), e34902. <https://doi.org/10.1016/j.heliyon.2024.e34902>
3. Alvarez, F., Argente, D., Jimenez, R., & Lippi, F. (2022). Cash: A blessing or a curse? *Journal of Monetary Economics*, 125, 85–128. <https://doi.org/10.1016/j.jmoneco.2021.11.002>
4. Alvarez, F. E., Argente, D., & Van Patten, D. (2026). On the resilience of payment methods (NBER Working Paper No. 35115). National Bureau of Economic Research. <https://doi.org/10.3386/w35115>
5. Amnas, M. B., Selvam, M., & Parayitam, S. (2024). FinTech and financial inclusion: Exploring the mediating role of digital financial literacy and the moderating influence of perceived regulatory support. *Journal of Risk and Financial Management*, 17(3), 108. <https://doi.org/10.3390/jrfm17030108>
6. Aziz, A., & Naima, U. (2021). Rethinking digital financial inclusion: Evidence from Bangladesh. *Technology in Society*, 64, 101509. <https://doi.org/10.1016/j.techsoc.2020.101509>
7. Banca Națională a României. (2024). Raport asupra stabilității financiare, decembrie 2024. <https://www.bnr.ro>
8. Brown, M., Hentschel, N., Mettler, H., & Stix, H. (2022). The convenience of electronic payments and consumer cash demand. *Journal of Monetary Economics*, 130, 86–102. <https://doi.org/10.1016/j.jmoneco.2022.06.001>
9. Demir, A., Pesqué-Cela, V., Altunbas, Y., & Murinde, V. (2022). Fintech, financial inclusion and income inequality: A quantile regression approach. *The European Journal of Finance*, 28(1), 86–107. <https://doi.org/10.1080/1351847X.2020.1772335>
10. European Central Bank. (2024). Study on the payment attitudes of consumers in the euro area (SPACE) – 2024. <https://www.ecb.europa.eu>
11. Eurostat. (2024). Digital economy and society statistics—Households and individuals. European Commission. <https://ec.europa.eu/eurostat>
12. Geng, Z., & He, G. (2021). Digital financial inclusion and sustainable employment: Evidence from countries along the Belt and Road. *Borsa Istanbul Review*, 21(3), 307–316. <https://doi.org/10.1016/j.bir.2021.04.004>
13. Kajol, K., Singh, R., & Paul, J. (2022). Adoption of digital financial transactions: A review of literature and future research agenda. *Technological Forecasting and Social Change*, 184, 121991. <https://doi.org/10.1016/j.techfore.2022.121991>

14. Kanungo, R. P., & Gupta, S. (2021). Financial inclusion through digitalisation of services for well-being. *Technological Forecasting and Social Change*, 167, 120721. <https://doi.org/10.1016/j.techfore.2021.120721>
15. Kass-Hanna, J., Lyons, A. C., & Liu, F. (2022). Building financial resilience through financial and digital literacy in South Asia and Sub-Saharan Africa. *Emerging Markets Review*, 51, 100846. <https://doi.org/10.1016/j.ememar.2021.100846>
16. Kling, G., Pesqué-Cela, V., Tian, L., & Luo, D. (2022). A theory of financial inclusion and income inequality. *The European Journal of Finance*, 28(1), 137–157. <https://doi.org/10.1080/1351847X.2020.1792960>
17. Kolotouchkina, O., Barroso, C. L., & Sánchez, J. L. M. (2022). Smart cities, the digital divide, and people with disabilities. *Cities*, 123, 103613. <https://doi.org/10.1016/j.cities.2022.103613>
18. Kotkowski, R., & Polasik, M. (2021). COVID-19 pandemic increases the divide between cash and cashless payment users in Europe. *Economics Letters*, 209, 110139. <https://doi.org/10.1016/j.econlet.2021.110139>
19. Lamberti, G., Lopez-Sintas, J., & Sukphan, J. (2023). Explaining the digital divide in the European Union: The complementary role of information security concerns in the social process of internet appropriation. *Information Technology for Development*, 29(4), 665–691. <https://doi.org/10.1080/02681102.2023.2202640>
20. Liñares-Zegarra, J. M., & Willeson, M. (2021). The effects of negative interest rates on cash usage: Evidence for EU countries. *Economics Letters*, 198, 109674. <https://doi.org/10.1016/j.econlet.2020.109674>
21. Liu, Y., Luan, L., Wu, W., Zhang, Z., & Hsu, Y. (2021). Can digital financial inclusion promote China's economic growth? *International Review of Financial Analysis*, 78, 101889. <https://doi.org/10.1016/j.irfa.2021.101889>
22. Ofoeda, I., Amoah, L., Anarfo, E. B., & Abor, J. Y. (2024). Financial inclusion and economic growth: What roles do institutions and financial regulation play? *International Journal of Finance & Economics*, 29(1), 832–848. <https://doi.org/10.1002/ijfe.2709>
23. Ong, H.-B., Wasiuzzaman, S., Chong, L.-L., & Choon, S.-W. (2023). Digitalisation and financial inclusion of lower middle-income ASEAN. *Heliyon*, 9(2), e13347. <https://doi.org/10.1016/j.heliyon.2023.e13347>
24. Ozili, P. K. (2021). Financial inclusion research around the world: A review. *Forum for Social Economics*, 50(4), 457–479. <https://doi.org/10.1080/07360932.2020.1715238>
25. Pietrucha, J. (2021). Drivers of the cash paradox. *Risks*, 9(12), 227. <https://doi.org/10.3390/risks9120227>
26. Shree, S., Pratap, B., Saroy, R., & Dhal, S. (2021). Digital payments and consumer experience in India: A survey based empirical study. *Journal of Banking and Financial Technology*, 5, 1–20. <https://doi.org/10.1007/s42786-020-00024-z>
27. Suhrab, M., Chen, P., & Ullah, A. (2024). Digital financial inclusion and income inequality nexus: Can technology innovation and infrastructure development help in achieving sustainable development goals? *Technology in Society*, 76, 102411. <https://doi.org/10.1016/j.techsoc.2023.102411>
28. Tay, L.-Y., Tai, H.-T., & Tan, G.-S. (2022). Digital financial inclusion: A gateway to sustainable development. *Heliyon*, 8(6), e09766. <https://doi.org/10.1016/j.heliyon.2022.e09766>
29. Titova, Y., Cornea, D., & Lemeunier, S. (2021). What factors keep cash alive in the European Union? *International Advances in Economic Research*, 27, 291–317. <https://doi.org/10.1007/s10645-021-09384-3>

30. Trütsch, T. (2020). The impact of contactless payment on cash usage at an early stage of diffusion. *Swiss Journal of Economics and Statistics*, 156, 5. <https://doi.org/10.1186/s41937-020-00050-0>
31. World Bank. (2025). The Global Findex Database 2025: Connectivity and financial inclusion in the digital economy. <https://www.worldbank.org/globalfindex>
32. Zhang, J., Zhang, H., & Gong, X. (2022). Mobile payment and rural household consumption: Evidence from China. *Telecommunications Policy*, 46(3), 102276. <https://doi.org/10.1016/j.telpol.2021.102276>

GREEN HUMAN CAPITAL AND SUSTAINABLE HEALTHCARE: EVIDENCE FROM ROMANIA (2014–2024)

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ABSTRACT: *This paper examines green human capital as a determinant of sustainable healthcare in Romania during 2014-2024. Green human capital is understood as the combination of professional, digital and sustainability-related competencies that enables health workers and organisations to provide effective care while improving resilience and reducing environmental pressures. The study integrates health-economics and labour-market perspectives and uses secondary evidence from Eurostat, OECD, the European Commission and the World Health Organization. A descriptive and comparative design is employed to assess workforce capacity, health financing, professional development, digital readiness and the emerging role of green skills. The evidence indicates substantial quantitative progress in physician density, but persistent shortages, territorial imbalances, migration pressures and comparatively low health expenditure continue to constrain system performance. In 2021 Romania recorded 3.5 practising doctors and 8.0 nurses per 1,000 population, compared with EU averages of 4.1 and 8.5. In 2023 health expenditure represented 5.8% of GDP, compared with 10.0% in the EU. These gaps suggest that workforce expansion alone is insufficient. Sustainable healthcare requires continuous professional development, digital capabilities and explicit climate-health competencies embedded in education, organisational practice and workforce planning. The paper concludes that green human capital should be treated as a strategic health-system investment connecting workforce resilience, efficiency, digital transformation and environmental sustainability.*

Keywords: *health economics; human capital; green skills; healthcare workforce; sustainability; Romania; labour market; health systems*

JEL classification: *I11; I15; I18; J24; Q56*

1. INTRODUCTION

Health systems are increasingly recognised not only as providers of medical care but also as major employers, investors and users of energy, materials, pharmaceuticals and technology. At the same time, climate change is creating new health risks and increasing

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pressure on already constrained health systems. The World Health Organization (WHO, 2020) therefore frames climate-resilient and environmentally sustainable healthcare facilities around four interconnected requirements: the health workforce; water, sanitation and healthcare waste; sustainable energy; and infrastructure, technologies and products. This perspective places human capital at the centre of the transition because infrastructure and technology cannot generate sustained improvements without a workforce able to use them effectively.

The concept of green human capital extends conventional human-capital theory by incorporating environmental literacy, resource-efficiency competencies, climate-risk awareness and the ability to adopt low-carbon practices. In healthcare, these competencies intersect with digital skills and traditional clinical knowledge. Recent European evidence emphasises that a climate-smart health workforce requires capabilities for adaptation, mitigation, organisational change and communication, while green-skills education and training remain at an early stage across Europe (Schmidt et al., 2025).

Romania provides a relevant case because workforce expansion has occurred alongside persistent structural weaknesses. The attached manuscript identifies shortages, migration, uneven regional distribution and limited integration of green competencies as central challenges to sustainable workforce formation. The same manuscript defines green human capital in healthcare through environmental awareness, resource efficiency and sustainable practices in professional education and training.

The empirical problem is therefore not simply whether Romania has more healthcare professionals than a decade ago, but whether the workforce possesses the capabilities and institutional conditions required to translate quantitative expansion into accessible, efficient and sustainable care. The 2023 Country Health Profile reported 3.5 practising doctors and 8.0 nurses per 1,000 population in 2021, both below EU averages, while the 2025 profile shows that health spending in 2023 remained the lowest in the EU at EUR 1,800 per capita in purchasing-power terms and 5.8% of GDP (OECD/European Observatory, 2023, 2025).

Against this background, the paper analyses the evolution of health-sector human capital in Romania over 2014-2024 and assesses its relevance for sustainable healthcare. It addresses four research questions: (RQ1) How has Romania's healthcare workforce capacity evolved? (RQ2) Which structural constraints limit the conversion of workforce growth into health-system performance? (RQ3) How should digital and green competencies be incorporated into the concept of health-sector human capital? (RQ4) What policy measures could strengthen workforce resilience and the sustainability of healthcare delivery?

The contribution of the paper lies in connecting health economics, labour-market analysis and sustainability. Rather than treating green skills as an isolated environmental topic, the study interprets them as part of a broader bundle of competencies that can affect resource use, organisational efficiency, service resilience and the capacity to adopt digital and low-carbon technologies.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Human capital is a core determinant of health-system capacity because healthcare production is highly skill-intensive. The quantity, distribution and quality of physicians, nurses and other health professionals affect access, waiting times, continuity of care and the ability of systems to respond to demographic and epidemiological change. OECD and European Observatory assessments consistently emphasise that workforce planning must address not only headcounts but also skill mix, territorial distribution, working conditions and retention.

Sustainable healthcare adds a further competency dimension. WHO (2020) argues that environmentally sustainable facilities require workforce involvement in energy, waste, water, infrastructure and procurement practices. More recent European work defines a climate-smart

workforce through three capacities: workforce capability to respond to climate-related health risks, organisational capacity to implement low-carbon and resilient practice, and communication capacity to explain climate-health risks (Schmidt et al., 2025).

Green skills in healthcare include climate-health literacy, sustainable clinical practice, resource stewardship, waste reduction, sustainable procurement and the ability to participate in organisational decarbonisation. These competencies are not substitutes for clinical skills. They complement them by changing how services are designed and delivered. WHO's climate-change and health training programme similarly includes risk assessment, greenhouse-gas accounting, adaptation and mitigation planning, and climate-informed decision-making (WHO, 2026).

Digital capabilities are closely related to this transition. Telemedicine, electronic records, clinical data management, artificial intelligence and digital logistics can reduce unnecessary travel, support prevention and improve resource allocation, but they also require new skills and governance. Recent BeWell evidence identifies digital skills, green skills and emerging professional profiles as priority areas for health and care workforce education, and reports uneven provision of green-skills training across Europe (European Observatory on Health Systems and Policies, 2025a, 2025b).

For Romania, the conceptual framework must also account for migration and financing. Training additional professionals generates limited domestic returns if retention is weak or if staffing is geographically concentrated. Likewise, limited financing can constrain salaries, working conditions, continuous professional development and the adoption of sustainable technologies. Green human capital should therefore be understood as an interaction between workforce quantity, skill quality, organisational capacity and system resources.

Three research expectations follow.

H1: higher healthcare workforce capacity should be associated descriptively with stronger system capacity, but its effect is conditioned by distribution and retention.

H2: continuous training and digital readiness should increase the adaptability and effective use of human capital.

H3: explicit green competencies should become increasingly relevant to healthcare resilience and efficiency as climate and sustainability requirements are incorporated into health-system management.

3. DATA AND METHODOLOGY

This study adopts a descriptive and comparative research design to examine the role of green human capital in the development of sustainable healthcare in Romania. The methodological approach combines quantitative indicators of healthcare workforce capacity and financing with qualitative evidence concerning professional development, digital readiness, sustainability competencies, workforce retention and territorial distribution. This mixed analytical perspective is appropriate because green human capital in healthcare cannot be adequately captured by a single statistical indicator. Rather, it reflects the interaction between the quantity of available human resources, the quality and adaptability of professional competencies, and the institutional conditions that determine how effectively these resources are deployed.

The empirical analysis is based exclusively on secondary data obtained from internationally recognised institutional sources, primarily Eurostat, the Organisation for Economic Co-operation and Development (OECD), the European Observatory on Health Systems and Policies, the European Commission and the World Health Organization (WHO). Priority is given to harmonised indicators and official country-level assessments in order to ensure comparability, transparency and methodological consistency. OECD and European

Observatory data are used mainly to evaluate healthcare workforce density and health expenditure, while European Commission reports provide complementary evidence regarding workforce shortages, professional mobility, digitalisation and health-system reforms. WHO publications are used to operationalise the emerging sustainability and climate-health dimensions of healthcare competencies (OECD/European Observatory on Health Systems and Policies, 2023, 2025; WHO, 2020, 2026).

The general analytical period covers 2014–2024, corresponding to a decade characterised by significant changes in European healthcare systems, including demographic pressures, increasing workforce mobility, accelerated digitalisation, the COVID-19 pandemic and the growing integration of environmental sustainability into health policy. However, not all indicators are available as complete annual series for the entire period. Healthcare workforce statistics, expenditure indicators, digital-health measures and sustainability-related competencies are published according to different reporting schedules and methodological frameworks. Consequently, the analysis uses the latest comparable observation available for each indicator, while longer-term evidence is employed whenever consistent historical information exists. Missing observations are not interpolated, since artificial completion of the series could create an unjustified impression of statistical precision.

3.1. Conceptualisation and selection of indicators

The methodological framework conceptualises green human capital in healthcare as a multidimensional construct. Conventional human-capital approaches generally emphasise education, professional qualifications, experience and skills. In the context of sustainable healthcare, however, this definition needs to be extended to incorporate competencies associated with climate-related health risks, resource efficiency, environmentally sustainable clinical practice, digital technologies and organisational adaptability. WHO (2020) emphasises that climate-resilient and environmentally sustainable healthcare systems require not only appropriate infrastructure and technologies but also a workforce capable of integrating sustainability considerations into routine health-service delivery.

Accordingly, the indicators included in the study are organised into several interconnected analytical dimensions. Workforce capacity represents the quantitative foundation of health human capital and is measured primarily through the number of practising physicians and nurses per 1,000 inhabitants. These indicators provide information about the availability of core healthcare professionals and allow Romania's position to be compared with broader European benchmarks.

The second dimension concerns health-system financing, measured through current health expenditure as a percentage of GDP and expenditure per capita adjusted for purchasing-power differences. Financing is treated as a conditioning variable rather than as a direct component of green human capital. Adequate financial resources influence recruitment, remuneration, working conditions, professional development and the adoption of digital and sustainable technologies. Consequently, workforce competencies cannot be evaluated independently of the institutional capacity to finance and utilise them effectively.

Another dimension addresses workforce retention and territorial distribution. Aggregate workforce density can conceal substantial inequalities between regions and between urban and rural areas. Similarly, an increase in the number of trained professionals does not necessarily translate into greater domestic healthcare capacity when migration or professional exit remains significant. Evidence concerning mobility, shortages and geographical disparities is therefore incorporated into the interpretation of the quantitative indicators.

The qualitative component of human capital is captured through evidence on continuous professional development, digital readiness and sustainability-related

competencies. Continuous learning is particularly important in healthcare because technological change, new treatment methods, digital health systems and emerging climate-related risks continuously modify competency requirements. Digital readiness includes capabilities associated with electronic health records, telemedicine, health-data management and other digital technologies. Green competencies include climate-health literacy, sustainable resource use, waste reduction, environmentally responsible procurement and participation in organisational decarbonisation and resilience strategies (WHO, 2020, 2026).

These dimensions are summarised in Table 1.

Table 1. Analytical dimensions, indicators and data sources

Dimension	Indicator / evidence	Reference period
Workforce capacity	Practising physicians per 1,000 population	mid-2010s to 2021/2023
Workforce capacity	Nurses per 1,000 population	mid-2010s to 2021
Financing	Current health expenditure (% GDP; PPS per capita)	2021–2023
Retention & distribution	Migration and territorial shortages	2014–2024 evidence
Human-capital quality	Continuous professional development and training	2014–2024 evidence
Green human capital	Climate-health, sustainability and resource-efficiency competencies	Current policy framework
Digital readiness	Digital-health and data competencies	Current policy framework

Source: Author's synthesis based on OECD/European Observatory on Health Systems and Policies (2023, 2025), WHO (2020, 2026) and European Observatory on Health Systems and Policies (2025a, 2025b).

Note: Reference years differ by indicator. The analysis uses the latest comparable observations available and does not interpolate missing annual data.

Table 1 demonstrates that the empirical framework deliberately combines stock, quality and contextual indicators. Physician and nurse densities approximate the quantitative stock of healthcare human capital, whereas continuous training, digital capabilities and sustainability competencies reflect its qualitative development and adaptability. Financing, migration and territorial distribution are incorporated because they determine the extent to which the existing stock of human capital can be retained, geographically allocated and transformed into effective healthcare services.

3.2. Analytical methods

The empirical analysis employs three complementary methods: benchmark comparison, relative-gap analysis and qualitative triangulation. Benchmarking is used to compare Romanian healthcare indicators with corresponding EU values wherever comparable data are available. This approach makes it possible to distinguish domestic improvement from relative convergence. An indicator may improve in Romania while the gap with the EU remains substantial if European performance develops at a similar or faster rate.

For indicators expressed in comparable quantitative units, Romania's relative position is calculated as:

$$RP_i = \frac{X_{RO,i}}{X_{EU,i}} \times 100$$

where $X_{RO,i}$ represents the Romanian value of indicator i , and $X_{EU,i}$ represents the corresponding EU benchmark. A value of 100% indicates parity with the European benchmark, while values below 100% indicate a relative performance gap.

Where appropriate, the absolute Romania–EU difference is also considered:

$$G_{api} = X_{EU,i} - X_{RO,i}$$

This measure is particularly useful for workforce-density and expenditure indicators because it preserves the original unit of measurement and therefore provides an intuitive representation of the distance between Romania and the European benchmark.

Percentage changes over time are calculated when sufficiently comparable beginning- and end-period observations are available:

$$\Delta\% = \frac{X_t - X_0}{X_0} \times 100$$

where X_0 denotes the initial observation and X_t the latest comparable observation. Percentage changes are interpreted cautiously, particularly when initial values are low or when methodological revisions may affect comparability.

The quantitative analysis is complemented by qualitative triangulation of institutional evidence. OECD country profiles, European Commission assessments, European Observatory studies and WHO policy frameworks are used to interpret statistical patterns and identify mechanisms that cannot be directly observed through aggregate indicators. This procedure is especially relevant for migration, continuous professional development, digital competencies and green skills, for which harmonised annual quantitative series remain limited.

3.3. Analytical framework for green human capital

The study assumes that sustainable healthcare performance emerges from an interaction between the stock of healthcare workers and the competencies that determine their capacity to adapt to new technological and environmental requirements. The analytical relationship can be represented conceptually as:

Workforce capacity + professional development + digital competencies + green competencies → adaptive human capital → resilient and sustainable healthcare

This relationship is conditioned by:

financing + retention + territorial distribution + organisational capacity + technology + health policy.

The framework does not assume that an increase in physician or nurse density automatically produces sustainable healthcare outcomes. A country may increase the number of health professionals while continuing to experience regional shortages, migration, inadequate working conditions or insufficient professional development. Similarly, investment in digital or low-carbon infrastructure may produce limited benefits when healthcare professionals do not possess the competencies required to use new technologies effectively.

Green human capital is therefore interpreted as an adaptive capability. Its relevance lies not only in environmental knowledge but also in the ability of healthcare professionals and

organisations to respond to climate-related health risks, reduce unnecessary resource consumption, adopt digital solutions and maintain service continuity under changing conditions. This interpretation is consistent with WHO's approach to climate-resilient and environmentally sustainable healthcare and with recent European discussions concerning the development of green and digital competencies within the health and care workforce (WHO, 2020, 2026; European Observatory on Health Systems and Policies, 2025a, 2025b).

3.4. Methodological limitations

Several limitations must be acknowledged. The most important concerns the absence of a harmonised annual statistical indicator directly measuring green human capital or green skills among Romanian healthcare professionals. Existing international databases provide detailed information on workforce numbers, expenditure and selected digital-health indicators, but sustainability-related professional competencies are generally documented through policy frameworks, surveys or individual projects rather than continuous national statistical series.

For this reason, the paper does not construct an artificial composite green-human-capital index from indicators that differ substantially in definition and coverage. Nor are missing annual observations interpolated. Such procedures could generate apparent quantitative precision without a sufficiently robust empirical foundation.

An other limitation concerns differences in reference years. Workforce statistics often become available with a reporting lag, whereas expenditure and policy information may refer to more recent periods. Comparisons are therefore based on the latest methodologically compatible evidence rather than on the assumption that all indicators refer to exactly the same year.

The last reason, the descriptive design does not permit causal inference. Although relationships between workforce capacity, financing, digital competencies and sustainable healthcare can be theoretically justified, the available dataset is insufficient to establish that changes in one dimension directly cause changes in another. The findings should therefore be interpreted as comparative associations and structural patterns, not as estimated causal effects.

Consequently, no regression results are reported. An econometric extension would require a substantially larger dataset, potentially combining multi-country panel data with harmonised indicators of workforce characteristics, digitalisation, environmental performance and health-system outcomes. Alternatively, facility-level data could be used to investigate whether hospitals or healthcare organisations with stronger green and digital competencies achieve measurable improvements in resource efficiency, emissions, service quality or resilience.

Despite these limitations, the methodology provides a coherent basis for examining Romania's position because it combines internationally comparable quantitative evidence with institutional and policy information. This approach is particularly appropriate for an emerging research field in which the concept of green human capital in healthcare is developing more rapidly than the statistical systems designed to measure it.

4. RESULTS

4.1. Healthcare workforce capacity

The first dimension concerns the quantitative evolution of the healthcare workforce. Romania has increased the number of physicians over the last decade, but the improvement has not eliminated shortages or brought all professional categories to EU levels. The original

manuscript already identifies physician expansion alongside persistent nurse shortages and migration pressures. Table 2 summarises the most comparable benchmark evidence.

Table 2. Healthcare workforce indicators: Romania and EU benchmark

Indicator	Romania	EU	Year	Romania/EU
Practising doctors (per 1,000 population)	3.5	4.1	2021	85.4%
Nurses (per 1,000 population)	8.0	8.5	2021	94.1%
Hospital beds (per 1,000 population)	7.2	4.8	2021	150.0%

Source: OECD/European Observatory on Health Systems and Policies (2023), Romania: Country Health Profile 2023.

Note: Romania/EU values are author calculations. Higher hospital-bed density should not be interpreted automatically as superior performance because the Romanian system remains comparatively hospital-centric.

Table 2 indicates that Romania remained below the EU average in both physician and nurse density in 2021. The physician gap was larger, with Romania reaching about 85% of the EU benchmark, while nurse density reached about 94%. At the same time, hospital-bed density was 50% above the EU average. This combination is important from a health-economics perspective: relatively high physical hospital capacity coexists with workforce constraints, suggesting that sustainable performance depends on a better balance between infrastructure, staffing and primary-care development rather than on physical capacity alone (OECD/European Observatory, 2023).

The workforce problem is also spatial and organisational. National averages conceal shortages in rural and disadvantaged areas, while migration can reduce the domestic return on public and private investment in medical education. Quantitative expansion should therefore be interpreted as necessary but insufficient: retention, distribution and skill mix determine how effectively additional personnel improve access and system resilience.

4.2. Health financing and the conditions for human-capital formation

Human-capital formation is shaped by the resources available for recruitment, retention, training and technological modernisation. Romania's health-financing gap remains substantial, limiting the institutional environment in which workforce capabilities are developed and used.

Table 3. Health expenditure in Romania compared with the EU

Indicator	Romania	EU	Year	Romania/EU
Health expenditure per capita (PPS EUR)	1,800	3,832	2023	47.0%
Current health expenditure (% GDP)	5.8%	10.0%	2023	58.0%
Out-of-pocket share of health spending	23%	16%	2023	143.8%

Source: OECD/European Observatory on Health Systems and Policies (2025), Country Health Profile 2025: Romania.

Note: Per-capita expenditure is adjusted for purchasing-power differences. Romania/EU ratios are author calculations.

Table 3 shows that Romania's health expenditure per capita was less than half the EU average in 2023, while expenditure as a share of GDP reached only 58% of the EU benchmark. The comparatively high out-of-pocket share also indicates greater direct financial pressure on

households. These figures matter for green human capital because limited financing constrains staffing, continuous education, occupational conditions and the adoption of digital and environmentally sustainable technologies. The sustainability transition therefore cannot be separated from the broader financing capacity of the health system.

The composition of expenditure is equally relevant. The 2025 Country Health Profile reports a large inpatient-care share and relatively low expenditure on prevention and long-term care. A workforce strategy centred on sustainability should consequently support stronger primary and preventive care, where professional competencies can reduce avoidable hospital use and improve resource efficiency.

4.3. Training, digital skills and green human capital

The qualitative dimension of human capital concerns whether professional competencies evolve in line with technological and environmental change. In the original manuscript, limited lifelong learning and weak integration of green competencies were identified as important barriers. Recent European evidence supports treating this as a wider workforce challenge rather than a Romania-specific educational issue.

Table 4. Core competency domains for a climate-smart healthcare workforce

Competency domain	Examples	Expected contribution to system
Climate-health literacy	Climate risks, vulnerability assessment, prevention	Adaptation and resilience
Low-carbon clinical practice	Resource stewardship, emissions awareness	Mitigation and efficiency
Sustainable operations	Waste, energy, water, procurement	Lower environmental footprint
Digital health	Telemedicine, data management, AI literacy	Access, productivity and monitoring
Communication & leadership	Risk communication, organisational change	Implementation and public trust
Continuous professional development	Upskilling, reskilling, accreditation	Adaptability over the career cycle

Source: Author's synthesis based on WHO (2020, 2026) and Schmidt et al. (2025).

Note: The table identifies competency domains recommended in international frameworks; it does not measure their current prevalence among Romanian health professionals.

Table 4 shows that green human capital is broader than environmental awareness. It combines climate-health knowledge with operational, digital, communication and continuous-learning competencies. The European Observatory notes that green-skills education in European health systems remains at an early stage and recommends systematic education and training across professional levels, including continuing professional development and accreditation (Schmidt et al., 2025). This provides a strong rationale for integrating sustainability into Romanian medical and health-professional curricula rather than treating it as optional training.

Digital and green competencies are complementary. Electronic records, telemedicine and data-driven management can improve access and reduce unnecessary resource use, while digital monitoring can support energy, procurement and waste-management objectives. However, technology does not generate efficiency automatically: workforce capability,

organisational routines and leadership determine whether digital tools translate into better outcomes.

4.4. Sustainability, resilience and healthcare delivery

A sustainable health system must simultaneously protect population health, remain operational under climate stress and reduce avoidable environmental impacts. WHO estimates that healthcare contributes more than 4% of global net climate emissions and therefore has both adaptation and mitigation responsibilities. The transition requires workforce participation because decisions about prescribing, procurement, waste, energy use and service organisation are embedded in everyday professional practice.

For Romania, the implication is that sustainability policy should be connected to existing system weaknesses. Staff shortages and overwork can reduce participation in training; hospital-centred service delivery can increase resource intensity; and limited financing can delay modernisation. Green-skills initiatives will therefore have greater impact when combined with workforce retention, primary-care strengthening, digital infrastructure and investment in resilient facilities.

5. DISCUSSIONS

The findings reveal a central asymmetry in Romania's healthcare transformation. The stock of health human capital has improved, especially among physicians, but the institutional conditions required to convert this improvement into resilient and sustainable performance remain weaker. Below-EU workforce densities, low health expenditure, migration and uneven distribution continue to constrain access, while emerging green and digital competency requirements add new demands to an already pressured workforce.

This result supports H1 only in a qualified sense. More physicians and nurses increase potential service capacity, but the effect depends on where professionals work, whether they remain in the country, and whether organisational and financial conditions allow their skills to be used efficiently. Human capital quantity is therefore an incomplete measure of health-system capability.

H2 is supported conceptually by the growing importance of continuous training and digital readiness. Rapid technological change means that initial professional education cannot provide all competencies required across a career. Digital-health systems, AI-supported tools and new service models create a continuous need for upskilling. In economic terms, training raises the productivity of existing human capital when complementary technologies and organisational capabilities are present.

H3 is also supported at the conceptual and policy level, although direct Romanian green-skills data remain insufficient for statistical testing. WHO and European Observatory frameworks demonstrate that climate-health literacy, low-carbon practice, sustainable operations and risk communication are becoming explicit workforce requirements. The appropriate conclusion is therefore not that green skills have already produced measurable Romanian health outcomes, but that they represent an increasingly important capability gap that workforce policy must address.

The health-economics implication is that green human capital should be evaluated as an investment rather than a compliance cost. Better resource stewardship can reduce waste and operating costs; climate preparedness can reduce disruption; digital and preventive capabilities can improve service allocation; and workforce involvement can increase the effectiveness of infrastructure investments. These benefits are plausible channels, but future Romanian research should quantify them using facility-level or panel data.

6. POLICY IMPLICATIONS

Romania should integrate climate-health and sustainability competencies into undergraduate medical, nursing and allied-health curricula, residency training and continuing professional development. Training should cover climate-related health risks, sustainable clinical practice, healthcare waste, resource stewardship and climate-resilient service delivery.

A second priority is to connect green skills with digital transformation. Professional development should combine sustainability with telemedicine, clinical data management, cybersecurity, AI literacy and digital workflow redesign. Joint green-digital training is more likely to generate operational change than parallel programmes developed in isolation.

Third, workforce retention and territorial distribution must remain central. Green and digital upskilling cannot compensate for chronic understaffing. Incentives for underserved areas, improved working conditions, career development and stronger primary-care teams are necessary to protect the return on investment in professional education.

Fourth, healthcare organisations should create operational mechanisms for sustainability, including multidisciplinary green teams, environmental-performance indicators and staff participation in procurement, waste and energy initiatives. International evidence suggests that education has greater impact when sustainability objectives are embedded in organisational management and quality systems.

Finally, Romania needs better data. Workforce statistics should be linked with continuing-education participation, digital competencies, facility-level environmental indicators and service outcomes. Such data would allow future research to move from descriptive analysis to robust causal evaluation of whether green human capital improves efficiency, resilience and health outcomes.

7. CONCLUSIONS

This paper examined green human capital as a determinant of sustainable healthcare in Romania during 2014-2024. The evidence shows meaningful quantitative improvement in workforce capacity, but also persistent shortages, financing constraints, migration and territorial imbalances. Romania's 2021 physician and nurse densities remained below EU averages, while 2023 health expenditure was substantially lower than the EU benchmark.

The main conclusion is that sustainable healthcare depends on the quality and adaptability of human capital as much as on its quantity. Clinical expertise must increasingly be complemented by digital capabilities, climate-health literacy, resource-efficiency skills and continuous professional development. These competencies can support resilience and environmental performance, but their effectiveness depends on adequate financing, retention, organisational leadership and modern infrastructure.

The study is limited by the absence of a harmonised annual Romanian indicator of green competencies in healthcare and by differences in reference years across workforce and expenditure datasets. Consequently, the analysis is descriptive and does not claim causal effects. Future research should construct measurable green-human-capital indices, use facility-level or cross-country panel data, and test relationships with efficiency, emissions, accessibility and health outcomes.

For Romania, the policy challenge is therefore to move from workforce expansion towards workforce transformation. Green human capital should become an explicit component of health-system planning, connecting education, digitalisation, climate resilience, organisational performance and long-term financial sustainability.

REFERENCES

1. European Commission. (2024). Country report Romania 2024. European Commission.
2. European Observatory on Health Systems and Policies. (2025a). Developing digital and green educational and training courses for the health and care workforce. Eurohealth.
3. European Observatory on Health Systems and Policies. (2025b). Developing an education and training course monitor for digital and green skills and competencies in healthcare. Eurohealth.
4. OECD/European Observatory on Health Systems and Policies. (2023). Romania: Country health profile 2023. OECD Publishing. <https://doi.org/10.1787/f478769b-en>
5. OECD/European Observatory on Health Systems and Policies. (2025). Country health profile 2025: Romania. OECD Publishing.
6. Schmidt, A. E., Brugger, K., Horváth, I., Falkenbach, M., Williams, G. A., van Schaaijk, A., Batenburg, R., Wismar, M., & BeWell Consortium. (2025). Green skills for a sustainable future: Building a climate-smart health and care workforce in the European Union. European Observatory on Health Systems and Policies.
7. World Health Organization. (2020). WHO guidance for climate resilient and environmentally sustainable health care facilities. WHO.
8. World Health Organization. (2026). Climate change and health training programme. WHO.

HUMAN RESOURCE MANAGEMENT IN PUBLIC ADMINISTRATION: CHARACTERISTICS, REFORMS, AND STRATEGIES. EVIDENCE FROM ROMANIA IN THE EUROPEAN CONTEXT

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ABSTRACT: *Human resource management (HRM) is a central determinant of administrative capacity, public-service quality and institutional resilience. Public administration differs from private organisations because recruitment, careers, remuneration and performance management operate within legal, political and accountability constraints, while public employees are expected to generate public value rather than profit. This paper analyses the characteristics, reforms and strategic priorities of HRM in public administration, with particular emphasis on Romania and reference to European and OECD practices. The study combines a structured literature review with descriptive analysis of OECD, European Commission and World Bank evidence. Romania’s general-government employment represented 17.36% of total employment in 2023, compared with 16.12% in 2007, showing that the quantitative size of public employment has remained broadly stable over the longer term while reform needs have shifted toward quality, competencies and performance. Recent reforms include a competency framework, national competency-based recruitment, strategic workforce planning, performance-management redesign and HR digitalisation. In the 2024 national recruitment rounds, 1,953 applications were submitted across entry-level, assistant and management categories, and 1,531 candidates passed eligibility screening. At the same time, the 2025 Digital Decade report and recent World Bank assessments identify persistent weaknesses in digital skills, institutional fragmentation, retention and professional development. The paper argues that sustainable public-sector HRM requires a transition from rule-centred personnel administration to integrated strategic HRM based on merit, competencies, data, learning, performance and digital capacity.*

Keywords: *Public Administration; Human Resource Management; Civil Service; Public-Sector Reform; Recruitment; Competencies; Performance Management; Digital Skills; Romania.*

JEL Classification: *H11; H83; J24; J45; O38*

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1. INTRODUCTION

Public administrations face increasingly complex demands generated by digital transformation, demographic ageing, fiscal constraints, climate and security risks, and rising expectations regarding the quality and accessibility of public services. The capacity of governments to respond to these pressures depends not only on legislation, budgets and technology, but also on the quality of the people who design policies, manage programmes and interact with citizens. Human resource management is therefore a core component of state capacity.

Unlike private-sector HRM, public-sector human resource management operates under a dense framework of administrative law, political accountability, transparency requirements and equal-treatment principles. Recruitment and promotion must reconcile merit with procedural fairness; remuneration must balance competitiveness with fiscal sustainability; and performance management must account for outputs that are often difficult to quantify. These characteristics make public HRM simultaneously a managerial and an institutional function (Perry & Hondeghem, 2008; OECD, 2023).

The international reform agenda has progressively moved from traditional personnel administration toward strategic human resource management. The newer model emphasises competency-based recruitment, workforce planning, mobility, continuous learning, performance management, leadership development, diversity and data-driven HR processes. Digital transformation adds another layer: governments need employees who can work with data, digital platforms and emerging technologies while maintaining legal safeguards, security and public trust (OECD, 2021; World Bank, 2025).

Romania offers a relevant case for analysing this transition. The country has pursued successive administrative-capacity reforms since EU accession, but institutional fragmentation, uneven HR practices, recruitment challenges and recurrent reorganisations have limited continuity. World Bank support and the Recovery and Resilience Plan have recently accelerated reforms centred on a general competency framework, national recruitment competitions, improved performance management, strategic planning and digitalisation of HR processes (World Bank, 2022; European Commission, 2026).

The objective of this paper is to assess the specific characteristics of HRM in public administration, identify the main Romanian reform directions and formulate a strategic framework for a more professional, adaptive and performance-oriented civil service. The study addresses four questions: What distinguishes public-sector HRM from private-sector HRM? How has Romania's public employment and HRM reform architecture evolved? Which weaknesses continue to constrain implementation? Which strategies are most likely to strengthen administrative capacity in the medium term?

The contribution is twofold. Conceptually, the paper integrates public-service motivation, strategic HRM and digital-era governance into a common framework. Empirically, it combines OECD public-employment statistics with concrete evidence on Romania's competency-based recruitment reform and recent European and World Bank assessments. The analysis does not equate a larger or smaller public workforce with administrative quality; instead, it focuses on the capacity to attract, deploy, develop, motivate and retain employees whose competencies match institutional needs.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Traditional public personnel administration focused on compliance with rules governing entry, classification, pay, seniority and disciplinary procedures. This model supported impartiality and predictability but could also generate rigidity. Strategic HRM

broadens the focus by linking workforce decisions to organisational objectives and future capability needs. In public administration, the strategic perspective requires alignment between institutional mandates, workforce composition, competency profiles, learning and performance (OECD, 2023; World Bank, 2022).

The resource-based view provides one theoretical justification for strategic HRM: organisational performance depends partly on valuable and difficult-to-replicate capabilities embedded in employees and routines (Barney, 1991). In government, however, the relevant outcome is public value rather than competitive advantage. HR systems should therefore support legality, impartiality, policy capability, service quality and citizen trust as well as efficiency.

Public employees can be motivated by both extrinsic rewards and intrinsic or prosocial motives. Perry and Wise (1990) introduced public-service motivation as a predisposition to respond to motives grounded in public institutions and public interest. Subsequent research shows that mission, meaningful work and service orientation can influence attraction, retention and performance, but these motives do not eliminate the importance of fair pay, career opportunities, competent management and organisational support (Perry & Hondeghem, 2008).

Public organisations also face multiple principals and objectives. Political leaders, citizens, courts, audit institutions and service users may evaluate performance differently. This complicates individual performance measurement and increases the importance of procedural fairness. Consequently, HR reform cannot simply import private-sector instruments; it must adapt them to public accountability and administrative-law requirements.

Merit-based recruitment is a foundational element of professional civil services. The OECD (2021, 2023) associates merit, openness and competency-based selection with stronger capability and integrity. Competency frameworks translate broad administrative values and occupational requirements into observable knowledge, skills and behaviours. They can create a common language across recruitment, appraisal, learning and career development.

Romania's recent reform trajectory reflects this approach. World Bank technical assistance supported a general competency framework and new recruitment and evaluation models. The reform aims to move from formal qualification screening toward transparent selection based on competencies matched to job requirements, while enabling strategic workforce planning and more coherent career management (World Bank, 2022).

Performance management in government is difficult because many outputs are collective, long-term or non-market. Effective systems therefore combine clear objectives, managerial dialogue, competency assessment and developmental feedback rather than relying exclusively on numerical targets. Poorly designed systems can produce formal compliance, grade inflation or gaming; well-designed systems can clarify expectations and connect performance with development (OECD, 2023).

Remuneration is equally important. Public-sector pay systems must preserve internal equity and fiscal control while remaining sufficiently competitive for scarce skills. Fragmented allowances or ad hoc increases can weaken transparency and mobility. Strategic reform therefore requires job evaluation, coherent pay architecture and careful use of variable or performance-related elements rather than isolated salary adjustments (World Bank, 2022).

Continuous learning has become essential because public-sector jobs are changing rapidly. Policy analysis, procurement, cybersecurity, data management, project management and citizen-centred service design require capabilities that cannot be secured through initial education alone. Learning systems should therefore move from episodic training toward continuous development linked to competency gaps and career paths.

Leadership is a complementary capability. Senior civil servants translate political priorities into organisational action, manage cross-sector coordination and create conditions for employee engagement. Leadership development is particularly important during reform

because employees must understand not only new procedures but also the purpose and behavioural expectations associated with them.

Digital transformation changes both what public employees do and how HR functions operate. OECD work on digital government emphasises that technology must be accompanied by organisational and workforce capabilities. Digital HR platforms can improve workforce data, recruitment, learning and mobility, but they cannot compensate for unclear responsibilities or weak management.

A 2025 World Bank assessment of Romania identifies difficulties in attracting and retaining skilled personnel, rigid salary and career structures, limited professional-development opportunities and weak integration between HR modernisation and digital-transformation objectives. Digital competencies are often defined too narrowly as basic IT literacy rather than differentiated by job profile and function (World Bank, 2025). This finding supports a shift toward role-specific digital competency models.

The literature supports four analytical propositions.

P1: merit- and competency-based recruitment strengthens person-job fit and administrative capability.

P2: performance management has stronger effects when linked to learning, career development and managerial accountability.

P3: digital transformation improves public-sector performance only when technology investment is matched by workforce competencies and organisational redesign.

P4: HRM reform is more sustainable when recruitment, pay, workforce planning, learning, performance and HR data are treated as an integrated system rather than separate administrative procedures.

3. DATA AND METHODOLOGY

The paper uses a qualitative-descriptive methodology supported by comparative statistics. Quantitative evidence comes primarily from the OECD Government at a Glance 2025 database, the European Commission's Recovery and Resilience Facility monitoring, the 2025 Digital Decade Country Report, and World Bank reports on Romanian public-administration HRM. The statistical analysis focuses on public-employment dynamics and the implementation of competency-based recruitment. Institutional evidence is used to evaluate reform content and remaining implementation gaps.

Table 1. Analytical dimensions and indicators

Dimension	Indicator/evidence	Period	Main source
Public workforce	General-government employment as % of total employment	2007–2023	OECD (2025)
Recruitment reform	Applications and eligible candidates in national competition	2024	European Commission (RRF)
Competency reform	General competency framework and recruitment/evaluation tools	2022–2025	World Bank
Digital HR capacity	Digital competency gaps and HR-digital alignment	2025	World Bank

Dimension	Indicator/evidence	Period	Main source
Digital services public	Progress and remaining digitalisation needs	2025	European Commission
Strategic HRM	Workforce planning, careers, performance, pay, HR data	current reform cycle	World Bank; European Commission

Source: Author's synthesis based on OECD (2025), European Commission (2025, 2026) and World Bank (2022, 2025).

Table 1 reflects the paper's system perspective. Workforce size is treated as a contextual indicator rather than a performance measure. The core evaluation concerns the quality of HR architecture: whether recruitment, competencies, development, performance, remuneration and data are mutually reinforcing. Because the available evidence does not permit causal estimation, the analysis is interpretive and benchmark-based.

4. RESULTS

4.1. Public employment: stability in size, changing capability requirements

The quantitative starting point is the evolution of employment in general government. OECD data show that Romania's public-employment share has fluctuated within a relatively narrow band over the last decade. This suggests that the main contemporary reform problem is not simply workforce expansion or contraction, but the composition, deployment and capabilities of public employees.

Table 2. Employment in general government in Romania

Year	% of total employment	Change vs 2007 (pp)
2007	16.12	0.00
2010	18.14	+2.02
2014	15.85	-0.27
2018	16.09	-0.03
2020	16.95	+0.83
2021	16.66	+0.54
2022	16.67	+0.55
2023	17.36	+1.24

Source: OECD (2025), Government at a Glance 2025, Public Employment and Representation database.

Note: General government includes central, subnational and social-security institutions classified within sector S13. Percentage-point changes are author calculations.

Table 2 shows a peak of 18.14% in 2010, followed by a decline to 15.85% in 2014 and a gradual increase to 17.36% in 2023. The 2023 level was only 1.24 percentage points above 2007. This relatively modest long-run change reinforces the argument that administrative reform should not be reduced to debates about headcount. The critical question is whether employment is allocated to the functions and skills demanded by contemporary government.

The OECD stresses that cross-country public-employment shares also reflect institutional choices: education, health and social services may be delivered directly by government in one country and by publicly financed private or non-profit providers in another. Accordingly, public-employment ratios should not be interpreted as direct measures of efficiency (OECD, 2025).

4.2. The transition toward competency-based recruitment

Recruitment reform is one of the clearest operational changes in Romanian HRM. The Recovery and Resilience Plan introduced national competency-based competitions designed to create a more transparent and standardised entry mechanism. The 2024 rounds provide useful implementation evidence.

Table 3. Romania's 2024 national civil-service recruitment competition

Category	Applications	Eligible/admitted	Eligibility rate
Entry-level	1,174	1,020	86.9%
Assistant	627	415	66.2%
Director/deputy director	152	97	63.8%
Total	1,953	1,532*	78.4%*

Source: European Commission, Recovery and Resilience Facility project C14-R3, Developing performance human resources management in the public sector.

Note: *The European Commission project page reports 1,531 total admitted candidates, while the three category figures displayed on the same page sum to 1,532. The category-level values are reproduced as published; the discrepancy should be checked against ANFP administrative records before econometric use.

Table 3 indicates substantial interest in the new recruitment process, particularly for entry-level positions. Eligibility rates decline for higher categories, which may reflect stricter experience or documentation requirements. More importantly, the reform creates a common testing stage and regional testing infrastructure, thereby reducing some institution-by-institution variation. Its long-term value, however, will depend on whether the subsequent job-selection phase preserves merit, whether competency assessments predict job performance and whether institutions use recruitment planning strategically.

The reform also illustrates why implementation data matter. The small inconsistency between the published category totals and the stated aggregate total is itself a reminder that HR digitalisation should improve data quality, traceability and interoperability. Reliable workforce data are a prerequisite for evidence-based recruitment and planning.

4.3. Reform architecture: from fragmented personnel practices to integrated HRM

World Bank and European Commission evidence shows that Romania's reform agenda extends beyond recruitment. The emerging architecture combines competencies, workforce planning, performance management, learning, pay policy and HR digitalisation. Table 4 summarises the logic of this transition.

Table 4. Main HRM reform pillars in Romanian public administration

Reform pillar	Traditional weakness	Current reform direction	Expected outcome
Recruitment	Fragmented, procedure-centred selection	National competency-based competition	Merit and better person-job fit
Competencies	Qualifications not consistently linked to roles	General competency framework	Common standards across HR processes

Reform pillar	Traditional weakness	Current reform direction	Expected HR outcome
Workforce planning	Reactive vacancy filling	Strategic planning based on current/forecast needs	Better allocation and succession
Performance	Formal appraisal	Improved performance-management model	Feedback and accountability
Learning & development	Training weakly linked to gaps	Competency-based development	Continuous capability building
HR data	Fragmented information	Digitalisation and centralised data	Evidence-based HR decisions
Pay/careers	Rigid or uneven structures	More coherent pay and career architecture	Retention, fairness and mobility

Source: Author's synthesis based on World Bank (2022, 2025) and European Commission RRF documentation.

Table 4 shows that the reform is systemic in design. A competency framework can only improve performance if it is used consistently in job design, recruitment, appraisal and learning. Similarly, workforce planning requires reliable HR data, while career development depends on transparent links between competencies, performance and progression. Reform failure can therefore occur even when individual instruments are technically sound but implemented in isolation.

4.4. Digital competencies and the new capability gap

Digital transformation is redefining administrative work. Romania has continued to invest in digital public services, but the European Commission's 2025 Digital Decade assessment calls for sustained resources and better streamlining of multiple projects. At the workforce level, the World Bank identifies a deeper issue: digital competencies are not yet systematically defined and integrated into HR processes.

Table 5. Digital-HRM challenges identified for Romania

Challenge	Observed issue	Strategic implication
Attraction and retention	Difficulty competing for skilled personnel	Target scarce-skill recruitment and career offers
Career/pay rigidity	Structures may not reward specialised capability	Improve job architecture and mobility
Professional development	Limited learning opportunities	Continuous role-specific upskilling
Digital competency definitions	Often reduced to basic IT literacy	Differentiate competencies by role/function
HR-digital alignment	Weak strategic linkage	Integrate digital strategy with workforce planning
Institutional fragmentation	Reform initiatives not always coherent	Strengthen central coordination and common standards

Source: World Bank (2025), Assessment of the Digital Competencies Needed in the Romanian Civil Service; European Commission (2025), Romania Digital Decade Country Report.

The findings in Table 5 demonstrate that digitalisation is primarily an organisational and human-capital challenge rather than a technology procurement exercise. A tax administrator, policy analyst, procurement specialist and senior manager require different digital competencies. A mature HR system should therefore identify role-specific proficiency levels and embed them in recruitment, learning and performance processes.

This conclusion is consistent with broader digital-government research, which emphasises that data, technology, skills and agile organisational processes are complementary. Digital systems can reduce administrative burden and improve accessibility, but benefits remain limited if employees cannot redesign workflows or if legacy procedures are merely transferred online.

4.5. Public-service delivery and the continuing implementation gap

Recent European Commission assessment shows that Romanian public-service delivery has improved in some areas, particularly digitalisation, but excessive paperwork, fragmented procedures and limited interoperability continue to weaken quality. These constraints have a direct HR dimension: employees operate within processes that may generate duplication, while managers have limited ability to redeploy staff from low-value administrative tasks toward analysis and citizen-facing services.

Table 6. Selected implementation pressures affecting HRM reform

Area	Evidence	HRM consequence
Administrative burden	Fragmented procedures and excessive paperwork	Time diverted from higher-value tasks
Interoperability	Limited integration across government levels	Duplicated work and data handling
Regulatory burden	66% of surveyed businesses view regulation as obstacle to long-term investment	Pressure for better policy and service capability
Digital public services	Investment has increased but projects need streamlining	Need for programme, product and digital skills
RRP implementation	HRM reform milestones tied to national recruitment and competency systems	Need for implementation capacity and continuity

Source: European Commission (2025/2026), Romania Country Report, Digital Decade Country Report and Recovery and Resilience Facility documentation.

Note: The 66% figure refers to the business-regulation perception cited in the European Commission country assessment; it is not an employee survey.

Table 6 indicates that HR reform cannot be separated from administrative-process reform. Recruiting highly capable staff into organisations with fragmented workflows may produce frustration rather than productivity. Conversely, process simplification without appropriate skills can fail during implementation. HRM and administrative digitalisation should therefore be sequenced together.

4.6. Assessment of the analytical propositions

Having examined the main dimensions of Romania's public-sector human resource management reform, the analysis can now be consolidated through an assessment of the

analytical propositions underpinning the study. Table 7 synthesises the evidence concerning competency-based recruitment, the integration of performance management with employee development, the human-capital requirements of digital transformation, and the systemic interdependence of HRM functions. Rather than implying causal confirmation, the assessment evaluates the extent to which each proposition is supported by the institutional reforms and empirical evidence documented by the OECD, World Bank and European Commission. This distinction is particularly important given the relatively recent implementation of several reform measures, which allows for an assessment of their institutional coherence and implementation progress but not yet of their long-term effects on organisational performance, workforce productivity or public-service quality.

Table 7. Assessment of the analytical propositions

Proposition	Evidence	Assessment
P1 Competency-based recruitment strengthens capability	Framework and national competition implemented; substantial candidate pool	Strong institutional support; outcomes require longitudinal evaluation
P2 Performance works best when linked to development	Reform connects competency framework, appraisal and L&D	Conceptually supported; implementation remains key
P3 Digital transformation requires workforce capability	WB identifies role-specific digital competency gaps	Strongly supported
P4 HR reforms must operate as a system	Recruitment, data, pay, planning and performance are interdependent	Strongly supported by reform architecture

Source: Author's assessment based on OECD, World Bank and European Commission evidence.

The evidence strongly supports the systemic character of HRM reform. The weakest empirical link concerns final outcomes: recent Romanian reforms are still being implemented, so it is too early to attribute changes in service quality or productivity directly to the new recruitment and competency systems. Future evaluation should follow cohorts of recruits, compare performance and retention, and measure whether competency-based tools improve organisational outcomes.

5. DISCUSSIONS

The Romanian case illustrates a broader shift in public administration from staffing control toward capability management. Public employment has not changed dramatically as a share of total employment, but the content of administrative work has changed. Digital services, EU fund management, strategic procurement, cybersecurity, regulatory analysis and crisis management require specialised capabilities that traditional seniority- and qualification-based systems may not identify effectively.

The competency framework and national recruitment model therefore represent a meaningful institutional innovation. Their potential advantage is consistency: common standards can reduce arbitrary variation across institutions and create a clearer link between job requirements and candidate capabilities. However, centralisation also creates risks if testing becomes overly generic. The national stage should establish common merit standards, while job-specific selection must remain sufficiently sensitive to occupational requirements.

Performance management is the second critical area. Public organisations often retain formal appraisal systems that differentiate weakly among employees. Reform should focus on managerial conversations, objective setting, behavioural competencies and development needs rather than simply introducing more indicators. Performance information is most useful when it informs learning, mobility, succession and recognition.

Digital competencies constitute the most dynamic challenge. The 2025 World Bank diagnosis is particularly important because it rejects the assumption that digital skills are synonymous with basic software use. Advanced public administration increasingly requires data literacy, digital-service design, cybersecurity awareness, AI governance and the capacity to manage technology suppliers. These capabilities must be differentiated by role and seniority.

Finally, reform sustainability depends on institutional continuity. Frequent reorganisations can disrupt workforce planning, career paths and accountability. Strategic HRM requires multiannual capability planning that survives organisational changes. The central HR authority must therefore combine standard setting with strong data capacity and support for line managers.

6. STRATEGIC FRAMEWORK FOR HRM REFORM

Building on the empirical findings and the assessment of the analytical propositions, the identified challenges can be translated into a coherent medium-term framework for human resource management reform in Romanian public administration. Effective modernisation requires moving beyond isolated HR interventions towards an integrated approach in which recruitment, workforce planning, competency development, performance management, career mobility, leadership and data-driven decision-making operate as mutually reinforcing components. Table 8 therefore proposes a strategic framework for the 2026–2030 period, linking the main HRM priorities identified in the analysis with specific policy actions and measurable monitoring indicators. The framework places particular emphasis on institutional capability and measurable outcomes, providing a basis for evaluating reform not only in terms of formal implementation, but also in terms of its capacity to attract, develop, deploy and retain the competencies required for an increasingly digital and performance-oriented public administration.

Table 8. Proposed strategic HRM framework for Romanian public administration

Strategic priority	2026–2030 action	Suggested monitoring indicator
Merit recruitment	Consolidate national competition and validate competency tests	Time-to-hire; applicant quality; probation success
Strategic workforce planning	Annual/multiannual capability plans by institution	Critical-skill vacancies; retirement risk; internal mobility
Digital competencies	Role-specific framework and mandatory learning pathways	Competency attainment by job family
Performance management	Link objectives, competencies, feedback and development	Quality of objectives; completion of development plans
Learning ecosystem	Create continuous, modular and digital learning offers	Training participation and post-training application

Strategic priority	2026–2030 action	Suggested monitoring indicator
Career and mobility	Transparent lateral and vertical pathways	Internal mobility; retention of high-demand skills
HR analytics	Interoperable central workforce data	Data completeness; forecasting accuracy
Leadership	Structured senior-management development	Leadership assessment; employee engagement
Employer attractiveness	Modern recruitment communication and employee value proposition	Applicants per vacancy; early-career retention

Source: Author's proposal based on OECD (2021, 2023, 2025), World Bank (2022, 2025) and European Commission reform priorities.

Table 8 translates the analysis into a medium-term strategy. The emphasis is on measurable capability outcomes rather than procedural completion. For example, the success of recruitment reform should not be assessed only by the number of competitions organised, but also by time-to-hire, quality of applicants, probation outcomes and retention. Similarly, training should be evaluated by competency acquisition and workplace application rather than attendance alone.

HR analytics should become the infrastructure connecting these priorities. A central workforce database can support retirement forecasting, vacancy planning, pay analysis, mobility and diversity monitoring. Data governance must nevertheless protect personal information and ensure that automated tools remain transparent and accountable.

7. POLICY IMPLICATIONS

Romania should preserve the direction of competency-based reform while strengthening its empirical validation. Competency profiles and assessment instruments should be periodically reviewed against evidence on actual job performance and adapted to the specific requirements of different occupational families.

Digital competencies should also be embedded across the entire employee lifecycle rather than treated as a separate component of professional development. Recruitment criteria, induction programmes, continuous learning, managerial expectations and promotion mechanisms should reflect the level and type of digital capability required for each position.

An equally important priority is the professionalisation of HR units within public institutions. Strategic human resource management requires expertise extending beyond traditional personnel administration to include workforce planning, organisational development, learning and development, HR analytics and change management. Strengthening these capabilities would enable HR functions to assume a more strategic role in supporting institutional performance and administrative modernisation.

Remuneration and career-management reforms should complement these measures by improving the public administration's capacity to retain employees with scarce and strategically important skills, while preserving transparency, internal equity and fiscal sustainability. At the same time, the public-sector employee value proposition should not rely exclusively on financial incentives. Meaningful work, opportunities for continuous learning, career and mobility prospects, flexible working arrangements where appropriate, and high-quality management can contribute substantially to employee attraction, motivation and retention.

Performance-management reform should place greater emphasis on its developmental function. Managers require appropriate capabilities in setting meaningful objectives, providing constructive feedback, conducting difficult performance conversations and managing individual and team performance. In the absence of such managerial capabilities, formal appraisal procedures and performance ratings risk becoming predominantly administrative exercises rather than effective mechanisms for improving individual and organisational performance.

The effectiveness of HRM reform should ultimately be assessed in relation to broader organisational and public-service outcomes. Indicators such as citizen satisfaction, service-processing times, regulatory quality, uptake of digital public services and organisational productivity can complement conventional HR metrics and provide a stronger basis for determining whether changes in recruitment, competency management, learning, performance and career systems generate measurable public value.

8. CONCLUSIONS

Human resource management is a strategic determinant of public-administration performance. The Romanian experience shows that the reform agenda has moved decisively beyond traditional personnel administration toward competencies, national merit-based recruitment, strategic planning, performance management and digital HR processes.

OECD data indicate that general-government employment represented 17.36% of total employment in 2023, only moderately above the 2007 level. This suggests that the central challenge is not simply the size of public employment, but the quality, allocation and adaptability of the workforce. The 2024 national recruitment rounds and the competency framework provide concrete evidence of institutional change.

Nevertheless, implementation gaps remain. Digital competency needs are insufficiently differentiated, career and pay structures can limit attraction and retention, professional development remains uneven, and fragmented administrative processes reduce the return on human capital. Reform therefore needs to operate as an integrated system.

The paper concludes that Romania's next stage of public-sector HRM reform should focus on evidence-based recruitment, role-specific digital capabilities, continuous learning, leadership, workforce analytics and transparent career mobility. Future research should use administrative microdata and longitudinal employee surveys to evaluate whether these reforms improve recruitment quality, retention, employee engagement, organisational productivity and citizen-facing service outcomes.

REFERENCES

1. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
2. European Commission. (2025). Romania 2025 Digital Decade Country Report. European Commission.
3. European Commission. (2026). Country Report – Romania. European Commission.
4. European Commission. (n.d.). Developing performance human resources management in the public sector (Recovery and Resilience Facility, C14-R3). European Commission.
5. OECD. (2021). Public Employment and Management 2021: The Future of the Public Service. OECD Publishing. <https://doi.org/10.1787/938f0d65-en>

6. OECD. (2023). Public Employment and Management 2023: Towards a More Flexible Public Service. OECD Publishing.
7. OECD. (2025). Government at a Glance 2025. OECD Publishing.
8. Perry, J. L., & Hondeghem, A. (Eds.). (2008). Motivation in Public Management: The Call of Public Service. Oxford University Press.
9. Perry, J. L., & Wise, L. R. (1990). The motivational bases of public service. *Public Administration Review*, 50(3), 367–373.
10. World Bank. (2022). The World Bank and the Romanian Government complete partnership on consolidating human resources practices in the public administration. World Bank.
11. World Bank. (2025). Assessment of the Digital Competencies Needed in the Romanian Civil Service: Taking into Account Relevant Policies at the National and European Union Levels. World Bank Group.
12. World Bank. (n.d.). Human Resources Management Development Portfolio in Romania. World Bank Group.

THE INTERSECTORAL STRUCTURE OF THE ROMANIAN ECONOMY AND ITS ECONOMIC IMPLICATIONS

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ABSTRACT: *This paper analyses the intersectoral structure of the Romanian economy and its implications for productivity, competitiveness and structural transformation. The study combines descriptive structural indicators with an input-output analytical framework based on Eurostat national accounts and FIGARO inter-country supply-use and input-output tables. Particular attention is given to sectoral composition, technical coefficients, the Leontief inverse, output multipliers and backward and forward linkages, while the empirical discussion places Romania within the broader EU convergence process. Recent statistics reveal a mixed structural profile. Romania reached approximately 78% of the EU average GDP per capita in 2024, compared with 44% at the time of EU accession, but important structural gaps remain. Agriculture still generated 2.5% of GDP in 2024, compared with 1.2% in the EU, while R&D intensity was only 0.5% of GDP versus about 2.2% in the EU. The share of Romanian SMEs with at least a basic level of digital intensity was 27% in 2023, compared with 57.7% in the EU. These indicators suggest that convergence in income has advanced faster than convergence in innovation and productive capabilities. The paper argues that Romania's next stage of development depends on strengthening domestic linkages between manufacturing, knowledge-intensive services, ICT, energy, transport, agriculture and SMEs. Industrial, digital and green policies should therefore be assessed not only by direct sectoral effects but also by their capacity to generate domestic value added, technological spillovers and resilient production networks.*

Keywords: *Romanian Economy; Intersectoral Structure; Input-Output Analysis; Structural Change; Sectoral Linkages; Productivity; Digitalization*

JEL classification: *C67; O11; O14; O33; L60*

1. INTRODUCTION

Romania has experienced one of the most pronounced income-convergence processes in the European Union. According to the European Commission (2026), GDP per capita increased from 44% of the EU average in 2007 to approximately 78% in 2024. This progress reflects capital accumulation, foreign direct investment, integration into the Single Market, labour reallocation and the expansion of export-oriented manufacturing and services.

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Nevertheless, rapid convergence in aggregate income does not automatically imply an equally rapid transformation of the productive structure. Persistent gaps in innovation, digital adoption, research intensity and labour productivity indicate that the quality of sectoral interactions remains a central issue for the sustainability of growth (European Commission, 2026; OECD, 2024).

The relevance of intersectoral analysis derives from the fact that modern economies operate as networks rather than as collections of isolated industries. Manufacturing purchases energy, metals, chemicals, transport, finance, software and professional services. Agriculture depends on machinery, fertilisers, energy, food processing, logistics and trade. ICT services increasingly enter the production process of almost every industry through software, data management, automation and digital platforms. As a result, the contribution of a sector cannot be evaluated only through its direct share in GDP or employment. Its wider importance also depends on the demand it creates for upstream suppliers and on the inputs it provides to downstream users (Leontief, 1986; Miller & Blair, 2009).

This perspective is particularly important for Romania. The economy combines internationally integrated manufacturing clusters with a rapidly expanding service sector and a still significant agricultural base. Eurostat (2026a) shows that agriculture generated 2.5% of Romanian GDP in 2024, more than twice the EU ratio of 1.2%. At the same time, the agricultural share of employment declined sharply during the previous decade, with Romania recording the largest reduction among EU Member States between 2013 and 2023 (-8.9 percentage points) (Eurostat, 2026b). These changes indicate substantial labour reallocation, but they do not by themselves reveal whether workers and resources have moved towards sectors with stronger productivity and linkage effects.

A second structural issue concerns the relationship between internationally competitive activities and the domestic economy. Participation in global and European value chains can stimulate exports, investment and technology transfer, but the domestic benefits depend on the local content of production and on the capacity of domestic suppliers to connect to multinational networks. When export-oriented industries rely heavily on imported intermediate inputs, part of the demand multiplier leaks abroad. Conversely, stronger domestic sourcing, engineering, logistics, ICT and business-service capabilities can increase the domestic value-added content of production (Eurostat & JRC, 2019; OECD, 2024).

The research gap addressed by this paper lies in the need to connect Romania's sectoral transformation with an explicit intersectoral interpretation. Earlier research has demonstrated the usefulness of input-output tables for understanding the relationship between goods and services in Romania (Goschin et al., 2015) and has examined the country's position in global value chains (Zaman & Vasile, 2015). However, recent structural developments associated with digitalisation, green investment, post-pandemic supply-chain adjustment and the latest phase of EU convergence require an updated analytical perspective. The availability of Eurostat FIGARO tables also provides a harmonised framework for connecting national production with international value chains (Eurostat, 2025a).

The objective of the study is therefore to assess the economic significance of Romania's intersectoral structure and to identify the channels through which stronger domestic linkages could support productivity, competitiveness and resilience. Four research questions are addressed: (RQ1) How has Romania's structural position evolved relative to the EU? (RQ2) Which sectors are expected to generate the strongest upstream and downstream effects in an input-output framework? (RQ3) What do recent indicators of agriculture, employment, innovation and digitalisation reveal about the quality of structural convergence? (RQ4) What policy measures could strengthen domestic value chains in the context of digital and green transformation?

The paper contributes to the literature by combining recent structural statistics with the logic of input-output analysis and by interpreting Romania's convergence through the quality of sectoral connections rather than sector size alone. The central proposition is that future convergence will depend increasingly on the capacity to transform internationally integrated sectors into anchors for domestic supplier development, innovation diffusion and higher-value services.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Structural transformation has traditionally been associated with the reallocation of labour and capital from low-productivity primary activities towards manufacturing and, subsequently, modern services. However, contemporary structural-change research emphasises that sectoral reallocation is only one dimension of development. Productivity also depends on technological specialisation, innovation intensity and the capacity of sectors to interact through intermediate demand (Fagerberg, 2000). The expansion of services does not necessarily reduce growth potential when services are used as productive intermediate inputs; knowledge-intensive business services can support innovation and value-added growth in client industries (Evangelista et al., 2013).

Input-output analysis provides a systematic framework for examining these interdependencies. Leontief (1986) conceptualised production as a system in which each industry simultaneously acts as a purchaser of inputs and a supplier of outputs. The technical coefficient matrix records the direct input requirements of production, while the Leontief inverse captures cumulative direct and indirect requirements. This makes it possible to calculate output multipliers and to evaluate the propagation of demand shocks across industries (Miller & Blair, 2009).

The linkage approach developed by Rasmussen (1956) and Hirschman (1958) extends this framework to the identification of key sectors. Backward linkages measure the intensity with which a sector stimulates its suppliers, whereas forward linkages reflect the extent to which its output supports downstream activities. A sector with strong backward and forward linkages can be economically important even if its direct GDP share is moderate because changes in its output propagate widely across the production network.

In open economies, domestic input-output relationships must be interpreted together with international production fragmentation. FIGARO provides harmonised EU inter-country supply-use and input-output tables that connect national accounts, trade, employment and production for EU Member States and major partners. The 2025 edition covers 2010-2023 at up to 64-industry detail, enabling analysis of domestic and foreign value added, global value-chain participation and employment embodied in exports (Eurostat, 2025a, 2025b).

Romania's integration into European value chains has been particularly important in manufacturing. Zaman and Vasile (2015) showed that global value-chain participation is relevant for understanding the origin and destination of income embodied in Romanian trade. At the same time, research on the Romanian service economy has highlighted the increasing interdependence between goods and services and the importance of input-output tables for structural analysis (Goschin et al., 2015). These findings remain relevant because modern manufacturing increasingly incorporates software, engineering, finance, logistics and data-intensive services.

The innovation dimension is critical. In 2024, Romania's R&D intensity was only 0.5% of GDP, compared with about 2.2% for the EU (Eurostat, 2025c). This gap limits the capacity of domestic firms to develop proprietary technologies, absorb external knowledge and enter more sophisticated supplier relationships. Similarly, digitalisation remains uneven. The European Commission (2024) reported that only 27% of Romanian SMEs reached at least a

basic level of digital intensity in 2023, compared with 57.7% in the EU. The 2025 Digital Decade assessment continued to identify weak SME digitalisation and low uptake of emerging technologies as constraints on competitiveness (European Commission, 2025).

The green transition also changes intersectoral relationships. Renewable energy, grid investment, building renovation, low-emission transport and circular production generate demand for construction, electrical equipment, machinery, engineering, ICT and professional services. The impact on domestic growth depends on whether these investments activate Romanian supply chains or primarily increase imports. For this reason, digital and green transformation should be treated as production-network processes rather than as isolated sectoral agendas.

Based on the literature, three analytical expectations are formulated. H1 expects manufacturing and infrastructure-related activities to display relatively strong backward linkages because they use a broad range of intermediate inputs. H2 expects energy, transport, ICT and selected business services to display important forward linkages because their outputs are used widely across the economy. H3 expects the economic gains from Romania's EU integration to increase when export-oriented activities develop stronger domestic connections with SMEs, knowledge-intensive services and innovation systems.

3. DATA AND METHODOLOGY

3.1. Data sources and analytical period

The study uses secondary data from Eurostat, the European Commission, OECD and the Romanian National Institute of Statistics. The core input-output source is Eurostat's FIGARO database. FIGARO contains EU inter-country supply, use and input-output tables, is updated annually and, in the 2025 edition, covers 2010-2023. It provides 64-industry and 64-product detail and is explicitly designed for the analysis of global production networks (Eurostat, 2025a, 2025b). National supply-use and input-output tables are generally available with a longer publication lag, which makes it necessary to distinguish the most recent macroeconomic benchmark year from the latest complete input-output reference year.

The empirical discussion therefore uses 2023-2024 indicators when reliable recent statistics are available, while the input-output methodology is specified for the latest FIGARO matrices. This avoids the methodological error of presenting 2024 as a complete harmonised input-output reference year. The analysis is primarily structural and descriptive: it establishes a reproducible framework for identifying key sectors while using recent statistics to interpret Romania's current convergence position.

Table 1. Statistical and input-output data architecture used in the study

Component	Indicator / content	Reference period	Primary source
Macroeconomic convergence	GDP per capita relative to EU average	2007, 2024	European Commission
Sectoral structure	Agricultural value added / GDP	2024	Eurostat
Labour reallocation	Agriculture share of employment	2013-2023 change	Eurostat
Innovation	R&D expenditure / GDP	2024	Eurostat
Digitalisation	SMEs with basic digital intensity	2023	European Commission / DESI

Component	Indicator / content	Reference period	Primary source
Labour market	Employment rate, age 20-64	2024	Eurostat
Input-output structure	Industry-by-industry transactions; value added in trade; GVC indicators	2010-2023	Eurostat FIGARO 2025

Source: Author's synthesis based on European Commission (2024, 2025, 2026) and Eurostat (2025a, 2025b, 2025c, 2026a, 2026b, 2025d).

Note: FIGARO 2025 covers 2010-2023. Recent 2024 indicators are used for structural benchmarking, not as a complete 2024 input-output matrix.

Table 1 clarifies the temporal structure of the empirical evidence. The most recent macroeconomic and structural indicators can be used to characterise Romania's position in 2024, but input-output calculations must rely on the latest available matrix. This distinction is important for reproducibility and prevents the mixing of annual national-account indicators with unavailable transaction matrices.

3.2. Input-output model

Let $Z = [z_{ij}]$ denote the matrix of intermediate transactions, where z_{ij} represents the monetary value of input supplied by industry i to industry j , and x_j represents total output of industry j . The direct technical coefficient is $a_{ij} = z_{ij}/x_j$. Matrix A therefore measures the amount of intermediate input from each supplying industry required per unit of output in the purchasing industry.

The standard Leontief quantity model is $x = Ax + y$, where x is the vector of gross output and y is final demand. Rearranging gives $x = (I - A)^{-1}y$. The Leontief inverse, $L = (I - A)^{-1}$, captures both the direct and indirect production requirements associated with a given vector of final demand, such that $x = Ly$. The column sum of L for a sector can be interpreted as an output multiplier: the larger the value, the greater the total production generated throughout the economy by an additional unit of final demand for that sector.

Backward linkages are derived from the column structure of the Leontief inverse and capture the capacity of a sector to stimulate upstream suppliers. A normalised backward linkage greater than one indicates an above-average upstream effect. Forward linkages capture the importance of a sector as an input supplier to downstream industries. In empirical applications, these can be derived from row-based measures or a Ghosh-type supply framework. Sectors with both normalised backward and forward indices above one may be classified as structurally key sectors (Rasmussen, 1956; Hirschman, 1958; Miller & Blair, 2009).

3.3. Complementary structural indicators

Because linkage intensity alone does not reveal productivity, innovation or social value, the input-output framework is complemented by indicators of income convergence, agricultural weight, employment reallocation, R&D intensity, SME digitalisation and labour-market performance. The comparison with the EU is used as a structural benchmark rather than as a target of identical sectoral composition. The purpose is to identify areas in which Romania's convergence in income is accompanied - or not accompanied - by convergence in productive capabilities.

3.4. Methodological limitations

Input-output models assume fixed production coefficients within each reference year and do not explicitly model price changes, substitution or capacity constraints. Linkage measures are therefore structural indicators rather than causal estimates. In addition, strong multipliers may occur in sectors with high environmental costs or low productivity, while technologically advanced sectors can have smaller domestic multipliers if they depend heavily on imported inputs. The interpretation consequently combines network centrality with productivity, innovation and digitalisation evidence. A further limitation is the publication lag of detailed matrices. Future versions of the analysis should update sector-level multipliers as new FIGARO matrices become available and should distinguish domestic from imported technical coefficients.

4. RESULTS AND DISCUSSION

4.1. Romania's structural convergence: a statistical benchmark

Romania's structural convergence with the European Union can be assessed not only through income dynamics but also through changes in the productive, technological and labour-market characteristics of the economy. While GDP per capita provides a general measure of economic convergence, indicators related to sectoral structure, research and development, digitalisation and employment offer a broader perspective on the capacity of the economy to sustain productivity growth and structural upgrading. Comparing these dimensions with EU benchmarks makes it possible to identify whether improvements in living standards have been accompanied by corresponding advances in innovation, technological capabilities and labour-market performance. Table 2 summarises the main indicators used to assess these different dimensions of Romania's structural convergence.

Table 2. Selected structural indicators: Romania and EU benchmark

Indicator	Romania	EU benchmark	Year / period	Romania relative to EU*
GDP per capita (EU=100)	78	100	2024	78.0%
Agricultural value added (% GDP)	2.5	1.2	2024	208.3%
R&D intensity (% GDP)	0.5	2.2	2024	22.7%
SMEs with at least basic digital intensity (%)	27.0	57.7	2023	46.8%
Employment rate, age 20-64 (%)	69.5	75.8	2024	91.7%

Source: European Commission (2024, 2026); Eurostat (2025c, 2025d, 2026a).

Note: *Author's calculation: Romania / EU benchmark $\times$ 100. Agricultural value added above 100% indicates a higher structural weight, not superior performance.

Table 2 reveals a clear distinction between income convergence and capability convergence. Romania reached approximately 78% of the EU average GDP per capita in 2024, a major improvement from the 44% recorded at accession in 2007 (European Commission,

2026). However, the innovation and digital indicators remain substantially weaker. R&D intensity was only 0.5% of GDP, or roughly 23% of the EU level, while the share of SMEs with at least basic digital intensity was below half of the EU benchmark. This suggests that a significant part of convergence has occurred without equivalent convergence in knowledge creation and technology diffusion.

The agricultural indicator points to another structural asymmetry. Agriculture's value added represented 2.5% of Romanian GDP in 2024, compared with 1.2% in the EU. The ratio is not inherently negative: agriculture can support food processing, bioeconomy activities and exports. Nevertheless, when combined with lower productivity and a historically high employment share, it indicates that structural transformation remains incomplete. The key policy issue is therefore not the elimination of agriculture but its integration with higher-value processing, technology, logistics and services.

The employment rate provides a more moderate gap. At 69.5% in 2024, Romania was closer to the EU benchmark of 75.8% than in R&D or digitalisation. This reinforces the view that Romania's structural challenge increasingly concerns the productivity and technological content of employment rather than employment quantity alone.

4.2. Agriculture: declining labour weight but persistent structural importance

Agriculture represents an important dimension of Romania's structural transformation, given its historically significant contribution to employment and its still comparatively high weight in economic activity. Although the sector has experienced a substantial decline in its share of total employment, its contribution to GDP remains above the EU average, indicating that agricultural restructuring is still ongoing. At the same time, recent productivity developments highlight the sector's vulnerability to economic, climatic and production-related shocks. Examining value added, employment and labour productivity together therefore provides a more comprehensive assessment of agriculture's changing position within the Romanian economy and its potential connections with food processing, technology, energy, transport and logistics.

Table 3. Agriculture-related structural indicators

Indicator	Romania	EU	Period	Interpretation
Agricultural value added / GDP	2.5%	1.2%	2024	Romania retains a larger agricultural economic weight
Change in agriculture share of total employment	-8.9 pp	EU share: 5.2% to 3.9%	2013-2023	Romania recorded the largest decline among EU countries
Agricultural labour productivity, annual change	-16.8%	+1.6%	2024 estimate	Strong adverse short-term productivity shock in Romania

Source: Eurostat (2024, 2026a, 2026b). Datasets cited by Eurostat include aact_eaa01, nama_10_gdp and nama_10_a64_e.

Note: The productivity figure is an annual change estimate for 2024 and should not be interpreted as a long-run productivity level.

Table 3 shows that Romania has undergone substantial labour reallocation away from agriculture. Between 2013 and 2023, agriculture's share of total employment fell by 8.9 percentage points, the largest decline reported among EU Member States (Eurostat, 2026b). This is consistent with structural transformation, as labour moves away from primary activities. Yet agriculture still generated 2.5% of GDP in 2024, more than twice the EU ratio, indicating that the sector continues to have macroeconomic relevance.

The 2024 fall in agricultural labour productivity (-16.8%, compared with an EU increase of 1.6%) illustrates the sector's exposure to climatic, price and production volatility (Eurostat, 2024). From an intersectoral perspective, this volatility can be partly mitigated by deeper integration with food processing, irrigation and energy infrastructure, machinery, storage, insurance, digital agriculture and logistics. The objective of structural policy should therefore be to raise value added along the agri-food chain rather than to assess primary agriculture in isolation.

4.3. Innovation and digitalisation as determinants of linkage quality

The innovation gap is one of the clearest constraints on intersectoral upgrading. Eurostat (2025c) reports that Romania devoted only 0.5% of GDP to R&D in 2024, compared with approximately 2.2% for the EU. Such a gap affects more than the research sector itself. Low R&D intensity can weaken the ability of manufacturing firms to develop advanced products, of SMEs to meet demanding supplier standards, and of service firms to provide specialised engineering, software and research inputs.

Digitalisation shows a similar pattern. In 2023, only 27% of Romanian SMEs had at least a basic level of digital intensity, compared with 57.7% in the EU (European Commission, 2024). The 2025 Digital Decade Country Report continues to describe enterprise digitalisation, especially among SMEs, as lagging behind the EU average, despite Romania's strong fixed-connectivity infrastructure and ICT talent base (European Commission, 2025). The policy significance is intersectoral: Romania already possesses a relatively visible ICT sector, but the economy-wide productivity effect depends on whether digital capabilities diffuse into manufacturing, agriculture, logistics, construction and business services.

Table 4. Innovation and digitalisation indicators relevant to intersectoral upgrading

Indicator	Romania	EU	Reference year	Gap (pp)
R&D expenditure / GDP	0.5%	2.2%	2024	-1.7
SMEs with at least basic digital intensity	27.0%	57.7%	2023	-30.7
Digital roadmap measures	98 measures	n/a	2025	n/a
Budget of Romania's Digital Decade roadmap	EUR 3.6 bn (1.01% GDP)	n/a	2025	n/a

Source: Eurostat (2025c); European Commission (2024, 2025).

Note: Digital roadmap values describe planned measures and budget, not realised outcomes.

The Romanian Digital Decade roadmap contains 98 measures with a budget of EUR 3.6 billion, equivalent to 1.01% of GDP (European Commission, 2025). The scale of planned intervention is relevant, but the structural criterion for success should be diffusion. Public support creates larger economic effects when digital investments strengthen supplier-client relationships and raise productivity in sectors beyond ICT itself.

4.4. Manufacturing and the logic of backward linkages

Manufacturing remains central to the Romanian production network because it combines export orientation with intensive intermediate-input use. Automotive, electrical equipment, machinery, chemicals, pharmaceuticals and other manufacturing activities require inputs from metals, plastics, energy, transport, warehousing, finance, software and professional services. In a Leontief framework, such input intensity normally produces substantial backward linkages. The magnitude of the domestic multiplier, however, depends on the origin of these inputs.

If a large share of intermediate goods is imported, the gross production response may be strong while the domestic value-added effect remains more limited. This is particularly relevant for economies integrated into cross-border manufacturing chains. FIGARO explicitly allows the researcher to distinguish domestic and foreign value added in exports and to measure global value-chain participation (Eurostat, 2025a). For Romania, this distinction should be central to future sector-level calculations: a strategically important sector is not simply one that exports heavily, but one that combines export capacity with domestic supplier development and knowledge spillovers.

The policy implication is that industrial upgrading should not be reduced to attracting final assemblers. Supplier-development programmes, certification support, technology transfer and collaboration with universities can increase the share of domestic firms able to provide components, engineering and specialised services. This would strengthen backward linkages and retain a larger proportion of final-demand effects within Romania.

4.5. Energy, transport and ICT as forward-linkage sectors

Energy, transport and ICT are structurally important because their outputs enter a broad range of downstream activities. Electricity affects virtually all production costs; transport and logistics connect suppliers, factories and markets; and ICT increasingly functions as a general-purpose input. These sectors are therefore expected to display significant forward-linkage characteristics, consistent with H2.

Energy is particularly relevant in the context of decarbonisation. Investment in renewable generation, electricity grids and energy efficiency can stimulate construction, machinery, electrical equipment, engineering and digital monitoring. At the same time, energy-price shocks can propagate rapidly into manufacturing and services. The intersectoral perspective therefore helps explain why energy policy is simultaneously an industrial and competitiveness policy.

Transport infrastructure has a similar horizontal function. Better road and rail connectivity can deepen domestic markets, reduce logistics costs and connect less-developed regions to industrial networks. The benefits extend to agriculture, manufacturing, tourism and services. Conversely, infrastructure bottlenecks reduce the effective multiplier of productive investment by increasing transaction costs.

ICT presents perhaps the clearest example of the difference between sectoral success and economy-wide transformation. Romania can have a competitive ICT industry while still recording weak enterprise digitalisation. The 27% SME digital-intensity figure demonstrates

this disconnect. Stronger forward linkages from ICT require widespread adoption of cloud computing, data analytics, artificial intelligence, cybersecurity and integrated enterprise systems across traditional sectors.

4.6. Interpreting Romania's intersectoral profile

The previous analysis highlights the heterogeneous contribution of Romania's major economic sectors to structural transformation, suggesting that their importance extends beyond their direct shares in output or employment. From an input-output perspective, the economic relevance of a sector also depends on the intensity of its relationships with upstream suppliers and downstream users. Manufacturing, energy, transport, ICT, construction, agriculture and services occupy different positions within the production network and therefore differ in their capacity to transmit demand, supply and productivity effects across the economy. Based on the theoretical framework of intersectoral linkages and the structural evidence discussed above, Table 5 synthesises the expected backward and forward linkage profiles of the main sector groups and identifies the principal channels through which they may influence Romania's broader production system.

Table 5. Expected structural role of major sector groups in the Romanian input-output network

Sector group	Expected backward linkage	Expected forward linkage	Main structural channel
Manufacturing	High	Medium-High	Demand for components, energy, logistics and business services
Energy & utilities	Medium	High	Input into almost all production activities
Transport & logistics	Medium-High	High	Connects domestic production and external markets
ICT & knowledge services	Medium	High and rising	Digital and knowledge inputs across sectors
Construction	High	Low-Medium	Strong demand for materials and local services
Agriculture	Medium	Medium	Potential through food processing, chemicals, machinery and logistics
Trade & consumer services	Medium	Low-Medium	Large final-demand role; heterogeneous productivity

Source: Author's conceptual synthesis based on Leontief (1986), Rasmussen (1956), Hirschman (1958), Miller and Blair (2009), Eurostat (2025a) and the Romanian structural evidence discussed above.

Note: These are analytical expectations, not estimated linkage coefficients. Empirical classification requires calculation from a specified FIGARO or national input-output matrix.

Table 5 summarises the structural expectations generated by the analytical framework. It deliberately distinguishes expected network roles from estimated coefficients. Manufacturing and construction are expected to have strong backward effects because they purchase diverse intermediate inputs. Energy, transport and ICT are expected to have stronger forward effects because they supply widely used inputs. Agriculture's network role depends heavily on its connection to processing and logistics. This classification provides a transparent basis for the next empirical stage, in which normalised linkage indices can be calculated directly from FIGARO.

4.7. Assessment of the analytical expectations

H1 is conceptually supported by the input structure of manufacturing and construction, but definitive confirmation requires calculated Leontief multipliers for the selected FIGARO year. The expectation is economically plausible because these sectors use broad bundles of intermediate goods and services. The domestic strength of the effect will depend on import penetration.

H2 is also consistent with the functional role of energy, transport and ICT. These sectors provide inputs used throughout the economy, making them likely candidates for above-average forward linkages. The digitalisation evidence reinforces the importance of ICT but also shows that Romania has not yet fully converted ICT capabilities into broad SME adoption.

H3 receives the strongest support from the combined structural indicators. Romania's income convergence is much more advanced than its R&D and SME digitalisation convergence. This suggests that the next stage of development requires qualitative upgrading of domestic production networks: stronger innovation, higher digital adoption and deeper connections between export-oriented firms and domestic suppliers.

5. POLICY IMPLICATIONS

The first policy priority is to move from sector-specific support towards intersectoral capability building. Industrial policy should strengthen networks linking manufacturing with Romanian SMEs, engineering, ICT, logistics, energy and research organisations. Supplier-development schemes should focus on standards, certification, automation, quality management and access to finance so that domestic firms can enter higher-value production chains.

Innovation policy must address the exceptionally low R&D intensity. At 0.5% of GDP in 2024, Romania remains far from the EU benchmark. Public policy should encourage business R&D, university-industry collaboration, applied research, demonstration projects and innovation procurement. The objective is not only to increase R&D expenditure statistically but to create commercially relevant knowledge flows between sectors.

Digital policy should prioritise diffusion rather than connectivity alone. Romania's digital infrastructure is a comparative strength, but only 27% of SMEs met basic digital-intensity criteria in 2023. Support for cloud services, AI, data analytics, cybersecurity and enterprise-resource planning should therefore target manufacturing, agriculture, logistics, construction and traditional services, where productivity spillovers can be substantial.

Green investment should be designed as an industrial-development opportunity. Renewable energy, grid modernisation, building renovation and sustainable transport can create domestic demand for electrical equipment, construction materials, machinery, engineering and software. Policy evaluation should monitor domestic value-added content and import dependence so that green spending also contributes to productive upgrading.

Agricultural policy should increasingly focus on value-chain integration. The decline in agricultural employment demonstrates ongoing structural change, but the sector's 2.5% GDP share remains significant. Investment in food processing, storage, irrigation, precision agriculture, renewable energy, logistics and branding can raise value retention without attempting to preserve low-productivity employment.

Finally, public investment appraisal should incorporate input-output and value-chain indicators. Direct jobs or sectoral output are incomplete measures of impact. Output multipliers, domestic value added, import leakage, employment embodied in final demand and normalised backward/forward linkages can provide a stronger basis for prioritising projects.

6. CONCLUSIONS

The analysis shows that Romania's economic convergence has been substantial but structurally uneven. GDP per capita reached approximately 78% of the EU average in 2024, yet the country remained far below EU levels in R&D intensity and SME digitalisation. Agriculture retained more than twice the EU economic weight, despite a pronounced decline in its employment share. These patterns indicate that the next stage of convergence will depend less on broad sectoral reallocation and more on productivity, innovation and the quality of intersectoral linkages.

The input-output framework provides a suitable analytical foundation for this assessment because it distinguishes direct sector size from economy-wide influence. Manufacturing can generate strong backward effects when it sources inputs domestically; energy, transport and ICT can generate broad forward effects because they supply essential inputs to multiple sectors. The economic value of Romania's participation in European value chains therefore depends on the density of domestic supplier networks and on the technological content of the relationships connecting firms.

The statistical evidence also reveals a gap between infrastructure or sectoral potential and economy-wide diffusion. Romania's ICT capabilities coexist with weak SME digital intensity, while rapid income convergence coexists with very low R&D intensity. Closing these gaps requires coordinated industrial, innovation, digital, education, infrastructure and green policies rather than isolated sector programmes.

The principal limitation of the current study is that the recent structural indicators and the latest complete input-output matrix do not refer to exactly the same year. For this reason, the paper avoids presenting invented 2024 multiplier values. Future research should calculate sector-level output multipliers and normalised backward and forward linkages from the latest FIGARO matrix, compare them with 2015 and 2019, and benchmark Romania against Central and Eastern European economies such as Czechia, Hungary and Poland. Additional extensions should distinguish domestic from imported inputs and combine the input-output structure with employment, emissions, innovation and ownership data.

Overall, Romania's development challenge is not simply to increase the size of manufacturing, services or agriculture. It is to create a more connected production system in which competitive sectors generate stronger domestic demand, knowledge-intensive services diffuse across traditional industries, green investment activates local capabilities and SMEs capture a larger share of value added. Such a transformation would strengthen productivity, resilience and the sustainability of long-term convergence.

REFERENCES

1. European Commission. (2024). Romania 2024 Digital Decade Country Report. Brussels: European Commission.

2. European Commission. (2025). Romania 2025 Digital Decade Country Report. Brussels: European Commission.
3. European Commission. (2026). 2026 Country Report - Romania. Brussels: Directorate-General for Economic and Financial Affairs.
4. Eurostat. (2024). EU agricultural labour productivity up by 1.6% in 2024. Eurostat News, 16 December 2024.
5. Eurostat. (2025a). FIGARO tables: EU inter-country supply, use and input-output tables, 2025 edition. Luxembourg: Eurostat.
6. Eurostat. (2025b). EU inter-country supply, use and input-output tables (FIGARO) - current prices (naio_10_fcp): Metadata. Luxembourg: Eurostat.
7. Eurostat. (2025c). EU spending on R&D exceeded EUR 403 billion in 2024. Eurostat News, 4 December 2025. Dataset: rd_e_gerdtdot.
8. Eurostat. (2025d). EU's employment rate reached almost 76% in 2024. Eurostat News, 15 April 2025. Dataset: lfsi_emp_a.
9. Eurostat. (2026a). Key figures on food chain - agriculture's value added. Eurostat News, 23 February 2026. Datasets: aact_eaa01; nama_10_gdp.
10. Eurostat. (2026b). Key figures on food chain - employment in agriculture. Eurostat News, 16 January 2026. Dataset: nama_10_a64_e.
11. Eurostat, & Joint Research Centre. (2019). European Union inter-country supply, use and input-output tables: Full international and global accounts for research in input-output analysis (FIGARO). Luxembourg: Publications Office of the European Union.
12. Evangelista, R., Lucchese, M., & Meliciani, V. (2013). Business services, innovation and sectoral growth. *Structural Change and Economic Dynamics*, 25, 119-132.
13. Fagerberg, J. (2000). Technological progress, structural change and productivity growth: A comparative study. *Structural Change and Economic Dynamics*, 11(4), 393-411.
14. Goschin, Z., Constantin, D. L., Roman, M., & Ileanu, B. (2015). Services and structural patterns of a post-transition Romanian economy. *Economic Research-Ekonomska Istraživanja*.
15. Hirschman, A. O. (1958). *The Strategy of Economic Development*. New Haven, CT: Yale University Press.
16. Leontief, W. (1986). *Input-Output Economics* (2nd ed.). New York: Oxford University Press.
17. Miller, R. E., & Blair, P. D. (2009). *Input-Output Analysis: Foundations and Extensions* (2nd ed.). Cambridge: Cambridge University Press.
18. OECD. (2024). *OECD Economic Surveys: Romania 2024*. Paris: OECD Publishing. <https://doi.org/10.1787/106b32c4-en>
19. Rasmussen, P. N. (1956). *Studies in Inter-Sectoral Relations*. Copenhagen: Einar Harcks Forlag.
20. Romanian National Institute of Statistics. (2025). *National Accounts and Supply-Use Tables*. Bucharest: INSSE.
21. Zaman, G., & Vasile, V. (2015). Romania and its position on the global value chain: An introductive analysis. *Procedia Economics and Finance*, 27, 136-143.

THE EMERGING ROLE OF NON-STATE ACTORS IN CONTEMPORARY ECONOMIC DIPLOMACY

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Abstract: *As old as civilization itself, diplomacy always held a central role in navigating the intricate relations between human communities. As described by Hamilton and Langhorn, somewhere in the 3rd millennium BC, the great civilizations of Mesopotamia reached the conclusion that it was better to hear the message than to eat the messenger, which paved the way for the main functions of diplomacy, remarkably constant throughout the ages, namely communication, representation, information-gathering and negotiation (Hamilton and Langhorne, 2011). Though the concept of economic diplomacy is a fairly recent one, its principles are historically enrooted in the evolution of human civilizations and international relations. Economic reasons have been one of the main drivers for conflict, along with ideological and identity-based differences, territorial disputes, political and structural issues. Against this backdrop, this paper examines how non-state actors have emerged as influential participants in economic diplomacy, shaping trade policy, investment flows, regulatory standards, and governance outcomes alongside and sometimes independently of states. While TNCs drive investment and regulatory convergence and NGOs promote accountability and inclusivity, the expanding role of these actors raises critical questions about governance, legitimacy, and the balance between private interests and broader societal objectives in international economic engagement.*

Keywords: *Economic Diplomacy, Non-State Actors, Post-Modern Models, Transnational Corporations, Non-Government Organizations*

JEL Classification: *F10; F13*

1. CONCEPTUAL DELINEATION: DIPLOMACY AND ECONOMIC DIPLOMACY

Diplomacy is the primary mechanism through which states and other international actors manage their relations, pursue their interests, and resolve conflicts without resorting to force. It is a method of influencing the decisions and behavior of foreign governments and peoples through dialogue, negotiation and other measures short of war and violence (Freeman, 2025).

Traditionally, diplomacy has been associated with formal interactions between sovereign states, conducted by accredited representatives such as ambassadors and foreign ministers. These interactions used to take place through established channels, including embassies, summits, and international organizations, and were guided by norms of negotiation, communication, and mutual recognition (Berridge, 2015). Diplomacy evolved alongside the

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modern state system, particularly after the Peace of Westphalia, which reinforced the principles of sovereignty and non-interference. Over time, diplomatic practices became more institutionalized, with codified rules such as those found in the Vienna Convention on Diplomatic Relations, which defines the privileges and responsibilities of diplomatic agents.

In a classical perspective, diplomacy is defined as “the conduct of relations between states and other entities with standing in world politics by official agents and by peaceful means” (Bull, 1995). More recent developments have led to a broader approach, defining diplomacy as being concerned with relations between states and between states and other actors (Barston, 2006).

One of the key branches of diplomacy, Economic Diplomacy (ED) is the process of mutual conditioning between politics and economics to enhance the stability of an area through another, which aims to satisfy the political and economic national interest negotiated at an international level (Vladoiu, 2025). According to van Bergeijk and Moons, ED is the use of government relations and influence to stimulate international trade and foreign direct investment, a set of activities that address the methods and procedures by which decisions are made at the state level regarding cross-border economic activities (Bergeijk and Moons, 2016). At the same time, it can be defined as the use of international political instruments to achieve economic objectives. In the opinion of the same authors, the interventions of state authorities have the role of smoothing some barriers to international trade, which can arise both due to cultural and institutional differences and due to lack of trust between the parties, as is especially the case with economic actors who want to penetrate a new market. The involvement of governments in certain transactions thus reduces their costs, as they bring increased trust capital, but also information to which private actors do not usually have access. In other words, the role of ED is to open markets and boost cross-border economic activities, respectively to provide assistance to companies from a certain state when they encounter difficulties in other countries.

Being a more pragmatic side of diplomacy, ED applies more to informal negotiation and voluntary cooperation and less to rule-based systems and legal commitments. This is why it is considered a stronger and more precise activity, while borrowing less of the secrecy, opaqueness and elitism that are stereotypical traits of traditional diplomacy (Bayne and Woolcock, 2017).

In most approaches, economic diplomacy is the general term to use for covering other more focused terms such as business diplomacy, commercial diplomacy or trade diplomacy. Consular visa services are sometimes tied to ED in relation to the migration flows they regulate. New concepts, such as catalytic diplomacy, network diplomacy and multistakeholder diplomacy have emerged, providing new tools not only to recognize a greater variety of stakeholders in diplomatic practice, but also to highlight the varied and changing character of the diplomatic process (Lee and Hocking, 2018).

2. THE COUNTER-NARRATIVES OF POSTMODERNISM AND THE EMERGENCE OF NON-STATE ACTORS AS GLOBAL PLAYERS IN INTERNATIONAL RELATIONS

Two foundational paradigms have long dominated the theory of International Relations (IR): realism and liberalism. These models provide contrasting explanations for state behaviour, the nature of the international system, and the prospects for cooperation. While both seek to explain patterns of conflict and cooperation, they differ significantly in their assumptions about human nature, state interests, and the role of institutions.

Realism is one of the oldest and most influential theories in IR. Rooted in the writings of thinkers such as Thucydides and later developed by scholars like Hans Morgenthau and

Kenneth Waltz, realism views the international system as anarchic, meaning there is no overarching authority above states (Waltz, 1979). In this environment, states are the primary actors and are driven by the pursuit of survival and power. Realists assume that human nature is inherently self-interested and that this tendency is reflected in state behaviour (Morgenthau, 1948). Central to realism is the concept of the “security dilemma”. At its core, it describes the paradox that, while building-up militarily to enhance its own security, a state can be perceived as a threat to others, thus triggering a cycle of mutual fear, arms racing and potential conflict that no party initially intended (Hertz, 1950).

Liberalism, by contrast, is a school of thought that argues cooperation, and not only conflict and power politics, and it is a central and recurring feature of world politics. Emerging from Enlightenment ideals and later articulated by the philosopher Immanuel Kant and, more recently, by the political scientist Robert Keohane, liberalism emphasizes the potential for cooperation among states (Kant, 1795; Keohane, 1984). While liberals acknowledge the anarchic nature of the international system, they argue that its effects can be mitigated through international institutions, economic interdependence, and the spread of democratic governance.

A key liberal concept is “complex interdependence,” which suggests that states are connected through multiple channels, economic, political, and social, reducing the likelihood of conflict (Keohane and Nye, 1977). Liberals also highlight the role of international institutions in facilitating cooperation, creating rules, providing information, monitoring compliance and reducing transaction costs (Martin, 1992). Furthermore, democratic peace theory, a central liberal claim, posits that democracies are less likely to go to war with one another due to shared norms and institutional constraints (Doyle, 1983).

Despite their differences, realism and liberalism are not entirely incompatible. Both recognize the importance of states and the absence of a global government, but they diverge in their expectations about the consequences of these conditions. Realism emphasizes competition and conflict, while liberalism underscores cooperation and progress.

Postmodernism in IR emerged in the late twentieth century as a critical approach that questions the basic assumptions and theories of mainstream currents. Influenced by post-structuralist philosophy, these approaches challenge the foundational assumptions of objectivity, rationality, and fixed identities in global politics. Rather than offering a unified theory, postmodernism in IR seeks to deconstruct dominant narratives and reveal how knowledge, language, and power interact to shape international outcomes. At the core of postmodern IR is scepticism toward the idea of an objective, knowable international system. Drawing on thinkers such as Michel Foucault and Jacques Derrida, postmodern scholars argue that what is commonly accepted as “reality” in international politics is socially constructed through discourse (Foucault, 1969; Derrida, 1967). Language does not merely describe the world; it actively constitutes it by framing certain actors, threats, and identities as legitimate or illegitimate. For example, the labelling of a group as “terrorist” versus “freedom fighter” reflects political power rather than neutral classification (Campbell, 1992).

A central concern of postmodernism is the relationship between power and knowledge. Foucault’s concept of “power/knowledge” suggests that power is exercised not only through material capabilities but also through the production of dominant discourses that shape what is considered true or possible (Foucault, 1980). In IR, this means that global hierarchies are maintained not only by military or economic strength but also by controlling narratives about sovereignty, development, and security.

Postmodern approaches also challenge the state-centric focus of traditional IR by emphasizing the role of non-state actors. These include transnational corporations, non-governmental organizations, transnational advocacy networks, illegitimate non-state actors and even individuals. Rather than viewing states as the sole or primary actors, postmodernists highlight how these entities influence global norms, policies, and identities (Keck and Sikkink,

1998). For instance, NGOs play a critical role in shaping human rights discourse, while transnational companies can wield economic power that rivals or exceeds that of smaller states. Postmodernism does not simply add non-state actors to existing frameworks; it questions the very boundaries between state and non-state, domestic and international. These distinctions are seen as constructed categories that serve particular political purposes (Walker, 1993). The rise of global media, digital communication, and transnational activism further blurs these lines, making it increasingly difficult to locate authority solely within the state.

3. FROM STATE-CENTRIC MODEL TO MULTI-STAKEHOLDER PROCESS

As a specialized branch of diplomacy, ED has traditionally been understood as a state-centric practice in which governments negotiate trade agreements, manage financial relations, and advance national economic interests through formal diplomatic channels. Rooted in realist and liberal traditions, this model assumes that states are the primary actors with both the authority and legitimacy to represent economic interests internationally. Institutions such as the World Trade Organization and the International Monetary Fund exemplify this framework, where state representatives dominate decision-making processes.

In recent decades, however, ED has undergone a significant transformation toward multi-stakeholder processes. Its processes bring states, business, civil society, cities and sometimes affected communities into joint platforms for trade, investment and sustainable development decisions. This shift reflects globalization, technological change, and the growing complexity of economic governance. Non-state actors now play a more prominent role in shaping economic outcomes (Pigman, 2016). These actors contribute expertise, mobilize public opinion, and influence regulatory standards, often operating across borders in ways that states alone cannot easily replicate. Globalization has transformed the organization of international economic relationships around the world, affecting the economic, social and political spheres of societies and citizens. It is characterised by a complex set of interconnectivities and interdependencies with an increasing number of actors vying to influence the outcome of these relationships (Saner and Liu, 2003).

The emergence of multi-stakeholder platforms has been particularly visible in areas such as digital trade, environmental standards, and global supply chains. For example, forums like the World Economic Forum bring together public and private actors to coordinate on global economic issues, the G20 has institutionalized engagement groups like the B20 for business, C20 for civil society, T20 for think tanks, while the Global SIDS Partnership Framework targets cross-sector collaboration for resilient, inclusive growth (Schwab, 2016). This model emphasizes inclusivity and flexibility but also raises questions about accountability and unequal influence, as powerful corporate actors may overshadow less-resourced participants (Falkner, 2008).

Overall, the transition from state-centric to multi-stakeholder economic diplomacy reflects a broader reconfiguration of authority in the global economy. While states remain central, they increasingly share the stage with a diverse array of actors, reshaping both the practice and governance of international economic relations. Bayne and Woolcock notice the significant changes in ED after the cold war, to such an extent that they introduce the concept of *New economic diplomacy* to describe the significant developments, the ever increasing role of non-state actors and their influence to the extent of forging new domestic policies (Bayne and Woolcock, 2017). In more recent publications, ED is seen as the ability of entrepreneurial actors to build new bridges complementary to state foreign policy (Wang and Miao, 2024). This shows the change in perspective related to the relevance of non-state actors in economic diplomacy.

ED has shifted from a state-centered model, focusing on statecraft and bilateral trade, to a multi-stakeholder approach to address complex, transnational economic challenges. Globalisation and democratisation have blurred the professional boundaries of diplomacy and changed the terms of definition, qualification and role expectations for diplomats, while alternative actors have emerged.

4. EMERGENT TYPES OF NON-STATE ACTORS ON THE STAGE OF ECONOMIC DIPLOMACY

In this section, we will cover some of the new participants in the ED processes, mainly the ones that are the most influential. We will not refer to the already established ones, as international organizations and institutions, as they are not under the scope of this research. We will instead try to focus on the most relevant newcomers and their role in the globalized world.

Transnational corporations (TNCs) have become central actors in contemporary ED, operating alongside (and sometimes independently of) states to shape global economic relations. The globalization of production, finance, and supply chains has elevated TNCs to the role of central players, not just background economic actors, whose decisions influence not only economic outcomes but also diplomatic priorities and international relations, according to the latest World Investment Reports.

Large TNCs have the ability to influence trade policy and negotiations, particularly in sectors such as energy, technology, and manufacturing, actively lobby governments and participate in consultative mechanisms related to trade agreements, such as NAFTA or GATT/WTO. Their input can shape provisions on tariffs, intellectual property rights, digital trade, and regulatory standards. As a result, economic diplomacy increasingly reflects not only national interests but also the strategic priorities of globally active firms.

An important role of TNCs in economic diplomacy is investment promotion and market integration. Through foreign direct investment (FDI), TNCs facilitate the flow of capital, technology, and managerial expertise across borders. Governments often engage in diplomatic efforts to attract or retain these investments, offering incentives and negotiating favorable conditions. In this context, TNCs act as both beneficiaries and drivers of diplomatic engagement, shaping bilateral and multilateral economic relations, this process being more and more visible in the Global Investment Competitiveness Reports of the World Bank. In many developing countries, TNCs embeddedness in local economies gives them bargaining power and a quasi-diplomatic position of negotiation with the host-state.

Another significant dimension is standard-setting and regulatory influence. TNCs often operate across multiple jurisdictions and contribute to the diffusion of norms and standards in areas such as labor practices, environmental sustainability, and corporate governance. In some cases, they collaborate with international organizations and NGOs to promote voluntary frameworks, thereby complementing formal diplomatic efforts and complying to the Guidelines for Multinational Enterprises issued by the Organization for Economic Cooperation and Development. Moreover, TNCs play a role in public diplomacy and soft power. Through corporate social responsibility (CSR) initiatives, branding, and engagement with local communities, they shape perceptions of their home countries and contribute to a country's economic image abroad. The International Monetary Fund's Research on Globalization and Corporate Influence notices that this is particularly relevant in emerging markets, where corporate presence can influence broader diplomatic relations.

At the same time, the growing influence of TNCs raises concerns about accountability and governance. The disproportionate corporate influence in economic diplomacy may undermine public interest, especially in areas such as environmental protection, labor rights, and taxation. This has led to increased calls for transparency, stronger regulatory frameworks,

and multilateral cooperation to ensure that corporate activity aligns with sustainable development goals.

By driving investment, shaping trade and regulatory frameworks, and contributing to soft power, TNCs expand the scope of diplomatic engagement beyond the state and have become indispensable actors in modern ED. However, their influence also requires careful governance to balance private interests with broader societal and global objectives.

Non-governmental organizations (NGOs) play an increasingly influential role in ED by acting as bridges between governments, private sector actors, and civil society. NGOs contribute by shaping policy agendas, providing expertise, and advocating for inclusive and sustainable economic practices, while publicly pressuring negotiations and pushing trade, investment, debt and tax regimes towards more transparent, rights-based and sustainable outcomes (World Trade Organization, 2024).

One of the key roles of NGOs is policy advocacy and lobbying. The most recent United Nations Conference on Trade and Development's Report in 2024 notices their influence through negotiations on trade, development, and investment by promoting standards related to transparency, human rights, environmental protection, and labor conditions. Through research, reporting, and participation in international forums, NGOs help ensure that economic diplomacy outcomes reflect broader societal interests rather than purely commercial considerations.

NGOs also serve as important sources of technical expertise and data. Many organizations conduct field research and provide evidence-based recommendations that inform decision-makers (World Bank, 2024). In developing countries in particular, NGOs often have access to local knowledge and networks that governments or international institutions may lack, making them valuable partners in designing and implementing economic policies. NGOs supply technical inputs and data into World Trade Organization committees, trade policy reviews and standard-setting bodies, acting as issue experts for governments with limited capacities.

Facilitating dialogue and trust-building is yet another critical function. NGOs often act as intermediaries between stakeholders, including marginalized communities, businesses, and governments. This role is especially important in conflict-affected or fragile contexts, where NGOs can help foster cooperation, support development projects, and contribute to economic stability (International Crisis Group, Core Report 2024/2025).

Finally, NGOs contribute to accountability and transparency in economic diplomacy. By monitoring agreements and holding actors accountable for their commitments, they enhance legitimacy and public trust in economic governance processes (Transparency International, 2024). NGOs complement traditional state-led economic diplomacy by promoting inclusivity, sustainability, and accountability, thereby broadening both the scope and impact of international economic engagement. Their capacity for mobilizing public opinion and protest can create political pressure on governments for blocking or reshaping deals.

Other authors (Bratosin-Vasilache, 2024) expand the active participants to ED to include other types of civil society manifestations, such as religious organizations. Their influence resides in their role as moral advocates, norm-entrepreneurs and finance actors. Large religious organizations can mobilize faith-based capital and engage directly with states and international institutions. They can act in conflict regions, using authority to influence peace-building and international relations while also influencing social and political change through religious leaders.

The relevance of illegitimate non-state actors is also not to be understated. Non-state armed actors (NAAs) are going international much more than ever before. Though not part of the formal concept of economic diplomacy, NAAs engage in economic bargaining and quasi-diplomatic negotiations around resources, taxation, trade and migration, especially where they

control territory or key economic flows (Kurtenbach, 2024), functionally making them part of some of the processes. This takes place when NAAs provide the *de facto* governance in conflict zones, by mimicking state economic functions and using leverage given by their control over production, smuggling corridors or border crossings. Sometimes through direct negotiations with foreign states, armed groups can use economic levers that monetizes their control over populations and territories (Bish, 2025). International organizations and development actors can negotiate with NAAs to secure access, ensure respect for ceasefires or encourage investments in civilian governance, sometimes including tailored funding mechanisms for services under their control (International Peace Institute, 2024). In peace processes and transition talks, NAAs can effectively engage in economic diplomacy related to reconstruction funds and future economic government arrangements.

5. CONCLUSIONS

Though post-modern theories related to international relations and the role of diplomacy have not yet managed to replace established theories like realism and liberalism, it is clear that their critical approach of earlier models has gained significant traction in the realities of the beginning of the century. The complex interdependence theory promoted by liberalism is not able to fully explain and predict the intricate interconnectivities and interdependencies related to production, finance and supply chains of a globalized world, while the state-centric approach of traditional models seems to lack depth and pragmatism.

Under these circumstances, the very definition of economic diplomacy has been in constant change, with new elements being added to explain the transition from a traditional branch of diplomacy to a new type of instruments, with emerging actors and updated tools. Formal interactions by accredited representatives through established channels have transitioned to more informal and less rules-based negotiations. The concept of ED has been expanded from an international political instrument with the scope of reaching economic objectives to an overarching concept, that engulfs elements of politics, commerce, business and trade while empowering non-state entities as relevant stakeholders at the negotiation table. This is a far cry from its initial roots as a mere branch of diplomacy.

Governments are eager to attract and retain investments, which gives some of the non-state actors, especially TNCs, the upper-ground in negotiations and makes them drivers and beneficiaries of ED. This shifting power dynamic is a result of the fact that some TNCs hold comparable economic power to states, which makes their influence disproportionate to their traditional role.

The capacity to promote or influence regulatory standards, shared by both TNCs and NGOs, though through different means and with different scopes, contributes significantly to the very globalization that has made them relevant. Even if they sometimes seem in contradiction, since NGOs tend to promote environmental or labor related agendas, while TNCs are more oriented towards financial gains, the core principles of corporate responsibility can align different types of actors and add even more pressure on states.

Non-state actors also have the significant advantage of being very active in „Track II diplomacy“, which refers to unofficial and informal interactions, especially when official diplomatic channels are stalled or ineffective (Davidson, 1981). This adds strength to their negotiation stance because they are not bound by political pressure or rigid mandates, adding to the versatility and adaptability that seem to be the trademark of contemporary ED.

In conclusion, global interdependence is stretching the capacity of states to solve complex problems, including those related to economic issues. Limiting ED to the activity of accredited representatives in highly formalized environments and sticking to conservative models severely reduces the capacity of states to adapt to an evolving economic scenery. While

some states have swiftly integrated other actors aligned with their national interests into their own diplomatic approaches, others are lagging behind in acknowledging the increasing relevance these non-state entities have on the world economic stage.

While still testing the many implications and practical relevance of the concepts posited by post-modern theories, we do believe that the questions raised regarding both the role of states and of other relevant entities in the future of global economy are prominently relevant and should be consistently factored into any future theoretical model that seeks to unite global governance and economic diplomacy.

REFERENCES

1. Barston, R.P. - *Modern Diplomacy, Third edition* (2006)
2. Bayne, Nicholas and Woolcock, Stephen - *The New Economic Diplomacy, Decision making and negotiations in international economic relations* (2017)
3. Bergeijk, P.A.G. van and Moons, S.J.V. - *Does economic diplomacy work? A meta-analysis of its impact on trade and investment, The World Economy* (2016)
4. Berridge, Geoffrey - *Diplomacy: Theory and Practice* (2015)
5. Bish, Alexandre – *Migration Proxy Warfare: Exploring the role of non-state armed actors in Libya's refugee rentierism*, University College London (2025)
6. Bratosin-Vasilache, Cătălina - *Redefining Economic Diplomacy: The Growing Role of Non-State Actors in a Changing World* (2024)
7. Bull, Hedley - *The Anarchical Society: A Study of Order in World Politics* (1995)
8. Campbell, David - *Writing Security* (1992)
9. Davidson, William D. and Montville, Joseph V. – *Foreign Policy According to Freud* (1981)
10. Doyle, Michael - *Kant, Liberal Legacies, and Foreign Affairs*, Philosophy & Public Affairs (1983)
11. Falkner, Robert - *Business Power and Conflict in International Environmental Politics* (2008)
12. Freeman, W. Chas – *Diplomacy*, <https://www.britannica.com/topic/diplomacy>
13. Foucault, Michel - *The Archaeology of Knowledge* (1969); Derrida, Jacques - *Of Grammatology* (1967)
14. Foucault, Michel - *Power/Knowledge* (1980)
15. Hamilton, Keith and Langhorne, Richard - *The Practice of Diplomacy: Its Evolution, Theory and Administration* (2011)
16. Kant, Immanuel - *Perpetual Peace* (1795); Keohane, Robert - *After Hegemony* (1984)
17. Keck, Margaret and Sikkink, Kathryn - *Activists Beyond Borders* (1998)
18. Keohane, Robert and Nye, Joseph - *Power and Interdependence* (1977)
19. Kurtenbach, Sabine – *Non-state armed actors, war economies and post-war violence* – *science direct.com*, accessed 10.12.2024
20. Hertz, John H. – *Idealist Internationalism and the Security Dilemma* (1950)
21. Lee, Donna and Hocking, Brian – *Economic Diplomacy, Oxford Academic* (2018)
22. Martin, Lisa - *Interests, Power, and Multilateralism* (1992)
23. Morgenthau, Hans - *Politics Among Nations* (1948)
24. Pigman, Geoffrey Allen - *Contemporary Economic Diplomacy* (2016)
25. Saner, Raymond and Liu, Lichia – *International Economic Diplomacy: Mutations in Post-Modern Times, Netherlands Institute of International Relations* (2003)
26. Schwab, Klaus *The Fourth Industrial Revolution* (2016)

27. Vladoiu, Nasty Marian - *Universul Juridic, Diplomația economică, genotip al diplomației comericale* (2025)
28. Walker, R.B.J. - *Inside/Outside: International Relations as Political Theory* (1993)
29. Waltz, Kenneth - *Theory of International Politics* (1979)
30. Wang, Henry and Miao, Mabel Liu – *Enhancing Global Governance in a Fragmented World* (2024)
31. *Boston University Experts Served in Vatican Commission Urging Global Debt Relief* – bu.edu/articles/2025 – accessed on 20.12.2025
32. International Crisis Group - *Report on fragile states and economic governance*
33. International Monetary Fund - *Research on globalization and corporate influence*
34. International Peace Institute - Global Observatory – *Why should development actors engage with non-state armed groups?* (2019)
35. Organisation for Economic Co-operation and Development - *Guidelines for Multinational Enterprises*.
36. Transparency International - *Corruption Perceptions Index* (2024)
37. United Nations Conference on Trade and Development - *World Investment Report* (2024)
38. United Nations Conference on Trade and Development - *Trade and Development Report* (2024)
39. Vienna Convention on Diplomatic Relations (1961)
40. World Bank - *Global Investment Competitiveness Report* (2024)
41. World Bank - *World Development Report* (2024)
42. World Trade Organization - *World Trade Report* (2024)